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Portrayal of Ottoman Empire in Iranian High School History Textbooks

Kemal Kaya
Van Yuzuncu Yil University

Abstract

This article focuses on how the relations between Ottoman and Iran, which are important states of Islamic history, are discussed in Iranian high school history textbooks. The shadow of collective belief and identity constructed through history education reverberates across the fields of international and foreign policy. Past relations affect two peoples not only politically but also socially and culturally, which mostly manifest themselves in the field of education. The way bilateral relations are addressed in textbooks directly affects the way two peoples perceive each other. The aim of this study is to determine the portrayal of the Ottoman Empire in Iranian high school history textbooks in terms of the relationship between history and identity. Document analysis was used to collect data from high school second- and third-grade history textbooks published between 2017 and 2018. A descriptive model was used. Qualitative research method was used for data collection, analysis and interpretation. Iranian history textbooks depict the Ottoman Empire as a neighboring state that sees itself as the protector of Islam and pursues anti-Shiite politics because it does not want a strong state in its east. They also portray the Ottoman Empire as an aggressive and opportunistic state that uses the internal weaknesses of the Iran State, which sees itself as the protector of Shiism.

Keywords: Islamic Republic of Iran, History Textbooks, Perception, Identity, Othering

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INTRODUCTION

Perception is a multi-faceted concept and a process in which stimuli are converted into meaningful experiences through our sensory organs. This experience, that is, perception, is a common product of stimulation and process. The transmission of stimuli to the brain by sensory organs is defined as sensation while making sense of internal and external stimuli through sensations is defined as perception. The Dictionary of Psychology defines perception as a simple state of consciousness acquired by sensing stimuli. The dictionary of the Turkish Language Association defines perception as the state of awareness and recognition of something by directing attention to it. The Dictionary of Sociology (Ozankaya, 1980) defines it as the effect of stimuli on sensory organs and their reflection in consciousness. In psychology, perception is defined as a process in which the brain analyzes stimuli together with their relationship to other stimuli around them and comprehends them as meaningful integrals. This is the process by which stimuli are understood. Unlike sensation, which is a simple physiological process, perception is a complex psychological phenomenon.

Perception is defined as a process in which independent sensory data are converted into a meaningful whole to understand stimuli (Cüceloğlu, 1996). Perception is unique to living things. Perceptual characteristics can be derived from the relationship between different stimuli and experiences or perceptions arising from those stimuli, and theories can be developed on perception in line with those inferences (Arkonaq, 1998, Coren et al., 1993). It is, however, impossible to observe perception directly, and therefore, the validity of those theories can be assessed only indirectly. Friman (1999) addressed Pepper (1967) to analyze perceptual actions and the interaction between emotions and the environment and argued that an object and an observer are necessary for perception to occur. When someone says, “I see a chair,” the chair becomes an object and he/she becomes an observer (Friman, 1999). Perception enabling us to see the chair presents the stored information in our brain and allows us to make an informed choice among numerous classified and comparable decisions. Contrary to common knowledge, it is not actually the eyes that see. What makes sight possible is actually the brain. If the visual processing center of the brain is damaged, it cannot send messages to the eyes, which, therefore, cannot see. Ἐπικούρειος (450 BC) stated 'What sees is mind, what hears is mind, the ear and eye are deaf and blind (Coren et al., 1993). Sensory information is acquired in two ways; progressive learning and asymmetrical learning. Progressive learning is education from infancy to adulthood involving inherited and acquired features. Asymmetrical learning is an educational process from childhood to adulthood, involving religion, business life, conflict and friendship, associations, heroes, leaders and fears, desires and anger (Godlewski, 2010; Godlewski, 2009). Learning shaped by the developments around it begins at birth and continues throughout our lives.

Perception has long been a preoccupation of philosophers tackling the questions on the source and validity of knowledge. Numerous philosophers have addressed the nature and process of perception and its value as a source of information and revealed many perceptions that look different from each other (Hacikadiroğlu, 1984). Epistemologists have explored whether there is a real world that is independent of human experience, and if so, how it can be learned and how its authenticity or accuracy can be determined. One of the basic questions is what the truth is, for which there is no definitive and "correct" answer. Discussions concerning the answer to the question usually end in “it depends.” The answer to the question can be reached on the basis of social structure and consensus and belief (Friman, 1999). Starting from the concept of “truth,” perception refers to conscious experiences among objects (Coren et al., 1993). Something which is right for someone might be wrong for him/her in a different situation. Similarly, something which is right for someone might be wrong for someone else. The truth varies from region to region, from country to country, even from person to person, and therefore, there is no single truth. Therefore, the perceived truth vary from person to person (Friman, 1999). People’s perceptions of things, therefore, vary according to the region, culture and individual.

Another philosophical debate is whether perception is innate or learned. While such nativist thinkers as Descartes and Kant argue that perception is innate, empiricist thinkers such as Berkeley and Locke argue that individuals develop perception skills through their experiences with objects.
around them. However, many contemporary psychologists think that both arguments have some merit. However, no one denies that practice and experience affect perception. Therefore, whether perception is innate or learned is still a moot point (Source, 1990). How perception occurs is more important than what perception is. In this process, perception causes differences among individuals depending on some factors.

It is mostly psychologists who have explored the scientific foundations of perception. They regard perception as a basic mental process (Gun, 2005). Perception organizes and interprets sensory data. It is a meaning-making process for external stimuli (Arkonacı, 1998). Perception can also be defined as mental interpretation of external stimuli. Perceptions show us what we see, how we interpret, what we believe and how we respond. Our perceptions create values in our minds and set and solve problems. Numerous psychologists characterize our perceptions that have such a powerful feature as real (Johansson and Xiong, Willimon, 2000). Perception affected by expectations and motivational situations categorizes the behavior and motives of other people in mind to update its prior knowledge with additional information in order to realize social perception (Arkonacı, 1998). Body language, words, clothing style and environment are the factors that affect perception. The combination of all these factors creates a value in the perceiver’s mind and allows him/her to make inferences (Baltas, 2007).

Sensory data are brought together to make a meaningful whole to understand or interpret them (Eren, 2010). Sensory data become neurophysiological energy at the sensory level at which perception starts. Genes and experiences affect perception the most. Perception is both a combination of innate and acquired skills and a result of the development of innate skills through learning (Arkonacı, 1998, Türk, 2014). The external information obtained, organized and processed allows people to develop a number of theories, assumptions and ideas about the world and adjust their behaviors and attitudes accordingly (Eren, 2010, p. 69).

In his study “Perception Warfare,” Friman (1999) states that Miller (1956) argues that perceptions are limited to skills and knowledge. In the same study, Friman (1999) also states that Simon (1987) argues that beginner and expert chess players use different moves and tactics. This shows that knowledge and skills play a critical role as they allow some people to find practical solutions to problems for which others have been unsuccessful because perception is affected by mental state, experiences, needs, conditioning, information, expectations and social environment. Everything we see, hear, taste, touch, smell and experience is affected by experiences, expectations, environment, interests and needs. Meaning and perspectives are formed through perceptual processes. Everyone perceives the environment in a special way through mental knowledge. Therefore, perception is actually a personality reaction. These processes are also active in the foundations of civilization and culture. Culture, social and individual values, aesthetic values and habits shape perception. The behaviors resulting from perception also play an important role in the establishment and development of culture. Therefore, culture and perception affect each other. Past impressions and experiences affect new perceptions. External stimuli are fundamentally established ideas or beliefs that assume a role in the processing of data in the brain. Fundamental beliefs allow people to filter information and assign meaning to them (Köröglu, 2009). Perception affects people's attitudes to facts or events. People's reactions vary according to their perceptions. The way we react to any situation depends on our perception. People's feelings for and reactions to a situation depend on how they interpret it and what they think of it. The situation itself does not directly determine feelings and reaction but perception is mediated by emotional response (Beck, 2015).

About two thousand years ago, Epictetus, a prominent stoic, stated that people are affected not by things but by how they perceive and make sense of them (Arslan, 2008). External stimuli and interactions are observed and evaluated at the level of consciousness, a connection is established between past and present experiences, and actions are designed accordingly. Therefore, perception varies from culture to culture and from individual to individual. People tend to organize their experiences and assign meaning to them. This trend is determined by culture, expectations, needs, unconscious tendencies, value judgments and conflicts. However, opinions, assumptions, theories and
ideas change over time because perception is continuous. New experiences, discoveries, beliefs, convictions and theories allow the processing and comprehension of new knowledge, which may cause people to change their minds or abandon their beliefs altogether (Eren, 2010).

Perception is a meaningful, systematic and total reaction of an organism to a stimulus. Perception is the result of senses and based on previous experiences and knowledge. Perception is, therefore, a personality reaction. The most important symptom is that one becomes aware that one’s senses belong to a particular stimulus. The fact that one develops a perception of a stimulus means that one knows about that stimulus. The proverb “out of sight, out of mind” also confirms that our perception depends on closeness, acquaintance and relationship.

State formation gave birth to the concept of sovereignty. It began with the 1648 Westphalia Treaty and reached a peak with the French Revolution based on the concept of imagined community described by Benedict Anderson (2004). As he puts it, a nation “is imagined because the members of even the smallest nation will never know most of their fellow-members, meet them, or even hear of them, yet in the minds of each lives the image of their communion.” The assessment of the creation of imagined communities through the concept of sovereignty has resulted in the formation of “us” and the “other.” Othering involving the negative abstraction that foreigners are different from us feeds off of this ground (Habermas, 2005). The interactions and education that we have had since childhood lead us to develop stereotypes about others (Semnani et al., 2012). International relations that should be based on feelings, sensitivity and ethical values are unfortunately overshadowed by prejudices due to the policies of nation-states (Levinas, 2003). International conflicts and colonialism and imperialism have deepened the gulf between peoples. Although technological developments and economic arrangements in the twentieth century made borders obsolete, they have failed to destroy the prejudices and negative portrayal of the other.

According to Durkheim’s social theory, boundaries are defined and grouped through the concepts of “within-group” and “without-group.” Socio-psychological definitions help us to distinguish between us and them and to keep people within the group. Ideals are philosophically the most important constituent elements on which the method used by modernity is based. As Neumann (1996) states, the self and the other should be defined to establish social boundaries. Beavers (1990) argues that the other has to exist as much as the meaning we attribute to it and limited to the way we construct it. Therefore, othering is used to justify the clash of civilizations, the Cold War polarization and discriminatory colonial policies.

According to the post-structuralist theory, identities, and therefore the Other, are produced by people. This leads to the use of discourses in daily life to produce meanings, to construct identities, to establish social relations, and ultimately, to carry out political and moral transformations because discourse has an important normalization capacity in itself. Normalization provides a background for predicting, and hence, normalizing the information that is intended to be accurate. Concepts produced within the framework of these discourses can be used to produce perceptions that are in sharp contrast to each other. Basing our relationship with the other on ethical values allows to eliminate negative perceptions (Levinas, 2003). What is meant by discourse here is not only verbal signs, but also photographs, texts and films. Concentrating on discursive practices enables us to recognize how truth and knowledge are produced together with political military and economic practices. Discourse analysis is a very important tool for researchers to understand and scientifically explain how, and most importantly, why an event or situation occurs (Doty, 1996).

Textbooks as a Means of Constructing Perceptions

Textbooks, which have an important place in educational institutions, are one of the most cost-effective and useful means of disseminating information and values to large audiences. Through the information and values that they include and exclude, textbooks are instrumental in constructing social reality from a certain perspective. The main problem with textbooks is about the information and values that they disseminate. Textbooks cover only a tiny fragment of the ideas, values, and
knowledge of a culture. The knowledge and values in textbooks are a result of complex cultural, economic and political processes that make up the social structure of a given period (Apple & Christian-Smith, 1991; Moses, 2010). Education policy selects only a portion of the universe of knowledge and values and organizes and eliminates them and places them in textbooks. McLaren (1989) states that no educational policy is politically and ideologically innocent. The concepts of school knowledge, curriculum and textbooks are, in a sense, intertwined with issues of gender, class, other, culture and power. Therefore, history is often considered a controversial subject since it is often used to shape a national identity and to create a particular image of the past and the other for future generations. Through implicit or explicit value judgments, the content of textbooks legitimizes the status quo. The stories of the past provide a context and perspective for today's events. Eclectic textbooks develop a line of logic that explains and justifies and reproduces the current social order. History textbooks often exalt certain identities while conjuring up the image of a glorious past and offer less information about the struggles and mistakes of the dominant group in society. Glorifying one group and demonizing or ignoring the other and interpreting historical events in favor of a particular agent is often a state policy.

The first studies on textbooks focused on stereotypes and xenophobia within the framework of the League of Nations after World War I. With the establishment of UNESCO after World War II, it was concluded that textbooks should have a content that strengthens international diplomacy and cooperation between peoples, and hence, universal peace. A Handbook for the Improvement of Textbooks and Teaching Materials as Aids to International Understanding published in 1949 set a series of criteria for the first time. After the World Wars, it was recognized that textbooks had nurtured hostility between nations and contributed to the bloody conflict in the past. A history teaching focusing on military achievements, in particular, plays an important role in the construction of “friends” and “foes” and “us” and the “other.” Research on textbooks focused on the elimination of elements that could provoke hostilities to prevent at least some of the conflicts that might arise in the future (Şimşek & Alaslan, 2014).

History textbooks are instrumental in both creating a perception. According to Wirth, textbooks misuse history. Wirth lists the forms of misuses of history as follows:

**Denying Historical Facts**: This method is often used and also promoted by the state. States deny facts due to the pressure of the international community. National history does not include certain “unfortunate” events to make people forget about them.

**Misleading**: False evidence is produced, and any material can be used as false evidence. In this age where images are of paramount importance, all kinds of falsification can be easily performed. Images are distorted. This tactic is increasingly used thanks to new information and communication technologies. Documents are falsified and destroyed, or historical events are presented in a distorted way. Countries join the national collective consciousness or misuse history by producing false evidence for their own reputation and interests.

**Focusing on a Specific Event**: States or nations focus on a particular event to divert people's attention to make them forget about a different historical event.

**Omitting**: Some information is ignored or omitted. Some parts of a historical event are not discussed.

**Misuse of History Due to Laziness or Ignorance**: Researchers do not update their information. Opinionated and narrow-minded scientists often commit this type of misuse.

**Misuse of History for Commercial Interests**: Clichés, biased information and ideologies are imposed through the media. Authors do their own publicity to increase the sales of their books that contain nonacademic information (Wirth, 2003).
Ottoman-Iranian relations

The House of Osman emerged as a frontier principality in the second half of the thirteenth century and rapidly expanded its geographical boundaries eastward and westward. The Ottoman dynasty conquered Istanbul and took almost all of Anatolia under its rule in the second half of the fifteenth century and became neighbors with the Aqqoyunlu, Qaraqoyunlu, Safavid Empires in the east, and with the European Empires in the west. The Safavid Empire was founded in the sixteenth century (1501-1508) in Persia. The first political relationship between the Safavid and Ottoman Empires began with the Safavid ruler Shah Ismail defeating the Aqqoyunlu State and making Tabriz the capital in 1502 (Kunt et al., 1997).

The main factor determining the relations of the two states was sectarianism. Partially religious conflicts took place between Safavid Shiite Iran and Sunni Ottoman Empire as both of them concerted efforts to expand their sphere of influence. The Ottoman Empire considered the growing influence of the Safavids on the Shiite tribes living within its borders to be a security problem. Therefore, the relation between the two empires shifted from political sphere to battlefields. Selim I took measures to prevent Iranian Shiite influence as soon as he came to power. Before his expedition to Iran, he eliminated many Kizilbashes, who were Safavid supporters. With the Battle of Chaldiran that ended with a decisive victory, the Ottoman Empire interrupted the Safavid Empire’s search for influence, albeit for a while and took control of Erzincan and Erzurum, which were of strategic importance. The Safavid Empire, on the other hand, entered a period of serious crisis (Emecen, 2003). Tahmasp I sought ways to increase his influence over the Shiite Turkmen groups in Anatolia, which led Suleiman I, the then Ottoman Empire, to a two-year expedition to Iran in 1534. During the first Irakeyn expedition, Suleiman I entered Tabriz. On its way back, The Ottoman Empire developed relations with Uzbek Muslims in eastern Iran to strengthen its role as the protector of the Sunni world against Shia Iran. Following the expeditions in 1548 and 1553, Tahmasp I of Safavid Iran and Suleiman I of the Ottoman Empire signed the Peace of Amasya in 1555 (Kılıç, 1997). Following the three great and costly expeditions during the time of Suleiman I, the Ottoman Empire put pressure on the Safavid Empire and drew a natural border by building castles and defensive lines in the conquered regions.

Despite several incidents, the two Empires remained loyal to the provisions of the treaty until the Ottoman Empire attack in 1578. However, the Safavid Empire faced political instability after the death of Tahmasp I in 1576, which encouraged the Ottoman rulers for war. Although some Ottoman rulers, especially the Grand Vizier Sokullu Mehmed Pasha, advised against breaking the peace, the Ottoman Empire declared war on Iran in 1578 and won a decisive victory and reached its widest borders in the east with the Treaty of Constantinople signed on 21 March 1590. After the subsequent wars, the Two Empires signed the Treaty of Nasuh Pasha (1612) and the Treaty of Serav (1618). The borders defined by the Treaty of Zuhab (1639), which were signed between the two Empires after Murad IV’s expedition, are still valid. The peace treaties signed in 1736 and 1747 also accepted the terms of the Treaty of Zuhab (Colak, 1976). The Treaty of Zuhab determined not only political, but also religious, economic and demographic borders between the two empires. Long-lasting wars were costly for both empires. Although the Ottoman Empire somehow managed to finance the wars, it went through tough times. Especially the taxpayers of Anatolian cities had to make serious sacrifices to finance the wars.

Iranian Education System

The modernization process of the Qajar dynasty is in many ways similar to that of the Tanzimat period of the Ottoman Empire. The Qajar dynasty implemented reforms on education as a result of economic and political developments. Dar’ül-Fünûn was founded in 1851 by Emir Kebir. It was the first higher education institution established in western style to train experts in science and technology. Having been the first secular educational institution to employ European teachers, Dar’ül-Fünûn was also the home of intellectuals who would later pioneer modernization in Iran.
reformists who wished to break the influence of the Ulama on education and law regarded education as an obligation of the state, which led to a duality in the socio-political structure of Iran. As in all examples of westernization, law and education were critical areas for secularization and modernization (Aşık, 2006).

With the transition to the constitutional regime in 1911, all educational institutions gathered under one roof and the number of western-style schools increased. During the Pahlavi dynasty (1925-1979), radical changes were made to improve, accelerate and modernize education for nation state building. Top-down reforms in all areas of daily life as well as in education led to a counter reaction in certain segments of the Iranian society, which turned into social protests from 1963 on and resulted in the 1979 revolution (Asl, 2007, Limbert, 1987).

The post-revolution regime made fundamental changes to education. This time, education became a means of Islamizing the whole system and raising new people in line with Islamic values. Colleges and universities were shut down to restructure the education system in accordance with the ideology of the new regime. Gender segregation was implemented at all primary and secondary schools. The Cultural Revolution Committee was established in 1980 to restructure and supervise the education system within the framework of Islamic values. New educational goals were set, new curricula were developed, and Islamic-based teaching materials were included in primary school curricula and textbooks within six months of the revolution. The philosophical transition that began with the 1979 Revolution created some changes in the attitudes and goals of the regime due to the economic demands and labor force necessities of the 1990s. The regime wished to strike a balance between the desire for cultural and spiritual independence from the West and the desire to be successful than the West (Arani et al. 2012).

Pre-university education in the Islamic Republic of Iran is 12 years (5 years of primary school, 3 years of secondary school, 3 years of high school and last 1 year of pre-college preparation). The Iranian education system, which has a dynamic nature, was restructured by the Ministry of Education again. Curricula, textbooks and school time were redesigned. Since the 2016-2017 academic year, 5-year primary education has been increased to 6 years and 4-year high school education has been reduced to 3 years. In this way, the 12-year education period has been 6 + 3 + 3.

In Iranian education system, high school is considered critical because it lays the foundations of philosophical, psychological and social life. According to the curriculum determined by the Ministry of Education, high school education has numerous religious, moral, scientific and educational, cultural-artistic, social, political and economic objectives. High school is a bridge between basic education and higher education and a transition period from general education to vocational education and prepares many people for social and professional life. Therefore, any success or failure at high school level directly affects the Iranian society (Safi, 2011). High school courses are offered within the general curriculum. Iran is composed of provinces, and therefore, geography textbooks contain information about each state.

As with other revolutionary societies that undergo rapid social and political transformations, so with Iran, textbooks, especially books of social sciences, were regarded as key transmitters of the values of the new regime. This importance attributed to textbooks is also obvious from the fact that they were modified right after the revolution. (Mehran, 2015). Especially books on history, economics, sociology and psychology were modified and all textbooks were rewritten in accordance with the ideology of the revolution in two years. History textbooks also play an important role in students' learning experiences. History textbooks are used more than other textbooks. They are, in a sense, curricula in Iran, as in countries that focus on building a national identity and instilling a sense of belonging (Moses, 2010). Therefore, their impact and role in lessons is more evident. Second, they teach citizens the official ideology of the state. Finally, they reconstruct people's past and image of national unity (Shorish, 1988). Iranian textbooks have been revised from now and then. Within the framework of this revision, a new curriculum and new books have started to be used as of 2016-2017 academic year. The textbooks which were previously 23x16 cm were increased to 27x20 cm.
Literature

There are numerous studies on Iranian textbooks. Some of them focus on Western image and representation of religious values in textbooks (Shorish, 1988; Matini, 1989; Mehran, 1989). Those studies reported that textbooks imposed Shah’s understanding of the West and focused on Persian culture while ignoring Islamic culture. Zarean’s (1998) research on the portrayal of the ideology of the 1969 revolution and of the Islamization of Iran in textbooks complements these studies.

There are also studies focusing on history textbooks to address the post-revolution Iran. Yazdanjoo (2012) explores how political and religious authorities used textbooks to make history teaching dependent on their own policies in the post-revolution Iran. Zadeh (2012) examines how history textbooks teach Iranian identity and history. Soltan Zadeh (2012) focuses on the use of history education to build Iranian national identity.

There are some Turkish researchers investigating the Iranian education system and textbooks. Kendirci (2006) focuses on the portrayal of religion and citizenship in Iranian primary school textbooks. Batan (2011) examines written and visual elements in Iranian primary and secondary school textbooks in order to analyze how Turks and the concept of Turkishness is portrayed in Iranian education system and policies. Celik and Celik (2015) and Cencen (2017) identify the discourses regarding Turks in the secondary school textbooks of the post-revolution Iran. There are, however, no studies investigating how Iranian high school history textbooks portray the Ottoman Empire.

Research Objective

The aim of this study was to determine how the Ottoman Empire is portrayed by Iranian high school history textbooks. The study sought to find answers to the following question:

What kind of discourses regarding the Ottoman Empire do Iranian high school history textbooks have? Are these discourses consistent with historical data?

METHOD

The aim of the study was to determine how high school history textbooks in the Islamic Republic of Iran depict the Ottoman Empire. A descriptive model was used. Qualitative research method was used for data collection, analysis and interpretation. Qualitative research is defined as a research method in which qualitative data collection techniques such as observation, interview and document analysis are used and perceptions and events are presented in a realistic and holistic manner (Yıldırım & Şimşek, 2004). Qualitative research is based on an interdisciplinary holistic perspective and adopts an interpretative approach to the research problem. Qualitative research addresses phenomena or events within their contexts and interprets them in terms of the meaning that people attach to them (Altunışık et al., 2010). Pingel (1999) states that quantitative and qualitative methods can be used in studies on textbooks. Quantitative methods focus on components such as how many times a word is used or how much space is devoted to a topic in a text. The qualitative method focuses on a deeper understanding and analysis of a text within its own context. Pingel (1999) identified four qualitative methods for textbook analysis: (1) hermeneutic analysis used to decipher hidden meanings in texts, (2) linguistic analysis examining (key-) words and terminology with controversial meanings, (3) intercultural analysis focusing on representative studies of controversial issues and taking into account both sides of the discussion and (4) discourse analysis used to determine what topics are important, what main themes are revealed and what values are suitable.

Data were collected using document analysis. Document analysis is the analysis of written materials containing information about a phenomenon (Yıldırım & Şimşek, 2004: 153). Textbooks are documents used in educational research. The following steps were taken to analyze the textbooks: (1) Current high school history textbooks used in Iran were obtained, (2) the sections concerning the
Ottoman Empire were translated from Persian into Turkish and (3) narratives and visuals about the Ottoman Empire were analyzed using discourse analysis (Pingel, 1999; Gee, 2005).

Results

The second-grade history textbook attaches special importance to the Safavid period in terms of Iranian history. It states that the Safavid Empire turned Shiism into an official sect, brought about an economic recovery and transformed Iran into a politically, geographically and socially integrated state. It also states that Iran developed political, economic and cultural ties with its neighbors and European states during that period, which had serious repercussions in the region and in the international arena (History 2). The Ottoman Empire became a staunch defender of Sunnism as a counter maneuver against the Shiite-ization of the Safavid Empire (Kunt et al 1997).

“Selim I became the Sultan of the Ottoman Empire and dispatched his large army to Iran. Although Selim I was looking for ways to expand his territory, he was actually worried and afraid of the establishment of a strong Safavid state. The two armies met in the plain of Chaldiran and the Shah's soldiers fought with courage. However, they could not stand before the firearms of the enemy (960) and, Tabriz, the capital of the Safavid Empire, fell under Ottoman occupation for a while” (History 2: 139).

The difference between the old and new textbooks is that the pejorative terms and stereotypes in the former have been replaced by more objective descriptions and explanations in the latter. For example, the old textbook described Selim I as “uncompromising, ruthless and stone-hearted” (History 271/3 1389: 32) but the new textbook does not contain just descriptions. Although the narrative texts do not contain such expressions, some reading texts do. In the activity regarding the reasons behind the defeat of the Battle of Chaldiran, Selim I was described as someone who is “eager to shed blood” quoted from page 288 of the Sefernâme-i Venizyan by Katrinuznu (History 2: 138).

In the activity, students are given two quoted texts and they are asked to compare them and interpret what kind of conclusion can be drawn. The Sefernâme-i Venizyan states that Iranian soldiers were in disarray because they lacked good command. Shelling the Iranian army by order of Sinan Pasha, the Ottoman army triumphed and immediately began plundering. It also argues that if it was not for the cannons, the Ottoman army could not have survived the Iranian arrows. The excerpt from Tarih-i Elçi-i Nizam Şah by Hürşah bin Kubad Hüseyni states that Iranian soldiers fighting fearlessly from dawn to dusk could not make a move against the enemy because they were out of ammunition (History 2: 138). The result that students can draw from those two texts is as follows: It is not courage and genius but military technology that won the Ottoman Empire the battle and If the Iranian army had had the same opportunities, it would have defeated the Ottoman Empire.

The grade-two history textbook describes the period of Tahmasp I, who ascended the throne after Shah Ismail's death, as the period during which the Iranian State grew stronger. After Shah Ismail's death, his son Tahmasp I ascended the throne at the age of two. “The Safavid Empire was going through political turmoil in the early years of his sultanate. On the one hand, the leaders of the Kizilbash provinces were a law unto themselves and struggling with each other, and on the other hand the Uzbeks were attacking from the east and the Ottomans from the west to the Iranian territory (History 2: 138). Tahmasp I immediately took over the internal affairs and neutralized the Kizilbash leaders. Then he defeated the Uzbeks and drove them to Khorasan. He took systematic measures to repel the Ottoman attacks. During his reign of 54 years, Tahmasp I secured the Safavid rule with a cautious and appropriate policy both within and without ” (History 2: 139). As stated in the narrative text, the Safavid Empire was under attack by its eastern and western neighbors due to the weakness caused by political and economic turmoil. The fact that the text states that the Safavid Empire repulsed the attacks as it grew stronger shows that the text portrays both neighbors as opportunistic.

“The history of Iran after Tahmasp I is discussed as follows: During the short reign of Ismail II and Mohammad Khodabanda after Tahmasp I’s death, the Safavid Empire again plunged into
political turmoil. When Abbas the Great ascended the throne (996), the Safavid Empire was going through domestic and foreign political turmoil. On the one hand, the Kizilbash leaders were fighting each other for their own personal interests, on the other hand, the Ottoman Empire was invading Iran territories. In the east, Horasan was targeted by the Uzbeks."

1. “Ensuring political military and internal security: the Kizilbashes were suppressed.

2. Formation of new military organizations: Until Abbas the Great, the Safavid army was composed of the Kizilbash of different provinces, and they were always pursuing their own interests” (History 2: 139).

In the Ottoman historiography, the Kizilbash is perceived as a great threat to Ottoman-Iranian relations. The narrative text also describes the Kizilbash as a threat to the Safavid Empire, suggesting that the Safavid Empire shares the same view of the Kizilbash as the Ottoman Empire, albeit implicitly.

The textbook also addresses the Ottoman-Iranian relations in the reign of Abbas the Great, which witnessed economic, social and cultural developments. “The enemy desperately left Iranian territory: Abbas the Great firstly suppressed the Kizilbash and then began to prepare to strike great blow on his external enemies. He thought that it was difficult to withstand the Uzbeks in the east and the Ottoman Empire in the west. He, therefore, made peace with the Ottoman Empire and sent troops to Khorasan to take heavy blows to the Uzbeks and defeated them. Then he defeated the Ottoman army with the sudden attacks of the Safavid cavalry that he sent to Azerbaijan and reclaimed the entire western Iran and Iraqi region. Another victory during the reign of Abbas the Great was the expulsion of the Portuguese from the Persian Gulf. Until then, the Safavid Empire lacked naval power. With the help of British ships, however, Abbas the Great reclaimed the Persian Gulf coast, which had been occupied by the Portuguese for a century” (History 2: 140).

The question “Why do you think the Ottoman rule had stopped for two centuries and why couldn’t resist the rebellion of small groups in 1135?” posed during the activity “Think and answer in connection with the subject” draws attention to the period of stagnation of the Ottoman Empire (History 2: 142).

The text addresses the Safavid-Ottoman relations under a separate title. “When the Safavid dynasty came to power, the Ottomans was already a considerable power. The Ottoman sultans regarded themselves as the Caliph, highest position in Islam, and representative of all Muslims. The Ottoman army quickly advanced on European soil. The Ottoman Empire saw the Safavid State as a threat to its expansionist policies. A few years after Ismail I came to power, Selim I, the Ottoman Sultan, headed towards Iran with a large army to eliminate the Safavid State. The Ottoman army slaughtered the Shiites in Anatolia and then defeated the Iranian army in Chaldiran. Other Ottoman sultans also fought the Safavid Empire many times, but the Safavids put up resistance and managed to stop the Ottomans. As a result, the Ottoman rulers were forced to end the war and make peace with the Safavid Empire” (History 2: 145).

Students are encouraged to make inferences with the question “What do you think would have been different in the Islamic world if peace had prevailed over war between the Safavid and Ottoman Empires? Please discuss” in the activity “evaluation and judgment” after the narrative text (History 2: 145).

The text points out two factors that developed relations between the Safavid Empire and European states. The first factor is that the Ottoman Empire determined the relations with Europe and Iran, which is expressed in the textbook as follows; “The attacks of the Ottoman army on European soil led the European states into alliance with the enemies of the Ottoman Empire. The European states became allies and collaborated with the Safavid Empire to stop those attacks” (History 2: 146). This can be considered a political reflection of “the enemy of my enemy is my friend.”
The textbook quotes from page 172 of Se feminâme by Sanson in the activity “comprehension and inquiry” performed after the narrative text. “No answer was as cute as the answer given to Iranians by German, Polish and Russian deputies, who were ready to cooperate with Iran against the Ottoman Empire. The Shah of Iran, however, promised the Ottoman sultan that he would maintain peace” (History 2: 147). With reference to this text, students are asked to describe how the Safavid Empire's political relations with its neighbors and European countries could be defined.

The textbook “Iranian and Contemporary World” is taught in the last years of high school in Iran. The book begins with the introduction of sources on contemporary world history and then addresses the Afsharid dynasty after the fall of the Safavid dynasty and the establishment of the Islamic Republic of Iran and the developments to date. The text titled “Iran from Nader Shah to Agha Mohammad Khan Qajar” addresses the relations with the Ottoman and Russia. Internal disorder arose with the fall of Isfahan and end of the Safavid rule. “The Afghans failed to establish sovereignty due to the inability of the Safavid Empire to dominate the whole country and the inexperience of state administration. The Russian and Ottomans Empires, which seized the opportunity, occupied our lands from the north and west. These conditions created the necessary environment for the liberation of Iran under the leadership of an Afsharan commander named Nadir Shah.” (History 3: 16). The text argues that the situation turned in favor of Iran after Nadir Shah's succession to the throne and defeat of the Afghans several times and describes it as follows: “Nadir then waged wars against the Ottoman and Russian Empires. He defeated the Ottoman army several times and reclaimed the occupied territories. Seeing the military power of Nadir, the Russians retreated without putting up a fight” (History 3: 17).

The text states that Nadir Shah agreed to ascend the throne on some conditions. “…Nadir Shah brought the notables of the country together and told them his conditions to ascend the throne. One of the most important of his conditions was to put an end to sectarian conflicts with the Ottoman Empire.” After he ascended the throne, he exerted much effort to eliminate political and sectarian conflicts with the Ottomans. He tried to achieve this sometimes through war and sometimes through peace but was unsuccessful due to internal and external turmoil that the Ottoman Empire was going through” (History 3: 18). The text states that the internal and external problems under Nadir Shah's rule were less than in the Safavid period. The most important international problem in this period was the political and military conflicts with the Ottoman and Russian Empires, which weakened the Iranian State in many ways (History 3: 22). The textbook states “a peace treaty was finally signed between the Iran State and the Ottoman Empire, despite Ottoman statesmen' opposition to Nadir Shah's efforts to end sectarian conflicts. Peace was maintained until Zindiye soldiers occupied Basra in the last period of Kerim Khan” (History 3: 21).

According to the text, Nadir Shah aimed to solve the problems arising from sectarian differences between and the Iran and Ottoman Empires and did not see this only as an external problem. The text states that Nadir Shah summoned 70 Sunni and Shiite clergymen from different parts of Iran under the name of Najaf Council in Najaf in 1643. The council accepted Shi'ism as the fifth true sect and Caferism as a true denomination that has common practices with the Shafi'i sect (History 3: 18). This shows that the problems arising from sectarian differences are seen not only as an international issue but also as an internal issue for Iran.

The Eighteenth and Nineteenth Century Ottoman history third grade textbook addresses the problems arising from sectarian differences within the context of Eastern Politics of European States and their consequences under the title of "The Sick Man of Europe: The Ottoman Empire." “In the eighteenth century, the Ottoman Empire ruled vast territories from North Africa to Eastern Europe. When the Afsharites came to power in Iran, the Ottomans were in the period of regression due to the presence of various minorities and denominations on large territories, their harsh policies over tribal and sectarian minorities, involvement of the harem in domestic politics and disruption of the military system. Russia, Britain, France and Austria were involved in the internal affairs of the Ottoman Empire under the pretext of protecting minorities, which made the Ottoman State even weaker. In fact, in the nineteenth century, the Ottoman Empire started to be referred to as the “Sick Man of Europe.” The Ottoman Empire focused on reforms and scientific endeavors to prevent further weakening and
also opposed Nadir Shah's proposal to establish a single sect in the Islamic world. The collapse of the Ottoman Empire coincided with the rise of European states. This allowed the growth of influence of European politics on the East” (History 3: 25).

The unit describing the period of the Qajar dynasty addresses the relations between the two countries in the context of the developments taking place independently of them, which is rather noteworthy. The text continues under the title of “Ottoman”: During the Qajar period, the two Muslim countries, the Ottoman and Safavid Empires, were in constant conflict with the European states, and therefore, had no strength left to continue hostility between each other. Despite the border disputes during the period of Fath-Ali Shah Qajar and Mohammad Shah Qajar, the Ottoman persecution of Alevis and trade problems between two countries, a peace agreement was signed between the two states through the mediation of Russia and Britain.

“Apart from political issues, there were commercial and cultural ties between the Ottoman and Iranian Empires. The Ottoman Empire introduced Iranian culture to Europeans. In the last period of Qajar, a new political and military order emerged in Europe. Although the British and the Russians hated the Iranian people, the Ottoman state attracted the Iranians with the slogan of Islamic unity.” (History 3: 46).

CONCLUSION AND DISCUSSION

The aim of this article was to determine how the Ottoman Empire was portrayed by Iranian high school history textbooks written based on a revised curriculum. The results show that the textbooks are more improved than they were in the past but that they use the methods of misleading, omitting and denying, which are three forms of misuses of history. It is no coincidence that the most controversial issues in the Iranian history textbooks, albeit rich in information and visuals, are conflict between the Safavids and the Ottomans such as the Ottoman–Persian Wars and struggle for influence in the Caucasus and the Middle East. These issues are controversial because both states try to justify their actions. In that context, Iran became the political embodiment of Shia Islam while the Ottoman Empire assumed the political leadership of Sunni Islam. Both states willing to expand their spheres of influence often came into conflict. The Safavids tried to have an influence on the Shiite tribes living within the borders of the Ottoman Empire while the Ottoman developed relations with Uzbek Muslims in the east of Iran. The narratives in the textbooks allow us to better understand how both states took advantage of each other's weaknesses.

The Iranian high school history textbooks state that the Ottoman Empire wishes to expand its sphere of influence to achieve its imperial objectives and sees the existence of a strong Safavid State as an obstacle to that end. According to a text comparing the military power of the two states, the Ottoman army is more organized and contemporary and has heavier artillery than the Iranian army whereas Iranian soldiers are braver and can shoot arrows better than Ottoman soldiers, however, they are disorganized because they have no good command. The text also states that the Iranian army was defeated because it ran out of ammunition and portrays the Ottoman state as a looter and opportunist due to its post-war actions and policies towards the internal turmoil in Iran in the era of Tahmasp I. The portrayal of the Ottoman Empire in the Iranian high school history textbooks is similar to that in the Iranian secondary school textbooks (Batan, 2011; Çencen, 2017; Çelik & Çelik, 2015). The text also argues that the Ottoman Empire had to end the war and sign a treaty with Iran because Shah Ismail's successors strengthened Iran's military power.

The reign of Selim I and Ismail I witnessed sectarian polarization. In that context, Iran became the political embodiment of Shia Islam while the Ottoman Empire assumed the political leadership of Sunni Islam to expand their spheres of influence, bringing the two states into conflict. Both states had to deal with many devastating consequences due to that polarization, which continued for decades. During his reign, Nader Shah wished to make Jafarism the dominant sect in Iran to end the sectarian conflict between the two states. In order to bring the two states closer, Nader Shah sent letters and ambassadors to Mahmud I to persuade him to accept Jafarism as the fifth sect of Sunnism. However,
Nader Shah's efforts came to a dead end because of the opposition of the Ottoman ulema. Therefore, the Iranian high school history textbook portrays the Ottomans as an empire whose policies are driven by sectarian fanaticism. Although the struggle between the Ottomans and the Safavids is generally perceived as a Sunni-Shiite conflict, it is actually political competition between the two states. However, the Iranian high school history textbook glosses over the social, economic, military and geopolitical aspects of that political conflict with sectarian cloud.

Although the Iranian high school history textbooks posit Iran and the Ottoman Empire as being at opposite poles, they have many common features. The Ottoman Empire is generally unwilling to wage war on multiple fronts at the same time. If it finds itself in that situation, it returns from one of the fronts as soon as possible even though the outcome is far from ideal. Iran also follows the same policy of not waging war on multiple fronts at the same time. After closing the eastern front, the Ottoman Empire deployed its army to the western front. Similarly, the Safavids turned to the east after ensuring the security of the western front. In line with this policy, the Safavids launched multiple expeditions on their Uzbek neighbors in the east as soon as their armed conflict with the Ottomans came to an end. As is known, the Ottoman Empire perceived Qizilbash as a threat to its rule. The successors of Ismail I also regarded Qizilbash as the main cause of many years of internal turmoil, and therefore, took harsh measures against it.

Iranian high school history textbooks are based on an understanding of history education in which certain values and strategic interests are disseminated to the whole nation through dramatic cases. Iranian history textbooks fictionalize the past in line with today's needs and concerns, use current concepts to make the past understood and regard today's problems as critical means of contextualizing the past. These books are the manifestation of Iran's desire to “become a great power” that shapes its current foreign policy. The textbooks explain Iran-Ottoman relations through Iran's security and strategic interests and its fight against atrocities against Ottoman citizens of the Shiite sect. The textbooks depict the Ottoman Empire as a neighboring state that sees itself as the protector of the Sunni Islamic world and pursues anti-Shiite politics because it does not want a strong state in its east. They also portray the Ottoman Empire as an aggressive and opportunistic state that uses the internal weaknesses of the Iran State, which is the representative of Shiism. According to the textbooks, the expansionist policies of the Ottoman Empire towards the West led the European states to develop political relations with Iran, and therefore, the Ottoman Empire was, in a sense, instrumental in introducing Iranian history and culture to Europe.

Despite their different social and political characteristics, Turkey and Iran feed off of the same cultural basin. Relations between the two states go back a long way, and they have common, commercial, strategic, and religious ties. Strengthening relations between the two states and societies is, therefore, important for the future. Based on the results, the following suggestions can be made:

For a more peaceful history teaching, both countries should adopt the principle of addressing their past conflicts in an accurate, complete, impartial and non-provocative manner and using a scientific and judgment-free language in their textbooks.

For fruitful relations, and stability and peace in the region, the two countries should develop cultural cooperation and establish joint commissions in order to replace the othering and biased language of textbooks with a more positive, peace-promoting and integrative one.

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University Students’ Emotions and Hopes as the Predictors of Their Psychological Resilience after Terrorist Attacks

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Abstract

The purpose of this study is to examine whether positive and negative emotions and hope level of university students after the terrorist attacks in Turkey predict their psychological resilience. The participants were selected by using simple random sampling method. Accordingly, a total of 362 students (250 female and 112 male) attending various undergraduate programs at Dokuz Eylül University Buca Education Faculty. The study were used Ego-Resiliency Scale, Positive and Negative Affect Schedule and Hope Scale were used as data collection tools. The data collected were analyzed by using stepwise regression analysis. According to the findings, hope and positive emotions are positively significant predictors of psychological resilience of university students after terrorist attacks. These two variables were found to explain 39% of the total variance in the psychological resilience scores of university students. However, the research findings also show that negative emotions are not a significant predictor of psychological resilience.

Keywords: Psychological Resilience, Terrorist Attacks, Positive and Negative Emotions, Hope.

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INTRODUCTION

Positive psychology highlights that it is essential to focus on individuals’ power and positive emotions in all circumstances; even in case of negative experiences (Seligman, 2002; Hefferon and Bonniwell, 2011). When people have negative experiences and when things go wrong in their lives, psychological resilience, which is defined as regaining mental health, becomes an important factor. According to the literature, psychological resilience can be defined as a skill which helps individuals to adapt to negative experiences encountered in real life, cope with problems and maintain mental health (Soylu, 2016).

Terrorist attacks all over the world affect individuals’ mental health because they – or even the whole society- may feel the risk of death during and after these attacks. According to the literature review, it is interesting that many studies focusing on psychological resilience were conducted after the September 11 attacks, which occurred in New York, the USA, in 2001 (Reissman, Klomp, Kent, and Pfefferbaum, 2004; Bonanno, Galea, Bucciarelli and Vhalov, 2006; Onwukwe, 2010). Unfortunately, there have been many terrorist attacks in different parts of Turkey recently. For instance, 1 police officer and 1 civil servant working in the courthouse died in a terrorist attack in İzmir, one of the biggest cities of the country. As a result of this attack, all the residents of the city felt stressful and anxious for a long time thinking that such an attack may happen again.

The literature mentions about some risk factors and protective factors related to psychological resilience. It is clear that a risk or stressful situation is necessary to examine individuals’ psychological resilience. Risk factor is defined as negative life experiences or disasters that individuals might encounter (Garmezy, 1993; Masten, 2001; Karaarmak, 2006; Gizir, 2007) throughout their lives. Death of a beloved person, health problems, violence, natural disasters as well as terrorist attacks are often evaluated as risk factors (Basım and Çetin, 2010; Güloğlu and Karaarmak, 2010). In this study, terrorist attack has been accepted as a risk factor due to the relevant emphasis of the literature.

Protective factors related to psychological resilience are defined as factors reducing or softening the effects of a risk, challenge or stressful activity. The literature lists various individual, environmental and family-based protective factors (Karaarmak, 2006; Gizir, 2007). This study examines “positive and negative emotions” and “hope” variables as protective factors, which are believed to be effective after terrorist attacks.

One of the factors focused on in this study is “positive and negative emotions” since they are believed to be related to psychological resilience. The studies show that there is a statistically meaningful positive relationship between positive emotions and psychological resilience; however, it was found that negative emotions do not have a statistically meaningful relationship with psychological resilience (Tugade, Fredrickson and Feldman Barret, 2004; Gloria and Steinhardt, 2016). Another studies revealed that psychological resilience had a negative meaningful relationship with anxiety and depressions, which are among negative emotions (Wang and Chen, 2015; Dray et al., 2017). Karaarmak (2007), in her study, found that positive emotions are a meaningful predictor of psychological resilience. Still another study, which also took terrorist attacks as a risk factor just like in the current study, was conducted with the people who personally experienced or eye-witnessed the September 11 attacks that occurred in New York in 2001. The study showed that there is a statistically meaningful relationship between positive emotions and psychological resilience (Onwukwe, 2010).

Another factor believed to be related to psychological resilience is “hope”. There are some studies which show that there is a positive relationship between hope and psychological resilience (Chung, 1996; Collins, 2009; Williams, 2009), and hope predicts psychological resilience (Ho-Kin et al., 2005; Kaya, 2007; Aydin, 2010). Similarly, Karaarmak (2007) suggested that hope and psychological resilience are related through positive feelings.

Current approaches in mental health tend to focus more on what works and why (Garavan and Albaugh, 2019). When evaluated through a developmental approach, the capacity of an individual to
respond to the negativity experienced by an individual is tied to the work of many systems with which the individual is related (Masten, 2019). Biological Psychiatry points out that neurobiological systems can improve psychological resilience in order to maintain mental health (Garavan and Albaugh, 2019). Family, school and society as well as the individual's own neurobiological stress regulation system are among these systems, and psychological resilience covers the resources and processes that the individual can apply. However, it is thought that the neurobiological stress regulation system, which is affected by the negativities, can be reprogrammed in the development process. It is mentioned that studies on psychological resilience can also be addressed from this developmental perspective. In this context, it is accepted that the self-regulation and stress regulation systems developed by the individual shape the development processes (Masten, 2015; Cicchetti, 2016; Masten, 2019).

Psychological resilience is defined as the skill to be able to maintain mental health when faced with negative experiences (Seligman, 2002; Hefferon and Bonniwell, 2011; Soylu, 2016), and most definitions mention about risk factors (Kararımak, 2006; Gizir, 2007). Therefore, it can be concluded that studying terrorist attacks in Turkey in terms of mental health within the framework of psychological resilience is important. Although it is reported that individuals living in communitarian cultures have higher levels of psychological resilience (Wu et al., 2011), it is necessary to examine psychological resilience and the factors that might increase psychological resilience of individuals living in Turkey, which is defined as a communitarian culture that has a tendency towards individualization (Mocan Aydın, 2000). Despite the increasing demand for research focusing on individuals’ psychological resilience after terrorist attacks in Turkey, the review of the related literature showed that no studies were conducted focusing on psychological resilience in relation to effects of terrorist attacks. Current research attempts to explore models that reflect psychological resilience not only at the individual level but also at the level of family, community and culture. It is important to examine the variables that are thought to have an impact on individuals in the society in which the research is conducted (Fast and Collin-Vézina, 2019).

Under the light of the information mentioned above, this study aims to examine whether positive and negative emotions and hope level of university students after terrorist attacks in Turkey predict their psychological resilience. Within the scope of the study, the researcher will try to answer the following research questions:

1. Do positive and negative feelings of university students after terrorist attacks predict their psychological resilience?
2. Do hope levels of university students after terrorist attacks predict their psychological resilience?

**METHOD**

**Design**

This study used a correlational research model in order to determine the variables predicting psychological resilience of university students. There are two main aims of correlational studies: to explain relationships between variables; and to test how predictive they are (Fraenkel and Wallen, 2006).

**Participants**

The population of the study is 6174 students attending 8 departments of Dokuz Eylul University Buca Education Faculty. *Table for sampling size for different population sizes* was used to determine the suitable sampling size for the study. According to this table, sampling size for a population of 6000 people is 361 (with 5% sampling error ratio) and 364 for a population of 7000 people (Krejcie and Morgan, 1970). Thus, the sampling size for this study was calculated as 364;
however, 6 people were excluded from the analysis because of problems faced while entering the data, so the data from 362 participants were analyzed. The participants were selected by using simple random sampling method. In this method, each person has equal and independent chance to be selected, but whole population must be listed first (Fraenkel and Wallen, 2006). As a result, a list showing the departments and programs in each department of the faculty was prepared and the programs to be studied were selected by lot. Accordingly, a total of 362 students attending various undergraduate programs at Dokuz Eylül University Buca Education Faculty during 2016-2017 academic year participated in the study. Of these students, 69.1% were female (n=250) and 30.9% male (n=112). The average age of the participants was calculated as 21.6.

Measures

**Ego-Resilience Scale:** Developed by Block and Kremen (1996) to measure psychological resilience, this 14-item four-point Likert-type scale was adapted to Turkish language by Karaırmak (2007). In this adaptation study, the researcher suggested a three-factor structure; namely personal strengths for recovery, positive evaluations about oneself and being open to innovations. Three subthemes obtained from explanatory factor analysis were supported by confirmatory factor analysis. The scores participants received from three subthemes form their psychological resilience score. It is suggested that the total score obtained from the scale should be used rather than individual scores from each subtheme. The high score from the scale shows a high level psychological resilience. Internal consistency coefficient of the scale was tested through Cronbach Alpha value and test-retest method. Cronbach Alpha value was calculated as .80 and test-retest (in three-week interval) reliability coefficient as .76. As for similar scale validity, the correlation with Connor-Davidson Psychological Resilience was calculated as .68. In addition, a positive meaningful relationship was found between the scores obtained from both psychological resilience scales (Karaırmak, 2007; Karaırmak and Siviş-Çetinkaya, 2011).

**Positive and Negative Affect Schedule:** Developed by Watson, Clark and Tellegen in order to evaluate individuals’ emotions, the scale was adapted to Turkish by Gençöz (2000). It consists of 20 items (10 positive and 10 negative), and each item is scaled from 1 to 5. According to the adaptation study, Cronbach alpha internal consistency coefficient was calculated as .83 and .86 for positive and negative emotions respectively. Similarly, test-retest consistency for the same variable was found .40 and .54 respectively. As for the criterion-related validity of the scale, Beck Depression Inventory and Beck Anxiety Inventory were used. According to the findings, positive emotion scale had .48 and .22 correlations for these inventories; and negative emotion scale had .51 and .41 correlations respectively for the same inventories.

**Hope Scale:** Developed by Snyder et al. (1991) to determine hope levels of individuals, the scale was adapted to Turkish by Akman and Korkut (1993). This four-point Likert scale consists of 12 items and has one-factor structure unlike the original version. A high score obtained from the scale means high level of hope, and a low score shows low level of hope. Internal consistency coefficient of the scale was calculated as .65. The correlation for test-retest, which was administered in four-week interval, was found to be .66 (Akman and Korkut, 1993).

**Personal Information Form.** Demographic information about the participants was obtained through a personal information form prepared the researcher. The form included questions about their age, gender, the department they attend and class level.

Data Collection

The data for the study were collected from the students attending randomly selected study-specific departments of Dokuz Eylül University Buca Education Faculty. The data collection tools were administered by the researcher herself. Despite the presence of the researcher during the data
collection process to answer possible questions and clarify misunderstandings, a short instruction was given at the beginning of the data collection tools.

**Data Analysis**

The data obtained in the study were analyzed by using SPSS (Statistical Package for the Social Sciences) software. Stepwise multiple regression analysis was applied to determine variables that have significant contributions to psychological resilience of university students so that the predictive power of study-specific independent variables for psychological resilience could be determined. Mahalanobis distance, Kolmogorov-Smirnov, autocorrelation (Durbin Watson / between 1.5 and 2.5), tolerance (higher than .10) and VIF (smaller than 10) values were calculated prior to multiple regression analysis.

**Results**

Dependent variables of the study was “psychological resilience”, and independent variables were “positive and negative emotions” and “hope”. Table 1 presents descriptive statistics of dependent and independent variables and the correlations between the variables.

**Table 1. Descriptive statistics of dependent and independent variables and the correlations between the variables**

<table>
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<tr>
<th>Variable</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Psychological Resilience</td>
<td>39.4</td>
<td>6.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Positive Emotions</td>
<td>28.3</td>
<td>7.6</td>
<td>.34***</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Negative Emotions</td>
<td>31.7</td>
<td>8.1</td>
<td>.06</td>
<td>-.07</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>4. Hope</td>
<td>25.2</td>
<td>3.9</td>
<td>.60***</td>
<td>.28***</td>
<td>.06</td>
<td>1.0</td>
</tr>
</tbody>
</table>

*** p<.001

According to the correlations between dependent and independent variables, there is a positive meaningful relationship between psychological resilience and positive emotions (r = .34, p<.001) and hope (r = .60, p<.001); also a positive meaningful relationship between positive emotions and hope (r = .28, p<.001). However, since all the correlation values were lower than .80, multiple correlation problems did not exist between the variables, which is a prerequisite for regression calculations.

Stepwise multiple regression for the psychological resilience of the participants was completed in two steps. Positive emotions and hope variables were entered into the analysis, and their predictive powers for psychological resilience were calculated. The results of stepwise regression analysis regarding how education faculty students’ psychological resilience levels were predicted were presented in Table 2 below.

**Table 2. Stepwise Regression Analysis Regarding How University Students’ Psychological Resilience Levels were Predicted**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SH</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
<th>R</th>
<th>R’</th>
<th>R’ Change</th>
<th>F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>16.068</td>
<td>1.664</td>
<td>.599</td>
<td>9.656</td>
<td>.000</td>
<td>.599</td>
<td>.358</td>
<td>.358</td>
<td>201.119</td>
</tr>
<tr>
<td>Hope</td>
<td>.925</td>
<td>.065</td>
<td></td>
<td>14.182</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>13.904</td>
<td>1.694</td>
<td>.545</td>
<td>8.207</td>
<td>.000</td>
<td>.626</td>
<td>.392</td>
<td>.033</td>
<td>19.666</td>
</tr>
<tr>
<td>Hope</td>
<td>.843</td>
<td>.066</td>
<td></td>
<td>12.720</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Emotions</td>
<td>.150</td>
<td>.034</td>
<td>.190</td>
<td>4.435</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the first step, hope, which is the best predictor of psychological resilience scores or the factor that accounts for the highest percentage of variance in psychological resilience scores, was included in the analysis, and it accounted for 36% of the variance. The dual correlation between psychological resilience and hope scores of the participants was found to be positively meaningful. In the second step, the analysis included “positive emotions” variable in addition to “hope” variable. The contribution of positive emotions variable was 3%, and two variables together accounted for 39% of the variance. The correlation between positive emotions and psychological resilience was positively meaningful. In conclusion, hope and positive emotions variables accounted 39% of total variance in psychological resilience scores.

**CONCLUSION, DISCUSSION AND SUGGESTIONS**

The results of the study showed that positive emotions and hopes of university students after terrorist attacks meaningfully predict their psychological resilience in statistical terms. However, it was found that negative emotions do not meaningfully predict psychological resilience. Similarly, the variable “hope” is primarily effective in accounting for psychological resilience, and positive emotions are secondarily effective.

First of all, the finding that hope predicts psychological resilience is supported by the findings of some studies in the literature (Ho-Kin et al., 2005; Kaya, 2007; Aydın, 2010). When the predictive role hope in psychological resilience is considered, it can be said that hope levels are an effective factor in psychological resilience of university students after terrorist attacks. The literature shows that as hope levels increase, individuals tend to adapt to changing conditions and try to deal with problems they face in their daily lives (Barnum et al., 1998; cited by Aydın, 2010). Under the light of this finding, it can be highlighted that it is important to increase hope levels of university students to support their psychological resilience in case of stressful events and their negative consequences in the country.

The results show a meaningful positive relationship between positive emotions and psychological resilience, which are in parallel with the findings in the literature (Karaırmak, 2007; Onwukwe, 2010). When the predictive power of positive emotions and psychological resilience is considered, it can be concluded that positive emotions are an effective factor on psychological resilience of university students after terrorist attacks in the country; though not as effective as hope. According to the literature, positive emotions are beneficial for both physical and mental health (Tugade et al., 2004). In addition, positive emotions play an important role in using available resources to cope with negative experiences. Fredrickson (2004), in his positive emotions theory, highlights that positive feelings increase many resources such as psychological resilience, which might also be considered as psychological resources. In other words, both the related research in the literature and the findings of the study reveal that psychological resilience of university students after terrorist attacks in our country increases when they feel positive emotions such as being interested, enthusiastic, determined and careful.

As for the fact that negative emotions do not meaningfully predict psychological resilience, there are studies that support (Tugade et al., 2004; Gloria and Steinhardt, 2016) or do not support this finding (Wang and Chen, 2015; Dray et al., 2017). The current study shows that negative emotions are not an effective factor for university students’ psychological resilience. When the claim that negative emotions restrict opinion and action repertoire of individuals is considered (Fredrickson, 2004), it is clear why negative feelings do not account for psychological resilience of university students. In this respect, it might be concluded that it is quite normal for university students to feel negative emotions and they do not have positive or negative effect on their psychological resilience.

Based on the research findings, it can be said that some characteristics come to the fore in psychologically more resilience individuals. In this study of Turkish culture, it is acceptable that hope and positive emotions are among these characteristics. Also in the related literature, hope and positive emotions are among the personality traits of psychologically resilience individuals (Seligman, 1990;
Tugade et al., 2004; Karaırmak, 2006). In this context, psychological counseling interventions focused on psychological resilience may be considered to offer a useful perspective in protecting the mental health of university students. Based on the knowledge that it is important to develop culture-sensitive models of psychological resilience (Fast and Collin-Vézina, 2019), it can be said that this work is valuable in terms of its emphasis on functioning characteristics in Turkish culture.

The study has some limitations as well. First of all, the study was conducted only with education faculty students, which is a limitation for the generalizability of the findings. It can be accepted as an another limitation not with individuals who are directly exposed to terrorist attacks, but also with individuals who have negative effects from terrorist attacks that occur frequently in the city and country they live in. In addition, research data were collected through self-expression scale. Self-report scales are preferred in the studies conducted in the field of psychological counselling because they have certain advantages in terms of time and practicality, and they are suitable for phenomenological perspectives (Heppner, Wampold, and Kivlinghan, 2013).

In conclusion, this study shows that positive emotion and hope levels of university students after terrorist attacks meaningfully predict their psychological resilience in statistical terms. Psychological resilience, as one of the important concepts of mental health, should be examined carefully both in Turkey and in the world. Making an evaluation of individuals’ psychological resilience and determining related variables are important in for both protective psychological counseling approach to be adopted and psychological counseling services to be provided after stressful situations. Within the framework of protective psychological counseling approach, it can be recommended that all university students should be well supported psychologically through primary level protective precautions within the framework of structures of positive psychology such as hope and positive emotions. In addition, studying different variables such as optimism, life satisfaction and well-being while evaluating psychological resilience of university students, especially after terrorist attacks, can bring valuable contributions to the literature. Finally, more studies might be conducted with students attending other universities and faculties so that the findings can be generalized scientifically.

REFERENCES


Do Tubitak-4006 Science Fairs Achieve Its Objectives? The Viewpoints of School Administrators And Teachers

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Cumhuriyet University

Abstract

The aim of this study is to review the opinions of principals and teachers on TUBITAK-4006 (Scientific and Technological Research Council of Turkey) science fairs which are organized in about 10,000 schools every year in Turkey. This study is a qualitative research and it is formed with phenomenological design. The study group is determined with criterion sampling method, and it comprises 10 teachers and 10 school administrators who have participated in TUBITAK-4006 science project fairs. The data are collected with a semi-structured interview form, and the interviews are carried out face to face. The data collected have been evaluated using content analysis method. As a result of the analysis, the viewpoints of the school administrators and teachers are presented in two themes and seven categories. For the both participant groups, the themes are analysed by categorizing them as the effects on teachers, the effects on students and parents. Besides, the suggestions category is indicated under one single title. According to the findings, all the participants stated that TUBITAK-4006 science project fairs are useful if carried out considering their purposes while they cause more harm when their objectives are disregarded.

Keywords: 4006 TUBITAK Science Fair, Project-Based Learning, Teacher, School Administrator

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INTRODUCTION

Scientific knowledge can only be reached by scientific research methods. When scientific research methods are taught students in education, it provides significant contribution to their academic development. Projects in schools are particularly important in students’ acquiring scientific research skills in educational institutions. Students focus on an outcome thanks to these projects and they practice the stages of a project as a scientific process. According to Ozden (2002), projects in schools play a complementary role in providing a better insight into curriculum. For this reason, it is apparent that project studies are crucial component of modern education in order for students to discover new information. Karadeniz and Ata (2013) have stated that project studies take students’ individual differences into account, they contribute to students’ developments and activate them.

When the literature is reviewed, it can be found that project studies are examined within the scope of project-based learning. Project-based learning is an effective teaching method in today’s modern educational concepts (Lam, Cheng, and Choy, 2010), and helps students to figure out complicated problems that they encounter (Şahin, Güven, and Yurdatapan, 2011; Korkmaz and Kaptan, 2001). In these kinds of teaching approaches which show students the ways to do self-assessment and develop different skills in learning (Çibik and Emrahgöl, 2008), students’ thinking, imagination, perception, creativeness, and decision-making skills are highlighted (Erdem, 2002).

While the students who are getting project-based learning make more progress in their behavioural, cognitive, and affective development (Johnson and Delawsky, 2013), their motivation is increased and they excel in cooperation in learning (Thomas, 2000; Green, 1998). Thanks to this approach, students can increase their inquiry-based learning ability (Wong, Quek, Divaharan, Liu, Peer, and Williams, 2006), they discover new information during the project developing process (Gallagher, Stepien, Sher and Workman, 1995), they develop their thinking skills and lifelong learning abilities (Hung and Wong, 2000), and they have the chance to collaborate with the parents to support the school program (Katz and Chard, 1992). The projects obtained as a result of the project developing process have many positive sides, and they are exhibited in different science fairs to advance science and to increase students’ motivation.

Science fairs are carried out in many countries so as to provide scientific literacy, to further students’ self-recognition, and for the development of science (Yasar and Baker, 2003; Ekici and Yılmaz, 2013). Science fairs have become an indispensable practice in educational institutions due to the opportunities they have created (Hampton and Licona, 2013). Students make use of their prior knowledge with their experience obtained from the science fairs (Balas, 1998), they learn new information about how a scientist work and the steps they follow (Wilson, Cordry, and Unline, 2004). Students do brainstorming, get exciting and new information, use their own imagination and skills while they are reviewing the projects (Kanematsu and Barry 2006).

Science fairs are non-formal learning medium including interactive activities with students (Keçeci, Zengin and Alan, 2017), bringing mobility into schools (Çolakoğlu, 2018), providing opportunities to students to share their research results with peers, teachers, parents, scientists, and other people in the society (Okayucu, 2019). Science fairs in which teachers and parents participate enthusiastically (DeClue, Johnson, Hendrickson and Keck, 2000) have an important place in school programs (Grote, 1995). Science fairs are the activities celebrating and evaluating the projects which are managed by students, and they contribute to students individual and social developments (Bence ve Bowen, 2009). In this regard, science fairs enable students to develop their sharing of experimental findings, their inquiry skills, offering research proposals, collaboration with peers, verifying the results skills (Sumrall ve Schillinger, 2004). The schools that ensure the active participation of the students to the science fairs show successful performance and this affects the advancement of the school positively (Harris, 2010; Akilli, 2017).

Science fairs in Turkey are organized by the schools affiliated to the Ministry of National Education (MEB) with the support of the Scientific and Technological Research Council of Turkey
The subject of this study, 4006-TUBITAK science fairs support program, have emerged from “Cooperation Protocol in Education” which is signed by MEB and TUBITAK, and implemented by TUBITAK, in order to enhance scientific culture in Turkey. The first fairs were supported in 2012-2013 academic year by 1000 pilot schools. Then, 881 schools in 2014, 3201 schools in 2015, 5986 schools in 2016, 5334 schools in 2017, and 9876 schools in 2018 have been supported (Okuyucu, 2019:203). 4006 Science Fairs Support Program aims to promote “Science Fairs” that offer a non-formal learning environment for 5th – 12th grade students who can do researches about the topics of their interests, exhibit their results of the, and learn with fun (Peten, Yaman, Vekli and Çavuş, 2019:80).

There are few numbers of studies on TUBITAK 4006 science fairs in literature. Çolakoğlu (2018) has studied the contribution of TUBITAK 4006 science fair supports to the education; Ataölüm, Selçuk, Ataç (2018) have studied the viewpoints of administrators, project coordinators and students on TUBITAK 4006 projects; Okuyucu (2019) has studied the viewpoints of teachers and students on TUBITAK 4006 science fairs; Sontay, Anar, Karamustafaoğlu (2019) have studied the viewpoints of secondary school students who participated in TUBITAK 4006 science fairs. When these studies are examined, it is found out that there are positive and negative views about TUBITAK 4006 science fairs. Considering 10.000 schools that have participated in TUBITAK 4006 science fairs in Turkey, the researches on this subject are not adequate enough.

New information and technologies that are based on scientific researches and projects are crucial in a country’s development. For this reason, in order to meet this need, TUBITAK 4006 science fairs help students to gain scientific research skills and they are necessary investments on the future of the country. Therefore, this study is vital for the development of students, schools, the society, and the country. New studies are expected to contribute more to the improvement of TUBITAK 4006. Due to this expectation and necessity, TUBITAK 4006 science fairs are determined as the subject of this study. Unlike the other studies, the viewpoints of administrators and teachers are analysed together in this paper. The aim of the study is to examine TUBITAK 4006 science fairs according to the views of administrators and teachers who take part in projects.

**METHOD**

This section includes the research design, study group, data collection tool and some information about the analysis of the data.

**Research Model**

This study is a qualitative research and it is made with phenomenological design. Phenomenology approach focuses on the sense humans make with their experiences. The same phenomenological experiences could mean different senses and experiences of people, and people’s past experiences are important as well as their current experiences (Saban and Ersoy, 2016:55). In phenomenological studies, the aim is to anatomize the phenomena which are observed in our environment but not examined in detail and not having a clear sense, and is to discover the effects of them on people (Yıldırım and Şimşek, 2011). In view of these explanation, it is clear that TUBITAK 4006 project studies in school are phenomena affecting all the stakeholders in schools. TUBITAK 4006 project studies are among the educational practises in schools and they are repeated every year, however, their purposes and advantages haven’t been made clear yet. With the intent of identifying the significance of the TUBITAK 4006 project phenomenon for stakeholders in schools, phenomenological design is used in this study.

**Study Group**

In order to determine the study group, criterion sampling method which is one of the purposive sampling methods is applied. According to Yıldırım and Şimşek (2011), the individuals of
the sampling must have previous experience on the subject of the study. The participants of the study group must essentially be selected in accordance with their previous experience and these participants must be meet the certain criteria. Creswell (2013) has stated that it is important to explain why some certain criteria are employed in determining the sampling of a study. Therefore, the study group of this study includes ten school administrators and ten teachers who have experience on TUBITAK 4006 project phenomenon. In determining the study group, the schools which have been holding TUBITAK 4006 project exhibitions for the last three years, and which are situated in Sivas city centre from various socio-economic backgrounds are opted for as the key criteria. Another criterion is to interview one teacher and one administrator from each school.

Data Collection Tool

It is necessary to ask some questions during an interview describing under which conditions and environment, what kind of experiences the participants have had to ascribe the expected senses on the phenomena relating to the data collection process (Saban and Ersoy, 2016:100-101). For this reason, the data of this study are collected with a semi-structured interview form which is occasionally used in phenomenological researches according to Yıldırım and Şimşek (2011).

While developing the semi-structured interview form, the literature is reviewed, and three teachers who have previous experience on the subject of this study have been interviewed, then the open-ended questions are prepared in reference to the data gathered from these interviews. Afterwards, two domain experts have examined the form and their opinions are taken into consideration. Two Turkish language teachers have gone over the form to check its legibility and clarity. Thereafter, the final semi-structured interview form is implemented on two teachers who are not included in the study group, and as a result of the feedbacks, it is determined that the interview form is suitable as data collection tool of this study. The questions posed to the participants are: a) How do TUBITAK 4006 project studies affect the school environment? b) How do TUBITAK 4006 project studies affect teachers? c) How do TUBITAK 4006 project studies affect students? d) How do TUBITAK 4006 project studies affect parents? e) What are your suggestions to make TUBITAK 4006 project studies more efficient and productive?

To employ the data collection tool, particular schools have been visited and the interviews are conducted with the school administrators and the teachers. Due to the unwillingness of the participants for voice recordings, their answers are noted down. So as not to skip any data, the participants are asked to fill in the interview form. As a result, it is seen that there is consistency with the interviewer’s notes and the participants’ interview forms.

Data Analysis

Data analysis in qualitative searches includes organization of data for the analysis, coding and gathering the observed data, thematizing them, and finally presenting the data in figures, tables or as a discussion (Creswell, 2013). The research data is evaluated with content analysis. As Yıldırım and Şimşek (2011) stated before, the coding process is completed after data during content analysis are examined in significant distinct fragments. The processed data obtained after coding are categorized and thematized, and data are made ready for representation. In presenting the data, the “representation through discussion” method which is stated by Creswell (2013) is adopted.

While representing data through discussion, the participants’ similar opinions were presented in a paragraph under pseudonyms. In the paragraphs, data were represented complementarily and fluently. The data represented under the themes were given in different paragraphs showing positive and negative views separately. Mainly, the findings were remarked for the readers in the first paragraph. Direct quotations were occasionally given in italics or in quotation marks in the paragraphs. After the coding of the data was finalized, an academician, who is a domain expert, were consulted
and it was found out that there was %85 (Miles and Huberman, 1994) similarity between the codes. Of the participants, the administrators were indicated as (A1, A2, A3), and the teachers as (T1, T2, T3).

**Validity and Reliability of the Study**

In this study, instead of using the terms validity and reliability, the concepts of credibility, transferability, consistency, and confirmability are preferred as Mills (2003) suggested. For this reason, in order to provide credibility, the interviews were conducted face to face, and besides the participants were asked to give their answers in written forms. With an objective stance during the interview, the participants were prevented to exhibit a particular bias. Collected data were examined under a word file. As for the transferability, each step of the study was clarified in the method section. By sharing the research questions, they are made public to be used in other studies. In order to provide consistency, interview memos and participants’ written forms were compared and checked. In addition, the feedbacks of two domain experts were also contrasted to reinforce the rate of consistency. Data collection process was clearly indicated in the study as regards to confirmability.

**FINDINGS**

As a result of the analysis, the opinions of the teachers and administrators are presented under two themes and seven categories. The themes are classified into the effects on teachers, the effects on students and the effects on parents for the both participant groups. And, the suggestions category is presented under a particular chapter.

**Teachers’ Opinions on 4006 TUBITAK Project Studies**

All the participants expressed their positive and negative opinions on TUBITAK 4006 project studies as well as their suggestions. This shows that the participant can consider the issue with various aspects. Much as 4006 TUBITAK project studies make the stakeholders in schools feel content, the problems that arise during the process shouldn’t be disregarded. The teachers’ opinions as a result of the analysis on the findings are examined under three categories which are the effects on students, the effects on teacher, and the effects on parent.

**The Effects on Students**

All of the participants have stated that 4006 TUBITAK project studies have beneficial outcomes for students when the processes of the projects are well organized. Especially, their advantages are defined such as its support in students’ gaining self-confidence, developing their critical and creative thinking abilities, boosting their problem solving skills, learning with fun, encouraging scientific research, improving their sense of wonder, improving the cooperation between students and teachers, motivating students.

Considering these, the participant S3 stated that “it contributes to the interests of the students by making them think about and working through the project, solve problems, concentrate on a specific topic.”, and the participant S7 expressed that “it creates an entertaining, didactic, and educational environment where students can share their scientific information after with their friends, teachers, and anyone who is interested.” The participants S8 and S6 pointed out that during the preparation of the projects, the method of learning through experience is highly functional, and it promotes learning of the scientific methods. The participants S10 and S2 emphasized that these projects provoke students’ curiosity and increase the cooperation between students and teachers. S9 described the benefits of the project studies saying “They both give students self-confidence and contributes to their desire to do researches. A students can get experience in doing researches on a topic, how to write a hypothesis, and their finding solutions etc. and they feel the happiness of creating a product.”
All of the participants think that unless 4006 TUBITAK project studies are carried out in accordance with its purposes, they bring disadvantages. It is pointed out that some students do not take responsibility, they consider them as an obligation, the ideas of the projects do not belong to students, unauthentic projects do not improve students’ creativeness, they fall behind in their classes, and students do not have enough knowledge.

The participant S2 stated that students do not take any responsibility, and added on “What is good about a study on which students do not think, produce nothing, and make no effort for. They are just a show off, and a cut and paste activities.” S6 told that he project studies are obligated to students and “It is not possible get an outcome by just saying let’s do a project. It would be better to fully support students, and to provide opportunities them if there happens to a study that emerges naturally.” S1 pointed out that especially 8th grade students are unwilling to participate in project studies due to their high school entrance exam, and these projects are “just a waste of time, and causes them to fall behind in their classes”. Another participant, S9, stating that the project studies must be carried out in accordance with their purposes, argued that “when a goal-oriented way is followed, there can be a good educational result, but when they deviate from the aim, they just become a burden on teachers and students.” S6, S8, and S7 emphasized that it is important to find ways to motivate students who are reluctant and irresponsible.

The effects on Teachers

All the participants stated that the project studies contribute a lot to teachers who actively participate in projects. Especially, there are some notable opinions which are; they provide teachers self-confidence and job satisfaction in their profession, they consolidate the cooperation between teachers and students, they give teachers the opportunity to get to know and discover their students, they improve teachers’ counselling skills, they make teachers realize their inadequacies, and they lead teachers to motivate themselves to make projects.

The participant T1 expressed that “the process of developing a project is tiresome, but it helps teachers to gain self-confidence towards doing projects.” And T5 stated that project studies enhance teachers’ job satisfaction and their productivity. Besides, T1 highlighted that projects contribute to students’ individual development and stated that “I think each student is an undiscovered treasure, and teachers have the chance to discover these treasures. What else could make a teacher happier than this?” The participants T2 and T6 stated that the process of project developing helps them realize their occupational inadequacies, and leading them to compensate them, in addition to this, T10 expressed that “project studies are good opportunities for teachers to improve their skills.” T8 and T4 explained that teachers do not have extra time for managing these projects during their class hours, so thanks to these projects, they get the opportunity to organize the activities that they are not able to do during class hours. Similarly, T3 stated that with the help of 4006 projects, teachers and students collaborate with each other and this has a positive outcome for the sake of the both parties’ development.

All the participants expressed that 4006 TUBITAK project studies are not functional in teachers’ aspect when they are not in accordance with its aims. Some of the highlighted drawbacks are; projects take up too much time of teachers, teachers’ doing the projects instead of students, teachers’ inadequate knowledge in designing projects, unauthentic projects having no benefit, teachers are forced to do the projects, teachers’ being reluctant to participate in projects.

In addition to these disadvantages, T7 stated that “Unfortunately, teachers carry all the burden on their shoulders. The teachers does the research, but the students present the project. This generation is used to gain everything effortlessly and they aren’t making any effort for the projects, so they can’t produce anything.” Similar to this, T5, T3, and T1 remarked that during the project developing process, while teachers are actively striving, students just do the presentation. The participants T8 and T6 criticised that these projects must be done voluntarily, however, teachers are forced to participate in these studies by school administrations. T9 noted the reaction against this
enforcement saying “We are such frustrated by the enforcement that some of colleagues intentionally offer poorly designed projects so that their projects can be rejected. They don’t want to be bothered with this burden.” T10 expressed that developing a projects necessitates special expertise and skills, and added on “As teachers we have too many inadequacies in designing an educational projects and counselling students for them.” As the participant T2 clearly defined, teachers who are project coordinators lack the experience and knowledge needed in projects, and this causes them to be demotivated and to lose their interest in the projects.

The Effects on Parents

All the participants stated that 4006 TUBITAK project studies are beneficial with regard to parents. In parents’ aspect, there appeared no negative view. Some notable views are; parents take part in education, they are proud of their children’s work, they are pleased with their children’s taking responsibility, and with the awards granted by TUBITAK for the projects, parents’ more frequent visits to schools.

T3, T7, and T9 expressed that parents feel proud of their children’s projects, and they feel great joy while they are visiting project exhibition. T5 described that the responsibility students take makes parents pleased, and added on “the parents become content when they see their children taking responsibility and achieving an objective.” According to the participants, the most welcomed side of the projects is the awards granted. T1, T4, and T10 uttered that financially disadvantaged students abstain from these kind of projects, but thanks to the awards granted, parents can also support their children. Through the projects, T2 stated that the parents are involved in education, they improve cooperation in teacher-student-parent triangle, and added on “The parents visit schools more frequently during the process of project preparation. They ask questions about projects, they offer their support, with the projects, schools have become a more attractive place for parents.

School Administrators’ Opinions on 4006 TUBITAK Project Studies

All the administrators expressed negative opinions on 4006 TUBITAK project studies while eight participants expressed positive opinions. As a result of the analysis on the findings obtained, the opinions of the administrators, the effects on students, the effects on teachers, and the effects on parents are examined in three categories.

The Effects on Students

The participants stated that if 4006 TUBITAK project studies are conducted in accordance with its objectives, they can contribute a lot to the development of students. The participants having a positive attitude claimed that project studies improve cooperation between students and also develop their socialization, raise their awareness, increase their performance, lead them to study, help them feel a sense of accomplishment, improve their sense of responsibility, help them to discover their hidden talents, reinforce their entrepreneurialism, improve their research and interpretation skills.

The participant A2 argued that “students have the opportunity to improve themselves by taking part in projects”, and A5 stated that “students’ interest in science as extracurricular activities contributes to science” Furthermore, the participants A1 and A6 claimed students feel the satisfaction of obtaining a result and finalizing a task so that their self-confidence is improved. A3 emphasized that school is not just about courses, and noted that “with the project studies, student have the chance to express themselves outside their classrooms and this changes their attitudes towards school. Y7 and Y5 pointed out that thanks to the project studies, students could improve their entrepreneurialism, and this encourages them to be open to new experiences. A8 underlined the improvement of the relationship between teachers and students, and stated that “as far as I can see, students’
sense of responsibility is improved and it contributes to their skills of doing researches, thinking, and interpretation as well as discovering their talents.”

All the participants claimed that when 4006 TUBITAK project studies are not carried out in accordance with their aims, they do not make any sense for the benefit of students. Some significant opinions are, unauthentic projects, less efforts by the students, students’ skipping the classes, waste of time, problems in schools’ discipline and order, students’ only doing the presentation, their being obligators is a waste of sources, they implicitly engage students in deception.

A2, A5, and A9 claimed that teachers manage the projects alone and students just do the presentation of them and this doesn’t bring any benefit to students. A10 stated that students do not take part in developing a project actively, and added on “these projects are perfunctory, students do not make any effort, and this is just a waste” A6 drew the attention to the problems occur in discipline and order of school during project period, and students have to skip their classes, moreover, A3 uttered that “there are some successful students who skip their classes and they are affected negatively” The participant A7 had a different standpoint, and claimed these studies are just deception; they misguide students as they imitate previous projects, and they misleading students to cheating and forgery, and added on “this is because the students are expected to do a scientific study although their curriculum doesn’t include a scientific, critical thinking approach. They cannot devise a project; however, teachers have to design projects due to the demand by directorate of national education, and students present these projects like theirs.”

The Effects on Teachers

The participants believe that 4006 TUBITAK project studies increase teachers’ motivation, contributes to teachers’ educationally, teachers feel proud of their work during project presentations, they raise teachers’ sense of belonging to school, teachers gain self-confidence while doing the projects, and teachers develop their vocational skills.

The participants A3 and A5 pointed out that with the project studies, teachers can break their routines and try new things, and this positively affect their motivation. A7 emphasized teachers’ organizational commitment uttering “I notice that teachers who have done successful projects come to school willingly and cheerfully.” Similar to this, A10 stated that teachers feel proud of themselves at the end of the project period, uttering “It is worth to see the pride and happiness in teachers during the presentation of the projects.” A1 and A6 expressed that teachers gain self-confidence thanks to these studies, and A8 mentioned their contribution to teachers’ vocational competence, remarking “teachers have difficulty in improving their vocational competence. They don’t have the chance to do that in schools. With the project studies, they get the opportunity to improve themselves.”

Some of the significant opinions of the participants about the negative sides of 4006 TUBITAK project studies are, teachers carry all the burden in developing the project, teachers are obliged to do projects though they are voluntary studies, teachers’ reluctance in staying in schools after their classes are over, their spending less time in classes, dealing with the paperwork.

A3, A4, and A9 argued that teachers find the project idea, and they seek to put these projects with students, so this indicates that teachers do the projects rather than students. A5 stated that teachers are pressed by directorate of national education into participating these projects, uttering “normally, projects require volunteering. The teachers who are willing to take part in the projects already do what they have to do. However, when these teachers are obliged to participate in the project, it makes the process tedious and senseless.” The participants A6 and A7 stated that teachers already have a heavy workload at schools, and together with the projects, teachers main responsibility which is lecturing is interrupted. A2 underlined teachers’ unwillingness to spend extra time in schools, likewise, A1 and A8 claimed that teachers consider the project studies as paperwork and they are not attentive enough to the projects.
The Effects on Parents

Most of the participants stated that 4006 TUBITAK project studies don’t have a significant effect on parents. A3 and A8 thought that some parents are mainly interested in their children’s achievements, but others are in the opinion that due to the project studies, students skip their classes.

A9 noted that “TUBITAK 4006 studies are advantages especially for rural school as they don’t have many chances in rural areas considering their distance. Project exhibitions in rural schools positively affect both students and parents” and also pointed out the parents in rural schools are more enthusiastic about the projects. A2 remarked that they cause financial burden on parents and they are deception, moreover, parents do not show their support with the projects. However, A4 and A10 put forward that project studies arouse parents’ sympathy to schools, and they enjoy seeing the project exhibitions.

Teachers and Administrators’ Suggestions on 4006 TUBITAK Project Studies

Regarding to 4006 TUBITAK project studies, teachers recommended that projects should be authentic, students should be active in the project period, projects should be conducted voluntarily, not compulsorily, teachers should receive special training about projects, parents should be informed about projects, TUBITAK should give priority to promising projects, and all the teachers should take the responsibility in project studies.

T2 emphasized that “whatever we do, however simple it is, it must include authenticity, it must reflect students’ ideas, it must be taken seriously tough very simple. They don’t have to be perfect, they mustn’t pretended to be better than what they are.” Similarly, T5 argued that “they must be picky about patents of the projects, and it is important avoid wasting time with unauthentic projects.” About one of the biggest problem which is compelling to do the projects, T3 pointed out that “directorate of national education should not force schools to do the projects, the schools should volunteer themselves.” And T7 explained “only with voluntary teachers and students, prolific individuals can come out.” T10 stated that project period has some certain steps, teachers and students should be trained about them, and added on “I think coordinator teachers and student who are supposed to participate in science fairs should be given seminars or in-service training. Teachers’ awareness in project consultation and scientific research studies should be raised. T6 drew the attention to the parents’ support saying “parent should be informed about it. It can be more effective to consider the projects as an opportunity to improve students’ creativeness, not as ordinary homework.” T9 argued that TUBITAK do not give priority to promising projects and added on “When TUBITAK do not give particular importance to promising students causes us think “Why would I do a project” First of all, TUBITAK should attach importance to projects. The authorities there should be qualified with their scientific knowledge.” T8 criticised that simply one teacher is assigned as project coordinator, all the teachers in schools must share the responsibility in project studies.

School administrators mainly suggested that 4006 TUBITAK project studies should be authentic, they shouldn’t have financial stress, a student-centred approach should be adopted, students should be guided city-wide, the number of class hours should be reduced and there should be spared more time for the projects, project should be conducted on a volunteer basis, setting up R&D units at schools, and training of the project stakeholders.

About the authenticity, A8 stated that “instead of ordinary projects, the ones which are feasible, authentic, and leading teachers and students to do researches should be picked.” Additionally, A3 added that “the projects must be authentic, scientific, and they must be carried out after brainstorming.” The participant A4 thought that “the quantity of the participation should be low, but the quality must be high.” A8 explained that students must actively take part in project studies and noted that “even though they are not a hundred percent authentic, the projects reflecting students ideas should be concentrated, supported
A10 remarked that the stakeholders of the projects should be trained, “teachers should be trained, convinced, supervised, given punishments and rewards, and school administrator should also be trained.” Furthermore, A1 stated students should be given professional assistance in city-wide. A7 noted that there are too many class hours to concentrate on project studies, so the class hours should be reduced. A2 referred the importance of R&D researches in the project period, and suggested to set up R&D units at schools. Having a different perspective, A5 thought that project studies should be carried out considering schools’ fields of study, so science high schools should take the leading role, besides, projects studies are fruitless in secondary school levels, and mainly high schools should be engaged in science projects.

**DISCUSSION AND CONCLUSION**

All the participant teachers and administrators agreed that 4006 TUBITAK project studies are beneficial when conducted in accordance with their objectives and the project period is well managed. Teachers and administrators noted that science fairs contribute to students’ social, affective, and cognitive development. According to the literature, it is understood that 4006-TUBITAK science fairs provide multiple contribution to students. 4006-TUBITAK science fairs; according to Okuyucu (2019) contribute a lot to students and teachers’ personal development, and improve their high-level thinking skills, to Çolakoğlu (2018), raise teachers and students’ enthusiasm, research and development, eagerness to learn; to Sontay, Anar, and Karamustafaoglu (2019), help students gain the abilities such as cooperation, creating new ideas, self-expression; to Atalıms, Selçuk and Ataç (2018), arouse students’ interest in participating social and cultural activities, improve their self-confidence, affect positively in school cognitive and affective behaviours. Besides, Özdemir and Babaoglan (2019) identified a positive relationship between scientific process skills of the students who participate in TUBITAK 4006 science fairs and their attitudes towards science fairs and science classes.

Apart from 4006-TUBITAK science fairs, there are other science fairs organized by different institutions under different names, and they also contribute to students’ development. The studies show that students taking part in science fairs; according to Grote (1995), Çavuş, Bağcan and Yılmaz (2018), Sülün, Ekiz and Sülün (2009), improve their science and problem solving skills; to Estves and Costa (2011), obtain new terms and gain the ability to do researches; to Ndlovu (2013), have the opportunity to experience real world; to Karadeniz and Ata (2013), develop their sharing, self-expression skills, and also influence their other classes positively; to Keceçi (2017), develop their skills in using the technology, and transferring their knowledge into real life; to Ocak and Korkmaz (2018), improve such skills as hands-on learning, acquiring permanent and tangible information. Yıldırım and Şensoy (2018) found out that there was a significant increase in their attention scores in scientific subjects with the students in the experimental group who participated science festivals, and it was identified that following the research, this increase continued after twelve weeks. Furthermore, Lattimer and Riordan (2011), Johnson and Delawsky (2013), Tonbuloğlu, Aslan, Altun and Aydın, (2013), Çiçek and Emmahoğlu (2008), Korkmaz and Kaptan (2002) discovered that project-based learning supports the development of students.

All the teachers and administrators agreed that 4006 TUBITAK project studies cause troubles when they are not carried out in accordance with their objectives. The notable opinions are; students do not take responsibility in projects, they don’t have enough information, unauthentic outcomes, the problems occur with the discipline and orders of the schools. According to the studies on TUBITAK 4006 Science Fairs, there are similar findings indicating the negative effects of them on students. Atalıms, Selçuk, and Ataç (2018) stated that due to the university entrance exams, students do not pay attention to or concentrate on projects, they do not get the support of their friends; Okuyucu (2019) found out that the shortage of laboratories, the insufficient sensitivity of the school administrations affect project studies negatively. Another study by Sontay, Anar, and Karamustafaoglu (2019) suggested that the troubles with which students face during the project period are; students cannot
finish their projects in time, they don’t have the necessary materials, they worry that they cannot develop the project.

The studies on project and science fairs apart from TUBITAK 4006 Science Fairs show that students, according to Ünver, Arabacıoğlu, and Okulu (2015), are reluctant, consider the projects like ordinary homework, try unauthentic projects; to Syer and Shor (2001), the time pressure that students face while preparing the projects lead them to unauthentic projects, and there isn’t given sufficient financial support for the projects. Furthermore, Hampton and Licona (2013) identified that due to the insufficient support given to students, the stress they feel keep them away from science, the problems that face during the project period creates misconception in students, and science is monopolized by some favorite elite students. It can be understood that both TUBITAK 4006 Science Fairs and other projects and fair studies possess negative outcomes affecting students. These findings support the results of this study.

All of the participants agreed that 4006 TUBITAK project studies have important contributions to teachers. Some notable opinions are; they provide self-confidence and job satisfaction to teachers, they increase the organizational commitment of teachers to schools, they create the opportunity for teachers to get to know their students and discover their potentials.

When the researches in the literature on project studies and science fairs are considered, it appears that they mainly focus on students. Their effects on teachers are not much elaborated. In respect to the researches on 4006 TUBITAK science fairs, Okuyucu (2019) claimed that teachers who are mentors in science fairs gain the abilities of managing the different phases of projects and guiding students, and Çolakoğlu (2018) argued that teachers become more eager to learn and to do searches as well as students. With regard to other project and science fairs rather than 4006 TUBITAK science fairs, Akilli (2017) pointed out that teachers gain experience in project preparation and implementation. Lam, Cheng, and Choy (2010) argued that teachers begin to think innovative and freely when they get enough support. Katz and Chard (1992) found out that teachers academic and intellectual capabilities are improved.

About the negative effects on teachers, the participant teachers and administrators agreed that teachers do not have enough information on designing a project, the projects are considered as being compulsory, and they give rise to teachers’ workload. There are similar findings in the literature. Accordingly, Chin (2013), Özden, Aydin, Erdem and Ekmeç (2009), Atalı, Selçuk and Ataş (2018), Bulunuz (2011) and Clark (2006) stated that teachers who are not experienced in projects face difficulties and they are not productive; Ünver, Arabacıoğlu and Okulu (2015) argued teachers have troubles in motivating students to design projects and getting the necessary financial aids, DeClue, Johnson, Hendrickson and Keck (2000), Bulunuz, Tapan-Broutin and Bulunuz (2016) pointed out that teachers have difficulty in finding original themes for the projects, and Okuyucu (2019) found out that teachers can not show their interest in project due to their intensive programs.

While teachers claimed that project studies positively affect parents, and they are proud of their children, and they visit schools more frequently, the administrators thought parents concentrate on their children’s academic achievements. In the studies about 4006 TUBITAK, it is found out that parents; according to Sontay, Anar and Karamustafaoğlu (2019), help their children while preparing the projects; to Atakmiş, Selçuk and Ataş (2018), are more inclined to contribute to schools thanks to the project studies. In other studies about science fairs and project studies in the literature, it is claimed by Arı (2010) that three quarter of teachers are in the opinion that parents regard projects and performance task as extra costs, heavy burden, and unnecessary activities; by Ünver, Arabacıoğlu and Okulu (2015) that some projects are prepared by parents but they are pretended to be students’; however, it is argued by Katz and Chard (1992) that projects provide the opportunity to work closely together; by DeClue, Johnson, Hendrickson and Keck (2000) that students are more successful with the support they get from their parents; by McDonough (1995) that when there are more support from the parents, students’ become to have a more positive attitude to science fairs. On the other hand, Liu and Chien (1998) found out that the parents who have got training for projects support their children,
and build better relationship with them while the parent who do not attend trainings for the projects consider the whole process as extra cost and waste of time.

Teachers and administrators suggested that 4006 TUBITAK project studies should be authentic, teachers and students should be trained, and they should participate in projects voluntarily.

When the studies about projects and science fairs in the literature are examined, it is seen that teacher training is one of the most common aspect of the suggestions. It is suggested by Chin lu (2013) that teachers should be trained through case study method; by Çiğdemoğlu, Tekeli and Köseoğlu, (2019) that teachers should be trained as mentors about project-based learning; by Demirezen and Akhan (2017) that a course on Action Search method is useful; by Ndlovu (2013) that teachers should be trained about projects. Trevethan, Kataoka and Silva Oliveira (2009), Yıldırım and Şensoy (2018) claimed that formal and informal learning environments should be integrated, and McDonough (1995) and Liu and Chien (1998) highlighted that parents should be trained about projects. Moreover, Lattimer and Riordan (2011) discussed about conferences targeting parents, teachers, and parents; Wilson, Cordry and Unline (2004) referred to the importance of teachers’ support; Bencze and Bowen (2009) pointed out sponsorships for the science fairs.

Fleming (2000) determined the 6 steps of designing a project as; authenticity, academic commitment, applied learning, active discovery, adult support, and evaluation practices, and thus put forward a pattern about how to implement project studies. It can be useful to build a training course according to this pattern. Dionne, Reis, Trudel, Guillet, Kleine and Hancianu (2012) determined the source of motivation to students to participate in science fairs as interests in science fairs, self-efficiency, appreciation and accomplishment, willingness to be part of a rich social environment, acquiring new learning experience skills. These findings which are intended to students’ motivation can be used to provide students’ participation in science fairs.

Based on the Research Findings,

The following ideas can be suggested;

1. The directorate of national educations should organize trainings for teachers, administrators, and students on project-based learning,

2. Granting extra services scores to teachers participating in science fairs,

3. Granting extra services scores to administrators who are qualified to organize science fairs in their schools while appointing school administrators,

4. Granting extra scores to students participating in science fairs after high school entrance exams (LGS),

5. Training parents by schools about the project period to get their support,

6. Allocation extra rewards by TUBITAK to authentic and promising projects,

7. TUBITAK 4006 science fairs should be an indispensable part of the school culture and teams should be organized to enable all the stakeholders to work cooperatively,

8. Students acquired skills and their project deliverables which they achieve during the science fairs should be registered on e-portfolio system within the scope of lifelong learning.
REFERENCES


Examination of Secondary School Students' Ability to Transform among Chemistry Representation Levels Related to Stoichiometry

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Abstract

The aim of this qualitative case study was to explore secondary students’ ability to transfer among representation levels in relation to stoichiometry. In the study, 40 students in the 11th grade from two classes of an Anatolian high school in the east part of Turkey were selected as sample group. The data were collected by using a questionnaire consists of ten questions designed specifically target the transformation from macroscopic to symbolic, from symbolic to submicroscopic, and from submicroscopic to symbolic level. The analysis of the data was carried out both deductively and inductively by content analysis method. The results indicate that many students were unable to establish an appropriate link among chemical representation levels regarding stoichiometry.

Keywords: Chemistry Education, Representations, Stoichiometry, Submicroscopic Level, Symbolic Level

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INTRODUCTION

Chemistry is an abstract discipline of science in nature (Talanquer, 2011; Taber, 2013). Although the basis of chemistry investigates the change of matter through observation, chemistry relies on explanations of observations through behaviors and interactions of invisible submicroscopic particles (Chittleborough & Treagust, 2007; Gkitzia, Salta & Tzougraki, 2011; Taber & García-Franco, 2010; Thadison, 2011). Since it is difficult to observe particles directly, chemistry is seen as difficult and complex (Cardellini, 2012; Krajcik, 1991; Nakhleh, 1992). Moreover, chemistry contains a language of symbols or formulas to represent the submicroscopic world. Johnstone (2000) proposed that chemistry is multi-representational in nature and it requires the use of three representations at macroscopic, submicroscopic and symbolic level. The macroscopic level can be characterized as visible chemistry in which changes in properties of matter can be described directly through senses (e.g., changes in state, color and temperature). The submicroscopic level is associated with the behavior and motion of very small units such as atoms, ions and molecules. It refers to explanations of macroscopic level in the form of molecular models, diagrams or particulate drawings. The symbolic level refers to representation of macroscopic and submicroscopic phenomena symbolically using mathematical and chemical equations, formulas of molecules, diagrams, etc. (De Jong &Taber, 2007; Johnstone, 1993, Kern, Wood, Roehrig, & Nyachwaya, 2010; Treagust, Chittleborough & Mamiala, 2003).

For conceptual understanding of concepts and problem solving in chemistry, the ability to understand and interpret three levels representations and the ability to establish a link between all levels of representations have been explicitly highlighted (Arasasingham, Taagepera, Potter, & Lonjers, 2004; Cooper, Stieff, & DeSutter, 2017; Johnstone, 2000; Head, Yoder, Genton, & Sumperl, 2017; Mocerino, Chandrasegaran & Treagust, 2009; Santos & Arroio, 2016; Sunyono, Yuaunita, & Ibrahim, 2015; Talanquer, 2011; Treagust et al., 2003). Santos and Arroio’s (2016) literature review of the studies related to the representational levels revealed that the submicroscopic level is the most challenging for learners to comprehend. Moreover, ability of many secondary and college students are poor to establish a link between levels of chemical representation and to transfer among them simultaneously (Arasasingham et al., 2004; Gabel, 1998; Kern et al., 2010; Sanger, 2005; Sim and Daniel, 2014; Treagust et al., 2003).

Stoichiometry, the topic of this study, is fundamental part of chemistry. Although changes in matter, the focus of chemistry, are either classified as physical or chemical change, chemistry depend heavily on chemical changes, that is, chemical reactions. Chemical reactions involve the rearrangement of atoms. Therefore, chemistry first requires understanding the relationship between products and reactants. For this, it is necessary to understand how to balance the reactions. In other words, since students will have to work chemical equations through almost all chemistry subject, writing a chemical equation is the first and one of the most important steps in all types of chemistry problems. Moreover, they should learn ways of representing molecules and how molecules react. Since stoichiometry pertains to chemical reaction, it can be described the heart of chemistry. Poor understanding of stoichiometry will make it much harder to solve chemistry problems and understand other chemistry topics (e.g., acids and bases, chemical kinetics, and chemical equilibrium). Stoichiometry studies amounts of substances that are involved in reactions. The literature review has shown that research studies generally focus on secondary and college students’ understanding of chemical representations, especially at submicroscopic level in relation to stoichiometry (Davidowitz, Chittleborough, & Murray, 2010; Kern et al, 2010).  

Regarding the relational understanding of the chemistry triplet, many studies focused on students’ ability to transform submicroscopic level to symbolic level or vice versa (Davidowitz et al., 2010; Kern et al., 2010; Sanger, 2005). Few studies explored students’ ability to make connections among all levels of chemical representation in relation to stoichiometry (Arasasingham et al., 2004; Sunyono & Ibrahim, 2015; Trivic & Milanavic, 2018). Since many of them were conducted with university students, relatively little is known about the ability of secondary students to transition
among all representational levels. To address this gap, this study aimed to explore the degree which secondary students’ ability to transfer among representation levels.

**METHOD**

**Research design**

This study is a qualitative research aiming to determine the level of understanding of students’ chemical representation levels about stoichiometry. Moreover, case study is preferred as a qualitative research method which offers gathering rich information about a case (such as a person, event, situation etc.) by facilitating the in-depth investigation of the subject of research (Yıldırım & Şimşek, 2008). The situation examined in this research is students’ ability to transform among chemical representations. This case study allows us to detect the diversity of students’ relational understanding among chemical representations in the context of stoichiometry.

**Participants**

The participants were 40 high school students (24 female, 16 male) from two classes of an Anatolian high school in Van, Turkey. Participants of the study were in the second semester of their 11th grade and their age was 16-17. Chemistry is taught as a separate and obligatory course in the 9th and 10th grade of all Anatolian high schools. Before the Grade 11, the all students are required to take many courses such as Math, Physics, Chemistry, Biology, Turkish, English, Second Foreign Language, Social Studies, Sports. At the end of 10th grade students need to decide which areas they wish to specialize in: science, social sciences, Turkish-Mathematics and foreign language. All students in this study had selected science as specialization areas. Therefore, the weight of the chemistry course they have is higher. They were introduced stoichiometry at the beginning of the 10th grade and were taught types of chemical reactions, balancing chemical equations and calculations with chemical equations (e.g., determination of composition of substances, amounts of substances, percentage yield). They also used their knowledge about stoichiometry while learning other chemistry topics (e.g., chemical equilibrium) during the 11th grade. All the students participated in the study voluntarily. Regarding the issue of confidentiality, all students were informed that their names would not be reported anywhere and the accessible data would be seen only by the researcher.

**Data collection**

A questionnaire was used to reveal students’ relational understating among chemical representation regarding stoichiometry. The questionnaire consists of ten questions designed specifically target the three categories for transformation among representations: i) ability to transform from macroscopic to symbolic, from symbolic to submicroscopic, and from submicroscopic to symbolic. Most of the questions were developed by the researcher and some of them adapted from chemistry sources in the literature (Davidowitz et al.,2010). On the questionnaire, students were required to

a) write the balanced chemical equations based on a written explanation including the name of reactants and products, and their macroscopic properties such as color and state of matter (three questions)

b) convert sub-micro drawings into chemical equations

- sub-micro drawing provided representation of reactants only (two questions)
- sub-micro drawing provided representation of reactants and products (three questions)
c) draw the submicroscopic image of the reaction at the beginning and at the end of the reaction based on a given balanced chemical equation (two questions).

The questionnaire was administered to 40 high school students during a 40-minute lesson. It should be noted that since no further explanation on drawings and written chemical equations was collected from each participant it is not known about what ideas underline the students’ responses.

Data analysis

The data were analyzed both deductively and inductively. First, the students’ responses to each question were examined and coded by the author. At the beginning of the data analysis, literature were reviewed and categories used in the previous research (e.g., chemical equation but not lowest whole number, drawings with formula mismatch) lead the author (Davidowitz et al., 2010; Kern et al., 2010). During the data analysis, a new category was created when a response did not fit an existing category, and existing categories were reviewed and improved as necessary. Periodically, all previously categorized answers were checked to see if they could be placed in a newer or different category. After the author analyzed the data, a chemistry educator examined the data for the validation of the identified categories. To ensure trustworthiness of the study, except students’ responses to Q3 and Q9 (students’ drawings at submicroscopic level), different examples of responses that were revealed for each question were shared with him to check whether them belongs to the related category. Moreover, the chemistry educator checked the categories associated with the drawings of five randomly selected students for Q3 and Q9. The inter-rater reliability was found to be .88 (Reliability=agreement/agreement + disagreement), indicating a good level of agreement (Miles and Huberman, 1994). The discrepancies emerged were resolved by discussion and all previously categorized responses were reviewed. The final version of the categories with the percentage of students were presented in the following part. Furthermore, to establish the reliability of the research, the analysis process was explained in detail and all different examples of responses for each category were provided in the results section.

RESULTS

The ability to convert macroscopic level to symbolic representation

Regarding the ability to transfer from macroscopic to symbolic representation, students were asked to write the balanced chemical equations based on a written explanation about three different type chemical reaction (Combustion [Q1], Decomposition [Q4], Double substitution [Q7]). In the explanations, students were provided the name of reactants and products, and their macroscopic properties such as color and state of matter. The analysis of the student responses to the questions (Table 1) indicate that their ability to convert the written explanation to symbolic representation as a form of balanced chemical equation differs according to different types of chemical reactions. The most correct answer was obtained in the question 4 (62.5%). Although some students wrote a correct equation (7.5% for Q1 and 10% for Q7), it was unbalanced. Regarding the incorrect responses, most of the errors were made in the formulas of the reactants and products. Especially for Q7, %52.5 students made error about the subscripts in chemical formulas of the one or more reactants and products. For example, some students wrote silver chloride as AgCl₂, calcium chloride as CaCl and calcium nitrate as CaNO₃. Moreover, 40% of students for Q1 wrote iron and oxygen in the form of ions in the chemical equation as Fe²⁺ and O²⁻. Furthermore, nine students for Q4 identified reactants and products incorrectly. Although students wrote reactants and products incorrectly in the chemical equation, most of them did not considered that the total number of atoms in the reactants and products is equal to each other. In other words, the chemical equations were unbalanced.
### Table 1 The analysis of the student responses to Q1, Q4 and Q7

<table>
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<th>Q1</th>
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<th>Q4</th>
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<th>%</th>
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<td>Correct balanced equation</td>
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<td>PbCO$_3$ + CO$_2$ + PbO</td>
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<td>2AgNO$_3$ + CaCl$_2$ + 2AgCl + Ca(NO$_3$)$_2$</td>
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<tr>
<td>2Fe+3/2O$_2$ Fe$_2$O$_3$</td>
<td>11</td>
<td>27.5</td>
<td></td>
<td>25</td>
<td>62.5</td>
<td></td>
<td>13</td>
<td>32.5</td>
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<td>4Fe+3O$_2$ 2Fe$_2$O$_3$</td>
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<td>Unbalanced equation</td>
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<td>3Fe + O$_2$ Fe$_2$O$_3$</td>
<td>3</td>
<td>7.5</td>
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<td></td>
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<td>AgNO$_3$ + CaCl$_2$ + AgCl + Ca(NO$_3$)$_2$</td>
<td>4</td>
<td>10</td>
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<td>Fe+O$_2$ Fe$_2$O$_3$</td>
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<td>Incorrect responses</td>
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<td>- formula mismatch</td>
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<td>2Fe+O$_2$ 2FeO</td>
<td>7</td>
<td>17.5</td>
<td>Pb + CO$_3$ + CO$_2$ + PbO</td>
<td>5</td>
<td>12.5</td>
<td>2AgNO$_3$ + CaCl$_2$ + AgCl + Ca(NO$_3$)$_2$</td>
<td>21</td>
<td>52.5</td>
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<tr>
<td>Fe$_2$+3O$_2$ 2FeO$_3$</td>
<td></td>
<td></td>
<td>Pb$_2$(CO$_3$)$_2$ + 2CO$_2$ + 2PbO</td>
<td></td>
<td></td>
<td>AgNO$_3$ + CaCl$_2$ + AgCl + CaNO$_3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe+ O$_2$ FeO</td>
<td></td>
<td></td>
<td>PbCO$_3$ + Pb$_2$ + (CO$_3$)$_2$</td>
<td></td>
<td></td>
<td>AgNO$_3$ + CaCl$_2$ + AgCl + CaNO$_3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe + 3O$_2$ Fe$_2$O$_3$</td>
<td></td>
<td></td>
<td>Pb(CO$_3$)$_2$ + CO$_2$ + Pb$_2$O</td>
<td></td>
<td></td>
<td>AgNO$_3$ + CaCl$_2$ + AgCl + NaNO$_3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3Fe + O$_2$ Fe$_2$O$_3$</td>
<td>5</td>
<td>12.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2Fe + 3O$_2$ Fe$_2$O$_3$</td>
<td>16</td>
<td>40</td>
<td>PbCO$_3$ + CO$_2$ + Pb$_2$O$_3$</td>
<td>9</td>
<td>22.5</td>
<td></td>
<td></td>
<td></td>
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<td>Incorrect responses</td>
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<td>- inappropriate reactant or product</td>
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<td></td>
<td></td>
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<tr>
<td>4Fe$^{3+}$+3O$_2$ Fe$_2$O$_3$</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>4Fe$^{3+}$+3O$_2$ 2Fe$_2$O$_3$</td>
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<tr>
<td>2Fe$^{3+}$ + 3O$_2$ Fe$_2$O$_3$</td>
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<tr>
<td>Fe$^{3+}$ + O$_2$ Fe$_2$O$_3$</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No answer or illegible</td>
<td>3</td>
<td>7.5</td>
<td></td>
<td>2</td>
<td>5</td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
The ability to convert submicroscopic level to symbolic representation

Regarding the ability to transfer from submicroscopic to symbolic representation, students were required to convert the data provided by sub-micro drawings into symbolic in the form of an equation. In Q2, Q5, and Q10, students were asked to create balanced equations based on the sub-micro drawings representing before and after the reaction by providing both reactants and products. While one of the sub micro drawings depict a reaction in which all reactants are converted into products (Q5), two of them include the reagent in excess (Q2 and Q10). In order to answer to Q5 students had to identify the product as CO$_2$ and H$_2$O. For a balanced equation, students are expected to apply the rule to chemical equations that reactants and products are always written using the smallest whole number ratios. The analysis of the student responses to Q5 (Table 2) indicate that only two students were able to write an appropriate balanced equation [CH$_4$+ 2O$_2$ $\rightarrow$ CO$_2$+ 2H$_2$O]. Although 85% of students generated the correct equation, they did not convert the coefficients to the small whole numbers [3CH$_4$+ 6O$_2$ $\rightarrow$ 3CO$_2$+ 6H$_2$O]. In other words, they translated the numbers of reactants and products given in the drawings directly into a chemical reaction. In addition, two students were not able to answer the question and the remaining made errors on identification of the products correctly (one students) and writing the balanced equation (one students).

For Q2 and Q10, students had to identify the product and realize that the drawing contains one of the reagents excessively but will not be written in the chemical equation. The analysis of the student responses indicates (Table 2) while five students (12.5%) were able to write an appropriate balanced equation for Q2, only one student was able to write correct balanced equation for Q10. Most students (65%f or Q2 and 87.5% for Q10) translated the drawing directly into a chemical equation including the reagent in excess. For Q2, although four students were able to identify reactants and products correctly, they could not to write a balanced equation. In addition, three students made errors in subscripts of reactants or products [2O$_7$ + 2H$_2$ $\rightarrow$ 5H$_2$O + 2H$_2$. Moreover, small number of incorrect responses to these questions (5% for Q2 and 7.5% for Q10) include errors related to formula of reactants or products and one student were not able answer the question 10.

Regarding the ability to transfer from submicroscopic to symbolic representation, Q6 and Q8 required students to write a balanced equation based on sub-micro drawings provided reactants only and explanations including the products name. While sub-micro drawing related to Q6 include no excess reactant, that for Q8 include excess reactant. The analysis of the student responses to Q6 (Table 3) indicate only five students were able to write an appropriate balanced equation although all of them not used whole numbers. 45% of students wrote a correct equation without converting the coefficients to the small whole numbers [6H$_2$O $\rightarrow$ 6H$_2$ + 3O$_2$]. Although formula of reactants and products are correctly symbolized in the equation, nine chemical equations provide by the students are not balanced and they involve errors related to coefficients. In addition, some incorrect responses to Q6 (15%) include errors related to formula of reactants or products. In fact, Hydrogen or Oxygen gases were not symbolized as diatomic in the chemical equation.
<table>
<thead>
<tr>
<th></th>
<th>Q2</th>
<th>n</th>
<th>%</th>
<th>Q5</th>
<th>n</th>
<th>%</th>
<th>Q10</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct balanced equation</td>
<td>H₂ + 1/2O₂ ⇌ H₂O</td>
<td>5</td>
<td>12.5</td>
<td>CH₄ + 2O₂ ⇌ CO₂ + 2H₂O</td>
<td>2</td>
<td>5</td>
<td>AB₂ + 1/2B₂ ⇌ AB₃</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Correct equation but not lowest whole numbers</td>
<td>2H₂ + O₂ ⇌ 2H₂O</td>
<td></td>
<td></td>
<td>3CH₄ + 6O₂ ⇌ 3CO₂ + 6H₂O</td>
<td>34</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbalanced equation</td>
<td>10H₂ + 7O₂ ⇌ 10H₂O</td>
<td>4</td>
<td>10</td>
<td>3CH₄ + 3O₂ ⇌ 3CO₂ + 6H₂O</td>
<td>1</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical equation including the reagent in excess</td>
<td>7O₂ + 10H₂ ⇌ 10H₂O + 2O₂</td>
<td></td>
<td></td>
<td>6AB₂ + 5B₂ ⇌ 6AB₁ + 2B₂</td>
<td></td>
<td></td>
<td>35</td>
<td>87.5</td>
<td></td>
</tr>
<tr>
<td>Incorrect responses – error in subscripts</td>
<td>2O₂ + 2H₂ ⇌ 5H₂O + 2H₂</td>
<td>3</td>
<td>7.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect responses – formula mismatch</td>
<td>H₂ + O₂ ⇌ H₂O</td>
<td>2</td>
<td>5</td>
<td>CH₄ + O₂ ⇌ CO₂ + 2H₂</td>
<td>1</td>
<td>2.5</td>
<td>AB₂ + B₂ ⇌ AB₄</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>No answer or illegible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
Tablo 3 The analysis of the student responses to Q6 and Q8

<table>
<thead>
<tr>
<th>Response Type</th>
<th>Q6</th>
<th>Q8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct balanced equation</td>
<td>2H₂O $\rightarrow$ 2H₂ + O₂</td>
<td>N₂ + 3H₂ $\rightarrow$ 2NH₃</td>
</tr>
<tr>
<td></td>
<td>H₂O $\rightarrow$ H₂ + 1/2O₂</td>
<td></td>
</tr>
<tr>
<td>Correct equation but not lowest whole numbers -</td>
<td>6H₂O $\rightarrow$ 6H₂ + 3O₂</td>
<td></td>
</tr>
<tr>
<td>Unbalanced equation</td>
<td>6H₂O $\rightarrow$ 3H₂ + 4O₂</td>
<td>4N₂ + 9H₂ $\rightarrow$ 8NH₃</td>
</tr>
<tr>
<td></td>
<td>6H₂O $\rightarrow$ 3H₂ + 3O₂</td>
<td></td>
</tr>
<tr>
<td>Chemical equation including the reagent in excess</td>
<td></td>
<td>4N₂ + 9H₂ $\rightarrow$ 6NH₃ + N₂</td>
</tr>
<tr>
<td>Incorrect responses—formula mismatch</td>
<td>6H₂O $\rightarrow$ 6O₂ + 12H</td>
<td>4N₂ + 8H₂ $\rightarrow$ 8NH₃</td>
</tr>
<tr>
<td></td>
<td>H₂O $\rightarrow$ H+ O₂</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6H₂O $\rightarrow$ 6H₂ + 6O</td>
<td></td>
</tr>
<tr>
<td>No answer or illegible</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Unlike to Q6, sub-micro drawing in Q8 refers to a reaction with excess reactant. Table 3 indicates only three students could provide a correct balanced equation. In addition, five students wrote a balanced equation without converting the coefficients to the small whole numbers [4N₂ + 9H₂ $\rightarrow$ 8NH₃]. Most of the students wrote an incorrect equation. 75% of them translated the drawing directly into a chemical equation including the reagent in excess [4N₂ + 9H₂ $\rightarrow$ 6NH₃ + N₂]. In addition, two incorrect responses to Q8 include errors related to formula of product, ammonia.

The ability to convert symbolic level to submicroscopic representation

Regarding the ability to transfer from symbolic to submicroscopic representation, students were required to convert the data provided by an equation into sub-micro drawings. The analysis of student responses to Q3 and Q9 (Table 4) indicate almost half of the students (42.5% for Q3 and 40% for Q9) drew a suitable submicroscopic representation of reactants and products. It is seen that most of them (32.5% for Q3 and 40% for Q9) limited the number of reactants and product in their drawings to the coefficients in the balanced equation. Although some students draw more molecules than represented as coefficient in the equation for Q3, some of submicroscopic representations are unbalanced. 15% of students for Q3 and 12.5% of students for Q9 did not considered that the total number of atoms in the reactants and products is equal to each other. Moreover, almost half of the students (42.5%) drew incorrect submicroscopic representation including one or more molecule not matching the correct molecular formulae. In other words, students’ responses revealed that the number of atoms in the molecule did not match the subscripts in the given equation. For example, some students depicted MgO as being composed of three particles (one Mg and two oxygen atoms) and represented FeCl₂ by one Fe and one Cl atom. Moreover, it is seen that some students confused the meaning of coefficients and subscripts since 2HCl was represented by two hydrogen atoms bonded to one chlorine atom in their drawings for Q9.

DISCUSSION AND CONCLUSION

Students’ responses to ten questions allow us to examine their relational understanding among chemical representations regarding chemical equation and stoichiometry which is an important aspect of competence in school chemistry. The literature emphasized students had difficulty in translation of chemical representations from one level to another in relation to various chemistry concepts (Devetak, Urbančič, Grm, Krenel, & Glazer, 2004; Farida, Widyanoto, & Sopandi, 2010; Tan, Goh, Chia, & Treagust, 2009; Tarkin-Çelikkıran & Gökçe, 2019). The findings of the study also indicate many
students were unable to establish an appropriate link among chemical representation levels regarding stoichiometry.

Regarding the ability to transfer from macroscopic to symbolic representation, the findings of the study reveal that some students made error in writing a chemical equation from a written explanation since they had difficulty in writing formula of reactants and products. The difficulties of the students in this area have been revealed in previous studies in the literature. According to the review study focused on students’ use and understanding of chemical formulas (Taskin and Bernholt, 2014), many research studies presented that students have difficulties in deriving the formula from a given compound name. Baah and Ampiah (2012) also found that the senior high school students presented poor performance on translating written statement about a chemical reaction into a chemical equation using symbols. Beside inability to writing correct chemical formula, the results of this study present that many students have misunderstanding about writing a chemical equation. Whether correct or incorrect chemical equation, most of the chemical equations written by students were unbalanced. In other words, many of the students ignored the equality of total number of atoms in the reactants and products.

In this study, student showed inability to convert the data provided by sub-micro drawings into symbolic in the form of an equation as in the other studies (Davidowitz et al., 2010; Sanger, 2005; Sunyono et al., 2015). Many students did not use the lowest whole numbers with correct ratio while balancing the chemical equation. In this case, students wrote the equation based on the image directly without balancing the equation with simplest ratio of the entities. Similar to Trivic and Milanovic (2018), these students did understand that coefficients in a chemical reaction represent the stoichiometric ratios.

**Table 4** The analysis of the student responses to Q3 and Q9

<table>
<thead>
<tr>
<th></th>
<th>Q3 2Mg(s) + O₂(g) → 2MgO(s) n</th>
<th>%</th>
<th>Q9 FeS(s) + 2HCl(aq) → FeCl₂(s) + H₂S(g) n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct representation</td>
<td></td>
<td>4</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Correct representation – based on coefficients in balanced equations</td>
<td>13</td>
<td>32.5</td>
<td>16</td>
<td>40</td>
</tr>
<tr>
<td>Incorrect representation – unbalanced</td>
<td>6</td>
<td>15</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Incorrect representation - inappropriate reactant or product (Formula mismatch)</td>
<td>17</td>
<td>42.5</td>
<td>17</td>
<td>42.5</td>
</tr>
<tr>
<td>No answer or illegible</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Moreover, when sub-micro drawing includes excess reactant, many students showed the excess reactant in the chemical equation. The idea that writing a chemical equation from submicroscopic representations directly depends on the number of particles in the drawing has been observed by other researchers (Arasasingham et al., 2004; Davidowitz et al., 2010; Sunyono et al., 2015). Similar to findings revealed in Sunyono et al. (2015), some students failed to identify the reaction products with correct formula in this study. Furthermore, three students for Q2 represented the number of particulates for each reactant as subscript while the number of atoms in the molecule as stoichiometric coefficient (e.g. using \(2O_2\) instead of \(7O_2\), and \(2H_2\) instead of \(5H_2\)). It is seen that these students have misunderstanding about the meaning of stoichiometric coefficient and subscript. Trivic and Milanovic (2018) found that some students confuse the meaning of these terms. In their study, it was revealed that some students thought that the coefficient shows how many atoms there are. Similarly, in this study, some students represent the number of atoms in the molecule as stoichiometric coefficient. To help students enhance their relational understanding of the chemistry triplet, teacher should differentiate the meaning of stoichiometric coefficient and subscript and focus on the relationship between submicroscopic representation and chemical equation referring symbolic level. While using submicroscopic representation, teachers should associate the number of sub-micro entities in the diagram with its chemical equation (Cheng & Gilbert, 2014).

While students move from symbolic level to submicroscopic level, they generally imaged the number of particles in the reagents and products as much as the stoichiometric coefficient in the balanced equation. Students might have misunderstanding about the meaning of stoichiometric coefficient. Research studies revealed that students do not understand the coefficients as the stoichiometric ratios of reactants and products (Trivic & Milanovic, 2018; Marais & Jordaan, 2000). In the study of Trivic and Milanovic (2018), one of twelve students interviewed said that coefficients represent how many molecules there are [e.g., \(3H_2O\) means there are three molecules of water]. The drawings of some students in the current study indicate that these have the same viewpoint for the coefficients in a chemical reaction. In addition, some students could not represent the chemical formula of reactants or products in their drawing correctly. There was a mismatch between the numbers of atoms in the molecule in students’ drawings and subscripts in the given equation. For example, some students represented \(2MgO\) as the structure for the molecular formula \(Mg_2O_2\) or \(2MgO_2\). As observed in the previous studies, students have difficulty in representing the right number of atoms and molecules in their drawings and the correct linkage of atoms in molecules (Arasasingham et al., 2004). Moreover, some students did not consider that the total number of atoms in the reactants and products is equal to each other in their drawings. Similar to previous studies, students had difficulty in representing molecules with the correct number and connectivity of constituent atoms (Arasasingham et al., 2004; Davidowitz et al., 2010; Kern et al., 2010). Some studies indicated that students may associate the coefficients in the chemical equation only with the first atom of the subsequent chemical formula (Smith and Metz, 1996). Similar to this idea, some participants of this study represented \(2HCl\) by two hydrogen atoms bonded to one chlorine atom. Use of visualization tools for submicroscopic representation with establishing link to other representation levels can enhance students’ understanding of submicroscopic level and its association with other levels (Farida et al., 2010; Herga, Cagran & Dinevski, 2016; Wu, Krajcik & Soloway, 2001).

Students’ ability to transform representational levels into each other tied to teaching process in classrooms and textbooks. To be able to transform from one level to another, student should be trained by using multiple representations with highlighting their inter-connectedness (Adadan, 2012; Baptista, Martins, Conceição, & Reis, 2019; Devetak, Vogrinc, & Glazar, 2009; Head et al., 2017; Jaber & Boujaoude, 2012; Mocerino et al., 2009; McBroome, 2011; Russell et al. 1997; Sunyono et al., 2015). Chemistry teachers should integrate three levels of representations in their teaching and explicitly emphasize association of each representation level with other levels (Demirdögen, 2017; Farida et al., 2010; Santos & Arroio, 2016). In addition to teacher use of chemical representations, students should be enrolled in activities including different representation levels and transitions between them (Farida et al., 2010; Santos & Arroio, 2016). Sunyono et al. (2015) reported that before using multiple representation method students were less able to interpret all chemical representations. At the end of the implementation of multiple representation method, it was seen that there has been an improvement.
of their ability to interpret the representation levels and transform among them in relation to stoichiometry. However, some students still had problems on interpretation of the submicroscopic representation and its association with symbolic and macroscopic level. Therefore, students should be regularly informed about interpretation and transformation of representation levels during chemistry courses.

Textbooks are source of information for both students and teachers. Therefore, representations took place in textbooks can support students’ and teachers’ use of representations to explain a chemical phenomenon and transformation among them. Textbook review studies revealed that multiple and submicroscopic representations appear in a small number in chemistry textbooks (Demirdöğen, 2017; Gkitzia et al., 2011; Shehab & BouJaoude, 2016). In addition to providing chemical representations in books, how they are given is of great importance. Degree of relation and link to the text is important for students to understand what the representation represents (Demirdöğen, 2017; Gkitzia et al., 2011). Demirdöğen (2017) revealed that surface features of submicroscopic and multiple representations were generally implicit or ambiguous for readers to interpret the meaning of representations correctly. Therefore, chemistry textbooks should establish an appropriate link between representations and text.

Some recommendations can be presented to researchers for further studies. For example, how a student interprets chemical representations and converts them into each other can be examined in more detail through interviews. This study focused on students’ ability to transform among chemical representations in the context of stoichiometry. However, similar studies can be carried out with different chemistry topics to learn more about the students’ ability to transform among chemical representations. Moreover, correlational studies between students’ relational understanding about chemical representations and teaching environment (e.g., teachers’ ability to convert representations into each other and their use of them during chemistry teaching) can be conducted to reveal the factors affecting students’ ability to transform among chemical representations.

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A Metaphoric Approach to the Conception of the “Teacher-Headmaster-School” in Different Age Categories

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Abstract

The aim of this study is to analyze the perceptions of the individuals of different ages about the concepts of teacher-manager-school by means of metaphors. Phenomenology method, one of qualitative research form, and convenience sampling have been used in this study. The study group consisted of 210 participants with different age levels. Research data has been obtained via metaphor identification form. Data has been analyzed by content analysis technique and according to research results, 542 valid metaphors have been determined. Five categories have been determined as to “teacher conception”, which are loadstar and future enlightening person, source of information, compassionate and sacred being, supervisor-disciplined and authoritative being and creator of future respectively. Another five categories for “headmasters” which are focus of management, authoritative and supervisor being, leader and loadstar being, financier of education, a being that have negative features. As to “school conception”, six categories have been defined: love and solidarity environment, growth and maturation environment, supervising and discipline environment, guidance environment and finance environment. The conceptual categories created as a result of this categorization process have been analyzed by Pearson's chi-square analysis by taking the age of the participants into consideration. As a result of the analysis, no significant difference has been found between age groups of participants as to teachers, principals and school concepts. Although a number of radical changes in the role of important components such as school-headmaster-teacher within the scope of modern education system are targeted, the traditional perceptions of these concepts continue.

Keywords: Metaphor, Headmaster, School, Teacher.

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INTRODUCTION

The concepts of teacher-headmaster-school, which are listed in basic elements of the education system, and the educational relationship between these concepts sometimes witnessed breaking/turning points and sometimes resisted against change with the economical, political, cultural and social changes. The strong focus drawn by these concepts within the education system has been interpreted by different groups considering various variables and it has led to dominant judgments, stereotypes and criticisms in the process, and at the same time accelerated various reform initiatives. Considering all these processes, teacher-headmaster-school concepts have been followed, perceived and interpreted by broad masses and their different strata with which the concepts relate. Mental perceptions, especially by individuals prepare the ground for discussing these concepts, creating social meaning, constructing an educational tradition and determining new policies and visions. Therefore, when this strong effect is taken into consideration, the mental perceptions of the individuals who are part of the education and the related meanings have importance to reveal them in the light of the concepts of teacher-headmaster-school. Although there are different perspectives used in the elucidation of mental perceptions, a perspective based on metaphors is adopted in this study.

The term metaphor (meta and pherein) the root of which is Greek is a form of figurative / symbolic language that is extensively discussed and studied (Stacey, 1997, p. 49). Metaphor theory shows the existence of analogy-based mapping that can establish connections between the target area and the source area as formulated by cognitive language science. This action occurs primarily logically at the conceptual level and consists of schemas of basic human experience (such as balance and symmetry). (Johnson, 1987, p. 26). Metaphors have educational use apart from their cognitive and literary aspects; and moreover, they provide an effective understanding and enhancement of affective development (Fraser, 2000, p.12). Metaphors can be evaluated as an educational source or tool based on reasoning through simile. Efficiency of metaphor concept stems from a traditional line based on comparison and similarity, and concept of representation, and the priority of thought on words and structural integrity. (Mouraz, Pereira and Monteiro, 2013, s. 100). In metaphoric relationships frequently used in everyday life, a concept or phenomenon with an analogy based approach is constructed with relation to another concept or phenomenon. As Tünkler (2013, p.11) states, “metaphor which will play an active role in the teaching of abstract concepts by embodying them, is a tool that enables the concepts to be acquired later on to find a place in the mental schema via previously acquired concepts through the similarities between the two concepts, to be included in the mental schema.”

Different uses of metaphors reflect the sociocultural structures of people about the world and show what is important in a particular culture and what the people who make metaphors care about. (Fraser, 2000, p. 3). Metaphors that play an active role in the construction, visualization and concretization of the concepts that can be described as difficult and abstract make it possible to explain an unknown phenomenon with a known one and making the known one similar to the unknown one. Thus, superficial and open metaphors reveal deep and creative metaphors and offer various clues to individuals. (Vadeboncoeur and Torres, 2003, p. 89). Metaphors are powerful forces that determine our ways of thinking about ourselves and others. Metaphors affect our thoughts with powerful but subtly methods (Berliner, 1990, p. 86). From this aspect, it can be used as powerful educational tools to help us understand the world and the situations in which we are related. (Perry and Cooper, 2001, p. 4). Metaphors, especially as linguistic materials that strengthen the relationship between concepts, organize cognitive and conceptual processes related to concepts in educational processes. Many things about what we say and how we shape our thoughts on concepts are often dependent on the use of metaphors. With this aspect, metaphors build our thoughts and help to understand the events. (Perry and Cooper, 2001, p. 4). Metaphors as educational and mental tools reveal the imagination and creativity of the students and show the mental maps and schemas created about the concepts. It also

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1 The words meta and pherein are used as to change and to transfer/ stand respectively (Levine, 2005, p.172).
2 In the mentioned metaphoric process, it is assumed that the target area is more abstract / unknown, and the source area is concretized using concrete / known concepts. This flow proceeds from the concrete / known concepts to the abstract / unknown.
enables students to explore new relationships by creating an organic bond between existing learnings and new learnings. It is observed that metaphorical processes are effective in classroom environments and teachers as well as students. In this context, metaphors can be actively used in teacher education, and in inservice and preservice activities. In particular, it gives us an opportunity to compare the factors that underlie the teaching roles in the light of the creative metaphors teachers use (Vadeboncoeur and Torres, 2003).

Metaphor-based studies that have a wide usage framework in the educational field have been discussed frequently in national and international literature. It is possible to come across studies related to many concepts like “teacher” (Berk, Gültekin and Çeçen, 2015; Cerit, 2008, Nikitina and Furuoka, 2008; Stichert, 2005) and the perception of teachers and candidate teachers on “child” concept (Kuyucu, Şahin and Kapıcıoğlu, 2013; Akgün, 2016), and student (Bozik, 2002; Sezgin, Koşar, Koşar and Er, 2017), “headmaster” (Çobanoğlu and Gökalp, 2015; Zembat, Tunçeli and Akşin, 2015), “geography, global warming and some history concepts (Öztürk, 2007; Keçe, 2014; Akşit, 2016), and program development (Semerci, 2007), “woman and man” (Sözer and Özkan, 2014; Topuz and Erkanlı, 2016), and chemistry, physics and biology (Harman and Çökelez, 2017), “e-book and integrated e-book (Özer and Türel, 2015) and “copy” (Yalmanci and Aydin, 2014, and “environment” (Meral, Küçük and Gedik, 2015). In this study, it is considered that it is important to determine the perspectives of the individuals from different generations about the concepts of teacher-headmaster-school and to make firm whether there is intergenerational differentiation in their perspectives. In the last century, there have been profound changes in education in Turkey and education system has been reformed periodically and updated continuously. Considering the change processes in this context, the effectiveness of the process is indirectly related to the changes in the perceptions of the teacher-headmaster-school concepts which constitute the cornerstones of the education system. It is also foreseen that the changes in the education system and the sharp fractures have created some changes in the perceptions of these concepts as well as resistance against change. For example, there has been an evolution from the disciplined teacher model “transmitting the information” created by the traditional understanding of education to the concept of guiding teacher who “forms the knowledge”. Moreover, the school has been transformed into a qualitatively and quantitatively with the understanding of “life itself” from an environment that is built with the walls where certain information is given uniformly. It is seen that there have been changes in the educational leadership created by constructivist educational understanding where the concept of headmaster is not handled in the context of rigorous supervision and guidance. In this context, it is important to analyze how the recent rapid changes in education are reflected in individuals in different age groups and what differences occur in the mental perceptions of individuals.

The aim of this study is to analyze the perceptions of individuals of different ages about the concepts of teacher-headmaster-school by means of metaphors. For this purpose, the following sub-problems have been sought:

1. What are the metaphors of individuals at different ages about the concept of “teacher”? In which conceptual category/categories are the identified metaphors involved?

2. What are the metaphors of individuals at different ages about the concept of “headmaster”? In which conceptual category/categories are the identified metaphors involved?

3. What are the metaphors of individuals at different ages about the concept of “school”? In which conceptual category/categories are the identified metaphors involved?

4. Does the conceptual category differ according to the gender of individuals of different age levels?
METHODOLOGY

Research Design

In this research, phenomenology is adopted from qualitative research models. Phenomenological reality in phenomenological approach is understood by the embodied experience. It is tried to catch the common features / essences of an experience or event with a close examination of individual experiences (Starks and Brown Trinidad, 2007). Phenomenology is based on the facts that we are aware of everyday life but do not have a detailed and in-depth understanding. Phenomenology provides a qualified research base for investigations aiming to analyze the facts which are not entirely unknown but not perceived fully (Yıldırım and Şimşek, 2016). In the studies based on phenomenology, data sources are individuals or groups who experience the case and can export the phenomenon (Büyüköztürk, Çakmak, Akgün, Karadeniz and Demirel, 2017). With this aspect it is a qualitative research approach which aims to evaluate the experiences (Miller, 2003). It is aimed to provide an in-depth and detailed description of the concepts mentioned by the phenomenology designed to describe the perceptions of the individuals of different age levels by means of metaphors and individuals of different age levels as data sources have been taken into consideration to reflect the phenomena.

Working Group

The research includes 210 participants within the scope of the problem. In the study, easily accessible situation sampling has been adopted from purposeful sampling methods and a sub-segment has been identified within the scope of the identified objectives and sub-problems. Purposeful sampling allows situations thought to have rich knowledge to be studied in-depth. In this sense, purposeful sampling methods are useful in the exploration and explanation of facts and events in many cases (Yıldırım and Şimşek, 2016). The frequency and percentages of the age and gender of the individuals in the study group are as indicated in Table 1.

Table 1. Frequency and percentage rates of gender and age of individuals in the study group

<table>
<thead>
<tr>
<th>Age</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-25</td>
<td>32</td>
<td>38</td>
<td>70</td>
<td>33.33</td>
</tr>
<tr>
<td>45-55</td>
<td>41</td>
<td>29</td>
<td>70</td>
<td>33.33</td>
</tr>
<tr>
<td>65 and over</td>
<td>36</td>
<td>34</td>
<td>70</td>
<td>33.33</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>101</td>
<td>210</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Data Collection Tool

While preparing the metaphor determination form which was planned to be used as a data collection tool, the researches on the determination of metaphor in various areas of literature were investigated. (Öztürk, 2007; Berk, Gültekin and Çençen, 2015; Keçe, 2014; Gömleksiz, Kan and Öner, 2012; Güven and Akhan, 2010; Külc, 2010; Çepni, 2013; Akşit, 2016). Based on the aforementioned research, participants were asked to answer open-ended sentences with a similar approach. While making open ended sentences, the aim of the study being taken into consideration, sentences like “teacher is like….. for me”, “ because…….” were prepared in the scope of the concepts (school-teacher-headmaster) chosen before. As Kaya (2013) stated, “metaphors in other words simile could be applied to anything ( concrete, abstract, alive, non-living beings) and participants were asked to the reason of the sentence using “because”. It is also possible to say that the word “like” for the use of metaphors as a research tool is primarily used to clearly demonstrate the link between “the source of metaphor” and “the subject of the metaphor (Saban, 2009. The participants were asked to complete this form, which consisted of open-ended sentences formed separately for each concept. In addition, explanations about the form were decided by taking the structure of the form created during the implementation process and the level of education and age of individuals into consideration. After the
necessary explanations were made to the participants by the researchers, the application process was started.

**Data Analysis**

Data analysis in phenomenology research is aimed at revealing experiences and meanings. There is an attempt to conceptualize the data and reveal the themes that can define the phenomenon in content analysis done for this purpose. Essentially, similar data are collected in terms of concepts and themes and interpreted in a way that the reader can understand (Yıldırım and Şimşek, 2016). With this aspect, metaphors formed by the participants about the concepts were analyzed by using the content analysis technique. Content analysis is a data analysis technique that aims to make in-depth and detailed inference from implicit contents based on written materials (Arikân, 2011). The content analysis process generally consists of the following processes: (Bilgın, 2000; Harris, 2001). In addition, chi-square analysis was used to analyze the difference between categorical variables in the analysis process of the fourth sub-problem.

**Coding**

The metaphors made up are listed in from A to Z on the excel program. In this process, forms that do not specify metaphor, and forms that indicate metaphor but do not explain the reason of it, and forms that specify multiple metaphors are excluded. The responses with which the participants sometimes referred to “qualification” or “recommendation” for teacher-headmaster-school concepts instead of specifying metaphors are excluded. The valid metaphors related to the concepts mentioned are pointed out in Table 2.

**Table 2. Valid metaphors detected during the coding process**

<table>
<thead>
<tr>
<th>The name of the concept</th>
<th>The number of the unanswered metaphor</th>
<th>The number of the unexplained metaphor</th>
<th>The number of the metaphor made up</th>
<th>The number of the valid metaphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>5</td>
<td>25</td>
<td>205</td>
<td>180</td>
</tr>
<tr>
<td>Teacher</td>
<td>1</td>
<td>8</td>
<td>202</td>
<td>193</td>
</tr>
<tr>
<td>Headmaster</td>
<td>2</td>
<td>39</td>
<td>208</td>
<td>169</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>72</td>
<td>615</td>
<td>542</td>
</tr>
</tbody>
</table>

**Category Creation**

The metaphors extracted were re-evaluated in terms of the “metaphor creation processes, the source of the metaphor, the relationship between the source and the subject” and the inappropriate metaphors were excluded. After the extraction process mentioned in the category creation step, metaphors were revised and listed in Excel program again in alphabetical order. Categories were determined after the analysis of the source of the metaphor and the bond between the source of the metaphor and the subject of the metaphor (three concepts determined in accordanc with the aim of the research). In addition, to understand who created the metaphors, information about the participants are listed in a separate column as follows: K1 for the women aged between 15-25, E1 for the men aged 15-25 and K2 for the women aged 45-55 and E2 for the men aged 45-55 and K3 for the women aged 65-over and E3 for the men aged 65-over...

**Providing Validness and Reliability**

Expert opinion was consulted on whether the categories systematized by the researchers adequately represent the metaphors created by the students. For this purpose, an expert opinion working in the field of educational sciences was used, the list of metaphors formed by experts and the list of categories created by the researchers were given to the experts. The experts were asked to match the metaphors in the first list (without metaphors being excluded) with the categories listed in the
second list. The matches done by the experts and the researches were compared and the evaluation was done through the “Reliability=agreement / (agreement + dissensus)” developed by Miles and Huberman (1994, p.64). The correspondence rate between the encoders is calculated as .75 for the school category, .81 for the teacher category, .71 for the manager category.

The data analysis process was detailed by the researchers metaphor sentences reflecting the categories and quoted directly were used in order to increase validity. In particular, detailing the data and explaining how the findings are reached within the scope of qualitative research is considered as a validating factor (Yıldırım, 2010). In addition, to the nature of qualitative research, whether the results obtained from the research handled with the metaphorical approach and the results obtained from the research are integrated in terms of theoretical relation were detailed to increase validity.

**Counting System and Inference**

After the determination of 542 valid metaphors and creation of 16 categories, all data were transferred to SPSS for analysis.

**FINDINGS**

**Findings Related to the First Sub Problems**

For the first sub-problem; The metaphors created by the participants regarding the concept of “teacher” and the conceptual categories containing the metaphors identified are as indicated in Table 3.

**Table 3. The metaphors created by the participants regarding the concept of “teacher” and the conceptual categories containing the metaphors**

<table>
<thead>
<tr>
<th>Categories</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over age range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compassionate and holy being</td>
<td>Friend (4), father(1), mother (8), sister (1), mother-father (1).</td>
<td>Mother (17), life (1), friend (1), best friend (1), mother-father (1)</td>
<td>Father (1), mother (15), parent (4), armchair (1), family (1), high mountain (1), life (1), rose (1), angel (1), mother-father (1), homeland (1).</td>
</tr>
<tr>
<td>Supervisory, disciplined and authoritarian being</td>
<td>Police (2), animal trainer (1), guardian (1), boss (1), başkan (1), shepherd (1).</td>
<td>Guardian (1), nightmare (1)</td>
<td>Shepherd (3)</td>
</tr>
<tr>
<td>The being building the future</td>
<td>Gardener (1), baker (1), farmer (1), tree(1), artist (2), soil (1).</td>
<td>Architect (1), building (1), artist (1), farmer (1), soil (1), pencil (1).</td>
<td>Gardener (1).</td>
</tr>
</tbody>
</table>

Total | 62 | 32,1 | 67 | 34,7 | 64 | 33,2 |
When Table 3 is examined, regarding the concept of teacher; it is seen that five conceptual categories have been identified as being guiding and enlightening the future, source of information, compassionate and sacred being, supervisory-disciplined and authoritarian being, and the constructor of the future. A total of 62 metaphors were produced by participants in the 15-25 age group, while those in the age range of 67 and over 65 produced a total of 64 metaphors. Some examples of the metaphors created for the teacher metaphor are as follows:

**E1**: “Teacher is like light because he enlightened us when there was no light in our village.”

**K1**: “The teacher is like an encyclopedia because the more we open and read, the more we learn new things.”

**K2**: “Teacher is like life because everything depends on him, such as our future, our personality…”

**E2**: “The teacher is like an animal trainer because he teaches people who are not aware of civilization.”

**E3**: “Teacher is like the sun because he enlightens us, and saves us from the darkness with his knowledge.”

**K3**: “The teacher is like a parent because he takes care of every student in both education and training and helps them get started.”

In addition, when metaphors related to the concept of teacher are examined, metaphors are mostly related to the conceptual category of “compassionate and sacred being”. Moreover, the most frequently emphasized metaphor was the “mother” as (f=8) in the 15-25 age group, (f=17) in the 45-55 age group and (f=15) in the 65 and over age group, respectively.

**Findings Related to the Second Sub Problems**

For the second sub-problem; the metaphors created by the participants regarding the concept of “headmaster” and the conceptual categories containing the metaphors identified are as indicated in Table 4.

**Table 4. The metaphors created by the participants regarding the concept of “headmaster” and the conceptual categories containing the metaphors**

<table>
<thead>
<tr>
<th>Categories</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over age range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus of management</td>
<td>Metaphors</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Boss (2), grandfather (1), chief (1), director (3), head (1), president (4), king (2), commander (3), headman (1), scales (1), captain (1), organizer (1), roof (1), queen bee (1), headworker (1)</td>
<td>24</td>
<td>14,2</td>
<td>Director (4), commander (1), head (3), headman (2), leader (4), shepherd (1), chief (5), commander (3), watcher (1), coordinator (1), minister (1), captain (2), superior (1)</td>
</tr>
<tr>
<td>Inspector (1), rule (1), scissor (1), wall (1), concrete (1), drone (1)</td>
<td>7</td>
<td>4,1</td>
<td>Concrete (1), police (2), supervisor (1), observer (2), lion (2)</td>
</tr>
</tbody>
</table>
When Table 4 is examined, regarding the concept of manager; it is seen that five conceptual categories have been formed: focus of management, authoritarian and supervisory being, leader and guiding being, being that finances education, being that hosts negativity. In this context, it is seen that a total of 57 metaphors are produced by the participants in the 15-25 age range, 58 by the participants in the age range of 45-55, 54 by the participants in the age range of over 65.

K131: “The headmaster is like a boss because he manages the teachers, the students, and the vice managers.”

K318: “The headmaster is like a father because he is serious and authoritarian, he runs a whole school.”

E23: “The headmaster is like a headman because the headmaster runs the school just as the headman manages the village.”

K236: “The headmaster is like a shepherd because the headmaster runs the school just as the shepherd manages the herd.”

E38: “The headmaster is like a monster because you’re afraid to go to him incase he gets angry.”

E125: “The headmaster is like a money hunter because he wants money for school in season and out of season.”

When metaphors related to the concept of headmaster are examined, metaphors are mostly related to the conceptual category of “focus of management” and the most frequently emphasized metaphors were the “father” as (f=7) in the 15-25 age group, (f= 6) in the 45-55 age group and the metaphor “director” (f=11) in the 65 and over age group, respectively.

**Findings Related to the Third Sub Problems**

For the third sub-problem; the metaphors created by the participants regarding the concept of “school” and the conceptual categories containing the metaphors identified are as indicated in Table 5.
Table 5. The metaphors by the participants regarding the concept of “school” and the conceptual categories

<table>
<thead>
<tr>
<th>Categories</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over age range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Love and solidarity environment</td>
<td>Metaphors</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Port (1), home (5), house (7), tree (1), orphanage (1), mother’s bosom (1)</td>
<td>16</td>
<td>8,9</td>
</tr>
<tr>
<td>Growth and maturation environment</td>
<td>Field (1), serum (1), living (3), water (1), soil (1), wold (1), garden (3), life (4)</td>
<td>15</td>
<td>8,3</td>
</tr>
<tr>
<td>Supervision and discipline</td>
<td>Jail (9), prison (3)</td>
<td>12</td>
<td>6,7</td>
</tr>
<tr>
<td>Advising and Guiding</td>
<td>Car (1), compass (5)</td>
<td>6</td>
<td>3,3</td>
</tr>
<tr>
<td>Financing environment</td>
<td>Penny bank (1), bank (1), workplace (1), business (1)</td>
<td>4</td>
<td>2,2</td>
</tr>
<tr>
<td>Information production environment</td>
<td>Bookshelf (1), factory (3), carpenter (1), field (1), encyclopedia (1)</td>
<td>7</td>
<td>3,9</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>33,3</td>
<td>56</td>
</tr>
</tbody>
</table>

When the metaphors formed by the participants related to the concept of school are examined, as shown in Table 5; there are six categories of love and solidarity environment, growth and maturation environment, supervision and disciplinary environment, guiding environment, financial environment and information production environment. Within the scope of the concept of school, the participants in the 15-25 age range produced 60, the participants in the 45-55 age range produced 56 and 65 and over age range produced 65 metaphors. Some examples of the metaphors produced are as follows:

\[E3^{60} \text{“The school is like a jail because it’s a place where there are always guards at the gate who don’t let us go out and and we have to be constantly.”} \]

\[K2^{61} \text{“The school is like a pool because it feeds on knowledge, it brims with knowledge and it is storehouse of knowledge.”} \]

\[K1^{61} \text{“School is like a home because half of our lives are spent there, it prepares us for the life and it determines our future.”} \]

\[E2^{48} \text{“The school is like a serum because it is the place where something is tried to be grown with preservation.”} \]

\[K2^{48} \text{“The school is like a factory because it struggles over to train a monotype person in our country.”} \]

\[E3^{48} \text{“School is a bookshelf because you can find all kinds of knowledge in it.”} \]

When metaphors related to the concept of school are examined, metaphors are mostly related to the conceptual category of “love and solidarity environment” and the most frequently emphasized metaphors were the “jail” as \(f=9\) in the 15-25 age group, “home” as \(f=9\) in the 45-55 age group and \(f=23\) in the 65 and over age group, respectively.
Findings Related to the Fourth Sub Problems

The conceptual categories created for the concept of “teacher” have been analyzed by taking into consideration the age groups of the participants. The findings obtained in this direction are as follows.

Table 6. Chi-square analysis results related to teacher concept

<table>
<thead>
<tr>
<th>Conceptual Category</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over</th>
<th>χ²</th>
<th>sd</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>The being that guides and enlightens future</td>
<td>16</td>
<td>26</td>
<td>19</td>
<td>9.8</td>
<td>15.499</td>
<td>8</td>
</tr>
<tr>
<td>Source of information</td>
<td>17</td>
<td>12</td>
<td>13</td>
<td>6.2</td>
<td>13</td>
<td>6.7</td>
</tr>
<tr>
<td>Compassionate and holy being</td>
<td>15</td>
<td>21</td>
<td>28</td>
<td>10.9</td>
<td>14.5</td>
<td></td>
</tr>
<tr>
<td>Supervisory, disciplined and authoritative being</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>1.0</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>The being that builds the future</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>3.1</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>67</td>
<td>64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the metaphors created regarding the concept of teacher were examined depending on the age groups, as seen in Table 6, there was no significant difference between the age groups. (χ² = 15.499, p>0.05).

The conceptual categories created for the concept of “headmaster” have been analyzed by taking into consideration the age groups of the participants. The findings obtained in this direction are as follows.

Table 7. Chi-square analysis results related to headmaster concept

<table>
<thead>
<tr>
<th>Conceptual Category</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over</th>
<th>χ²</th>
<th>sd</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus of management</td>
<td>24</td>
<td>29</td>
<td>29</td>
<td>17.2</td>
<td>14.455</td>
<td>8</td>
</tr>
<tr>
<td>Authoritative and supervisory</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>4.7</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Leader and guiding being</td>
<td>10</td>
<td>11</td>
<td>15</td>
<td>6.5</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>The being that finances education</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Being that hosts negativity</td>
<td>11</td>
<td>9</td>
<td>1</td>
<td>5.3</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>58</td>
<td>54</td>
<td>34.3</td>
<td>32.0</td>
<td></td>
</tr>
</tbody>
</table>

When the metaphors created regarding the concept of teacher were examined depending on the age groups, as seen in Table 7, there was no significant difference between the age groups. (χ² = 14.455, p>0.05).

The conceptual categories created for the concept of “school” have been analyzed by taking into consideration the age groups of the participants. The findings obtained in this direction are as follows.

Table 8. Chi-square analysis results related to school concept

<table>
<thead>
<tr>
<th>Conceptual Category</th>
<th>15-25 age range</th>
<th>45-55 age range</th>
<th>65 and over</th>
<th>χ²</th>
<th>sd</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Love and solidarity environment</td>
<td>16</td>
<td>25</td>
<td>38</td>
<td>13.9</td>
<td>21.1</td>
<td>18.005</td>
</tr>
<tr>
<td>Growth and maturation environment</td>
<td>15</td>
<td>12</td>
<td>8</td>
<td>6.7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Supervision and discipline environment</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>2.2</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Advising and Guiding environment</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>3.3</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Financing environment</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1.1</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Information production environment</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>3.9</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>56</td>
<td>64</td>
<td>31.1</td>
<td>35.6</td>
<td></td>
</tr>
</tbody>
</table>

65
When the metaphors created regarding the concept of teacher were examined depending on the age groups, as seen in Table 8, there was no significant difference between the age groups. ($\chi^2 = 18.005, p > 0.05$).

**DISCUSSION AND RECOMMENDATIONS**

In this study, which aims to analyze the perceptions of different aged individuals on school-teacher-headmaster concepts through metaphors, the metaphors related to school concept are parallel to the studies of Saban (2008) in terms of love and solidarity environment, and advising and guiding environment, and centre of discipline and control, and growth and maturation environment; and they are parallel to the studies of Nalçacı and Bektaş (2012) in terms of guiding, shaping, authority, information providing; and parallel to the ones of Grady, Fisher and Fraser (1995) in terms of solidarity and collaboration environment. In addition, they are parallel to the research of Mahlios and MAxon (1998) in terms of family, garden, jail and factory metaphors. Moreover, they are parallel to the studies of Gradt, Fisher and Fraser (1995), and Saban (2008) and Inbar (1996) in terms of the metaphors that have negativity such as military camp, jail and open prison. Although schools are explained through their positive characteristics such as love and solidarity, growth and maturation, and knowledge production environment, there are negative situations that cannot be neglected thus taking attention. Interestingly, most of the metaphors related to school in the literature emphasize the restrictive, alienating and artificial nature of school and schooling. (Hardcastle, Yamamoto, Parkay and Chan, 1985). Contrary to the “school” fiction that is intended to be constructed with a constructivist approach, most of the participants explained the supervision and discipline dimension of the school with the metaphors of jail, prison, cage etc. It is thought that the increase in administrative understanding, which is placed on the discipline ground especially in schools, with an opposite understanding of pedagogical principles is effective in this situation. It is thought that the participants' perceptions can be strengthened by schools not being able to provide activities that can be associated with daily life, inadequate comprehensiveness of extracurricular activities, imprisonment of students in school boundaries in addition to the lack of contemporary administrative understanding. Moreover, mental images such as a large, noisy, absurd, horrible place used by students to describe the school show that students perceive the school as chaotic rather than organized and planned (Demir, 2007). In the light of the researches examined, it is seen that metaphors focusing mainly on the financing aspect of the school are mostly used, although it is not frequently included in the literature. Recently, especially the increase in the number of private schools, donations collected in schools, the increase in the budget spent on the school on a personal basis such as stationery, additional resources, uniforms and so on and transportation costs open financing aspect of education to debate. When the metaphors in the financial environment category related to the concept of school are examined, it is seen that the private side of schools like bank/commerce apart from public finance draws attention. This situation is thought to be the result of the necessity of local elements and families to contribute to education, in a sense that resources are obtained from social finance systems rather than public finance systems.

The metaphors related to concept of headmaster are parallel to the studies carried out by Browne-Ferrigno (2003) in terms of being a leader, and Pesen, Kara and Gedik (2015) in terms of being the focus of management, and being advisor / guide, and being an element of negativity, and being strict and oppressive; and Akan, Yalçın and Yıldırım (2014) in terms of being an element of management; and Cerit (2008) in terms of control, authority and management; and Yalçın and Erginer (2012) in terms of hosting negativity. However, as in the concept of school, it is seen that a strict, authoritarian control-discipline concept is frequently involved. The authoritarian and oppressive side of the concept of headmaster is underlined by every age group and the school administration is symbolized nearly just by this side. This is an indication that the effect of traditional management approach is still ongoing and the concept of supervision is perceived in the same framework. When it comes to headmaster, the concepts of governance and control are mostly perceived by “pressure and authority” and the transformative and modifying role of management and control is ignored. When the developed metaphors are examined (shepherd, chief, inspector, police, etc.), there is no perception of democratic, objective, developer and transparent manager, on the other hand the perception of headmaster directing, ordering, putting pressure is common. However, as in the metaphors of the
school concept, the financing dimension of education can be seen in the concept of headmaster as the person who finances education in various ways. In particular, when the educational budget of the school is limited in terms of socio-economic conditions, it is perceived as a duty of the headmaster to provide budget through individual efforts like donations, grants, projects etc.

The conceptual categories related to teacher concept are parallel to the studies carried out by Yılmaz, Göçen and Yılmaz (2013); Ekiz and Koçyiğit (2011), and Stichert (2005); and Nikitina and Furuoka (2008); and Martinez, Sauleda and Huber (2001); and De Guerrero and Villamil (2002) in terms of pathfinder, raw material, producer, source of information, guide, leader and sacred being; In terms of metaphors such as the police and the boss, the study is consistent with the findings of the research carried out by Nikitina and Furuoka, (2008). The teacher, who is considered as the center of power, authority and management in the class, is positioned at the top of the hierarchy created in this sense in the classroom. In this respect, considering the participants in different age groups, it is also observed that the traditional teacher image is still handled with the concepts of supervision-discipline and authority. Considering the voluminous space occupied by the concept of authority in Turkish culture, it is necessary to predict similar mental perceptions. On the other hand, metaphors open to the change emphasized by the constructivist education, adopting a flexible managerial understanding, and referring to the constructive and entrepreneurial teacher characteristics are rarely encountered. In addition, when the metaphors created are examined, it is observed that the personality of the teacher has an important effect on teacher perception as well as the teacher’s classroom management, subject area knowledge, general culture etc. educational characteristics. In every age group, the metaphor which has been the most frequently discussed within the concept of teacher is mother and the concept of teacher is depicted as a compassionate and sacred being through metaphors such as mother, mother – father, sister, and family. This finding of the study is consistent with the results of the research conducted by Yılmaz, Göçen and Yılmaz (2013) and Ocak and Gündüz (2006). It is likely that the time spent with the teacher, the most important element in the school, which can be considered as the first social environment after the family, feeds the formation of this perception.

When metaphors related to school-teacher and headmaster concepts are considered within the age groups, no significant change has been observed between different age groups. The fact that the mental perceptions of these concepts, which are discussed in a wide range from 15-25 age group to 65 and over age group do not change despite the radical changes in educational processes is an indication that the traditional line prevails. Program changes taking place periodically in the history of the Republic have made strong claims in forming a “new” education process each time and it has been concerned about transforming and strengthening all sub-systems of education in order to meet the requirements of the age. Particularly in 2005, a number of important changes in the role of important components such as school-headmaster-teacher were targeted with radical changes and breakdowns accompanied by a strong educational discourse. However, when the metaphors and conceptual categories are evaluated, it is seen that the traditional roles related to school-headmaster-teacher concepts continue.

Based on the findings obtained from the research, the strong effect of metaphors in revealing mental perceptions has been taken into consideration and a comprehensive framework has been tried to be drawn. Metaphors play an important role as a means of creating reflection and awareness among educators (De Guerrero and Villamil, 2002). However, metaphors are largely though non-primary offer a powerful way for people to conceptualize and ultimately understand life experiences. (Mahlios, Shaw and Barry, 2010). In this context, future research and the underlying reasons of mental perceptions and images related to the concepts of teacher-schoolheadmaster can be handled through functional variables in the formation of these perceptions and images.

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Analysis of the Relationships between Mathematics Achievement, Reflective Thinking of Problem Solving and Metacognitive Awareness

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Abstract
In this study, it was examined that in what level reflective thinking towards problem solving skills and metacognitive awareness explained maths course achievements of the students and the relationships among these variables were studied. Relational survey model was applied. The study included 412 seventh grade students from two different secondary schools within each of the three central districts located in Ankara. In this study, “Reflective Thinking Skill Scale to Problem Solving (RTSSPS)” and “The Metacognitive Awareness Inventory for Children (MAI-C)” and the scores of “Maths Course Achievement” were used. “Pearson Momentler Correlation Coefficient” and “Multiple Linear Regression Analysis” were used in the correlational and regression analysis. It was determined that there was a strong positive significant correlation between students’ maths achievement, reflective thinking towards problem solving and metacognitive awareness. It was also determined that there was a strong positive significant correlation between reflective thinking towards problem solving and metacognitive awareness.

Keywords: Achievement, reflective thinking, problem solving, metacognition

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INTRODUCTION

Today, it has become evident that the student is not considered to be as a passive receiver of knowledge, but as an active participant. The perception of the education in which information is actively structured in the mind through basic skills in learning environments has gained more importance. In this sense, it is aimed to equip students with high level cognitive skills among which are critical thinking, analytical thinking, reflective thinking, inquiry, research, adaptation to new situations, decision making, implementing, and problem solving (Orakci, Durnali, & Aktan, 2019). Maths is accepted as one of the courses aiming to enable students to gain these skills and abilities.

Maths is a discipline that develops estimating, calculating, counting, drawing and measuring via human mind to solve problems in daily life throughout environmental influences (Altun, 2013). It is a universal language created as a result of using relations and symbols between sizes, numbers and shapes (Baykul, 2009) and that develops analytical thinking (Minisker, 2006). The main purpose of teaching maths is to gain a problem solving approach with basic knowledge and skills towards maths through mathematical concepts and systems required in a person’s daily life and to gain a system of thinking that solves events through problem solving approach (Altun, 2014). Maths makes it possible to understand the relations in our close environment and to make logical inferences by analyzing the available information (Baykul, 2009). It is a subject in which students can experience problems and failures in terms of teaching maths. The abstract concepts in Maths can be cited as one of the reasons for this situation (Baykul, 2009; Ernest, 2010).

Achievement can be expressed as an individual’s achievement of a desired goal. When it comes to education, it is linked to the fact that the student exhibits their behaviour with regard to the objectives of the curriculum (Demirtas & Gunes, 2002). Besides, it is an indication of the degree to which the objectives of the course or curriculum are realized (Ozguven, 2002). The variables affecting the students’ maths achievement should be determined and the necessary precautions should be taken to contribute to the students’ achievement (Dursun & Dede, 2004). Different studies revealed that academic achievement was in relation with cognitive processes such as learning style and intelligence, and affective factors including personality traits, motivation, self-efficacy, and devoting enough time for course responsibilities, as well as parental attitude, family income, teaching leadership specification of the teachers, teachers’ competence, their attitudes towards students and other environmental factors (Howie & Pietersen, 2001; Wang, 2004).

According to maths educators, the improvement of problem-solving skills of students is the primary goal of maths education (Karatas & Guven, 2003; Kilic, 2013; Lester, 2013; Szabo, 2017). A problem is mainly identified as a conflict situation where an individual has more than one possibility of reaching a goal, disturbing the individual mentally or physically from being obstructed (Cubukcu, 2011; Karasar, 2009). In other words, problem is a situation that confronts the individual with the need of decision on the choice of strategy that can be used to solve the problem. In a problematic situation, there should be a difference between the current situation and the ideal situation (Kneeland, 2001). Problem solving is the process of choosing and implementing the tools and behaviours that are effective and useful to overcome the difficulties that an individual faces to fulfil his or her purpose (Bingham, 2004; Duman, 2013). Problem solving is a skill that an individual acquires by learning and should develop constantly (D’Zurilla & Chang, 1995; D’zurilla & Nezu, 2006; Krulik & Rudnick, 1989). Problem solving is high-level goal-oriented mental skill that requires a conscious and rational effort.

Problem solving skills include the skills necessary for an individual to solve the problems when faced with a difficult problem (Yetkin & Bascan, 2008). Problem solving is an important part of an individual's mental behaviour. One’s self-perception is important in the development of problem-solving skills. In addition, the individual sometimes solves the problem by trial and error, sometimes solves with the scientific method (Miller & Nunn, 2001). It is a complex process and it is recommended by experts that this process be performed gradually because the gradual division of the problem-solving process facilitates both teaching and learning (Senemoglu, 2013). It is clear that
problem solving is divided into various steps for the improvement of cognitive and metacognitive skills related to problem solving by many researchers (Dewey, 1910; D’Zurilla & Goldfried, 1971; Garofalo & Lester, 1985; Krulik & Rudnick, 1989; Morgan & Williams, 2007; OECD, 2004; Polya, 1997; Stevens, 1998; Schoenfeld, 1985).

Problem solving, which is a vital skill in all of the training programmes, has become the main goal of maths education with George Polya’s work (1887-1985) (Okur, Tatar, & Isleyen, 2011). Polya (1997) identified four stages of problem-solving process. These steps are: “understanding the problem, preparing the plan for the solution, applying the prepared plan and evaluating the solution”. It is essential for learners to have problem-solving skills from early ages and to use this skill at school and in their everyday life (Sahin, 2015). Enabling learners to acquire problem solving skills increases the achievement of the course with regard to academic achievement and, from a social perspective, helps an individual and group live in harmony (Altun, 2013, Kahramanoglu & Deniz, 2017, Senemoglu, 2013). Problem solving is not only a scientific method but it also allows students to learn and use different upper mental skills including critical, creative, analytical and reflective thinking in the solution phase of the problem (Posamentier & Krulick, 2009).

Within the process of problem solving, student's thinking about problem and combining their own knowledge and experience for the solution are related to reflective thinking (Buzdar & Akhtar, 2013). Reflective thinking is a cognitive feature that is learned and developed consciously. Therefore, it is important to have this type of thinking in school environment (Wilson & Jan, 1993). Reflective thinking, which is an inquiry approach that cares about constructivism in education, enables the individual to reconstruct his/her experiences (Mahnaz, 1997). John Dewey, one of the most famous educators in the USA, proposed the concept of reflective thinking to improve students’ problem-solving skills and to encourage a spirit of research in students in the direction of supporting student-centered education. According to Dewey (1933), reflective thinking is an effective, coherent and careful thinking of an information structure that supports any thought or knowledge and the achievement of its intended results. When students encounter any problems, they believe that systematic, careful and disciplined thinking around a scientific roof will help them to solve problem. The aim of reflective thinking is to understand a situation or a problem and to find a better solution (Kizilkaya & Askar, 2009). In this context, problem solving is one of the most important skills that an individual should have and reflective thinking is thought to contribute to the problem-solving process. Actions carried out in reflective thinking process are questioning, reasoning and evaluation (Kizilkaya & Askar, 2009; Hong & Choi, 2011). RTTPS encourages students to take initiation to solve, to keep up their interests, and to create an understanding of environmental control in them (Epstein, 2003). The development of reflective thinking skills in students has an influence on their success in maths and problem solving (Meissner, 2006).

Some researchers have associated problem solving process with reflective thinking skills. According to Ferri (2003), reflective thinking skills are related to examining the problem in various dimensions rather than finding out what the result is when a problem is encountered. These thinking skills include evaluating the assumptions put forward in the problem-solving process (Mezirow, 1991). Reflective thinking skills allow the evaluation of the solutions for the problem and choosing the best solution for it (Bingham, 2004). According to Tripp (2003), reflective thinking starts with defining the problem, then things to be done in the context of the problem are listed. Reflective thinking takes place at this stage. Following this stage, a plan is made for the application, and it is put into practice. The things that have been done by that time are evaluated by explanations and this process continues with a rotating cycle. It can be said that reflective thinking skills towards problem solving are a combination of reflections made during problem solving stages. In other words, RTTPS are a high-level thinking style which is carried out in the process of problem solving from the understanding of the problem to the resolution, in the stages of focusing, planning, finding possible solutions, decision making and evaluation (Saygılı & Atahan, 2014)

The concept of metacognition can be generally identified as awareness of an individual’s own cognitive processes (Dunlosky & Metcalf, 2009; Nelson, 1999), observing and controlling them
(Flavell, 1987) and their arrangement (Kuhn & Dean, 2004). The knowledge about cognition including the achievement of certain goals of individuals, and arrangement of one’s cognitions are two main elements of metacognition (Flavell, 1976; Garofalo & Lester, 1985; Lester, Garofalo & Kroll,1989; Veenman, 2006). In short, metacognition can be expressed as mental processes involving cognitive awareness (Martinez, 2006). It has been among the prominent concepts in recent years. This is due to the assumption that metacognition is effective in gaining competencies such as learning to learn and self-learning, which are beginning to dominate education with regard to the paradigm of our era (Akpunar, 2011). Metacognition is employed to regulate and monitor cognitive processes (Chauhan & Singh, 2014), such as communication, convincing, memory, language learning, reading and comprehension, interest, social awareness, problem solving, self-control, and individual learning (Flavell, 2004). It was stated that the individual, task and strategy variables, and the interactions of these variables play an important role in the formation of metacognitive knowledge, (Flavell, 1979; Veenman, 2005). Flavell (1979) explained these variables as “The category of individual encompasses everything about the beliefs about you and the nature of other people in the context of cognitive processes. The category of task shows the individual’s knowledge on nature of the situation and the necessity of a particular task. The category of strategy deals with the information on what kinds of cognitive attempts will be likely to be effective in achieving which of sub-goals and targets they can achieve. “Metacognitive knowledge is related to the fact that individuals are aware of what they know, whereas metacognitive skills, including the actions of observation and regulation are related to their ability to know when and how to use this knowledge is related to (Depaepe, Corte and Verschaffel, 2010; Özcan, 2015; Schoenfeld, 1987).

Problem solving skills include a metacognitive process based on the awareness of one’s own mental skills, his/her ability to monitor and control the problem-solving process (Demirel, 2012; Mayer, 2001; Schoenfeld, 1992). Metacognition is a key concept in problem solving skills (Jacobse & Harskamp, 2012; Lee, Chang, & Lee, 2001; Schoenfeld, 1985; Scott & Berman, 2013). Derry and Hawkes (1993) discussed two important metacognitive skills in problem solving. These were “self-monitoring” and “planning”. “Self-monitoring” means the individual’s ability to create self-control in the process of problem solving. “Planning” involves the individual’s ability to break the problem into sub-targets that can be separately solved. Diverse studies have determined that there existed a meaningful relationship between metacognitive skills and problem solving; the teaching of metacognition skills improved students’ problem solving ability and as a result, they organized their mental processes more effectively (Bayat & Tarmizi, 2010; Demir, 2016; Kahramanoglu & Deniz, 2017; Kaplan, Duran, & Bas, 2016; Karakelle, 2012; Kramarski, Mevarech, & Arami, 2002). Centered on the examinations of the definitions of metacognition in the related literature, there are six main aspects: “awareness, control, evaluation, planning, monitoring and self- efficacy” while there may be other aspects of metacognition. As for MA, it is linked to an individual’s character of consciousness about his/her learning, building and developing way of knowledge. (Anderson & Nashon, 2007).

MA is the ability of the individual to be aware of his or her own cognitive processes and to be able to control the processes by keeping them under control (Sari, 2015). It is the ability of an individual to plan, sort, monitor and use his or her cognitive processes in a better way (Schraw, & Dennison, 1994). In short, the individual is aware of the learning strategies that are appropriate for him or her (Demirsoz, 2010). According to Mason and Santi (1994), MA is in existence at several levels: the awareness of what one knows, why one knows that this is true, awareness of knowledge building procedures, and awareness of changes in one’s conceptual structures. These are phases of dialogue argumentation as individuals come into the group environment. Here, it is seen that individual thought has a relationship with group dynamic (as cited Nielsen, Nashon & Anderson, 2009, p.7). MA provides planning, sequencing, and monitoring in learning process for individuals, which directly improves performance (Schraw & Dennison, 1994).

When the studies were examined in the related literature, it can be said that the studies showing the relationship between metacognition and problem solving have started to increase in recent years. In the studies, it was revealed that problem solving skills centred on metacognitive understanding was a method that improved self-regulation skills (Ay & Bulut, 2017). In some studies,
examining the relationship between metacognitive skills and problem solving (Balci, 2007; Bars, 2016; Demir, 2016; Kaplan, Duran & Bas, 2016; Karakelle, 2012; Kramarski, Mevarech & Arami, 2002; Lee, Teo & Bergin, 2009; Swanson, 1992; Teong, 2002), it was found that the level of MA improved the level of RTTPS. It was also revealed in different studies that metacognitive skills increased the success of problem solving (Ozsoy, 2007, Ozsoy & Ataman, 2009; Sengul & Isik, 2014), similarly, metacognitive skills affected maths course achievement positively (Ataalkin, 2012; Deniz, 2017; Kahramanoglu & Deniz, 2017; Kapa, 2001; Pehlivan, 2012). In another study by Tat (2015), it was determined that the most important variables RTTPS were the level of students and teachers. In some studies, investigating the relationship between problem solving and reflective thinking skills and maths achievement (Bas & Kivilcim, 2013; Sen, 2011), it was found out that the students who had RTTPS were more successful. The fact that students have RTTPS enables them to spend more time on recognizing, understanding, and solving problems, thus increasing their course achievement (Kizilkaya, 2009; Serin & Korkmaz, 2018).

When the results of the above-mentioned studies were examined, it was revealed that problem solving skills centred on metacognitive skills improved self-regulation skills and having reflective thinking skills towards metacognitive skills and problem solving were important variables in increasing problem solving skills and achievement of the course. On the other hand, maths is seen as a course that most of the students are afraid of. Why so many students are afraid of maths may be that students cannot escape from their prejudice including failure. Students can overcome their fears when they increase their success in maths (Ekenel, 2005). MA and RTTPS are two important concepts that increase success (Alic, 2007; Celik, 2012; Receber, 2011). In addition, this research can give new ideas to researchers who will conduct research in the field of maths education. Based on the results of the research, it can also help teachers who are the practitioners of the maths education program to provide appropriate learning environments to enable them to develop their own perceptions and MA. It is believed that this research can help to improve the quality of education, and to guide teachers on why it is necessary to increase their MA and RTTPS when organizing teaching processes.

Taking into account to these facts, the purpose of this study is to analyze whether RTTPS and MA predict students’ maths achievement significantly. In this context, the research questions below will be addressed:

1. Is there a meaningful relationship between RTTPS and students’ maths achievement?
2. Is there a meaningful relationship between MA and students’ maths achievement?
3. Is there a significant relationship between RTTPS and MA?
4. Are the levels of MA and RTTPS are significant predictors of maths achievement?

**METHODOLOGY**

In the study, it was examined that in what level RTTPS and MA predicted maths course achievements of the students and the relationships among these variables were studied. In the study, relational survey model was applied. The researchers focused on how phenomena interacted with each other in the natural environment without establishing any experimental designs. It is undisputed that establishment of an experimental design including a causal and controlled investigation will be a more effective way. However, relational research based on the interaction of variables is determined in the natural environment of events and phenomena. Relational survey model researches based on the interaction of variables also contribute to science by providing a perspective to possible prospective research. The selection of the method as descriptive-based relational comparison restricts the interpretation of a causal effect even if there are possible relationships and interactions among variables.
Research Sample

The study consisted of 501 seventh grade students from two different secondary schools within each of the three central districts (Cankaya, Kecioren and Yenimahalle) located in Ankara. Since the data did not show a normal distribution, the outlier labeling technique was used. As a result of these procedures, 412 seventh grade middle school students are the sample of the study. Of these students, 203 (49%) are female and 209 (51%) are male. The “purposeful sampling strategy” was chosen since it is easy to collect information from participants who are easily accessible to the researcher (Senol, 2012).

Research Instrument

In this study, “Reflective Thinking Skill Scale to Problem Solving (RTSSPS)” and “The Metacognitive Awareness Inventory for Children (MAI-C)” were utilized as data collection instruments. The achievement scores of the maths course of the students were obtained from the school administrators.

RTSSPS

The scale developed by Kizilkaya and Askar (2009) aims to determine seventh grade students’ RTTPS. The scale is a five-point Likert-type scale with a Cronbach’s Alpha value of 0.83. “Questioning” (5 items), “Reasoning” (4 items) and “Evaluating” (5 items) are sub-dimensions of the scale. The highest score to be obtained from the scale is 70 while the lowest is 14. With regard to the confirmatory factor analysis done for the the validity studies of the scale, the fit indices are “X²/sd=2.69”, “GFI=0.92”, “AGFI=0.89”, “NNFI=0.93”, “CFI=0.95”, “RMSR=0.08”, “RMSEA=0.071”. The Cronbach α is 0.73 for the “questioning” sub-dimension of the scale, “0.71” for “reasoning”, and “0.69” for “evaluation”, and “0.83” for the whole of the scale. Although these reliability values are not excellent, they are acceptable levels of reliability. However, this scale was preferred instead of any other tools for reflective thinking in problem solving. The reasons for this are that it is a measurement tool developed with regard to the students in target audience in Turkey and it was developed with regard to Turkish culture. The fact that there were not too many items in the measurement tool led the researchers think that middle school students would answer questions without losing their attention. This situation was expected to increase the reliability of the research. Reflective thinking is embodied as being aware of what people are doing and thinking about what they are doing. The items of this scale also question students’ thoughts and evaluations on how they solve the problem after they solved it.

MAI-C

The Turkish version of the scale was developed by Sperling, Howard, Miller and Murphy and adapted by Karakelle and Sarac (2007). It consisted of A and B forms. The A form with 12 items developed for third, fourth and fifth graders is a 3-point Likert type scale changing from 1 (“never”) to 3 (“always”) whereas the B form with 18 items developed for sixth, seventh and ninth graders is a 5-point Likert type scale changing from 1 (“never”) to 5 (“always”). In this study, the B form was used as it was conducted with seventh graders. The highest score that can be got from the scale is 90 while the lowest score that can be got from the scale is 18. The Cronbach α of the scale that consists of one dimension is 0.72. The reliability value of this scale is not perfect, but it is within acceptable limits. First of all, the research instrument that is appropriate for the students in the target audience of the research and specific to the Turkish culture was searched. Since this did not happen, it was decided that this scale was appropriate to use. The fact that there were not too many items in the measurement tool led the researchers think that middle school students would answer questions without losing their attention.
Maths Achievement

At the beginning of the research, researchers thought to measure maths achievement by a multiple-choice achievement test. In order to conduct this, it is essential to develop the achievement test, to perform the test application, to calculate the item analysis and the KR-20 reliability value of it and to give the final version of it. It was thought that this process would take time and extend the duration of the research. In addition, it is not possible to measure all the achievements in the 7th grade maths course program with multiple choice items. From time to time, items that require open-ended or progressive response to show the steps of problem solving should also be used. All these reasons led to researchers use achievement measured by teachers in classroom environment as a data. This has advantages and disadvantages. While measuring maths achievement, teachers use multiple choice, true false question types, open-ended item types that require short answer, oral and written exams, and project assignments as performance indicators. In this way, the process is better observed. On the other hand, problems such as objectivity, validity and reliability of teachers’ measurements constitute the disadvantage of the measurements made by them.

Research Process

The schools where the research process was implemented were visited a week in advance. The class list and maths achievement scores of the students were requested from the school administration. It was interviewed with the teachers of the classes to be practiced and information was given about what needs to be done on the day of the application. On the day of the application, information about the research was presented before the application of the scales to the students. It was emphasized that participation was centred on the principle of volunteering in the study and it was stated that the students who did not want to be a participant had this right. Each of the scales was marked with a different sign. The students were not asked to write their names in the measurement tools. They were asked to bring the scale to the researcher. The student who brought the scale was told to show his or her name silently in class list, and so it was made sure that the scales belonged to the student.

Data Analysis

In data analysis within the direction of research questions, relation analysis and linear regression analysis were realized. The fact that the data showed a normal distribution enabled “Pearson Moments Multiplication Correlation Coefficient” and “Multiple Linear Regression Analysis” to be used. “Kolmogorov Smirnov Normal Distribution Test” was applied to the scores got from the scales of MAI-C, RTSSPS and from maths course (Buyukozturk, 2013, Kalayci, 2005).

The results of the “Kolmogorov Smirnov Normal Distribution Test” of the data got from 501 students are summed up in table 1.

<table>
<thead>
<tr>
<th>Scales</th>
<th>N</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflective Thinking Skill Scale towards Problem Solving (RTSSPS)</td>
<td>501</td>
<td>0.044</td>
</tr>
<tr>
<td>The Metacognitive Awareness Inventory for Children (MAI-C)</td>
<td>501</td>
<td>0.112</td>
</tr>
<tr>
<td>Maths Course Achievement Scores</td>
<td>501</td>
<td>0.039</td>
</tr>
</tbody>
</table>

As seen in Table 1, the scores obtained from MAI-C showed a normal distribution (p>.05), but scores from RTSSPS and Maths Course Achievement scores did not show a normal distribution (p<.05).

In the data of the scales whose scores did not show a normal distribution, outliers were examined (Kalayci, 2005). After outliers were examined, the “Kolmogorov Smirnov Normal Distribution Test” was again applied to the scores of the remaining 412 participants. The test results are summed up in table 2.
Table 2. The Results of the Kolmogorov-Smirnov Normal Distribution Test After the Examination of Outliers

<table>
<thead>
<tr>
<th>Scales</th>
<th>N</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTSSPS</td>
<td>412</td>
<td>0.200</td>
</tr>
<tr>
<td>MAI-C</td>
<td>412</td>
<td>0.200</td>
</tr>
<tr>
<td>Maths Course Achievement Scores</td>
<td>412</td>
<td>0.200</td>
</tr>
</tbody>
</table>

As shown in Table 2, after the examination of outliers, the scores of the remaining 412 participants showed a normal distribution. Based on these results, it was decided to use “Pearson Moments Correlation Coefficient” in the correlation analysis and “Multiple Linear Regression Analysis” in regression analysis.

**FINDINGS**

**The relation between RTSSPS, MAI-C and Maths Course Achievement**

The relation between levels of students’ reflective thinking, MA and maths course achievement were investigated. The results obtained are summed up in table 3.

Table 3. The Relationships between Reflective Thinking Skill Scale towards Problem Solving, Metacognitive Awareness and Mathematics Achievement

<table>
<thead>
<tr>
<th>Mathematics Achievement</th>
<th>Reflective Thinking towards Problem Solving</th>
<th>Metacognitive Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0.794**</td>
</tr>
<tr>
<td>Reflective Thinking towards Problem Solving</td>
<td>0.794**</td>
<td>1</td>
</tr>
<tr>
<td>Metacognitive Awareness</td>
<td>0.785**</td>
<td>0.989**</td>
</tr>
<tr>
<td></td>
<td>0.989**</td>
<td>1</td>
</tr>
</tbody>
</table>

**p<.01, n=412

As seen in Table 3,

- It was revealed that there existed a strong positive meaningful relationship between RTTPS and students' maths course achievement (r=0.794, p<.05). It can be said that as the level of RTTPS increased, maths course achievement also increases.

- It was revealed that there existed a strong positive meaningful relationship between MA and students' maths course achievement (r=0.785, p<.05). It can be said that as the level of MA increased, math course achievement also increased.

- It revealed that there existed a strong positive significant relationship between students' RTTPS and MA (r=0.989, p<.05). It can be said that as the level of MA increased, RTTPS also increased.

**The Effect of the Levels of MA and RTTPS on Maths Course Achievement**

Whether the levels of students’ MA and RTTPS were significant predictors or not was examined. The model formulated is as follows:

\[ \hat{Y} = b_0 + b_{ref \ think \ prob \ solving} x_{ref \ think \ prob \ solving} + b_{metacog \ aware} x_{metacog \ aware} \]

This analysis was performed by multiple linear regression analysis. Multiple linear regression is applied in cases where the number of explanatory variables is at least two and more predicted variables are single. The results are summarized in Table 4.
Table 4. The Effect of the Levels of Metacognitive Awareness and Reflective Thinking towards Problem Solving on Maths Course Achievement

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>Collinearity Statistics (VIF)</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>26.810</td>
<td>4.137</td>
<td>6.481</td>
<td>0.000</td>
<td></td>
<td>349.58</td>
<td>2</td>
<td>0.000</td>
</tr>
<tr>
<td>Reflective Thinking towards Problem Solving</td>
<td>1.053</td>
<td>0.261</td>
<td>4.035</td>
<td>0.000</td>
<td>46.482</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metacognitive Awareness</td>
<td>-0.034</td>
<td>0.213</td>
<td>-0.158</td>
<td>0.874</td>
<td>46.482</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When Table 4 looked at carefully, it is seen that the constant is significant. It can be interpreted that other variables that were not formulated except explanatory variables (MA and RTTPS) to be formulated were significantly predictive of Maths course achievement. RTTPS is a significant predictive of Maths course achievement (p<.05), but MA is not a significant predictive of it (p>.05).

Variance Inflation Factor (VIF) shows multicollinearity between predictive variables. In the event that VIF is “1”, there are not multicollinearity between predictive variables. There is strong multicollinearity between predictive variables in the event of 1≤VIF≤10. In the event of VIF>10, there are strong multicollinearity between predictive variables, the model formulated is invalid and a regression model should be formulated with nonparametric or biased estimation methods (Ozdamar, 2013). The ANOVA Model test results show that the model is significant (F_{(2)}=349.581, p<.05). Although this result shows that the model formulated is significant and appropriate, the validity of the model formulated becomes controversial because of the strong level of autocorrelation among the variables in the VIF statistic. The model formulated was re-established by being divided into two linear regression models instead of multiple linear regression to prevent misleading and bulging correlation values as a result of autocorrelation. The results are summed up in table 5.

Table 5. The Effect of Reflective Thinking towards Problem Solving on Maths Course Achievement

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>R</th>
<th>R^2</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>27.377</td>
<td>2.062</td>
<td>13.278</td>
<td>0.000</td>
<td>0.794</td>
<td>0.631</td>
<td>700.802</td>
<td>1</td>
<td>0.000</td>
</tr>
<tr>
<td>Reflective Thinking of Problem Solving</td>
<td>1.012</td>
<td>0.038</td>
<td>26.473</td>
<td>0.000</td>
<td>0.794</td>
<td>0.631</td>
<td>700.802</td>
<td>1</td>
<td>0.000</td>
</tr>
</tbody>
</table>

When Table 5 looked at carefully, it is seen that the constant is significant (p<.05). As a result, it can be interpreted that other variables that are not modelled apart from the level of RTTPS were predictive of Maths course achievement. The level of RTTPS has an effect on maths course achievement and is a significant explanatory factor (p<.05). The regression model formulated as a result of ANOVA test is appropriate and significant (F_{(1)}=700.802, p<.05). The results of the analysis of the effect of the level of MA on the achievement of the maths course are summarized in table 6.

Table 6. The Effect of Metacognitive Awareness on Maths Course Achievement

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>p</th>
<th>R</th>
<th>R^2</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>42.338</td>
<td>1.546</td>
<td>27.394</td>
<td>0.000</td>
<td>0.785</td>
<td>0.616</td>
<td>658.347</td>
<td>1</td>
<td>0.000</td>
</tr>
<tr>
<td>Metacognitive Awareness</td>
<td>0.816</td>
<td>0.032</td>
<td>25.658</td>
<td>0.000</td>
<td>0.785</td>
<td>0.616</td>
<td>658.347</td>
<td>1</td>
<td>0.000</td>
</tr>
</tbody>
</table>

When Table 6 looked at carefully, it is seen that the constant is significant (p<.05). As a result, it can be interpreted that other variables that are not modelled apart from the level of MA were predictive of Maths course achievement. The effect of the level of MA is effective in the achievement of the maths course and a significant explanatory factor (p<.05). The regression model formulated as a result of ANOVA test is appropriate and significant (F_{(1)}=658.347, p<.05).
RESULTS AND DISCUSSION

With regard to the results of the research, it was determined that there existed a strong positive significant correlation between students’ maths course achievement and RTTPS. The way to succeed in maths is directly related to good problem solving. In this sense, how problem-solving process works in teaching maths is very important (Olkun & Toluk, 2004). Problem solving skills arise as one of the most important skills in an individual. In this context, reflective thinking skills are thought to contribute to problem solving process (Kızılkaya, 2009). Similarly, it was determined that students who reflected on problem solving environment spent more time on questions and gave up less (Gama, 2004). In this context, it can be stated that reflective thinking can only be observed in the problem-solving process in the best way based on the fact that when it arises at a particular problem is perceived (Shermis, 1992). Being a successful problem solver also brings critical thinking, decision making, MA, reflective thinking, asking questions, analyzing and synthesizing (Hacısalihilioğlu, Mirasyedioğlu & Akpınar, 2003). It can be stated in this study that as the level of RTTPS increased, achievement of math scores also increased. In a study by Bas and Kivilcim (2013) investigating the relationship between high school students’ RTTPS and their academic achievement in maths and geometry courses, a strong positive meaningful relationship was found, which supports the findings of this study. Similarly, in a study by Sen (2011), it was revealed that there existed a strong positive significant correlation between RTTPS and students’ maths course achievement. Similarly, in a study by Kızılkaya (2009), it was determined that there existed a strong positive significant correlation between students’ reflective thinking skills and their maths course achievement. With regard to the findings of that study, it can be stated that students’ having reflective thinking skills has a positive influence on their being successful in maths and solving problems (Meissner, 2006). It can be stated that students who had RTTPS, spent more time to recognize, understand and solve problems, combined knowledge and experience by rethinking problems and thus it increased the success of the course (Buzdar & Akhtar, 2013; Kızılkaya, 2009; Serin & Korkmaz, 2018).

With regard to the results of this research, it was found out that the level of RTTPS is an effective and significant explanatory factor on maths course achievement. According to the results of the similar studies, it was determined that the teaching of metacognition skills increased achievement in problem solving hence the students organized their mental processes more effectively (Bayat & Tarmizi, 2010; Demir, 2016; Kahramanoglu & Deniz, 2017; Kaplan, Duran, & Bas, 2016; Karakelle, 2012; Kramarski, Mevarech, & Arami, 2002; Schoenfeld, 1985). RTTPS includes concepts such as inferencing, generalizations, reasoning between events and relations, hypothesis creation, hypothesis evaluation, recalling, problem solving, using necessary information to understand the problem, analyzing information and discussion (Erginel, 2006). Students benefit from reflective thinking skills in developing new learning strategies by questioning activities in the learning process (Kahyaoglu & Elcicek, 2016; Uygun & Cetin, 2014). Based on the results of the research, the structuring of teaching activities for students with activities that improve their reflective thinking skills can make contributions to their course achievement and the development of mental processes.

In addition, it was revealed that there existed a strong positive significant correlation between students’ maths course achievement and MA. It can be stated that as the level of RTTPS increased, maths course achievement also increased. Some similar studies examining correlation between MA and students’ maths course achievement (Ataalkin, 2012; Deniz, 2017; Kahramanoglu & Deniz, 2017; Kapa, 2001; Pehlivian, 2012) supported the findings of this study. MA is the ability of students to control their individual learning, and to have sufficient skills for problem solving strategies and problem-solving stages (Akyolcu, 2013). Based on the research results, it is thought that students who take more responsibility in their own learning, control their learning, have metacognitive skills and use them effectively in problem solving processes will be more successful in the course (Ozturk, 2017).

It was determined that there existed a strong positive significant correlation between students’ RTTPS and MA. It can be said that as the level of MA increased, RTTPS also increased. Some similar studies (Balci, 2007; Bars, 2016; Demir, 2016; Kaplan, Duran & Bas, 2016; Karakelle, 2012; Kramarski, Mevarech, & Arami, 2002; Lee, Teo, & Bergin, 2009; Swanson, 1992) examining
correlation between RTTPS and MA supported the findings of this study. The development of reflective thinking skills and MA in students is effective in both maths and problem solving (Mayer, 2001; Meissner, 2006; Schoenfeld, 1992). MA enables students to embody maths course composed of abstract concepts and learn it better (Ozturk, 2017). The study results show that RTTPS and MA can be effective variables in increasing maths achievement. In the light of these results, it can be said that students who take responsibility in their own learning processes and have the skills to control learning processes can increase course achievement.

In this study, it was determined that both the level of MA and the level of RTTPS were significant explanatory variables on maths course achievement. With regard to the research results, it may be stated that students who have higher MA and RTTPS can be more successful in maths courses. The regression models that were formulated also showed that other variables that were not modelled except explanatory variables (RTTPS and MA) to be modelled have also an effect on maths course achievement.

With regard to the results of the study, it is advised to include activities that will improve MA and reflective thinking skills in teaching and textbooks for students. In addition, it is suggested to diversify teaching methods for the maths lesson in a way that will provide these skills, and to support teachers’ MA and RTTPS with in-service training activities.

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The Effects of Science Teaching Practice Supported With Web 2.0 Tools on Prospective Elementary School Teachers’ Self-Efficacy Beliefs

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Abstract

This study aims to analyse the effects of science teaching practices supported by Web 2.0 tools on prospective elementary school teachers’ perceptions of self-efficacy beliefs in using Web 2.0 tools. The study was conducted in pre test-post test quasi-experimental design with no control group, and it was supported with qualitative data. The research was conducted with the participation of 40 prospective teachers registered in Elementary School Teaching Department of a state university in 2017-2018 academic year. The study was conducted throughout a semester (for 14 weeks) within the scope of the course Science and Technology Teaching II. The lessons were taught in consistence with constructivist learning approach directed to all the gains available in the 3rd and 4th grade Science teaching curriculum prepared by the Ministry of National Education (MNE) (2018) on the basis of student-centred methods and techniques by supporting with Web 2.0 tools. 23 Web 2.0 tools in total were used throughout the study. The “Web 2.0 Rapid Content Development Self-efficacy Scale” developed by Birişci, Kul, Aksu, Akaslan and Çelik (2018) in addition to an interview form of open-ended questions developed by the researcher to obtain prospective teachers’ views on the use of Web 2.0 tools in science teaching were used in this study. Consequently, it was found that science teaching practices supported by Web 2.0 tools had positive effects on prospective elementary school teachers’ their self-efficacy perceptions on the use of Web 2.0 tools. An examination of the participants’ responses to the open-ended questions demonstrated that the participants said that Web 2.0 tools had positive impacts especially on the learning process and they were innovative and they improved upper order thinking skills, creativity and imagination and that they could be used especially in eliminating the anxiety and misconceptions in science teaching.

Key words: Web 2.0 Tools, Self-Efficacy, Science Teaching, Prospective Elementary School Teacher

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INTRODUCTION

Pedró (2006) describes today’s children as “New Millennium Learners”. One of the concepts used in the meaning of “New Millennium Learners” is Prensky’s concept of “digital natives” (Prensky, 2001). Prensky (2001) labels those who are familiar with digital media instruments as “digital natives” and those who are not familiar with those instruments as “digital immigrants”. A number of skills that today’s students who are labelled as “digital natives” are referred to as the 21st century skills. Several different groupings are available in this respect. An examination of National Research Council (2012) in particular makes it clear that it is demanded that students in general develop such skills as problem solving, critical thinking, communication, collaboration and self-management skills- which are referred to as he "21st century skills" (Cited in Yalçın, 2018, p. 184). ISTE (b.t.) emphasised that students should meet certain standard so that they could actualise instances of effective learning in the digital world. The standards were distinguished as "creativity and innovation, communication and collaboration, research and flow of information, critical thinking, problem solving and decision making, digital citizenship and use of technology" (Cited in Günüç, Odabaşı and Kuzu, 2013, p. 438). Günüç, Odabaşı and Kuzu (2013) conducted a study on the 21st century skills through Twitter with the participation of prospective teachers. Following the interviews with the participants and the content analysis of their tweets, the characteristics of 21st students were divided into four main themes and ten sub-themes as personal skills (cognitive, intrinsic/self and social), research skills and skills of getting informed (researching, learning and getting informed), creativity, innovation and career skills (career and innovation) and technological skills (using and making widespread)- as in the literature. It is apparent from those findings that the expectations of societies have changed in the 21st century- in which we live- and the target of societies now is to raise individuals who can adjust to technological developments and changes, who can keep themselves up to date, who can generate knowledge and can use advanced technologies (Dağhan et al., 2017, p. 217), who have upper order thinking skills, who can work in teams and who have high communication capability.

Teachers began to follow and learn different and new applications so as to be able to attract the attention of new generation students- who are labelled as digital natives. Those rapid changes arising also influence educational and instructional environments. In consequence, technological devices such as smart boards, tablet PCs and 3D printers apart from traditional materials are also widely and effectively used in the classroom (Elmas and Geban, 2012). Teachers in Europe and in Turkey have been making projects by collaborating by means of projects such as E-twinning and Scientix and by making use of technology. E-twinning provides the necessary support, instruments and services through the use of information technologies, it facilitates schools to set up short-term or long-term partnership in any issue and thus it encourages cooperation between schools in Europe (http://etwinning.meb.gov.tr). Scientix project is a project which aims to make inquiry-based education in teaching science, technology, engineering and mathematics in Europe through Scientix portal and which is open to teachers, academicians, administrators, parents and anybody who is concerned with science and mathematics education (http://scientix.meb.gov.tr/).

One of the conditions for teachers- who play significant roles in the process of students learning- to rise individuals who are capable of using technology effectively and of developing it is that they should be able to use technology effectively and integrate it into instructional activities efficiently (Yanpar, Tokmak, Özgelen and İncikabı, 2013, p. 2). As Borich (2017) also states, it is difficult for teachers to keep students’ attention alive if they address them only through oral presentations considering especially the fact that today’s students are accustomed to visual stimuli and multimedia presentations. Teachers need classroom technologies leading to fundamental renovations and changes in teaching to attract students’ attention and to meet various need of them (p. 208). The old patterns in the learning process have changed thanks to Web technologies. One of the reasons for it is that people now search for online learning environments rather than books and encyclopaedias in researching a subject. Another reason is the change in patterns of learning. Individuals wishing to reach knowledge can now access to the relevant experts through e-mail and social media. The third
reason is that individuals can be in the position of both learners and teachers since those devices offer ease in online learning (Shank, 2008, p. 244).

The major aim of Web 2.0 technologies- which were first suggested by Tim O’Reilly in an international conference in 2004- is to secure that people can share content without facing any technical obstacles and that they can make use of the social interaction and cooperation potential of the internet (Ata, 2011, p. 20). Web 2.0 tools in general represent a structure securing creativity, communication, safe information sharing, joint workability and functionality in web design (Uçak and Çakmak, 2010, p. 44). In other words, Web 2.0 technology means individuals’ creating content easily and their contribution to the existing content on the internet (Atıcı and Yıldırım, 2010, p. 287). One of the most important sides of Web 2.0 tools is that they make it possible for teachers and learners to go out of the classroom environment and to contact people from all over the world about projects and ideas they want. Participants’ web literacy and collaborative active participation come into play while they are using the Web 2.0 tools- which enable them to have practice with materials which are coded as open resource (Horzum, 2010, p. 612-613). Students can work at their own pace of learning by means of Web 2.0 technologies, which are student-centred. In this way, those technologies also enable learners to make self-improvement (Özerbaş and Mart, 2017, p. 1153).

Web 2.0 tools, which can easily be used by the young generation- who are digital natives- also started to attract teachers’ attention. Teachers and prospective teachers who would like to appeal to a generation of “digital natives” have had the obligation to improve themselves in terms of technology. Teachers’ and prospective teachers’ perceptions of self-efficacy is also important here. As is commonly known, the concept of self-efficacy is a concept available in Bandura’s theory of social learning. Bandura (1977) describes “individuals’ beliefs in how well they can do the actions necessary for coping with any situation” as self-efficacy belief (Cited in Akkoyunlu and Orhan, 2003). That is to say, it is individuals’ own judgement of their capacity to do an action (Lee, 2005, s. 490, Cited in Acar, 2019).

Various studies have been conducted today especially about teachers’ and prospective teachers’ self-efficacy perceptions. Prospective teachers’ beliefs in themselves are capable of affecting their achievement in their professional life. The desire of prospective teachers who will be the teachers of a mass of people labelled as digital natives to use web 2.0 tools in particular in our time- when technology is so influential and when rapid advances occur- and the extent to which they consider themselves adequate in this respect is a subject that needs researching.

Prospective teachers themselves should learn about such these tools during their undergraduate education and their anxiety- if there is any- should be eliminated so that they can make teaching plans suiting to the characteristics of learners and so that they will not get out of date when they become practising teachers. A review of studies performed in this respect demonstrates that teachers’ perceptions of self-efficacy in technology occupy a significant place in deciding on how much to benefit from technology in performing the teaching process (Abbit, 2011; Albion, 1999; Chen,2008; Cited in Biririş, Kul, Aksu, Akaslan and Çelik, 2018, p.193).

A review of literature makes it apparent that generally such tools as Facebook, YouTube, Yahoo Messenger, Wikis, blogs and podcasts were considered in relation to the use of Web 2.0 tools (Ata, 2011; Baltacı Göktaşlay and Özdiilek, 2010) or that the effects were researched by using only one or two Web 2.0 tools (Yılmaz, 2017; Zengin, Bars and Şimşek, 2017). The review of relevant literature also demonstrates that studies mostly focus on teachers’ and prospective teachers’ views and on how often they use such tools (Efe, Söylemez, Oral and Efe, 2014; Efe, 2015; Özerbaş and Mart, 2017; Özer and Özer, 2017).

Altık, Yükseltürk and Üçgül (2017) taught many pre-service teachers attending various universities how to use the Web 2.0 tools within the scope of their project and then asked for their views. At the end of training, they stated their opinions about particularly the academicians who offered training within the scope of the project and about the gains they obtained after the activity. The
participants were offered applied education by means of several Web 2.0 tools in four days. While the prospective teachers said that they were pleased with the education they said that the duration of education was inadequate. The item that the participants considered the most negative was that the educational content was not associated with the students’ domain of work. The reason for it was explained as the fact that the academic staff who were trainers were from computer and information technologies department. The following statement made by one of the participants in particular was remarking: “It was too short. It would have been beneficial to make projects in groups. For example, it would have been more effective if they had added another week and if we had made group projects in our area of studies in week two” (s. 4-5). In fact, the finding called attention to an important problem. In this respect, Mishra and Koehler (2006) mentions failure in teachers’ integration of technology with teaching in general and they suggest the theory of Technological Pedagogical Content Knowledge (TPCK) to improve such competence.

Mishra and Koehler (2006) built “technology” on Shulman’s formula of “pedagogical content knowledge” and thus they recommended a conceptual framework for educational technology. According to Mishra and Koehler (2006), TPCK is composed of three types of knowledge (technological knowledge, pedagogical knowledge and content knowledge) and of other knowledge which is the intersection of those types of knowledge (technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge and technological pedagogical content knowledge). Mishra and Koehler (2009) describe TPCK as “the whole of knowledge about the representation of concepts through technology, the use of pedagogical techniques in positive ways to teach the knowledge in a domain, what makes concepts easy or difficult to learn and how technology helps to solve the problems learners encounter, students’ prior knowledge and theories of knowledge and about how to use technology to develop new theories of knowledge on the basis of current knowledge or to strengthen the previous knowledge” (Cited in Timur and Taşar, 2011, p.p. 840-841). It was found on examining the studies available in the literature that teachers who were good at TPCK knew how to use technology in teaching, that they knew the length of time needed for teaching to be conducted with such technologies, that they knew how to solve the problems learners were probable to encounter with technology, and how to regulate teaching and learning according to technological possibilities (Canbazoğlu Bilici, Yaman and Kavak, 2012).

This study is important in that it is an experimental study enabling prospective elementary school teachers to learn by doing and by experiencing how to use the Web 2.0 tools and what pedagogical techniques to use to teach the subjects available in science teaching curriculum prepared by MNE (2018).

This paper seeks answers to the question of whether or not science teaching conducted with the support of Web 2.0 tools had any significant differences on prospective elementary school teachers’ self-efficacy beliefs in Web 2.0 tools. The research questions were formulated as in the following:

1. Do practices of science teaching supported with Web 2.0 tools have any significant differences on prospective elementary school teachers’ self-efficacy beliefs in Web 2.0 tools?
   a) Do practices of science teaching supported with Web 2.0 tools have any significant differences on the sub-factors of "preparation", "presentation" and "evaluation"?
   b) Do prospective elementary school teachers’ self-efficacy beliefs in Web 2.0 tools differ significantly according to gender?
2. What are the views held by prospective elementary school teachers in relation to teaching conducted with the support of Web 2.0 tools?
METHOD

Research Model

This study was performed by using single group pre-test-post-test experimental design, one of the quantitative research approaches investigating the effects of science teaching conducted with the support of Web 2.0 tools on prospective elementary school teachers’ self-efficacy beliefs in Web 2.0 tools. A group is given a pre-test measurement first and then it is given an experimental procedure in such a design and finally the group is given a post-test (Cresswell, 2014, p. 172). Several and differing types of qualitative data in addition to “Web 2.0 Rapid Content Development Self-efficacy Scale” were used so as to be able to interpret the process. Observation form were completed every week throughout the semester, all the digital materials were evaluated, the differing and remarkable parts of the prospective teachers’ presentations were video recorded, the responses to the open-ended questions were put to content analysis and the participants’ statements were quoted directly. The researcher had the opportunity to make long observations and to collect long term data since she was also the lecturer who taught the course. In this context, the criteria related to validity and reliability in particular (long-term interaction, diversification, participant approval, detailed descriptions) recommended by Yıldırım and Şimşek (2006, p. 265) were taken into consideration in the qualitative part of the study. Using the data collected in different methods to confirm each other increases the validity and reliability of the conclusions reached (Yıldırım and Şimşek, 2006, p. 267).

The Study Group

The study was conducted with the participation of 40 prospective teachers (27 female and 13 male) who were the third-year students in the elementary school teaching department of a state university. It was found in an interview with the participants at the beginning of the semester that they had never heard of Web 2.0 tools before and neither had they used them before. The prospective teachers were informed of the course content at the beginning of the semester. They said that they would like to take part in the research voluntarily.

Data Collection Tools

Web 2.0 Rapid Content Development Self-efficacy Belief Scale: The “Web 2.0 Rapid Content Development Self-efficacy Belief Scale” developed by Birişçi, Kul, Aksu, Akaslan and Çelik (2018) was used as the tool of data collection in this study. The maximum score receivable from the 5-pointed Likert type 21-item scale was 105 whereas the minimum score receivable from the scale was 21. The scale contained three sub-factors labelled as preparation, presentation and evaluation. Differing scales are available in the literature. However, this scale which was developed by Birişçi, Kul, Aksu, Akaslan and Çelik includes items with statements to determine the adequacy level of using the Web 2.0 tools at the stages of planning a lesson as different from all other scales. In that case, the purpose is to determine the lesson planners’ adequacy levels of including the Web 2.0 tools in the educational-instructional process.

The Interview Form: A form of six open-ended questions was used. Question one asked what Web 2.0 tools the prospective teachers used, question two asked the participants to tell three Web 2.0 tools they liked using the most and why they liked them, question three asked them the positive sides of using Web 2.0 tools in classes and the reasons for them, question four asked the restrictions and reasons for the restrictions, question five asked them whether or not they would like to use Web 2.0 tools when they become teachers and the reasons for their choice and finally question six asked them to make recommendations for using Web 2.0 tools effectively in science teaching.

The Observation Form: An observation form prepared by the researcher was used in evaluating the Web 2.0 tools the prospective teachers used and the lesson presentations they made throughout the semester. The weeks, the web 2.0 tools used by the groups and for what subjects they
used the tools were regularly written down. The observation forms were evaluated for the groups who made presentations according to a rubric which was prepared by considering the analysis and unity of the units of science course. The groups who made presentations about the units of science course were evaluated by both the researcher and the other students through observation forms each week. At the end of lessons, each prospective teacher was given feedback about the points which were found positive or negative during the observations.

**Digital materials prepared by using the Web 2.0 tools:** All the digital materials prepared by the prospective teachers were collected at the end of the semester and were evaluated in terms of principles of material preparation, and the way they considered science subjects was examined in detail. The parts lacking as well as the best examples were noted down for each group.

**Research Process**

The study was conducted with the participation of 40 prospective teachers attending the elementary school teaching department of a state university in 2017-2018 academic year. The applications lasted throughout the semester (for 14 weeks) within the scope of the course Science and Technology Teaching II. Prior to the application, the “Web 2.0 Rapid Content Development Self-Efficacy Belief Scale” was given as the pre-test. The prospective teachers were informed of Web 2.0 tools by making them a 2-hour presentation about Web 2.0 tools at the beginning of the semester. Two elementary school teachers were invited into the classroom within the scope of the course and they shared concrete examples by describing the Web 2.0 tools they used in their classes and by demonstrating them in the classroom. In this way, two practising teachers (1 male and 1 female) teaching in two different state schools informed the prospective teachers of the tools and thus it was understood that the issue was not only in theory but that it was also in practice. Of the teachers invited into the classroom, the female one had 12-year teaching experience while the male one had 20-year teaching experience. The researcher intended to arouse the prospective teachers’ curiosity about the semester with such remarkable activities at the start of the semester. The visiting teachers made a brief evaluation by using the application “Kahoot”, found the participant with the biggest number of correct answers, gave a pen to the winning participant and thus promoted participation. All the prospective teachers listened carefully from the beginning to the end, and they were informed of the applications. They had the opportunity to ask the teachers questions at the end of the lesson. Meanwhile, the researcher joined the class as an observer and thus had the opportunity to observe the prospective teachers’ excitement. All the activities available in the course Science and Technology Teaching II were done by using the Web 2.0 tools in the following weeks under the guidance of the researcher. All the class downloaded the application “Edmodo” with the guidance of the lecturer and they kept online interaction throughout the semester. They had the opportunity to reach the lecturer when they had problems.

The students were divided into 9 groups to prepare the activities in relation to the gains available in the science teaching curriculum prepared by the Ministry of National Education (MNE, 2018). Each group shared the units available in the in the 3rd and 4th grade curricula for science teaching, and they were allowed time to prepare activities for the units they were assigned. Science activities were designed by using different Web 2.0 tools for the relevant gains each week. The groups planned the teaching process by blending together the student-centred methods and techniques which were consistent with constructivist teaching and discovery learning in preparing the subjects they were given. Activities to improve problem-based learning, project-based learning, experimental method and scientific process skills were planned within the scope of the course and were conducted with the guidance of the researcher. The groups told the researcher about their projects a week before their presentation and asked for the researcher’s views about the projects throughout the semester. They investigated the Web 2.0 tools that they would use under the heading of “technological knowledge”- a component of TPCK- and they learnt how to use them. They determined how to integrate the Web 2.0 tools that they would use in the section of “technological content knowledge” and they chose the appropriate tools according to subjects and thus they evaluated the tools. After the first three weeks,
the prospective teachers had the freedom to choose the Web 2.0 tools so that their “technological content knowledge could develop, and thus they shared with the researcher the Web 2.0 tools they researched and wanted to use prior to their presentation and they exchanged views with the researcher.

Each group prepared concept maps with “inspiration” or “mindmeister” programme for the whole unit they were responsible for. The researcher observed throughout the semester that the groups mostly used such tools as “Kahoot”, “Inspiration”, “Quiver” and “Plickers” in their presentations. The Web 2.0 tools that the prospective teachers liked using are mentioned in the findings section. Each group was also told to introduce a web 2.0 tool that had not been used in the classroom before. The web 2.0 tools used in the classroom in the previous weeks could also be used again. All the participants learnt a new application each week before leaving the class. 23 Web 2.0 tools in total were used during the semester. The “Web 2.0 Rapid Content Development Self-Efficacy Belief Scale” was given as the post-test at the end of the semester. In addition to that, the interview form containing open-ended questions was also distributed to the prospective teachers. All prospective teachers completed the forms eagerly at the end of the process and supported the research. During the application, the prospective teachers were informed of Web 2.0 tools according to the grouping shown in Table 1. The information about the units available in the MNE (2018) curriculum for science teaching and the Web 2.0 tools used are shown in Table 2.

### Table 1. A Classification of Web 2.0 Tools Used in the Application according to the Areas of Use

<table>
<thead>
<tr>
<th>Types</th>
<th>Web 2.0 Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Kahoot, Socrative, Plickers, Learningapps, Easytestmaker, Mentimeter, Quizlet</td>
</tr>
<tr>
<td>Video-Animation-presentation</td>
<td>Voki, Poplet, Powtoon, Goanimate, Phet, Prezi, Genially</td>
</tr>
<tr>
<td>Augmented reality</td>
<td>Aurasma (HP Reveal), Chromville, Quiver</td>
</tr>
<tr>
<td>Concept Map</td>
<td>Inspiration, Mindmeister, Goconqr</td>
</tr>
<tr>
<td>Cartoon</td>
<td>Toondoo</td>
</tr>
<tr>
<td>Poster-bulletin board</td>
<td>Canva, Padlet</td>
</tr>
<tr>
<td>Coding</td>
<td>Code.org, QR Reader, Scratch</td>
</tr>
<tr>
<td>Digital story</td>
<td>Photostory</td>
</tr>
</tbody>
</table>

### Table 2. The Science Units Taught and the Web 2.0 Tools Used During the Study

<table>
<thead>
<tr>
<th>Groups</th>
<th>Distribution of Science Course Units</th>
<th>Web 2.0 Tools Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>3.1 and 4.1</td>
<td>Inspiration, Kahoot, QR Reader</td>
</tr>
<tr>
<td>Group 2</td>
<td>3.2 and 4.2</td>
<td>Inspiration, Aurasma, Canva</td>
</tr>
<tr>
<td>Group 3</td>
<td>3.3 and 4.3</td>
<td>Inspiration, Plickers, Quizlet, Scratch, Learningapps, Powtoon, Prezi, Aurasma, Voki, Poplet</td>
</tr>
<tr>
<td>Group 4</td>
<td>3.4 and 4.7</td>
<td>Toondoo, Voki, Kahoot, Quizlet, Socrative, Phet, Padlet, Powtoon, Genially, Learningapps</td>
</tr>
<tr>
<td>Group 5</td>
<td>4.4</td>
<td>Powtoon, Goconqr, Padlet, Toondo, Aurasma</td>
</tr>
<tr>
<td>Group 6</td>
<td>3.5</td>
<td>Inspiration, Kahoot, Powtoon, Quizlet, Photostory, Easy test maker, Mentimeter, Socrative, QR Reader</td>
</tr>
<tr>
<td>Group 7</td>
<td>4.5</td>
<td>Inspiration, Voki, Plickers, Padlet, Powtoon, Prezi, Kahoot, Aurasma</td>
</tr>
<tr>
<td>Group 8</td>
<td>3.6 and 4.6</td>
<td>Inspiration, Plickers, Kahoot, Powtoon, Mindmeister</td>
</tr>
<tr>
<td>Group 9</td>
<td>3.7</td>
<td>Inspiration, Learningapps, Powtoon, Voki, Toondo, Aurasma, Quizlet</td>
</tr>
</tbody>
</table>

### Data Analysis

### Quantitative Findings and Interpretations

The normal distribution of the data which are the parametric test assumptions of the data obtained from the scale aiming to determine the prospective teachers’ Web 2.0 rapid content self-
efficacy beliefs and the homogeneity of variances were tested statistically. Whether or not the data coming from the groups had normal distribution was analysed with “skewness and kurtosis coefficients” and with “Kolmogorov-Smirnov test” and the homogeneity of variance was analysed with Levene’s Test of Equality of Error Variances. It can be said that the distribution of the data is normal and that the variances are not homogenous because the p values were found to be smaller than 0.05 at the end of the Smirnov test and Levene’s test and because the skewness-kurtosis coefficients were not within the desired interval (-1, +1). Non-parametric statistics were used since the data did not meet the parametric test conditions after the analyses.

Wilcoxon signed rank test was used to check whether or not science teaching practice supported with Web 2.0 tools had any significant differences in the scale aiming to determine prospective elementary school teachers’ Web 2.0 rapid content development self-efficacy beliefs and in its sub-factors (preparation, presentation and evaluation). On the other hand, Man Whitney U test was used to check whether or not prospective teachers’ self-efficacy beliefs in Web 2.0 tools differed according to gender. The effect size (r) was calculated in determining the power of correlations between variables, and consequently, the values of 0.10, .30 and 0.50 were interpreted as small, medium and large effect size, respectively (Cohen, 1998). The data were analysed on SPSS 23.0 package programme. Bonferroni correction was made in the analysis of the data to check the type 1 errors. Bonferroni correction is determined with the formula significance level/the number of groups (Vialatte and Cichocki, 2008). Significance level was found as 0.05/2=0.025 when the number of groups is 2 in this study.

Findings and Interpretations

Whether or not science teaching practice supported with Web 2.0 tools caused any significant differences in the scale for determining prospective teachers’ beliefs in Web 2.0 rapid content development self-efficacy and in the sub-factors of the scale (preparation, presentation and evaluation) was checked through Wilcoxon signed rank test, and the results are shown in Table 3.

Table 3. Wilcoxon Signed Rank Test results for the Pre-test and Post-test scores received from the Scale and from the sub-factors of the scale aiming to determine the beliefs of prospective elementary school teachers who practise science teaching supported with Web 2.0 tools in Web

<table>
<thead>
<tr>
<th>2.0 rapid content development self-efficacy</th>
<th>Beliefs in Web 2.0 tools self-efficacy scale</th>
<th>Post test-pre test</th>
<th>n</th>
<th>Rank mean</th>
<th>Rank total</th>
<th>z</th>
<th>p</th>
<th>r (effect size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>Negative rank</td>
<td>2</td>
<td>1.50</td>
<td>3.00</td>
<td>5.47</td>
<td><strong>0.00</strong></td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive rank</td>
<td>38</td>
<td>21.50</td>
<td>817.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equal</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Negative rank</td>
<td>5</td>
<td>3.10</td>
<td>15.50</td>
<td>5.16</td>
<td><strong>0.00</strong></td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive rank</td>
<td>33</td>
<td>21.98</td>
<td>725.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equal</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>Negative rank</td>
<td>2</td>
<td>1.50</td>
<td>3.00</td>
<td>5.41</td>
<td><strong>0.00</strong></td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive rank</td>
<td>2</td>
<td>21.00</td>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equal</td>
<td>37</td>
<td>777.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative rank</td>
<td>1</td>
<td>1.50</td>
<td>3.00</td>
<td>5.47</td>
<td><strong>0.00</strong></td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive rank</td>
<td>2</td>
<td>21.50</td>
<td>817.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equal</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*based on negative rank  
**p<0.01

The results for Wilcoxon Signed Rank Test done to find whether or not the pre-test and post-test scores of the participants who practised science teaching supported with Web 2.0 tools and the scores they received from the whole scale differed significantly are shown in Table 1. The analysis results demonstrated that there were significant differences between the pre-test and post-test scores...
received from the preparation \((z=5.57; p<0.01)\), presentation \((z=5.16; p<0.01)\) and evaluation \((z=5.41; p<0.01)\) sub-factors of the scale for beliefs in web 2.0 tools self-efficacy and from the whole scale \((z=5.47; p<0.01)\). Considering the rank mean and rank total of the differences in scores, it is apparent that the difference is in favour of positive rank, that is to say, in favour of post-test scores. Accordingly, it may be said that science teaching practice supported with web 2.0 tools have significant effects on increasing the prospective elementary school teachers’ beliefs in web 2.0 tools self-efficacy. On examining the effect sizes for the Wilcoxon signed rank test in the sub-factors and in the whole scale, the effect size \((r)\) was found as 0.86, 0.82, 0.85 and 0.86 for the sub-factors of the scale and for the whole scale. Thus, the effect was high for the sub-factors and for the whole scale, and therefore it can be said that the difference between the pre-test and post-test scores that the prospective teachers doing science teaching practice supported with web 2.0 tools received from the scale is big.

Whether or not the beliefs of prospective elementary school teachers practising science teaching supported with web 2.0 tools in web 2.0 tools self-efficacy differed according to gender was tested with Mann-Whitney U test, and the results are shown in Table 4.

Table 4. The Mann-Whitney U Test Results for The Beliefs of Prospective Elementary School Teachers Practising Science Teaching Supported with Web 2.0 Tools According To Gender

<table>
<thead>
<tr>
<th>Beliefs in Web 2.0 tools self-efficacy scale</th>
<th>Gender</th>
<th>n</th>
<th>Rank mean</th>
<th>Rank total</th>
<th>U</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>Female</td>
<td>27</td>
<td>17.98</td>
<td>485.50</td>
<td>107.50</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>13</td>
<td>25.73</td>
<td>334.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Female</td>
<td>27</td>
<td>19.20</td>
<td>518.50</td>
<td>140.50</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>13</td>
<td>23.19</td>
<td>301.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>Female</td>
<td>27</td>
<td>18.59</td>
<td>502.00</td>
<td>124.00</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>13</td>
<td>24.46</td>
<td>318.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Female</td>
<td>27</td>
<td>18.50</td>
<td>499.50</td>
<td>121.50</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>13</td>
<td>24.65</td>
<td>320.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An examination of Table 4 makes it clear that there are not significant differences between scores received from the preparation \((U=107.50; p>0.025)\), presentation \((U=140.50; p>0.025)\) and evaluation \((U=124.00; p>0.025)\) sub-factors of the scale for beliefs in web 2.0 tools self-efficacy and from the whole scale \((U=121.50; 0.025)\) according to gender. This indicated that gender did not have significant effects on prospective elementary school teachers’ beliefs in web 2.0 self-efficacy- that is to say, there were no significant differences between male and female prospective elementary school teachers’ web 2.0 tools self-efficacy beliefs.

Qualitative Findings and Interpretations

The participants’ responses to the open-ended questions were put to content analysis. Efforts were made to describe the data and to reveal the truths that may be hidden in the data through content analysis. The participants’ responses were examined one by one and the meaningful words and sentences available within the data were labelled and coded. Then, the codes were divided into themes (Yıldırım and Şimşek, 2006, pp. 227-238). The frequencies were calculated by basing the responses on fundamental points. Direct quotations were also made to present the remarkable data. Another expert was also consulted in coding and in distinguishing the themes. The agreement between the experts was calculated by using the formula suggested by Miles and Hubberman (1994), and the agreement was found to be 89%. Having a value above 70% indicates that there is agreement between coders (Miles & Hubberman, 1994). The participants were informed of the study, and they were told that their names would be kept confidential. For the confidentiality of the names, codes such as K1, K2, etc. were used in this study.
Table 5. The Participants’ Views on the Web 2.0 Tools they most Frequently Chose to Use

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Kahoot</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Plickers</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Quizlet</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Socrative</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Learningaps</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Mentimeter</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Flippquiz</td>
<td>1</td>
</tr>
<tr>
<td>Augmented reality</td>
<td>Aurasma (HP Reveal),</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Chromville</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Quiver</td>
<td>2</td>
</tr>
<tr>
<td>Concept maps</td>
<td>Inspiration,</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Mindmeister,</td>
<td>1</td>
</tr>
<tr>
<td>Videos-animations-presentations</td>
<td>Powtoon</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Voki</td>
<td>3</td>
</tr>
<tr>
<td>Posters-bulletin boards</td>
<td>Canva</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Padlet</td>
<td>2</td>
</tr>
<tr>
<td>Cartoons</td>
<td>Toondoo</td>
<td>2</td>
</tr>
<tr>
<td>Coding</td>
<td>Scratch</td>
<td>1</td>
</tr>
<tr>
<td>Digital stories</td>
<td>Photostory</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>Google</td>
<td>1</td>
</tr>
</tbody>
</table>

According to Table 5, the web 2.0 tools that the participants most frequently choose to use are divided into 9 categories. The categories are distinguished as evaluation, augmented reality, concept maps videos-animations-presentations, posters-bulletin boards, cartoons, coding, digital stories and other. Responses related to each category were also coded. Consequently, it was found that the participants preferred to use the web 2.0 tools in the categories of “evaluation, augmented reality and concept maps” the most frequently. The frequencies for the codes in each category are shown in the Table. Thus, it was found that “Kahoot” in the category of evaluation, “Aurasma-HP Reveal” in the category of augmented reality and “Inspiration” in the category of concept maps were the most frequently chosen web 2.0 tools. Some of the views justifying the choices were as in the following:

K1: “I liked Kahoot the most because I had fun even when racing. I think students will like it more than I do.”

K3: “It was photo story because it is both entertaining and didactical. It appeals to more than one sense.”

K5: “It was Kahoot because it helps to make students love the test.”

K7: “It was Aurasma because it was amazing just like a symbol’s coming to life.”

K10: “It was Kahoot because I had never thought that evaluation was so easy.”

K13: “It was Aurasma because it was the irreplaceable in the digital bulletin board.”

K14: “It was Inspiration because it is more useful to form our own concept maps while teaching a subject.”

K15: “It was Aurasma because we sometimes have limited possibilities. We may not show or see some of the things alive.” It is an advantage.”

K22: “It was Padlet because it was easy to use.”

K25: It was Powtoon because it supported teaching the subject and we could use our own voice.”
K27: “It was Voki because we could animate. It offered a more enjoyable learning environment.”

K36: “It was Plickers because students may not have technological resources (computers, Tablet PCs, etc.). This tool can be used with anybody.”

K37: “It was Inspiration because I myself also make concept maps or mind maps while studying. Just like summarising. It makes sure that all the knowledge is here, in my hands.”

Table 6. The Participants’ Views on the Positive Sides of Using Web 2.0 Tools

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects on the learning process</td>
<td>Attracting attention to the lesson</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Meaningful learning</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Learning easily</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Learning by having fun</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Retention in learning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Learning by doing and experiencing</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Visual learning</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Easy applicability</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Teaching self-efficacy perception</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Versatile learning</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Learning differently</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Student-centred</td>
<td>1</td>
</tr>
<tr>
<td>Effects on students</td>
<td>Appealing to the “z” generation</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Improving imagination</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Developing self-confidence</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Promoting achievement</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Assuring competition between students</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Contemporary</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Innovativeness</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Providing scientific knowledge</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Possibility to reach multiple data</td>
<td>1</td>
</tr>
<tr>
<td>Effects on upper order thinking skills</td>
<td>Problem solving skills</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Critical thinking skills</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>Positive effects on the process of teaching</td>
<td>6</td>
</tr>
</tbody>
</table>

As clear from Table 6, the participants views on the positive sides of Web 2.0 tools were considered in 4 categories labelled as “effects on the learning process”, “effects on students”, “effects on upper order thinking skills” and “as “other”. Several meaningful codes were obtained especially in the categories of “effects on learning process” and “effects on students”. The codes of attracting attention to the lesson, meaningful learning, learning by having fun, retention in learning and learning by doing and experiencing were the codes with the highest frequency in the category of effects on the learning process. Codes such as appealing to the z generation, improving imagination, developing self-confidence and innovativeness were obtained in the category of effects on students. It was a remarkable finding that the participants mentioned positive effects on problem solving skills and on critical thinking skills in the category of effects on upper order thinking skills. 6 participants said that using the web 2.0 tools had generally positive effects on the process of teaching in the category of “other”. Some of the participants’ views on the positive effects of using the web 2.0 tools were as in the following:

K1: “we will certainly be valued in the schools we teach and we will be advantages compared to other teachers. I am sure I will motivate students to participate in classes and to be curious.”

K7: “They enable a different type of and versatile teaching. Many tools are enjoyable and easy to understand. The tools will certainly attract students’ attention when they see them.”

K14: “Now there is technology in every part of life”. We are technology immigrants, but our students are technology natives. They are born into technology. Teaching them with those programmes will be more fun and more understandable to them.”
K23: “Students’ attention can be attracted to lessons more quickly. Teachers can reach a lot of data instantly.”

K25: I find web 2.0 tools useful because they transfer knowledge through an activity instead of transferring it directly and because they help us do it through technology. Another positive side is that they put students into a competition with each other.”

Table 7. The Participants’ Views on the Limitations of Using the Web 2.0 Tools

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and materialistic conditions</td>
<td>Inadequate school infrastructure</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Need for tablet PCs and personal computers</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Difficulty in application in crowded classrooms</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Economic problems</td>
<td>1</td>
</tr>
<tr>
<td>From the aspect of students</td>
<td>Not attracting attention due to technological satisfaction</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Appropriacy to students’ level</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unsociability</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Getting away from nature</td>
<td>1</td>
</tr>
<tr>
<td>From the aspect of teachers</td>
<td>Inability to use technology</td>
<td>2</td>
</tr>
<tr>
<td>Stemming from Web 2.0 tools</td>
<td>Time limitation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Need for updating</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Language of use being English</td>
<td>1</td>
</tr>
</tbody>
</table>

An examination of the participants’ views about the limitations of using the web 2.0 tools shown in Table demonstrates that there are four categories labelled as “physical and materialistic conditions”, “from the aspect of students”, “from the aspect of teachers” and “stemming from web 2.0 tools”. The headings coded as inadequate school infrastructure, need for tablet PCs and personal computers and difficulty in application in crowded classrooms stand as the codes for which the most frequently views are stated in the category of “physical and materialistic conditions”. On the other hand, it was stated in the category of “from the aspect of students” that they might not attract students’ attention due to technological satisfaction, that they might not be appropriate to students’ levels and that students might be isolated from nature or become anti-social if there are too many applications. Two participants stated in the category of “from the aspect of teachers” that there could be limitations due to inability to use technology. In the category of “stemming from web 2.0 tools”, however, it was stated that there could be problems stemming from time limitations, that some of the applications needed updating and that English as the language of use could cause problems. Some of the participants' views on the limitations of the web 2.0 tools were as in the following:

K3: “The limitations of the web 2.0 tools, the economic status of the students in the classroom and the technological inadequacy of the class. Another limitation can be the teachers’ lack of education in this matter.”

K7: “The technological lack of the school, the teachers’ status in using and preparing, the teacher’s ability to use technological tools are the limitations.”

K15: “They are difficult to use in classrooms.”

K22: “every student may not have their own Tablet PC or computer. So we cannot always use them.”

K24: “It is not so easy to have access to technology in every school or in every region. For this reason, we can use them in a limited number of locations”.
Table 8. The Participants’ Views on the Use of Web 2.0 Tools in Science Teaching

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits in the process of teaching</td>
<td>Science teaching course as the most appropriate course</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Learning by having fun</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Being able to use at any stage of the lesson</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Improving creativity</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Reinforcing the subjects</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Promoting the quality of teaching</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Eliminating the science anxiety</td>
<td>1</td>
</tr>
<tr>
<td>Benefits in science subjects</td>
<td>Concept teaching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In simplifying the difficult concepts</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>In eliminating misconceptions</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>In teaching abstract concepts</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Suitability to any subject</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Suitability to experimentation-observation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>In reinforcing the subjects</td>
<td>2</td>
</tr>
<tr>
<td>Recommendations</td>
<td>Courses should be added in undergraduate</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>In-service training should be offered</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>More web 2.0 tools should be used in relation to the gains.</td>
<td>2</td>
</tr>
</tbody>
</table>

According to Table 8, the participants’ views on the use of Web 2.0 tools in science teaching is considered in three categories distinguished as “benefits in the process of teaching”, “benefits in science subjects” and “recommendations”. On examining the codes included in the category of “benefits in the process of teaching”, the codes that science course was the most appropriate course for using web 2.0 tools, that they could be used at any stage of lessons, that they could improve creativity and that the science anxiety could thus be eliminated were remarkable. Views related to effects on concept teaching especially were stated in the category of “benefits in science subjects”. One of the issues teachers have difficulty in teaching is naturally the process of concept teaching in science education. There are several studies on identifying and eliminating misconceptions in particular in the literature. Prospective teachers say that web 2.0 tools will be beneficial due to the fact that teaching abstract concepts is a more challenging job. Their recommendations in this respect are capable of contributing to the area. They suggest that there should be courses in undergraduate education and practising teachers should also be taught the tools through in-service training and seminars.

Some of the views held by the participants in relation to the use of web 2.0 tools in science teaching were as in the following:

K9: “They can be taught to all students in universities in a programme. I think it will be more efficient and students will use them more efficiently in this way.”

K13: “In my opinion, tools should be known very well. In this way, one can be more effective and more efficient.”

K24: “Prospective teachers can be offered comprehensive courses about what web 2.0 tools are and about how to use them. More could be invested in the field of education and environments that teachers can use in their classrooms can be formed.”

K27: “They provide more effective learning environments than classical methods in especially difficult subjects like electricity in which it is possible to have misconceptions and there are abstract concepts. We can use them in every subject we study this semester and at any stage of lessons readily. Prospective teachers should be offered a course in the use of web 2.0 tools just like a course in using computers. We didn’t know any applications apart from Kahoot before the course Science Teaching.”

1 After this study, the researcher made the recommendation in the faculty she worked at an elective course on using web 2.0 tools be included in the undergraduate programme. Consequently, such a course was offered to prospective elementary school teachers officially as an elective course in the Fall semester of 2019-2020 academic year.
K30: “They should absolutely be used in science teaching. I think every teacher should use them.”

K32: “Experimentation, observations and more than that can be done in the classroom. Kids can see and make comments on what they see. It would be great.”

**DISCUSSION AND RECOMMENDATIONS**

We live in an era in which technological developments are rapid and we are surrounded by several technological tools and equipment. It seems impossible in such an environment to force the young generation—whom we describe as digital natives—to attend classes in traditional classrooms and to educate them away from technology in traditional methods (Eryaman, 2007; Elmas and Geban, 2012, p. 251). The educational-instructional environments and programmes should be regulated by taking the characteristics of today’s students into consideration in the light of the above-mentioned fact. In this context, this current paper aimed to make prospective teachers familiar with the web 2.0 tools—which have been increasingly used today—and to make them see that they can use the tools in the science teaching course. They were given the opportunity to have one-to-one practice with web 2.0 tools that they could make use of. This paper intended to show prospective teachers that web 2.0 tools are not only technological tools but that they should also learn how to use them by doing and by experiencing according to the course book units and gains mentioned in the curriculum prepared by MNE (2018). A teaching process suitable to all the components of TPCK (content knowledge, pedagogical knowledge, pedagogical content knowledge, technological knowledge, technological content knowledge, technological pedagogical knowledge, technological pedagogical content knowledge) was planned. In this way, the prospective elementary school teachers learnt what the web 2.0 tools involved and what web 2.0 tools to use and how to use them in the process of making students active while teaching the science subjects they were assigned. Efforts were made to cause positive effects on their beliefs in self-efficacy in web 2.0 tools through study made during the semester. Thus, they were offered guidance to use those tools easily without having a feeling of apprehension and with full self-confidence when they become teachers.

The findings obtained in this study demonstrated that the sub-factors of the scale (preparation, presentation, evaluation) and the whole scale had large effects and that there were big differences between the pre-test and post-test scores in the beliefs of the prospective teachers who practised science teaching supported with web 2.0 tools in self-efficacy in Web 2.0 tools. Accordingly, it may be said that applications of science teaching supported with web 2.0 tools had significant effects on increasing their beliefs in self-efficacy in web 2.0 tools. The sub-factors of the scale also represent the stages of a lesson. Therefore, it was found that the scale caused considerably significant differences in the prospective teachers teaching in preparation, presentation and evaluation. As evident in the qualitative findings, the participants also stated that those tools could be used at any stage of a lesson.

Another finding demonstrated that there were no significant differences between male and female prospective teachers’ beliefs in web 2.0 tools self-efficacy. That is to say, it was found that gender did not have significant effects on the participants’ beliefs in their self-efficacy in web 2.0 tools. Researchers who worked with prospective teachers in TPCK applications and analysed self-confidence (Bağdiken and Akgündüz, 2018; Meriç, 2014) did not find any differences between levels of self-confidence according to gender. The interpretation that all the prospective teachers regardless of gender use technology and that they internalise it can be made as Bağdiken and Akgündüz (2018) also state.

Elmas and Geban (2012, pp. 250-251) classified the benefits of web 2.0 tools as the benefits of using web 2.0 tools”, “the benefits of using web 2.0 tools for students”, and “the benefits of using web 2.0 tools for the classroom environment in addition to the classification recommended by Byrne (2009) as “efficiency”, “motivation”, “learning” and “learning to learn”. The categories and codes distinguished in this current study in relation to the positive sides of web 2.0 tools in the analyses are also similar to the ones available in the above-mentioned studies.
On examining the qualitative findings obtained through the interview questions in this study, the codes such as “appealing to the z generation”, being innovative”, “being contemporary” and “effects on upper order thinking skills” in the prospective teachers views on the positive sides of web 2.0 tools can be interpreted as being associated with the competencies described in the science teaching curriculum prepared by MNE in 2018. The national competencies were described and presented under 8 headings in the curriculum. Those competencies- which are supportive of one another and which are mostly inclusive of another- are listed as communication in native language, communication in a foreign language, competence in mathematics and basic competence in science/technology, digital competence, learning to learn, social and citizenship competence, taking the initiative, and cultural awareness and statement. It is pointed out in the curriculum that those competencies should be considered important to be able to raise individuals who achieve success in information society (MNE, 2018, pp. 5-6). The views that the participants stated about the positive sides of web 2.0 tools are important in that they are parallel to the competencies targeted in the curriculum.

The results obtained in this study are similar to the ones obtained in the literature. Akkaya (2019) concluded that the activities developed in relation to computer hardware with the help of web 2.0 tools had positive effects on learners’ achievement, on their attitudes towards computers and on their perceptions of self-efficacy in developing web 2.0 activities. The participants said in the interviews that they found web 2.0 tools easy, convenient and enjoyable to use and that they also wanted to use those tools in other courses. The findings obtained in terms of perceptions of self-efficacy in developing web 2.0 activities and the findings obtained from the participants’ views were similar to the ones obtained in this study.

Whereas the prospective teachers referred to the property of “attracting attention to the lesson” as positive side of web 2.0 tools in Table 6, three participants laid emphasis on “not attracting attention due to technological satisfaction” in Table 7. Based on this finding, researchers and teachers can get the message that they should use web 2.0 tools in their classes in place and in sufficiently by considering their limitations as well as the positive sides.

The qualitative results obtained in this study are similar to the ones obtained in Bolatlı and Korucu (2018). Bolatlı and Korucu (2018, p. 476) found that using web 2.0 tools made STEM educational environments enjoyable. One of the prospective teachers included in the study said that the science should always be taught like that. The participant emphasised that retention in teaching would be attained and that learning would be easier in this way (p. 473). It was another finding reported that students would actively participate in classes and they would not feel bored in teaching in the form of group work and that positive effects would be caused on students with low self-confidence and achievement.

The participants in this study stated the views that using web 2.0 tools in classes could have positive effects especially on the learning process and that it would increase learners interest and achievement in the course. Baltacı Göktalay and Özdírek (2010) found that prospective teachers had positive attitudes towards web 2.0 tools and that they said they wanted to use such technology in their professional life. Batıbay (2019) investigated the effects of Kahoot- a web 2.0 tool- on motivation and achievement in Turkish classes in a study conducted with the participation of secondary school students. Accordingly, the researcher observed increase especially in the students’ motivation. Özdemir and Esen (2018) recommended different types of tools in relation to how to use web 2.0 tools in measurement and evaluation in particular. The researchers pointed out with examples that students’ engagement would increase in lessons that were taught by using web 2.0 tools and that classes would be more enjoyable.

The results obtained in this study are similar to the ones obtained in another study. Ünlüer (2018, p. 59), in a study conducted with the participation of prospective teachers, reported that the use of web 2.0 tools in lessons taught by prospective teachers made lessons more enjoyable, that it secured learning by having fun, that it attracted students’ attention, that they participated in lessons more
actively, that it resulted in retention in learning and that it made the learning process easier by making classes no longer monotonous. The participants also stated views on the limitations of web 2.0 tools in the study. Accordingly, they said that web 2.0 tools could not be used in learning environments unless the internet and the required hardware is not available, that the use of such tools necessitated prior knowledge on the part of teachers and students and that using those tools would cause harm rather than benefits if they are not use with appropriate integration strategies (p. 59). Those limitations described at the end of the study conducted by Ünlüer (2018) are parallel to the codes distinguished in this study on the basis of the prospective teachers’ statements about “the inadequacy of school infrastructure”, “the need for Tablet PCs and personal computers” and “being difficult to use in crowded classrooms”. While the prospective teachers said that web 2.0 tools would have positive effects on the process of teaching on the one hand, they also stated their apprehensions that might stem from inadequacy of technical equipment and technological infrastructure on the other hand. More should be done to resolve the problems related to crowded classrooms and to the lack of technological equipment and materials in classrooms. As is commonly known, teachers’ and prospective teachers’ beliefs in their self-efficacy in the teaching process is one of the important factors influential in their achievement in classroom management and in increasing students’ motivation and achievement (Özdemir, 2008, p. 279). In the context of today’s technologies, identifying teachers’ and prospective teachers’ beliefs in their self-efficacy in web 2.0 tools and their professional development depending on this play important parts in organising in-class activities with those technologies (Biritsci, Kul, Aksu, Akaslan and Celik, 2018, p. 193).

Ministry of National Education (2008) identified 6 main competencies, 31 sub-competencies and 233 performance indicators within the scope of “General competencies of Teaching Profession”. technology-related performance indicators are available in the two sub-competencies “securing personal development” and monitoring and contributing to professional developments” under the heading of “personal development competencies”. The performance indicators mentioned are “having technology literacy”, “following the developments in information and communication technologies” and “benefiting from information and communication technologies to support their professional development”, respectively. In the sub-competency of “considering the interest and needs” under the main competency of “recognising students”, the performance indicator of “preparing learning environments suitable to students with different experiences, characteristics and abilities by using information and communication technologies” is available. The performance indicator “including in the lesson plan how to use information and communication technologies” is available under the sub-competency of “lesson planning” under the main competency of “teaching and learning process”. Performance indicator of “accessing to resources related to teaching-learning and evaluating them in terms of accuracy and appropriacy” available under the sub-competency of “material preparation” under the same main competency is also remarkable. Another performance indicator, “setting models to using technological resources effectively and teaching them” is available under the sub-competency of “arranging learning environments”. The performance indicator of “taking precautions prioritising health and safety in learning environments where equipment and materials and technology are used” is available under the sub-competency of “behavioural management”. The performance indicators of “analysing the data by using information and communication technologies” and “sharing the results of evaluation with parents by using information and communication technologies” under the sub-competency of interpreting the data by analysing them, and giving feedback about the development of students” under the main competency of “monitoring and evaluating learning and development” are also available (MNE, 2006, pp. 8-43).

Taking those performance indicators into consideration, it is apparent that integrating technology into education is apparent in the process of teacher training. Therefore, universities- which are the teacher training institutions- should take those needs into consideration and plan the educational-instructional process accordingly. Considering those findings and the similar findings obtained in the literature, the following could be recommended to the future researchers:

Academic staff can offer prospective teachers of all branches applied teaching of how to plan teaching with web 2.0 tools during undergraduate education. Thus, detailed information on different
types of web 2.0 tools can be offered to prospective teachers. This study was conducted with the participation of prospective elementary school teachers. Applied studies with web 2.0 tools can be conducted in courses such as science teaching, mathematics teaching, Turkish teaching, social studies teaching and so on with the participation of prospective teachers of differing branches. Applied examples can be included in relation to prospective teachers’ content knowledge, pedagogical knowledge and technological knowledge in their own areas. Experimental studies on attitudes, motivation and retention in learning beside self-efficacy could also be designed. It might be recommended that prospective teachers keep contact with university and receive support from lecturers after they become teachers and that Ministry of National Education offer in-service training and seminars in this respect. Cooperation between provincial directorates of national education and universities have been increasing in recent years. Similar studies concerning technology integration could also be conducted with the participation of practising teachers. Teachers can be offered applied education considering their needs especially in seminars and thus seminars can be more efficient and education on technological pedagogical content knowledge- which may be lacking- can be offered.

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Relationships between Prospective Teachers’ Multicultural Education Attitudes and Classroom Management Styles

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Abstract

This correlation study investigates the relationships between prospective teachers’ multicultural education attitudes and classroom management styles. The participants were 495 prospective teachers majoring in different departments of education faculties at two state universities in Turkey. “Democracy and Multicultural Education Attitude Scale” and “Classroom Management Style Scale” were used as data collection tools. Correlation and regression analyses were performed for data analysis by using SPSS 23.0 software. The results of descriptive analyses showed that most of the participants adopted authoritative style in terms of classroom management. Also, they had positive attitudes towards multicultural and democracy education. According to correlation analysis, there were significant relationships between the variables. Specifically, authoritative style was a powerful predictor of the attitude towards democracy and multicultural education. The prospective teachers with more authoritarian and indifferent styles had more biases towards multicultural education. Moreover, it is estimated that discussion and educational implications will shed light on teacher education.

Keywords: Multiculturalism, Multicultural Education, Attitude, Classroom Management Style, Prospective Teacher.

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INTRODUCTION

Multiculturalism is also a concept that based on the phenomenon of globalization emerging from dizzying developments in technology and political, cultural, and economic events. Although multiculturalism first came to the fore in countries such as America, Australia, and Canada, it has become an important issue for almost all countries in political, economic, and cultural dimensions (Parekh, 2002). According to Banks (2008), multiculturalism is a multi-faceted concept that involves recognizing different cultural characteristics such as age, sexual orientation, disability, social class, ethnicity, religion, and language in comparison to mono-culturalism.

Today, countries have started to shape their education policies with this awareness. This concept, which finds its place in practice as “multicultural education”, provides a basis for equal education of students with different ethnicity, language, religion, race, gender, sexual orientation rather than a standardized understanding and argues that they should not experience inequality of opportunities due to these differences (Banks & Banks, 2010). Multicultural education is based on philosophical concepts such as peace, freedom and equality. With this understanding of education, it is aimed to help culturally diverse learners to develop coexistence skills by providing equal opportunities to them (Banks, 2010). In societies where such an educational approach is not seen, education programs focusing on the characteristics of the dominant culture are prepared and the cultural differences of minority groups are ignored.

One of the most important variables in the implementation of multicultural understanding is the education programs being used (Gay, 1995). Even if a multicultural approach is included in the existing curricula, teachers should internalize the understanding of multicultural education and develop the necessary attitudes in order to maintain the understanding of multicultural education and to achieve its aims (Banks, 2008). One of the primary goals of the multicultural perspective is to redefine the aims of education and democracy by deepening them at the cultural level (Banks, 2002). What is expected from the education system within the scope of this goal is to educate individuals who are democratic, free and able to make their own decisions, yet this is only possible with the democratization of the education. Teachers who do not adopt multicultural understanding cannot create a democratic learning environment in the classroom. This situation may bring about problems such as discrimination, polarization and othering, and may lead to the formation of a classroom climate where negative perceptions towards students' differences prevail (Banks & Banks, 1995). Therefore, in order to avoid negative situations due to these and similar differences, educators should have the necessary personality traits for multicultural education and learners should have a positive attitude towards individual differences in cultural context (Bennett, Niggle & Stage, 1990).

Although multicultural education has recently been the focus of interest for researchers, the practice of multicultural education in teacher education is still in its infancy. Specifically, in Turkey, where different ethnic origins are hosted, about 15 different languages are spoken, religious and sectarian diversity as well as regional differences are observed and a multicultural texture prevails, the concepts of democracy and multiculturalism need to be treated at a more advanced level and their educational roles should be deepened (Parker & Sword, 2013). However, the contents of multicultural education for prospective teachers in higher education are not included in the curricula adequately. In addition, it is also seen that issues related to multicultural education are the result of unintended learning taking place within the hidden curriculum other than the written and formal curriculum. Therefore, educations, lectures or activities that teachers receive before starting the teaching profession should be able to develop their attitudes towards multicultural education and maintain this understanding.

The relevant researchers have predominantly focused on the assessment of the situation or scale development studies in relation to prospective teachers’ multicultural education attitudes (Aslan & Kozikö glu, 2017; Cho & DeCastro-Ambrosetti, 2005; Yazıcı, Başol & Toprak, 2009). Besides, although there are studies in critical or theoretical (Sleeter & McLaren, 1995; Eryaman, 2007; May & Sleeter, 2010) and partially relational contexts (Koçak & Özdemir, 2015; Yaşar Ekici, 2017), the
variables underlying the prospective teachers’ perspectives towards multicultural education have not been the subject of research much. In fact, in-depth examination and revealing of the factors affecting prospective teachers’ attitudes towards multicultural education can make significant contributions to teacher education in both theory and practice.

One of these important variables is also the teachers’ classroom management styles. Accordingly, the teachers’ individual differences should be taken into consideration in the development of multicultural education understanding (Akçaoğlu, 2017). In preservice education programs, there are courses related to classroom management for the professional development of prospective teachers. Therefore, it can be said that prospective teachers receive a planned education on classroom management. During this education, they can develop their own classroom management styles in line with their prior knowledge and experience by developing a perception towards providing an appropriate learning environment in the classroom.

Importantly, these management styles can be an important determinant in the development of their attitudes towards multicultural education and the creation of a suitable education environment in accordance with this understanding of multicultural education. The democratic values underlying this understanding can only be learned and internalized by practising in democratic environments. According to Ertürk (1993), students cannot be expected to grow up by experiencing democracy unless teachers create a democratic environment in all aspects. Therefore, it is thought that teachers who do not exhibit a democratic management may discriminate among students without considering the cultural diversity in the classroom. These reactions of the teachers may cause a negative classroom climate. Therefore, there is a need for relational studies in which classroom management styles of prospective teachers are revealed and discussed together with the element for multicultural education and individual differences are emphasized in cultural context. In the relevant literature, there are very few studies that provide correlative evidence between prospective teachers’ classroom management styles and their attitudes towards multicultural education. Therefore, in the present study, the relationships between prospective teachers’ classroom management styles and their attitudes towards multicultural education was examined. The findings of the present study may contribute to taking necessary measures and making educational inferences regarding the change of prospective teachers’ attitudes, beliefs and perspectives towards multicultural education due to their classroom management styles that shape after starting their teaching career.

In the light of this information, the research questions (RQ) were as follows:

- RQ1- What are the relationships between prospective teachers’ democracy and multicultural education attitudes and classroom management styles?
- RQ2- Do classroom management styles of prospective teachers predict their multicultural education attitudes?

**Multicultural education attitude**

Educators have play an important role in achieving the objectives of multicultural education. The knowledge, readiness, attitudes and competencies that teachers have regarding multicultural education are effective in organizing educational situations in accordance with the purpose (Banks, 2008). In this respect, it has become a necessity for teachers to be informed and educated in order to acquire awareness about the different characteristics of students due to multicultural education especially prior to teaching service (Premier & Miller, 2010; Riedler & Eryaman, 2016). As a matter of fact, the prospective teachers who do not have this awareness may have negative tendencies towards the differences of learners after starting teaching.

Teachers’ positive perspectives about multicultural education is an important factor in creating an appropriate classroom environment for all students to receive equal education without being exposed to discrimination (Banks, 1994). With respect to the development of this understanding of
education, the pre-service education is effective in the development of the prospective teachers' perspectives and tendencies towards multicultural education. In this regard, Bennett, Niggle and Stage (1990) underlined that prospective teachers should hold the values of respect for universal human rights, respect for the world community and respect for the world in the development of multicultural education. On the other hand, Van der Zee, Van Oudenhoven, Ponterotto and Fietzer (2013) examined the prospective teachers' multicultural personality traits in terms of cultural empathy, flexibility, social assertiveness, open-mindedness, and emotional balance.

Educators and prospective teachers should have the necessary beliefs and attitudes towards this understanding of education in order to acquire the values and characteristics of multicultural education. As a matter of fact, attitudes have a dynamic effect on behaviours (Myers, 1996) and, accordingly, it can be claimed that the effect of educators' attitudes is the determinant of their reactions to multicultural education. The positive or negative tendencies of educators towards multicultural education can be described as their attitudes towards this understanding of education.

Classroom Management Style

In enabling the students to achieve the learning objectives in the process of teaching and learning, the interaction between teacher and student is very important in terms of classroom climate. The teachers' knowledge and skills of classroom management come to the forefront in creating a positive classroom climate. Classroom management is a multidimensional concept that means to provide a favourable environment by minimizing the obstacles to learning (Emmer, Evertson & Worsham, 2003).

The teacher's role and responsibilities in terms of a good classroom management are great. The communication pattern established by the teacher in the classroom, his/her way of guiding the students, and his/her effective management of the learning process are considered important for an effective classroom management (Aktan & Sezer, 2018). Classroom management should not imply a teacher's having an authoritarian attitude and applying pressure on students using the element of force. As a matter of fact, in most of the studies in the literature, student achievement in the classes where effective classroom management was applied was found to be higher than the one in the classes where authoritarian style and force was used.

On the other hand, teachers' behaviours towards students in the classroom, their styles of communication with students, the rules they set up in the classroom, the methods and techniques they use in the classroom are reflections of their classroom management styles. Although the classroom management styles of the teachers in the relevant literature are classified in different ways, the researchers have predominantly accepted the four management styles proposed by Bosworth (1997): authoritarian, authoritative, laissez-faire, and indifferent. Specifically, teachers with an authoritarian style try to create a classroom environment where they try to dominate the students by using the element of "force" in the classroom, adhere to the classroom rules and do not take into consideration the students' decisions. Teachers in this category use the "control" factor at the highest level and believe that the punishment approach should be used in the classroom. Authoritative teachers try to apply rules based on logical reasons in the classroom. It is essential that students are warned politely rather than being rebuked. The classroom climate is generally positive, and teachers treat students sincerely. There is a controlled learning environment open to criticism and discussion. Teachers with a laissez-faire classroom management profile aim to create a flexible environment within the classroom. They value students' affective characteristics. Teachers with indifferent classroom management style do not tend to exert any discipline and pressure on students. These teachers try to spend time in the classroom without focusing on the effectiveness of the teaching-learning process. They are also insensitive to students.
METHOD

This study adopted as a predictive correlational design. This model allows to examine the relationships among variables and reveal the predictive power of them (Büyüköztürk, Kılıç Çağmak, Akgünl, Karadeniz & Demirel, 2012). It was selected to determine the possible effect of the independent variable on the dependent variable. However, this design can not clearly indicate causation. In the study, whereas the independent variables of the research are the sub-factors of classroom management style, “authoritarian”, “authoritative”, “laissez-faire”, and “indifferent” as predictor, the dependent variables are the variables of “attitude towards multicultural education”, biased attitude towards multicultural education”, “attitude towards democracy education”, “attitude towards democracy”, and “attitude towards cultural differences”.

Participants

The participants were 495 prospective teachers majoring in different departments of education faculties at two state universities in Turkey. 197 of these participants were male and 298 of them were female, aged from 19 to 28 (M = 21.02, SD = 1.14). 157 of the prospective teachers were sophomores, 165 of them were juniors, and 173 of them were seniors. The participants were selected according to the following two criteria: (i) majoring in any department of education faculty (ii) taking “classroom management” course.

Instruments

Democracy and Multicultural Education Attitude Scale consisting of five factors with 27 items was developed by Toraman, Acar and Aydın (2015). The sub-factors are as follows: “attitude towards multicultural education” (AtME; 7 items; e.g., “If I had a decision-maker role in the education system, I would bring a multicultural perspective to education.”), “biased attitude towards multicultural education” (BAtME; 7 items; e.g., “The practice of multicultural education in the schools irritates me.”), “attitude towards democracy education” (AtDE; 5 items; e.g., “I include democracy education in my classes.”), “attitude towards democracy” (AtD; 5 items; e.g., “I see cultural differences among students as a wealth of our society and democracy.”), and “attitude towards cultural differences” (AtCD; 3 items; e.g., “I teach the course according to my students' cultural differences in order that they can become successful”). Using a 5-point likert scale (ranging from “strongly disagree”=”1” to “strongly agree”=”5”), the participants rated their responses.

In the present study, the internal consistency coefficients were satisfactory for sub-factors: .85, .87, .89, .83, and ,.77, respectively. According to Tavşancıl (2014), the coefficients higher than .70 can be considered reliable. The confirmatory factor analysis presented acceptable indices ($\chi^2/df = 2.71$; TLI = .92; NFI = .89; GFI = .89; RMSEA = .05; SRMR = .04). Schermelleh-Engel, Moosbrugger and Müller (2003) suggested that TLI, NFI, GFI indices should be higher than .90 and RMSEA, SRMR values should be lower than .08 for acceptable model fit.

Classroom Management Style Scale consisting of four factors with 12 items was developed by Bossworth (1997) and adapted into Turkish by Aktan and Sezer (2018). The sub-factors, each of which consists of 3 items, are as follows: “Authoritarian” (e.g., “I do not accept the excuses of the students who come to class late”), “Authoritative” (e.g., “I always try to explain the reasons for my decisions and rules to my students.”), “Laissez-faire” (e.g., “I always respect when my students ask for permission to leave the classroom during lesson.”), “Indifferent” (e.g., “I do not want to impose sanctions on my students by means of rules.”).

In the present study, the internal consistency coefficients were acceptable for sub-factors: .72, .74, .72, and .70, respectively. According to Tavşancıl (2014), the coefficients higher than .70 can be considered reliable. The confirmatory factor analysis presented acceptable indices ($\chi^2/df = 2.39$; TLI = .93; NFI = .90; GFI = .92; RMSEA = .04; SRMR = .03). Schermelleh-Engel, Moosbrugger and Müller (2003) suggested that TLI, NFI, GFI indices should be higher than .90 and RMSEA, SRMR values should be lower than .08 for acceptable model fit.
Procedure and data analysis

The permission was obtained from two researchers who developed the scales. The data were collected during the spring semester of 2018-2019 academic year. The participants completed the scales in 7-15 minutes. All analyses were carried out by using SPSS 23.0 software. To address the RQs of study, the correlation and regression analyses were used. Prior to regression analysis, the assumptions such as normality distribution, outliers, linearity, and multicollinearity were tested. The skewness and kurtosis values were checked for normality. The values ranged from +2 and -2 for all sub-factors of the variables.

When the relationships between the independent variables were examined, the highest correlation value was .48. Büyüköztürk (2012) expressed that if this value is above .80, there can be multi-connection problem. According to regression analysis, Variance Inflation Factor (VIF) values ranged from 1.14 to 2.67 and Tolerance Value (TV) ranged from .30 to .59. Büyüköztürk (2012) also suggested that there can be multi-connection problem when VIF is above .10 and TV is less than .20.

RESULTS

Descriptive Statistics

According to the descriptive statistics, most of the participants had more authoritative style \((M = 4.24, SD = .42)\) and less indifferent style \((M = 2.85, SD = .75)\). Whereas the AtME \((M = 3.48, SD = .73)\) and AtDE scores of prospective teachers \((M = 3.11, SD = .59)\) were high, the AtCD \((M = 1.67, SD = .42)\) and their BAtME \((M = 2.51, SD = .62)\) scores were low. Table 1 shows the mean, standard deviation as descriptive statistics.

Prior to correlation and regression analyses, the effects of the variables of gender and grade on multicultural education attitude and classroom management styles were checked. For this, the independent sample t test and one-way ANOVA were used, respectively. The results showed that these demographic variables had no significant effect on the sub-factors of the scales \((p > .05)\). The results showed that the prospective teachers’ multicultural education attitude can be examined independently from demographic variables.

Correlation Analysis

To answer RQ1, correlation analysis was conducted. The results revealed that there were significant relationships between the sub-factors of variables. Table 1 shows the correlation coefficients for all variables.

Table 1. The findings of descriptive statistics and correlation analysis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>(M (SD))</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Authoritarian</td>
<td>3.35 (.69)</td>
<td>.23**</td>
<td>.34**</td>
<td>.48**</td>
<td>.30**</td>
<td>.36**</td>
<td>.17**</td>
<td>.22**</td>
<td>.22**</td>
<td></td>
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<tr>
<td>2. Authoritative</td>
<td>4.24 (.42)</td>
<td>.48**</td>
<td>.06</td>
<td>.56**</td>
<td>-.16**</td>
<td>.71**</td>
<td>.73**</td>
<td>.66**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Laissez-faire</td>
<td>3.49 (.56)</td>
<td>.40**</td>
<td>.44**</td>
<td>.22**</td>
<td>.30**</td>
<td>.41**</td>
<td>.39**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Indifferent</td>
<td>2.85 (.75)</td>
<td>.18**</td>
<td>.49**</td>
<td>.05</td>
<td>.09</td>
<td>.12*</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. AtME</td>
<td>3.48 (.73)</td>
<td>.21**</td>
<td>.57**</td>
<td>.67**</td>
<td>.61**</td>
<td></td>
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<tr>
<td>6. BAtME</td>
<td>2.51 (.62)</td>
<td>-.21**</td>
<td>.16**</td>
<td>-.10**</td>
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<tr>
<td>7. AtDE</td>
<td>3.11 (.59)</td>
<td>.66**</td>
<td>.41**</td>
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<tr>
<td>8. AtD</td>
<td>3.00 (.55)</td>
<td>1</td>
<td>.46**</td>
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<td></td>
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<tr>
<td>9. AtCD</td>
<td>1.67 (.42)</td>
<td>1</td>
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**p < .01, *p < .05, AtME: Attitude towards Multicultural Education, BAtME: Biased Attitude towards Multicultural Education, AtDE: Attitude Democracy Education, AtD: Attitude towards Democracy, AtCD: Attitude towards Cultural Differences**
As shown in Table 1, while authoritative style was positively and moderately correlated with AtME ($r = .56$), AtDE ($r = .71$), AtD ($r = .73$), and AtCD ($r = .66$), it was negatively and weakly correlated with BAtME ($r = -.16$). Laissez-faire style was positively and moderately correlated with AtME ($r = .44$), AtD ($r = .41$), and AtCD ($r = .39$). It was also positively and weakly correlated with BAtME ($r = .22$) and AtDE ($r = .30$). There was a positive and moderate significant relationship between indifferent style and BAtME ($r = .49$). Indifferent style was positively and weakly correlated with AtME ($r = .18$) and AtCD ($r = .12$). As indifferent style was not significantly correlated with both AtD and AtDE, it was not included in the regression analysis.

### Regression Analysis

To answer RQ2, regression analysis was conducted. The results showed that some independent variables were significant predictors of the dependent variables. Table 2 shows the findings of regression analysis.

<table>
<thead>
<tr>
<th>Table 2. The findings of regression analysis.</th>
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<tr>
<td>Variable</td>
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<tr>
<td><strong>AtME</strong></td>
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<td>Authoritarian</td>
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<td>Authoritative</td>
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<td>Laissez-faire</td>
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<td>Indifferent</td>
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<tr>
<td><strong>BAtME</strong></td>
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<tr>
<td>Authoritarian</td>
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<tr>
<td>Authoritative</td>
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<tr>
<td>Laissez-faire</td>
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<td>Indifferent</td>
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<tr>
<td><strong>AtDE</strong></td>
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<tr>
<td>Authoritarian</td>
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<tr>
<td>Authoritative</td>
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<tr>
<td>Laissez-faire</td>
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<td><strong>AtD</strong></td>
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<td>Authoritarian</td>
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<tr>
<td>Authoritative</td>
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<tr>
<td>Laissez-faire</td>
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<td><strong>AtCD</strong></td>
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<tr>
<td>Authoritarian</td>
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<tr>
<td>Authoritative</td>
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<tr>
<td>Laissez-faire</td>
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<td>Indifferent</td>
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As shown in Table 2, all the independent variables together explained 42% of the total variance of AtME ($F_{(4,490)} = 59.92$, $p < .001$). The strongest significant predictor was authoritative style ($\beta = .45$) while indifferent style was not a significant predictor of AtME ($p > .05$). The independent variables together explained 34% of the total variance of BAtME ($F_{(4,490)} = 49.54$, $p < .001$). All of the independent variables were significant predictors of BAtME: indifferent ($\beta = .34$), authoritative ($\beta = -.31$), authoritarian ($\beta = .21$), and laissez-faire ($\beta = .15$). The independent variables explained together 40% of the total variance of AtDE ($F_{(4,490)} = 64.37$, $p < .001$). The strongest significant predictor was authoritative style ($\beta = .62$) and other styles were not significant predictors of AtDE ($p > .05$). The independent variables altogether explained 47% of the total variance of AtD ($F_{(4,390)} = 85.09$, $p < .001$). The strongest significant predictor was authoritative ($\beta = .60$). None of the authoritarian and indifferent styles were significant predictors of AtD ($p > .05$). Lastly, the independent variables together explained 27% of the total variance of AtCD ($F_{(4,490)} = 34.52$, $p < .001$). The strongest
predictor was authoritative style ($\beta = .38$), yet authoritarian and indifferent styles were not significant predictors of AtCD.

**DISCUSSION AND CONCLUSIONS**

The results showed that prospective teachers had mostly authoritative style in terms of classroom management. This finding is consistent with the results of some similar studies in the literature (Ekici, Aluçdibi & Öztürk, 2012; Yurtal & Yaşar, 2018). In the research, the prospective teachers' attitudes towards multicultural education and democracy are generally positive. Remarkably, it is an important finding that they have low attitudes towards cultural differences. This finding indicates that students have general knowledge about multicultural education and democracy, but more specifically, they do not have enough information about cultural differences and sensitivities.

The results of the correlation analysis showed that there was a significant relationship between prospective teachers' classroom management styles and their attitudes towards democracy and multicultural education. Specifically, the attitudes of prospective teachers with authoritative classroom management style towards multicultural education, democracy, democracy education and cultural differences were found to be remarkably positive. There were moderately positive significant relationships between laissez-faire classroom management style and prospective teachers' attitudes towards multicultural education, democracy and cultural differences. In addition, prospective teachers' biased attitudes towards multicultural education are positively correlated with indifferent, authoritarian, and laissez-faire classroom management styles while they are negatively and weakly correlated with authoritative classroom management style. According to these results, it can be said that authoritative management style is compatible with democratic and multicultural understanding. On the other hand, this also indicates that prospective teachers with other management styles have biases towards multicultural education. These findings are related to within the scope of democratic values (Çiftçi, 2015; Yılmaz, 2010).

According to the findings obtained from the regression analysis, the most powerful predictor of the attitude towards multicultural education is authoritative classroom management style. This means that prospective teachers with authoritative style can have positive attitudes towards democracy, democracy education, and cultural differences. Therefore, teachers need to have an authoritative understanding of classroom management in order to create a positive classroom climate for multicultural education. On the other hand, authoritative style is a negative predictor of multicultural education while indifferent and authoritarian classroom management style is a positive predictor of biased attitude towards multicultural education.

**Educational implications**

This study has some educational inferences in the light of the findings. Authoritative classroom management is considered important in creating a democratic classroom climate and minimizing the problems arising from individual differences of learners. Therefore, it can be focused on the necessary activities for prospective teachers to adopt authoritative management style. On the
other hand, it should also be focused on the internalization of the multicultural education and democratic values by teachers. For this purpose, the integration of multicultural education into the curricula and teaching courses such as classroom management and teaching principles, methods, and techniques can be provided in teacher education. It is also possible that the students who will be educated by teachers who have been raised with a democratic understanding will develop positive attitudes towards these concepts. In addition, as a role-model in teacher education, the academicians' management behaviours in the classroom can be a latent variable in the formation of classroom management styles of prospective teachers.

It is known that the considerations such as a good management of not only the teaching resources but also the individuals, the provision of the coordination in student behaviours with an effective supervision and the creation of a positive learning environment are on the foreground while talking about a good classroom management (Taylor, 2009). Besides, the democratic behaviours of the teachers and the frequency of these behaviours in the classroom climate are important for the students to imitate these behaviours. Considering that teachers are also influenced by student behaviours, this democratic environment created by mutual interaction minimizes the problems such as “relationship management” and “behaviour management” which were put forward by Akin, Yıldırım and Goodwin (2016) as some of the problems experienced by teachers in classroom management.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has some limitations. First, the study sample consists of prospective teachers, not teachers in service. Although it is a strong criterion that the prospective teachers are taking the classroom management course in selecting the sample of the present study, the inclusion of in-service teachers in the research is important for questioning the generalizability of the findings obtained from this study. Secondly, the recent study focused on the classroom management styles and attitudes towards multicultural education in a correlational context. Further research should examine the relationship the attitudes towards multicultural education and the variables such as democratic values, classroom climate, educational beliefs, critical thinking. Modelling studies can be also conducted.

Today, education systems have shaped to constructivist approach. Hence, the understanding of classroom management shifts from an authoritarian and teacher-centered understanding to a democratic and student-centered one. Although this change occurs in theory, the teachers’ managerial behaviours, communication styles and biases are affected by their attitudes and beliefs during the practice in the classroom. Importantly, these relational issues also fall within the scope of the hidden curriculum covering unintended learning outside the formal curriculum (Fidan & Tuncel, 2018). Therefore, classroom management styles and attitudes towards multicultural education may also be the subject of research in the context of the hidden curriculum.

REFERENCES


A Multi-Way Intervention to Improve the Social Acceptance of a Student with Learning Disabilities

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Abstract

The aim of this study is to investigate how a student with learning disabilities is socially accepted by his peers in the classroom when social skills training and academic support are concomitantly provided. The participants consisted of 15 (7 female, 8 male) typically developing high school students attending Grade 1 and a student with learning disabilities. One-group pretest-posttest design was utilised. The research data was collected through the sociometric technique of peer nomination before and after the intervention programme. In addition, the effects of the implemented programme were examined via a semi-structured interview with the student with learning disabilities and his family. The data was analysed via the technique of sociogram, and descriptive analyses were conducted as well. The research results indicate that the programme in question was effective on the student with learning disabilities’ social acceptance among his typically developing peers. Furthermore, the interviews with his family show that the implemented programme provided a variety of benefits for the student with learning disabilities.

Keywords: Social Acceptance, Students With Learning Disabilities, Typically Developing Students, High School Students

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INTRODUCTION

Students encounter social duties, such as initiating and keeping interaction, resolving conflicts, making friends and achieving common interpersonal goals with their peers at school every day (Pearl & Donahue, 2004). Some students have difficulty in performing these duties and face the risk of exclusion by their peers (Pijl & Frostad, 2010). A certain part of such students is composed of those with learning disabilities (LD) (Swanson & Malone, 1992). Although students with LD have difficulties mainly in reading, writing and mathematics (Kirk, 1963), they encounter several difficulties in social fields as well. Bryan (1974) first referred to these social difficulties in his paper titled “Peer Popularity of Learning Disabled Children”. It was also found in subsequent studies that students with LD are more socially isolated and less accepted by their peers when compared to those without LD (Baydik & Bakkaloglu, 2009; Gresham & Reschly, 1986; Lorger, Schmidt, & Vukman, 2015; Pavri & Luftig, 2001). Given that a majority of students with LD receive inclusive education, these students spend at least one third of their everyday life together with their typically developing friends. Any problems in LD students’ social relations with typically developing peers may therefore negatively affect their emotional, social and academic development (Bender, 2008). Limited positive communication between students with LD and their peers not only reduces their social learning opportunities but also may lead to further exclusion in the future and negative psychological effects (Valås, 1999). In a meta-analysis, Parker and Asher (1987) argue that there is a considerable link among peer acceptance, school dropout, criminality, and psychopathology. In another research, Pijl and Frostad (2010) conclude that students with low acceptance by their peers run the risk of low self-concept. According to Wiener and Tardif (2004), students with LD have less reciprocal friends, lower friendship quality, lower social acceptance, and lower academic self-concept than their peers have. Students with LD were also found to exhibit social skill deficits, high levels of loneliness, depression and problem behaviours. As Nabuzoka and Smith (1993) found out, students with LD are rejected and exposed to bullying, as they are shyer, less popular, and fewer nominated as a leader, compared to typically developing peers. According to Wiener and Schneider (2002), compared to non-LD students, LD ones make less reciprocal friendships, make friends with those who have more problem behaviours, select younger ones as friends, and do not keep friendships for a long time. Students with LD have a lower quality of friendship, experience more conflicts and have more difficulty in solving problems related to friendship. Another remarkable point about the social difficulties of students with LD is that those problems continue in later ages as well (Bender, 2008). For instance, Estell et al. (2008) concluded that students with LD have lower social standing among their classmates from Grade 3 to 6. In the mentioned research, compared to typically developing peers, students with LD scored lower in terms of being nominated as one’s best friend, had lower peer popularity, and scored lower in terms of being socially preferred. Vaughn, Elbaum and Schumm (1996) found that average and high achieving elementary students were more liked than those with LD, and the latter’s social functioning remained quite steady, though the number of their reciprocal friendships increased during an education year (from fall to spring). A similar one-year research on children from Grade 2 to 6 shows that students with LD may face social rejection to a greater extent, even though they establish reciprocal friendships (Tur-Kaspa, Margalit, & Most, 1999).

In addition to the above-mentioned studies, it is possible to find a series of research results indicating that students with LD are lonely as they are less accepted by their peers (Conderman, 1995; Frederickson & Furnham, 2004; Kuhnke & Wiener, 2000; Lorger et al., 2015; Mand, 2007; Margalit, 1991; Margalit, Tur-Kaspa, & Most, 1999; Nabuzoka & Smith, 1993; Pavri & Monda-Amaya, 2000; Schmidt, Prah, & Čagran, 2014; Schwab, 2019; Yu, Zhang, & Yan, 2005). When those research results are assessed as a whole, it can be said that there are significant difficulties in social development of students with LD. In line with the related studies, it is very crucial to answer following questions: “Why these students are exposed to social rejection?”, “What can be done to improve the social acceptance of students with LD?”. Vaughn, Zaragoza, Hogan and Walker (1993) and Putnam, Markovchick, Johnson and Johnson (1996) analysed peer rejection of students with LD from two
points of view. The first point is low academic achievement, and the other one is social skill deficits of students with LD. The present study analyses the problem from the mentioned points of view.

### Academic Skill Deficits

Students with LD have problems in early literacy skills in the preschool period (Schneider, Roth, & Ennemoser, 2000). After starting school, they have difficulty in academic skills, e.g. reading (80%), writing and mathematics (Gersten, Fuchs, Williams, & Baker, 2001). Academic failure may be considered as characteristic of students with LD. Most of these students are identified by academic failure after starting school. According to Peleg (2009), students with LD reported higher levels of test anxiety and lower levels of self-esteem than their non-disabled peers did. Students’ with LD academic performance was possibly impaired by their intense distress. Academic failure can lead to lower motivation, higher anxiety and introversion among students with LD. Moreover, those academic difficulties can result in gradual estrangement from school and peers and can eventually lead to school dropout (Sutherland & MacMillan, 2001). These factors make it difficult for students with LD to be accepted by their peers. It is attested that academic achievement enhances social acceptance (Gifford-Smith & Brownell, 2003). Supporting students with LD academically can therefore help improve their social acceptance.

### Social Skill Deficits

Social skills comprise abilities to start a conversation, to ask a question, to apologise, to make decisions etc., which are used in school and everyday life (Kavale & Mostert, 2004). Having and using these skills affect one’s social development and relations in a positive way. Social skill deficits are seen as characteristic of students with LD (Forness & Kavale, 1996). According to the Interagency Committee on Learning Disabilities (ICLD, 1987), social skill deficit is a feature distinguishing many students with LD from students with other learning problems. In a meta-analysis, Nowicki (2003) found that students with LD have lower peer acceptance and poor social skills. According to Wiener and Sunohara (1998), mothers of students with LD claimed that their children had problems in reading social clues; therefore, they frequently and unintentionally distanced themselves from their friends, and their problems of impulse control led to conflicts. Al-Yagon (2012) found that adolescents with LD had more socio-emotional problems, had difficulties in making bilateral relations, had a variety of behavioural problems, and had more troubles in their relations with parents and teachers than typically developing peers had.

In a longitudinal study (from kindergarten through Grade 3) by Vaughn et al. (1993), it was found that students with LD exhibited lower social skills and higher levels of behaviour problems than their peers with average and high achievement did, and these behaviour problems continued in later years. The researchers determined a relationship between social skills and academic achievement. They observed that students’ with LD behaviour problems stem from attention deficit, anxiety, and introversion. Moreover, students’ with LD levels of peer acceptance were significantly lower than those of students with average and high achievement. Estell et al. (2008) likewise found that students with LD lag behind their typically developing peers in terms of acquiring social skills and have difficulty in meeting their deficits in social skills. As it is understood, social skills constitute another crucial factor to improve the social acceptance of students with LD.

### Present Study

In their meta-analysis, Forness and Kavale (1996) demonstrated the positive effects of social skills training on students with LD. However, they observed that these effects remain limited when compared to those on typically developing students, as also evidenced by Kavale and Mostert (2004). Forness and Kavale (1996) addressed the importance of academic support in students’ with LD self-esteem and peer acceptance. They emphasized the need for social skills training considering that the deficits thereof cause difficulties for students with LD in learning and academic environments, as well
as in relation to their self-concept. These results impel researchers to embark on a quest to find different ways to improve social acceptance of students with LD. Between academic improvement and social skills training, researchers thus need a coordination much closer than observed in studies carried out up to now. Techniques of social skills training ought to comply with those of academic training (Forness & Kavale, 1996; Kavale & Mostert, 2004). Accordingly, we think, it is crucial to provide academic support in company with social skills training in order to enhance the social acceptance of students with LD. Therefore, the aim of the current study is to investigate the effects of co-providing a student with LD with social skills training and academic support on social acceptance by his peers. We sought answers for the following research problem:

- What is the effect of providing a student with LD with social skills training along with academic support on social acceptance by his peers?

**METHOD**

**Research Design**

A one-group pretest-posttest design was used. The research is a special case study in the same time, as a student was examined in detail via different data collection sources related to his social acceptance.

**Participants**

The research was carried out with 15 typically developing students attending a high school in a south-eastern city of Turkey and a student diagnosed with LD. Although the classroom comprised 20 students in total, the data was collected from 16 students, since two students did not participate in the first implementation, and another two did not participate in the second implementation. Seven of the participants are female, and nine are male. The ages of the typically developing students range from 15 to 16. Ali, who is the one diagnosed with learning disabilities, is a 16-year-old male student. His mother and father have bachelor’s degree. He did not have any problem in the pre- and post-natal period. His speech development was delayed, however. His family received support from language and speech experts for Ali who did not acquire speaking skills until he was 3-4 years. Ali’s speech-related problems continued until he started school. His family also reported that Ali had difficulty in activities requiring eye-hand coordination.

According to the other data obtained from the interview, LD symptoms were not observed in Ali’s family. His parents reported that Ali’s major problems emerged after he began school, though he had difficulties in finding playmates in the pre-school period. His introversion and the problems he had in reading and writing were followed by an examination process to establish a diagnosis. Nevertheless, Ali was not diagnosed with any disorder following the initial pedagogical and medical examinations. Eventually he was diagnosed with LD in the last examination in 2016. The examination report particularly mentions of the significant difficulties Ali had in academic and social skills. The tests indicated his IQ score (WISC IV) as 90 points. Ali was included in this research, because (1) he and his parents were voluntary to participate, and (2) he was socially isolated from his peer classmates as understood from the interviews with his family and the school counselling service.

**Data Collection**

The sociometric peer nomination technique was used to determine Ali’s social position in his classroom and the change of that position. Peer nomination is the most commonly used sociometric technique to reveal the social position (popular or rejected) of students with LD (Frederickson & Furnham, 1998; Margalit & Al-Yagon, 2002). This technique requires students to sort out of their classmates complying with certain sociometric criteria (e.g., name three classmates you like to play with” or “name three classmates you like to work together with) (Avramidis, Strogilos, Aroni &
The question in this research is as follows: **Name three classmates with whom you like to be always together within the classroom.**

We also conducted an interview with the student with LD and his family. The questions on the family interview form are as follows: (1) Have you observed any academic and social changes in your child following the implemented programme? How? (2) Have you observed any changes in Ali’s communication with you during this process? How? The questions on the student interview form are as follows: (1) Have you benefitted from this process in academic and social terms? How? (2) Have you enjoyed this training programme? How? While preparing these interview questions, the opinions of a special education specialist and a measurement and evaluation specialist were taken. The special education specialist explained his views on the suitability of the questions for the purpose of the research. In addition, the support was obtained in consultation with a language specialist about whether the questions were understandable or not. The validity of the interview questions was tried to be ensured by taking all these measures. The interviews lasted for averagely 10-15 minutes. The data was recorded via a dictation machine and by taking notes at times during the interviews.

**Implementation**

A meeting was held with Ali and his parents prior to the implementation, in addition to obtaining information about Ali from the school counsellor. We exchanged views on the content, weekly frequency, and duration of the intervention programme in question. All these meetings were held at different times, with the researcher and Ali, with the researcher and Ali’s parents, and with all of them being together. During this process, Ali was seen to have difficulty in expressing himself (self-disclosure) and reading comprehension in academic terms. He had some difficulties in activities requiring motor skills and eye-hand coordination as well. On the other hand, it was noted that Ali played and enjoyed table tennis, albeit being not good at it. The intervention programme was rearranged accordingly. The final form of the programme was sent to two specialists with PhDs in special education, and it was finalised in accordance with their assessments. Consequently, the programme was structured on three dimensions: (1) developing reading comprehension skills (2), developing social (self-disclosure) skills, (3) supporting psychomotor (tennis) skills. In each implementation day, a cognitive strategy training was provided to improve Ali’s reading comprehension skills during the first 40-minute session, followed by a social skill training to enable him to express himself in the second 40-minute session. Table tennis was played in the last 40-minute session in order to help him develop social and psychomotor skills. The sessions were planned to take place two days in a week and to last for 12 weeks (through March-April-May).

The second phase involved the implementation of peer nomination pre-test within Ali’s classroom to see the development of his social acceptance level. Voluntary classmates of Ali were included in the research after permission was received from the school administration. The interviews with the participants lasted for averagely 10-15 minutes. The data was recorded through the notes taken by the students. The classroom data was collected by the school counsellor, considering that the researcher’s presence in the classroom might affect Ali negatively. The pre-test was followed by the intervention programme for Ali. The conduct of that programme was assisted by two 4th grade students receiving education in the department of Psychological Counselling and Guidance in the university where the researcher works. These university students were selected considering that (1) they have successfully completed the courses of social skill training, learning disabilities, and group counselling, and (2) they could easily communicate and carry out activities with Ali as their ages were closer to his. The intervention programme was implemented after the researcher provided the assistant students with a weeklong (eight sessions) briefing about the conduct of the programme. The sessions of reading comprehension and social skill training were conducted at the drama hall of the university where the researcher works, while the table tennis practice was performed at the playing field within the same campus.
Sample Practice

<table>
<thead>
<tr>
<th>Session: Reading Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration:</strong> 40 minutes</td>
</tr>
<tr>
<td>Reading comprehension strategies (activating prior learning and making a guess before reading; re-reading in cases of failure to understand and underlining important parts during reading; summarising and identifying the main theme after reading) were practically demonstrated on the text with the counsellor.</td>
</tr>
<tr>
<td>- In this session, Ali was asked to apply the strategic steps before, during and after reading on a given text.</td>
</tr>
<tr>
<td>- At this phase, counselling was made as long as the participant needed when applying the strategies.</td>
</tr>
<tr>
<td>- In line with the requirements, the participant was provided with clues, feedback, and corrections.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session: Social Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration:</strong> 40 minutes</td>
</tr>
<tr>
<td>A drama play was performed with roles changing, in order for Ali to express himself and discuss his problems comfortably. When he was asked to represent the essential problems with his family, he played a role in which his father said that Ali played with phone too much.</td>
</tr>
<tr>
<td>- First, one of the students played Ali’s father, while Ali played himself.</td>
</tr>
<tr>
<td>- Second, Ali played the role of his father, while the student took on the role of Ali.</td>
</tr>
<tr>
<td>- Third, Ali played one of his friends, while two of the students played Ali and his father.</td>
</tr>
<tr>
<td>In this way, it was aimed</td>
</tr>
<tr>
<td>* to reveal Ali’s lucid feelings and thoughts about the hassles he encountered at home.</td>
</tr>
<tr>
<td>* to assess his thoughts on how his father and friends understand him, and to understand their feelings of closeness to Ali</td>
</tr>
<tr>
<td>* to reveal how they view themselves (how his father and friend get along with Ali in the eyes of Ali)</td>
</tr>
<tr>
<td>* to enable Ali to disclose himself, sharing his feelings and thoughts better through drama</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session: Table Tennis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration:</strong> 40 minutes</td>
</tr>
<tr>
<td>- Table tennis was played between Ali and the two assistant students.</td>
</tr>
<tr>
<td>- As table tennis is played between two people, Ali was made to feel like winner, defeated, and spectator who favours one of the players.</td>
</tr>
<tr>
<td>- Thus he was made to express his feelings by congratulating the winner and rejoicing or getting sad when his favourite player won or lost.</td>
</tr>
<tr>
<td>- He was enabled to develop his eye-hand coordination and to control his motor skills via table tennis.</td>
</tr>
<tr>
<td>- As he was skilled at table tennis to a certain extent, he was made to taste the feeling of achievement in an easier way.</td>
</tr>
</tbody>
</table>

The researcher and the assistant students met each week to assess the intervention sessions. A peer nomination post-test was applied in Ali’s classroom after the end of the 12-week intervention process. A meeting was also held with Ali and his family after the programme.

Data Analysis

The peer nomination employed to ascertain Ali’s social acceptance levels among his classroom peers both in the beginning and the end of the intervention programme was analysed by constructing a sociogram, whereas the interviews with Ali and his family were analysed descriptively.

FINDINGS

This section includes the results related to the social acceptance levels of the student with LD among his classmates before and after the intervention programme implemented in accordance with...
the aim of this research. The opinions of Ali and his family about the efficiency of the programme were presented as well.

The results obtained from the peer nomination test carried out in the classroom of the student with LD prior to the intervention are shown in Figure 1.

![Sociogram](image)

**Figure 1. Pre-intervention sociogram of the classroom**

Figure 1 shows that the students 3, 6 and 9 were the most nominated ones with the highest level of social acceptance among their classmates. Student with LD Ali and the student 14 were the least nominated ones, on the other hand. It is understood that these two students were excluded from the student groups within their classroom when compared to their typically developing peers. It can be said that both students have difficulties in terms of social acceptance in their classroom. While the student 14 had a reciprocal friendship (with the student 9), none of the classmates Ali chose named him as friend. Ali was chosen only by the student 14 who also remained outside the groupings. It is of note that Ali was the third choice of the student 14. Therefore, it is clear that his classmates did not prefer Ali as their friend before the intervention. While the participants were asked to name three students within the scope of the programme, Ali named just two of his classmates, not writing down a third one. It can be concluded that Ali was lonely in his classroom and had difficulty in making reciprocal friendships. Besides, the first choices of the female students were often the female ones, and those of the male students were the male ones. It is another finding of the research that Ali was not chosen by any of his female classmates.
Figure 2. Post-intervention sociogram of the classroom

The post-intervention data presented in Figure 2 indicate that the students 3 and 6 were the most nominated ones just as they were before the intervention. On the other hand, student with LD Ali was preferred by three classmates this time, which is indicative of a positive development regarding Ali’s social acceptance among his classmates. The most outstanding result is that Ali’s friendships became reciprocal in tandem with the intervention programme. The students 5 and 16 nominated Ali as their friend, albeit as the third choice, and the student 14 nominated Ali as friend as the second choice. In this context, it can be inferred that Ali made reciprocal friends. The fact that Ali was not the first choice of any of his classmates even after the intervention is a remarkable data. As it was the case before the intervention, the first choices of the female students were the female ones, and those of the male students were the male ones, which can be interpreted as a sign of the continuing social distance between the female and male students within the classroom. In conclusion, social acceptance of the student with LD increased and he acquired reciprocal friendships in line with the conducted intervention programme.

Effects of the Intervention Process on the Student

The student with LD and his family were asked to give insight into the effects of the intervention process on him. This section includes an analysis of the in-depth interviews with the student with LD and his parents, who were included in the process.

Parent Opinions

It was inferred from the interview with Ali’s parent that the implemented programme was effective for their child to develop social, academic and motivation skills.

The mother expressed her opinions as follows:

We observed that Ali developed mainly in the social field. We noticed that he made a few friends for the first time following a particular phase of this training. We saw for the first time
such behaviours as meeting with his friends somewhere and going with them to cinema. He is talking to these friends on the phone as well. Previously he lacked self-confidence but I can say that his self-confidence has increased after this process.

I notice that recently he has been more responsive in terms of doing his homework. Previously he did not care much about whether or not he had any homework. I can say that he has developed in this sense. Previously we had to compel him to sit at the table to study but now he is concerned on his own responsibility, saying “I have to do my homework”, “I have to solve test questions”, etc.

The father explained the benefits of the programme as follows:

I observe that this process has significantly contributed to my son. It has effects especially on his socialisation. He has made more friends. I can say that his level of understanding has also developed slightly. I notice the development of this skill when I study with and listen to him. More importantly, I witness that he makes jokes when talking to his friends on the phone or face to face, a feature that was inexistent in the past.

There has been a positive change in his communication with us. He was already positive and moderate previously. I can say that he has reached a good point in expressing himself. I think these kinds of programmes are important especially for students with difficulties. In both private and state schools, there are regulations mostly aiming at normal and supernormal students. There is not much regulation for such abnormal children. Therefore, I think, these kinds of programmes are important for the social development of such children.

In the eyes of his parents, the implemented programme has contributed to Ali’s development of social skills in particular and has been effective in terms of making and keeping friendships. They also observed enhancement in Ali’s self-confidence.

**Student Opinions**

During the interview, the student with LD emphasized that the implemented programme was effective for him to develop social, emotional, and communicative skills. He stated that the process contributed to him in terms of sharing something interpersonally, expressing himself better, and developing friendship skills.

The student with LD expressed his thoughts as follows:

I can say that it has been useful for my interpersonal communication. I feel better when communicating with my friends, family, and people around me. I could not express myself comfortably before this programme. I began to express better after the programme. Now I can better manifest my emotions.

I can say that it has been partly useful for my courses. I can say that it has reflected much on my social relations.

Joining in this training was enjoyable. I am happy to join in that. They say that I have a different and nice voice. Maybe I can make radio programme in the future.

Ali reported that he found the intervention programme enjoyable and was pleased to have participated in it. He stated that the programme contributed significantly to disclosure of his feelings and thoughts. He made and maintained friends in this way. It is possible to conclude that the programme in question was effective seeing what Ali’s friends, parents, and Ali himself put forth.
DISCUSSION

This research was carried out to investigate the effects of co-providing a student with LD with social skills training and academic support on social acceptance by his peers. First, it was detected that the student with LD had a lower level of social acceptance compared to his peers before the intervention. This result is in agreement with the results of other studies showing that students with LD have lower levels of social acceptance (Fırat & Koyuncu, 2019; Frederickson & Furnham, 2004; Lorger et al., 2015; Schmidt et al., 2014; Yu et al., 2005). Similarly, as a meta-analysis by Nowicki (2003) indicates, students with LD have higher social risks and lower social statuses compared to students with average and high academic achievement. The fact that students with LD have difficulties in academic fields like reading, writing, and mathematics (Gersten et al., 2001), social skill deficits (Kavale & Forness, 1996) and behavioural problems (Sze, 2010) may prevent their acceptance by peers. It was seen that implemented intervention programme increased Ali’s social acceptance among his peers. This result indicates that supporting students with LD in terms of academic and social skills can be influential in increasing their levels of peer social acceptance.

Second, it can be said that the multi-way structure of the intervention programme was effective in reaching successful results in this research. The areas in which the participant has difficulties and the areas in which he can improve were detected at the onset of the research. Accordingly he was provided with cognitive strategy training to develop comprehension skills, and self-disclosure training to develop his social skills. He was included in table tennis to develop psychomotor, eye-hand coordination, and attention skills. In their meta-analyses, Forness and Kavale (1996) and Kavale and Mostert (2004) found that interventions of social skill training for students with LD had limited effects. Given that individuals’ social development is a multi-dimensional and integral process, supporting students with LD only in a particular area is not expected to be sufficient for their social development. For instance, the fact that the participant has had problems in eye-hand coordination since his infancy may have prevented him from joining in plays that are the basic social activities in childhood. The deficiency in academic skills may also have negatively affected his participation in academic activities in the classroom. These are the very factors that lead to social exclusion of students with LD. Families and researchers need to evaluate students with LD in detail, to reveal their strengths and weaknesses, and to contribute to the development of those weaknesses in an integrated way, which is important for social development of students with LD.

Third, none (except one) of his classmates nominated Ali as his/her close friend before the intervention. “My father says I am playing with mobile phone too much, but none of my friends sends text messages to me, so I am not much interested in mobile phone”, Ali said in a pre-intervention session. Hence, the participant can be said to have difficulties in establishing cordial and reciprocal relations with his classmates. Previous studies also argue that students with LD have troubles in making reciprocal, qualified, and long-term friendships (Vaughn et al., 1996; Wiener & Schneider, 2002; Wiener & Tardif, 2004). This leads students with LD to loneliness. It is emphasized in the relevant literature that students with LD are lonelier than their peers are (Pavri & Luftig, 2001; Valås, 1999). Having compared students with LD and typically developing ones, for example, Valås (1999) found that the former were less accepted by their peers, had lower self-concept and felt lonelier. It can be said that social and academic skill deficits cause students with LD to be lonely and distanced from social interaction. Although social skills are needed to initiate social interaction, the latter is needed to develop social skills as well. LD students’ lack of interaction with their peers can lead to underdeveloped social skills, which in turn can eventuate in a vicious cycle for their social development. That is to say, social and academic skill deficits can cause lower peer acceptance; lower peer acceptance can cause loneliness; loneliness can cause less social interaction; less social interaction can cause underdeveloped social and academic skills.

Fourth, as understood from the paper hitherto, students with LD need more familial support than their typically developing peers do. Being supported by their parents in a favourable domestic environment is crucial for the socio-emotional development of students with LD (Idan & Margalit, 2014). Learning disability causes developmental retardation in one or multiple areas, mainly in
information processing and motivation, as well as academic and social skills. Any retardation in these areas might negatively affect the interaction of students with LD with their families. As Schmidt et al. (2014) found, students with LD have more difficulty in communication with their family members than the non-disabled have. However, the fact that families are confused about what to do and where to consult to overcome those difficulties is another problem situation. This can sometimes lead to delay in diagnosis and intervention, as it was the case with the participant in this research. Delays in intervention can further the negativity in child-family communication. It is of importance, therefore, to inform families about learning disability, as they are expected to have a pioneering role in academic and social development of students with LD.

Finally, during the interview with him, Ali expressed that he found the intervention programme useful and enjoyed having participated in it. In this regard, it can be said that the programme in question has a high social validity. During the interviews with them, his parents reported that the programme enhanced Ali’s motivation and self-confidence. He was also reported to behave more responsibly regarding his homework. It can be concluded that the intervention programme contributed to the development of self-regulation skills, which is of prime importance for students with LD.

Limitations and Implications

This research has several limitations, despite the fact that it puts forth significant findings about social acceptance of students with LD. First, the intervention programme to increase social acceptance was applied on just one student, which limits the generalisation of the findings. Further effects can be observed by implementing an intervention programme on larger groups. Second, regarding the social acceptance within the classroom, the participant was not nominated by any of his classmates as their first choice. The change of peer acceptance was handled in a four-month period. Four months could not be enough to evoke a change in student perceptions. Hence, longer periods of interventions and longer periods of evaluations to see the effects of those interventions are fundamental. Finally, the efficiency of the intervention programme was analysed over the participant’s level of social acceptance in his classroom and the interviews with his parents. To what extent the participant developed in reading comprehension and social skills was not assessed in a way specific to the participant.

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International Student Selection Process in Turkey: Characteristics, Challenges and Opportunities

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Demet Hatice Özerbaş
Gazi University

Abstract

The purpose of this study is to examine the characteristics, problems and possible solutions in the international student selection process faced by higher education institutions in Turkey. The study group is composed of academic and administrative executives who are involved in the foreign student selection process of 5 universities in the Aegean region, the Marmara region, the Western Black Sea region, the Eastern Black Sea region and the Eastern Anatolia region. The research is designed with a case study of qualitative research methods. Semi-structured interview form was used in data collection process and data was analysed by content analysis method. According to the results of the research, the most common cases of higher education institutions in foreign student selection process are; management process of application processes, organization and transparency problems in exams, lack of cooperation between institutions, false document and document verification problem, inability to follow the applicants at the national level, high record deletion, quota of not filling the quota, preference infinity, special talent exam problem, shortcomings of legislation, central database deprivation, lack of centralized control and lack of personnel. Possible solutions have been developed in order to eliminate these problems.

Keywords: Foreign Student, Foreign Student Examination (FSE), International Student Selection

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INTRODUCTION

Important technological developments in the last century have eliminated the concept of border crossing between countries. People can easily travel out of the country due to work, education, sightseeing etc. reasons and the number of this group increases day by day. This situation has brought important changes and developments in education opportunities abroad. Globalization, the willingness of states to gain competitiveness, and the policies of international organizations also have an impact on international student processes (Bloom, 2006). International students are an important part of the contextual background of globalisation (Montgomery, 2010).

The number of international students in the world has increased significantly in recent years. International students are becoming a major market that makes an important source of income and makes a significant contribution to the world economy. (Alimukhamedov, 2015; Levent & Karaevli, 2013; Tekelioglu, Baser, Ortlek & Aydinli, 2012; Kiroglu, Kesten & Elma, 2010). Therefore, the internationalisation of higher education has gained an important place not only for educational and scientific reasons but also because of socio-economic concerns (Chen, 2010). This market has become a multi-billion dollar sector worldwide (Cheung, Yuen, Yuen, & Cheng, 2011). The United States of America host the highest number of international students in the world. While the number of international students in US higher education was 310,000 in 1980, this number reached 1,094,792 in 2017 and according to the US Department of Commerce, these students made a contribution of US $ 42 billion to the American economy in 2017 (IIE, 2018). International students are an important part of cultural interaction and political connection, as well as financial gain for the countries where they study. For this reason, many countries, which want to be effective in the world, are offering education to more international students and aiming to strengthen these students' ties with their countries. With this dimension, international students have become an indicator of a country's soft power capacity (Popa, 2014).

Many developed and developing countries have invested heavily in educational institutions in the last 30 years. However, the problem of the decrease in the population growth rate seen in many of these countries in recent years raises the risk that the existing educational infrastructure and resources will remain above the national need and work with low capacity. This situation carries very important risks for the continuation of the existing system. Qualified educational institutions created with large investments are trying to protect their systems by making more use of the international student market. For example, China, which reached the highest level of 125 million students in 2008, is expected to decrease to 69 million in 2050 (AEI, 2006). Turkey is seen trying to make recruiting more international students in recent years which cannot be filled by national quotas in order to protect the continuity of national students or student quota given by the Higher Education Council. This poses similar risks to the education system of many developed and developing countries on a global scale. Therefore, the internationalization of higher education institutions is becoming a very important phenomenon.

International students have emerged as an important concept for both material and political power. The internationalization of higher education has a positive impact on the ability of governments to produce policy (Lau & Lin, 2017; Viczko & Tascón, 2016; Wadhwa & Jha, 2014). For this reason, governments attach great importance to attracting more foreign students to their country (Gromov, 2017). At the same time, qualified graduate international students increase the scientific research capacity and international competitiveness of the universities they study at (Özer, 2012). International students are becoming the main characteristic element of college degree education institutions (Wang & Li, 2016). More and more countries are trying to gain a stronger position in the international student market. While Turkey was an international student sending country for years, now offers a significant number of students learning service in recent years (Şahin & Demirtaş, 2014). Turkey is becoming a major point in training and developing a common culture (Yardımcıoğlu, Beşel & Savaşan, 2017). Increasing the number of students in Turkey causes several problems experienced in the selection process for international students. When the literature is examined, it is seen that the researches about the problems experienced in these processes are almost none, but the researches are

Aim of this study is to examine the scope of the status of international student selection and placement process in Turkey institutions and organizational activities and to develop solutions that would eliminate the problems encountered in this process.

**International Students in Turkey**

The number of international students studying in Turkey in the last 10 years has increased from 15,893 students to 125,138 students. The number of students by educational levels and gender is given in Table 1.

**Table 1. Numbers of International Students in Turkey Studying by Education Level Between the years 2015-2018**

<table>
<thead>
<tr>
<th>Year</th>
<th>Associate Degree</th>
<th>Undergraduate</th>
<th>Postgraduate/Master</th>
<th>Doctorate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>T</td>
<td>M</td>
<td>F</td>
</tr>
</tbody>
</table>

M – Male, F – Female, T – Total (YÖK, 2015a; YÖK, 2016a; YÖK, 2017a; YÖK, 2018a)

When the table is examined, it is seen that the maximum number of students in all years is at the undergraduate level, then at the level of master, doctorate and associate degree. The number of male students is almost twice that of female students. The number of students in 2018 increased by 73% in 4 years compared to 2015.

**Table 2. Numbers of International Students Graduated from Turkey by Education Level Between the years 2013-2016**

<table>
<thead>
<tr>
<th>Year</th>
<th>Associate Degree</th>
<th>Undergraduate</th>
<th>Postgraduate/Master</th>
<th>Doctorate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>T</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>2013</td>
<td>117</td>
<td>97</td>
<td>214</td>
<td>1.288</td>
<td>710</td>
</tr>
<tr>
<td>2014</td>
<td>141</td>
<td>124</td>
<td>265</td>
<td>1.633</td>
<td>882</td>
</tr>
<tr>
<td>2015</td>
<td>186</td>
<td>122</td>
<td>311</td>
<td>2.202</td>
<td>1.117</td>
</tr>
</tbody>
</table>

M – Male, F – Female, T – Total (YÖK, 2014; YÖK, 2015b; YÖK, 2016b; YÖK, 2017b;)

The increase in the number of students is similar in the number of graduates. The number of graduates in 2016 increased by 136% compared to 2013. The countries sending the most students to Turkey in last four years are given in Table 3.
ears, students from Islamic states have an important place in international students for Turkey. Turkey has a very respectable and popular position among the states of Islam due to their rich historical and cultural heritage. Islamic states, especially those with a majority Muslim population, are significant sources of students. Students from these countries make up a major portion of the international student body in Turkey.

The attending reason distribution of students in neighbouring countries varies significantly and regulations in these countries significantly affect the number of students coming to Turkey. Students from neighbouring countries such as Iraq, Iran and Greece are noteworthy. It should be noted that the attending reason distribution of students in neighbouring countries varies significantly by the attending reason.

When examined the neighbouring countries, especially in the last 5 years due to the civil war in Syria, Syrians in Turkey is opening the way for studying in Turkish universities has increased significantly by the Great Student Project implemented in 1992 by the Republic of Turkey. With this policy, it is aimed to raise the human resources power needed for the development of the states belonging to related communities, to improve the culture with Turkish language, to raise the Turkish-friendly generations and to strengthen the ties with these countries. (Kavak & Baskan, 2001; Çelik & Baskan, 2008; Kılçar, Sarı & Seçilmiş, 2012). When analyzed as of today, the majority of international students in Turkey consists of students from countries in this category.

When examined the neighbouring countries, especially in the last 5 years due to the civil war in Syria, Syrians in Turkey is opening the way for studying in Turkish universities has increased significantly and regulations with incentives. In addition, the presence of a significant number of students from neighbouring countries such as Iraq, Iran and Greece are noteworthy. It should be noted that the attending reason distribution of students in neighbouring countries varies from Greek and Bulgarian students. Majority of the students coming into Turkey from these countries constitute Turkish origin students.

Especially as a result of reinforcing foreign policy road map to the states belonging Islamic religion in the last few years, students from Islamic states have an important place in international students for Turkey. Turkey has a very respectable and popular position among the states of Islam due

### Table 3. Countries Having the Most Students in Turkey

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>T</td>
<td>R</td>
<td>N</td>
</tr>
<tr>
<td>Syria</td>
<td>3</td>
<td>2,785</td>
<td>5,560</td>
<td>3</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1</td>
<td>3,692</td>
<td>10,638</td>
<td>1</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>2</td>
<td>2,647</td>
<td>9,092</td>
<td>2</td>
</tr>
<tr>
<td>Iran</td>
<td>4</td>
<td>915</td>
<td>5,302</td>
<td>4</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>5</td>
<td>1,149</td>
<td>3,672</td>
<td>6</td>
</tr>
<tr>
<td>Iraq</td>
<td>6</td>
<td>1,402</td>
<td>3,033</td>
<td>5</td>
</tr>
<tr>
<td>Germany</td>
<td>23</td>
<td>197</td>
<td>728</td>
<td>26</td>
</tr>
<tr>
<td>Greece</td>
<td>7</td>
<td>377</td>
<td>1,826</td>
<td>8</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>16</td>
<td>207</td>
<td>1,011</td>
<td>20</td>
</tr>
<tr>
<td>Somalia</td>
<td>19</td>
<td>209</td>
<td>915</td>
<td>13</td>
</tr>
<tr>
<td>China</td>
<td>13</td>
<td>297</td>
<td>1,088</td>
<td>15</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>9</td>
<td>452</td>
<td>1,799</td>
<td>9</td>
</tr>
<tr>
<td>Kirghizistan</td>
<td>8</td>
<td>402</td>
<td>1,819</td>
<td>7</td>
</tr>
<tr>
<td>Egypt</td>
<td>34</td>
<td>188</td>
<td>410</td>
<td>29</td>
</tr>
<tr>
<td>Yemen</td>
<td>25</td>
<td>298</td>
<td>678</td>
<td>19</td>
</tr>
<tr>
<td>Palestine</td>
<td>17</td>
<td>266</td>
<td>976</td>
<td>16</td>
</tr>
<tr>
<td>Pakistan</td>
<td>12</td>
<td>393</td>
<td>1,127</td>
<td>11</td>
</tr>
<tr>
<td>Libya</td>
<td>18</td>
<td>638</td>
<td>957</td>
<td>10</td>
</tr>
<tr>
<td>Jordan</td>
<td>30</td>
<td>185</td>
<td>507</td>
<td>25</td>
</tr>
<tr>
<td>Kosovo</td>
<td>10</td>
<td>281</td>
<td>1,237</td>
<td>14</td>
</tr>
</tbody>
</table>

R – Country Ranking in Table, N – New Registration, T – Total (YÖK, 2015a; YÖK, 2016a; YÖK, 2017a; YÖK, 2018a)
to historical features, being governed by democracy, taking place in the world’s 20 largest economies, and established close ties with western educational institutions.

**International Student Selection System in Turkey**

Turkey has a two-stage structure for international student selection system, including examination and preference process.

![Diagram of International Student Selection System in Turkey](image)

While a single examination was performed in the first stage for Foreign Nation students made by Measuring-Selection and Placement Center (ÖSYM) until 2010, it was decided to FSE be done separately by each university after the decision taken by Higher Education of the General Assembly in the meeting held on 21.01.2010.

Even though FSE is not a mandatory examination for admission to Turkish Higher Education, but it is preferred because it takes place as the main score in the preference process. Although many important universities in Turkey execute their own FSE, universities accept each other's FSE points. The registration phase of this process is usually carried out in January-April and the examinations are usually completed in April and May. A candidate can take the FSE examination of the institution of his/her own choice. Mathematics and Geometry are the topics of the exam. Each institution is free to prepare its own exam questions, subject to the topic explained by the Council of Higher Education (YÖK).

In the second stage, the Preference Process, each university independently publishes guidelines on which foreign students will be enrolled in which departments. The candidates who have applied for placement in these departments are ranked according to the points based on the score and the selection process is completed with the announcement of the students who are eligible for registration. Universities usually declare one or more additional places for remaining quotas. Each university accepts its own limitation as an application score in the Preference Process. Although many institutions choose to use FSE score, there are universities that choose high school diploma grade or another grade. There is no single application at this point.
The Council of Higher Education (YÖK) annually explains the guidelines and quotas of which university to accept students for which score type. The types of points accepted during the preference process are given in Table 4.

### Table 4. Most Accepted at the International Student Placement Rate Type in Turkey

<table>
<thead>
<tr>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSE</td>
</tr>
<tr>
<td>ABITUR Exam</td>
</tr>
<tr>
<td>French Baccalaureate Diploma</td>
</tr>
<tr>
<td>SAT I Exam</td>
</tr>
<tr>
<td>GCE AL</td>
</tr>
<tr>
<td>ACT (American College Test)</td>
</tr>
<tr>
<td>Afghanistan Concurs General State Examination</td>
</tr>
<tr>
<td>University placement exam in the People's Republic of China (GAOKAO)</td>
</tr>
<tr>
<td>Indonesian Ujian National Exam (UN) or UAN</td>
</tr>
<tr>
<td>TAWJIHI Exams</td>
</tr>
<tr>
<td>High School Diploma</td>
</tr>
</tbody>
</table>

(YÖK, 2018c)

There are many types of international grade points when the score types are examined, but it is not possible to say that the international score types are accepted by many universities. Generally, in universities that accept these types of grade points are reduced their influence by applying a coefficient to scores. The most accepted type of grade is FES. Apart from FSE, many universities use high school diploma grade. However, to be able to enter prestigious departments, candidates should get a score of 90-100 especially in FSE. Other types of points are generally effective in the use of empty quotas. It is also seen that some universities have only students with a diploma grade/score since there is a validation or calculation difficulty in all types of scores except for the diploma.

### METHOD

The research was conducted with qualitative research methods. Qualitative researches aim to reveal the perception and events in a holistic and realistic way by observation, interview and document analysis, such as using data collection methods (Yıldırım & Şimşek, 2013). The research is designed with a case study which is a qualitative research method. In the case studies, it is aimed to investigate the causal linkages of the situations which are very complex to investigate experimentally (Aytaclı, 2012). Instead of examining a limited number of variables by following certain rules, will be examined a single case or event which reveals why the event occurs in specific way and will be sharpened the details that future research will focus on (Davey, 1991).

### Study Group

The study group consists of 5 managers who are responsible for organizing foreign student selection processes of 5 different universities in the Aegean region, Marmara region, Western Black Sea region, East Black Sea region and Eastern Anatolia region. A purpose sampling type of an easily accessible state sampling method was used in the selection of the study group. Since the researcher chooses a sample that is close and easy to access, this method gives the research speed and practicality (Yıldırım & Şimşek, 2013).

When the total student capacity of 5 institutions which constitute the study group is examined; it is seen that universities provide education services to more than 7 thousand foreign students, more than 7 thousand quotas are available in 2018-2019 academic year, more than 25 thousand students...
apply for this quota and 4 institutions that have more than 10 thousand students participated in FSE in 2018. One university in the study group does not take the FSE.

Data collection tool

Interview form and document analysis were used as data collection tool. The interview form was developed by using current foreign student selection processes and field literature analysis. The interview form developed was evaluated by two experts and finalized after requested changes had been made. In addition, document analysis of foreign student statistics of the last years published by official institutions has been examined.

Data Collection

In the process of collecting data, 4 people in the study group used phone call and 1 person used face-to-face interview. The interviews were recorded and then text analysis was made and reported. The statistical reports published by the official institutions were analyzed and the data was combined to analyze during research phase and the statistical transformations of the foreign students were investigated.

Data Analysis

In order to analyze the data obtained, content analysis was applied. The purpose of this analysis is to systematically identify the participant's views and to familiarize the researcher with the data and to prepare the data for further analysis. (Altunışık, Coşkun, Bayraktaroğlu & Yıldırım, 2007:269). For this purpose, the problems arising in the interview reports were categorized under common themes, the similarities and differences of the effects they have created in different institutions are examined in depth.

Research Questions

Foreign student selection process consists of two stages in Turkey: exam and placement. Although the research questions were formed in these two stages in particular, common problems of both phases and general problems were examined. According to this research questions are;

1. What are the problems encountered during the examination of foreign students?
2. What are the questions encountered in the process of foreign student placement?
3. What are the general questions encountered in the selection process of foreign students?

RESULTS

1. What are the problems encountered during the examination of foreign students?

Table 5. Theme, category and frequency of problems in the examination process

<table>
<thead>
<tr>
<th>Theme</th>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational problems</td>
<td>Date Conflict</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Clarity Problem</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Subject area uncertainty</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unexplained exam results</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Optical reader problem</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Exam language problem</td>
<td>1</td>
</tr>
</tbody>
</table>
Examining the problems encountered during the examination process under the theme of organizational problems; Date Conflict, Clarity Problem, uncertainty of subject area, unexplained exam results and optical reader problem.

2. What are the questions encountered in the process of foreign student placement?

Table 6. Theme, category and frequency of problems in the placement process

<table>
<thead>
<tr>
<th>Theme</th>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document problems</td>
<td>Fake document</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Unconfirmed document</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Translation problem</td>
<td>1</td>
</tr>
<tr>
<td>Score Type problems</td>
<td>Inability to understand international documents</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Distrust of other institutions for FSE</td>
<td>3</td>
</tr>
<tr>
<td>Registration problems</td>
<td>Remaining empty quotas</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>High number of record deletion</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Preference limit</td>
<td>3</td>
</tr>
<tr>
<td>Special skill</td>
<td>Special skill Exam</td>
<td>2</td>
</tr>
</tbody>
</table>

It is observed that the problems encountered during the placement process are grouped under four themes. Document problems are fake documents, unconfirmed documents and translation problems. Score type problems are, inability to understand international exam systems, documents and distrust of other institutions for FSE. Registration problems are remaining empty quotas, high number of record deletion and preference limits. There is also special skill exam problem.

It is seen that the problems experienced during the placement process consist of more components and the problems stem from the national system problems rather than the institutional deficiencies.

3. What are the general questions encountered in the selection process of foreign students?

Table 7. Theme, category and frequency of general problems

<table>
<thead>
<tr>
<th>Theme</th>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational issues</td>
<td>Operational differences</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Lack of cooperation</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lack of staff</td>
<td>3</td>
</tr>
<tr>
<td>Structural problems</td>
<td>Central control</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lack of central database</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Lack of legislation</td>
<td>4</td>
</tr>
</tbody>
</table>

It is seen that the general problems affecting the whole foreign student selection process are divided into six categories under two themes. Organizational issues are operational differences, lack of cooperation and lack of staff. Structural problems are central control, lack of central database and lack of legislation.
DISCUSSION AND CONCLUSION

The main problem in the examination process, which is the first stage of the foreign student selection process, is the subject area uncertainty, the problems related to the scope validity and reliability of the examinations. The lack of clear and plain rules in the legislation causes institutions to develop their own solutions. This causes a major problem on the reliability of exams in accountability and transparency.

“I have experienced myself that the universities that carry out the FSE are secretive. Some of these processes can be dictated to be a little more transparent, and so these processes can be determined by how other universities can see and decide whether to use that score.” G1

It is observed that the institutions choose secretion of exam questions, the scope validity and the statistical information they made. This causes very strong doubts about the reliability of the exams. The exams made by many institutions are another problem. It is also discussed what these exams vary in content and difficulty should measure. Although the relationship between inter-institutional scores is not known, the student who gets a very high score from the examination of an institution can get a very low grade from the other institution in the same period.

“…this is a process that can be influenced by many things, like how the university practicing exam, the question of at least what the psychometric properties of the questions are, or, roughly speaking, the preparation of the scores and the process of any kind, the implementation of it, the very different source of variance. I think it is necessary to try to control a mechanism within FES, at least like an assessment. Currently, universities are a little too autonomous.” G1.

“…but we wonder how safe their exam is performed. A test being done in computer environment and we are not supposed to trust this test.” G2

“For Let’s assume that there is such a university, the student took 100 and the other also 100. How trustful can a test be with so many 100? So, the universities must take it serious.” G3

The fact that the institutions have suspicion for each other's exams and especially the ones considered as the best do not accept a score other than their own exams and the institutions reveal the distrust of each other's exams.

In order to solve this problem; the content of the examinations should be determined more strictly, there should be some statistical validation tools for the exams, and the institutions should be obliged to publish statistical reports explaining the examination processes in detail. Moreover, rather than granting this authority to each university, joint examinations can be organized by coordination at a regional-based university. These universities, which will be authorized to carry out exams, can conduct their examinations in coordination with other universities in their region. This situation will increase the cooperation between institutions and also reduce the energy spent by each institution on its own and will lead to more efficient use of all kinds of resources. Thus, conflicts on the dates of the exam will also be prevented.

“FSE does not have to be done from a single center, but certain centers can be at least highlighted” G1.

“Therefore, similar universities should be able to pass this exam with each other. For example; universities in nearby cities may be involved in a common program, including coefficients.” G2
“For example, let’s assume that we have a union of regional universities. Universities should be able to coordinate between themselves which to make the examination of a university, and which to run the placement of another university.” G5

The use of optical forms in the examination process is another problem area in the examination process. Even though use of optical examination form is a common type of exam for Turkey, students of many countries are not familiar to optical form and have never taken an examination with optical form before. For this reason, it is seen that the students mark the examination booklets and leave the optical form empty and therefore their exams are invalid or the optical form marking process is done by the organizing institution and creates a serious loss of time and effort.

“Students do not know the optical coding system. So, it took time for us to explain this situation there. There was an additional workload for our staff. ... therefore, they only mark the booklet. The optic form is empty. So, we have to evaluate it as zero.” G2

“Our exams are multiple choice. But for the students outside of our own country especially in the Arab region, they look at your optic forms like they come from another world. Students don’t know optical forms. We’re filling out those optical forms. It's too hard.” G4

In order to solve this problem, ÖSYM marking method that puts out a booklet to new practices in the national exam in Turkey is thought to be a solution to this problem experienced in the FSE. It should be noted that this method requires expensive hardware devices in the evaluation process. For this reason, doing examinations in common centers will eliminate the situation of many institutions investing in the same technologies; reduce the costs of preparing questions, exam organization and exam evaluation, will improve the quality of the organization.

In another problem encountered in the exam process is which languages to be used for the exam questions. In order to expand the target audience of the exams, institutions prepare their questions in more than one language and in this case, if the correct translation methods are not used, they bring various problems.

“We are having trouble with multilingualism. When you translate the question into Arabic or English, it is quite difficult for us to reach the right man and set the text.” G4

It is not possible for the institutions to translate the questions without any meaning or content shift in the corporate confidentiality by the experts of the field. Related with this problem, in the cooperation between institutions, a pool of questions can be created by examining the questions, according to the difficulty level and the multi-language option and the solutions available in terms of labor, time and cost can be provided.

Apart from these, planning examinations on similar dates as is another organizational problem encountered during the examination process. Again, in this case, it can be overcome by increasing cooperation between institutions and creating common calendars.

Considering the placement process, it is seen that the biggest problem is the problem of counterfeit documents. This problem appears to be due to the lack of a mechanism by which digitally requested documents can be verified during the application. These digitally loaded documents can be easily manipulated with the help of today's information technologies. You cannot be aware of these tricks until the original of the document is requested. The institutions place the students with reference to these digitally uploaded documents and check the accuracy of the documents during registration.

“The number of candidates rejected in 2017 is 818 and there are 104 false statements and false documents.” G1.
“Last year, 8 students uploaded false documents. We got these. We even filed a criminal complaint, but the prosecutor’s office rejected our application because it was a declaration-based document. This is an irony.” G2

“Certainly, this is one of the biggest chronic problems. Fake documents, especially foreign students, so to speak, has become a fashion. Everyone does it. Fake paperwork in the document, fake paperwork on the date of birth, fake paperwork on the score... This needs to be surmounted. Look, this is a very important problem. To prevent this, it should be coordinated by the Higher Education Council.” G3

“We confirm the paperwork with primitive methods.” G4

“Every year there happens to be 5 or 6, in fact, maybe even at least 10.” G5

In case of false documents detected during registration, the applications are considered invalid. However, when it is considered that there are such a large number of false documents, it is not wrong to guess that there may be situations that cannot be determined. As reported in the interviews, it was stated that 104 fake documents were found in 818 documents. Two very important factors that complicate the resolution of document fraud are that not to be able to understand the original language of the documents and/or having no opportunity to verify the documents at the source.

Another problem of the preference process is the high number of registration deletion and the inability to fill the quota.

“2,609 students applied in 2016, and in 2017 1,807 students applied... Our occupancy rate is 31%, 74 of 237 places have been filled in 2016. We reached 20% of our quota in 2017.” G1.

“We had about 484 available slots last year. We can fill all 484 in the placement rate. However, a total of 145 applicants were registered in the registration process. As I mentioned, the reason for this is that as the mortars are high or at the same time the student earns several universities and changes their places continuously.” G2

“This year we placed 300 students and 50 students were enrolled. Our total quota is close to 400. I mean, in 50 to 400, this is a very low rate.” G3

“Our biggest problem now is that the students applying, ie the students who are settling in, do not show up to register. Here the rate is very high, more than half do not show up. For example, in case they can't settle into the section they want, they do not come. He's trying his chance somewhere else. We do not take the student again as a rule.” G5

The root source of the problem lies in the lack of disabling the opportunity to make reference to all universities in Turkey. A student can apply to all universities which have foreign student quotas if they wish. The reason for this is that the application system of each university is different and has no information exchange to each other. Even in Turkey, while the Turkish students can choose a limited number of sections in the transition to higher education, there is no limit to the number one choice for foreign students. This situation leads to the fact that a student with a high score will be able to choose several universities at the same time and choose the best among themselves. For this reason, many universities cannot complete the registration process of the student that has been settled. This situation brings with its significant problems. The first is that the quotas remain empty, and the second is the deprivation of other students who can register to that department. Thirdly, even if these students are enrolled in a university, they will be able to cancel the registration because of the existence of a situation where they can always get better.

“In 2017, 52 records have been deleted. So, I guess the rate is 1 to 9.” G1.
“There are around 1000 foreign students at our university. ...record deletion rates have increased in the last 3 years. For example, the number of students enrolled last year was between 40 and 50. The most erasure rate was recorded at the end of 2016. Approximately 80 students record have been deleted at the time.” G2

“After the registration, and even after completing 1 year, the number of people who change section or university are around 40%.” G3

This poses a significant risk to the system and causes the system to become clogged and not to work efficiently. Students having similar chance fill in the list of settlers of different institutions, but since they are able to register in university they cause empty education slots in other institutes and leave the institution when they have a better opportunity. Although they have very important losses in terms of labor, time and cost, these students' system obstructive activities cannot be prevented by any sanctions. However, Turkish college degree students in Turkey are temporarily exposed to sanctions for rights or points.to drop in case of doing something similar. The main reason why these and similar sanctions cannot be made to foreign students is that these abuses cannot be tracked and cannot be limited.

“Any FSE student can apply to 100 universities at the same time and can be settled to each one of them. Therefore, if a student is placed here in the Faculty of Medicine, this student can register another Faculty of Medicine in another university when he is eligible, and this prevents another student who wants to get into his place. Similar cases happen in other universities too.” G2

“Foreign students should be prevented from applying to more than one place at the same time. ...student passes exam, for example, eligible for dentistry with very high scores, such as 98 points, really successful students but no one does not apply for placement. I called the students in this process, remember, you were insisting so much, you said you would come. So why did you change placement? Dear teacher, I won the X University and I will attend classes there. Since they apply 10 different universities, then they get to decide on their own.” G3

“Maybe student can settle in two places. This is an advantage for the student. But a student should not be placed because he has enough score for anywhere he applies.” G5

There are also significant differences in the scores accepted during the placement process. Although many institutions place their placement with the FSE score, the diploma grades and various international exam scores are also used for placement processes. At this point, the transparency problems of the FSE exam continue in the process of placement and the institutions approach the FSE scores except their own.

“So, I don't know if exam is good enough, it's a complete conundrum or maybe I don't know” G1

The understanding of international examinations, their validation and which of these exams have the validity, or the validity of this exam results another problem area. In all cases where there is no reliable and viable national examination, alternative points and placement will always be on the agenda. Especially the large differences between the institutions in terms of the points that can be accepted in the settlement is another factor that makes the operation of the process difficult. Some universities accept all types of scores by applying various coefficients, some accept students from one point, while others accept students from different types of points at each stage of the process. This situation is also required to be linked to a central rule by legislation.

“We have a problem not understanding national and international examination systems.” G1
“Firstly, international exam scores types like SAT, IB, Baccalaureate, ABİTUR accuracy can not be provided by the universities in Turkey. However, if the exam organizers can put verification code in the exam paper, we can verify.” G2

“Our biggest problem is not being able to see a diploma grade from Turk originated geography. Student sums, subtractsand comes up with a score. But when we get the diploma, we have to recalculate. In Arabic geography, there are formats that change every year. For example, the diploma format in Saudi Arabia differs almost every year.” G4

Another problem area during the placement process is the special skills test. Although some candidates are very successful from special skill examinations, they cannot register to these departments because they cannot meet the FSE score requirement, and highly skilled students have to be eliminated. In this case, it is seen that an arrangement should be made in the admission conditions of the departments with special skill.

“Particularly, we have difficulty in taking students to departments that require a special skill exam. These students take a high score in the BESYO exam and are getting a good section, but candidate can not pass FSE limit so that he cannot get into that section. We are experiencing difficulties in departments that require this type of special skill exam. Exam is composed of two phases, candidates cannot get the exam even if they are successful in the second phase because they fail in first phase.” G2

Apart from the main problems in the examination and placement processes that constitute two separate layers of the foreign student selection process, there are a number of general problems affecting all stages of the process. Especially the lack of inter-institutional cooperation is one of these problems.

“Of course, in the sense that the institutions cooperate one-to-one with itself or the cooperation of their institutions by a common center, would be an important advantage.” G1

“Not enough cooperation is provided. Universities see this process as a purely commercial competition or are trying to make their own launches.” G2

“I think that collaboration between universities is certainly not enough. I think that; the universities should be organized by the Council of Higher Education (YÖK) including a common database, YÖKSİS like, universities should come together and create a delegation in all processes of foreign students, this committee should have a neat administration and a fine organization at the top. I think universities should cooperate on this subject.” G3

“Can’t be! Either there is a competition among universities, or there are neutral universities that remain indifferent to this process. In fact, there are universities moving away from this process. There are universities that insulate themselves and that are far from this process. Although there are two main reasons for not being able to cooperate, I do not believe that universities work in coordination in this sense.” G4

“I don’t think there is enough cooperation. Everybody is talking ahead, but I don’t think it’s a productive collaboration.” G5

This situation is the basis of many other problems in both the exam organizations and placement processes. The main problem of placement process problems is also the lack of cooperation like; the lack of trust of each other’s exams between institutions, the date conflicts of the examinations, the organizational problems of examinations, the inability to fill the quota, the inability to verify the documents accuracy. At this point, the regional collaborations to be established, the process of jointizing and acting on the regional common systems, both the process of preparing the exams and
the labor that each institution repeats during the placement process, will provide a great savings in time cost and will lead to a more healthy and smooth progress of the process.

“For example, we have a union of regional universities. Universities should be able coordinate between themselves and make the examination of a university, and the placement of another university.” G5

Another problem area affecting the whole process is the lack of legislation. In this respect, it is seen that the legislation in the Higher Education Council is in a very general framework, leaving the institutions more autonomous. This situation causes big differences in the implementation process and causes the institutions to carry out the process independently of each other. The same problem brings with the idea of lack of control. According to the current legislation, every institution can make an examination under any conditions. All critical stages are left to institutions; the standards of the examination, the analysis that should be done after the exam, the process of the preparation of the exam, the preparation of the question and the process of exam application. Such unexplained areas cause differences and insecurities among institutions, and a standard at national level cannot be provided. The inadequacy of inter-institutional co-operation results in institutions adopting very different practices. The fact that the legislation allows for a wide variety of practices, the excessively flexible situation makes it difficult for institutions to co-operate in common. A comprehensive legislative effort is required on this subject.

“The subject of the exam is given to us. We prepare questions about the subject given at the initiative of our mentors. This means that improvements can be made to the scope validity.” G1

“Actually, it is not enough. For example, if the student has dual nationality, we are asked to use the first nationality, but the first nationality is not approved by Governorships or Population Directorates. So we have to stay with the declaration based documents.” G2

“Let me give you an example; the students parents work in Germany, but student has graduated from a high school in this city. So, even this person is Turk in reality student had the right to apply for foreign students the examination. This was a great cause of injustice. Because we all know that this is a difficult process for Turkish students to win medical school and dentistry. However, these foreign students were treated like foreign nationals by going through the back door with the gap in the legislation. I can tell you that there are all sorts gaps in legislation in these matters.” G3

“There is no legislative provision that restricts us in the placement, but I wish we had.” G4

“I think the legislation is not enough. There are problems in terms of legislation. Actually, they're changing rules while the game is on. They are changing the rules with the decision of the Commission.” G5

The selection process of a foreign student is a comprehensive organization that takes approximately 6 months of period. Considering that thousands of students apply, it is obvious that the institutions spend a considerable amount of time on this organization. The insufficiency of the number of personnel involved in this process is an important organizational problem.

“The unit has one person actually works in our university and might be the only university that has a personel for this in Turkey. We are one of the three-four most applied universities” G2

“Core staff has 2 people. This number is definitely not enough.” G3
“We are 4 people working on this subject and it is definitely not enough. We are asked to follow other projects while working on this. We're trying to catch up with all of them at the same time. I'm dealing with whole other projects during dealing with placement process. I'm only assigned person on this. Other personnel are Other friends are trying to validate applications. We also have deficiencies on validation too. I try to verify and direct them besides my other responsibilities. While doing these things, we should only spare time for these self-contained works. That would be more efficient.” G5

Providing the regional cooperation and division of labor with the institution, each university will be able to make a more efficient organization with less burden in this process. The time spent on this work needs to be understood correctly by the corporate managers.

Autonomous areas in legislation create serious differences in implementation between institutions. These differences cause institutions not to understand each other, to avoid co-operation, and to distrust other institutions. Therefore, the standards of the basic joint practices should be determined and a national consistency should be ensured in the management of both the examination and placement processes.

“The fact that each university adopts a different foreign student recruitment process is the biggest obstacle for us to carry out a healthy process.” G3

The differences between these practices and the institutions make different decisions on the processes, create the impression that the process is carried out without supervision. The right of an institution turns into the wrong of the other institution, which leads to the idea that the process is not carried out with seriousness.

“The process of placement and application are not under State or the most serious control.” G2

“Our state needs to intervene as a superstructure. Either the student placements will have certain quotas and certain arrangements will be done or if the process will continue in this way it needs to be compiled and organized.” G3

The lack of a common system - the database – is shown as the main source of many problems in the process

“More importantly, the fact that YÖK’s not creating a common data or pool for foreign student recruitment leaves us in a very difficult position.” G3

“I believe that this can only be accomplished through an online verification system that can be installed, and any printed document should be accepted as unreliable.” G4

“Creating a data pool, combining programs and receiving application forms prior to placement would be more efficient” G5

The need for a central recording system is essential to solve many problems in the examination and placement process. All relevant institutions with a central recording system to be created for foreign students willing to study in Turkey would be able control themselves which secure the basic data of the students admitted through this system. Students using fake paperwork etc may be banned by means of this system and suspended for a period of a few years. With the enforcement of sanction channels, students may avoid applying for false papers. Likewise, the number of universities or departments to which they can apply within a term can be restricted, enabling more effective use of quota and the placement of more students. Additional rules to be introduced in a number of sanctions or placement procedures to be introduced in case of deletion of records and similar cases will prevent the problem of permanent institution changing. This need is extremely important for the future of the
process and its ability to progress steadily. In this way, this system can be used for the purpose of providing accurate educational policies by directing both demographic and more qualified sub-information of foreign students studying nationwide. As a result of study case on Turkey's foreign students process done by Ozer (2012) draws attention application collection process as one of two basic problems experienced by applicants. One of the most comprehensive analysis about the international students in Turkey is made by Özoğlu, Gür and Coşkun (2012). This analysis also mentions that the application processes are complex and expensive and that a central application system should be established as in the important countries in this field. Although six years have passed, the same problem remains valid today.

“If a panel is created such as YÖKSİS and if foreign students are recorded into a common database with unique foreign identification numbers I think a student should only be settled with 5 universities simultaneously in Turkey. Even 5 is too much, 2 or 3 maybe... If the student has settled in the first placement in the quota process, they should not be included in the additional quota. Because they really block the others education rights. This adversely affects the process and makes a tremendous difference in the number of settled and enrolled students.

“... for example, when a person wants to register for our system, I should be able to see which university he/she applied to. Such a platform should be developed first. If a student misrepresents his / her information to a university, it must be blocked at other universities or the same information should be served. First of all, such an improvement in the application process is an improvement especially for universities.” G2

“I believe that a common data base, data sharing, especially a common data sharing system to prevent false documents in the registration process, should be carried out with a collective organization.” G3

The greatest gain that countries obtain from their foreign students is not material but political gain. When these students return to their countries of origin at the end of their educational life, they will always try to maintain their commercial and goodwill links with the countries where they are educated when they have important roles or positions in their countries' systems, (Mueller, 2009). This provides a gain that any other investment cannot, in order to keep the political, cultural and economic ties between the countries constant and very strong. For this reason, it is very important in pre-training and education processes as well as in policies and strategies after education. The process should be planned and organized as a whole in order to provide maximum benefit from foreign student investment.

Increasing the number of universities in Turkey can provide more students with educational opportunities. Turkey has to increase the number of international students, in order to attract qualified foreign manpower countries, needs to organize in a highly disciplined and orderly manner in the process. For this purpose, the most important stage in the process, the application and placement process should be planned without any problems. This study examines the current problems of the first stage of the process and possible solutions.

All of the results show that; creating a comprehensive legal arrangements on foreign students in Turkey, increasing controller mechanisms, providing inter-university regional cooperation opportunities and encouraging the mobilization of institutions in this direction, recording and monitoring all processes of foreign students with a central software infrastructure and particularly, it suggests that the pre-training, training process and post-training policies and strategies should be planned in depth.

Increasing number of students, effective foreign policy and a regional power with a flourishing economy, Turkey has become the country of its benefits that international students are required to be a global actor and they must be used and planned in the most efficient way. This
strategy will be created in the right direction will be able to obtain a much stronger place with Turkey on the world stage.

**SUGGESTIONS**

1. Studies aiming to create practical principles for improving organizational activities of the examination process should be carried out.

2. Regional or central coordination offices and International Student Workshops should be organized at national level in order to increase inter-institutional cooperation opportunities.

3. Work on the necessary infrastructure and software analysis for the centralized common database or common system studies.

4. The International Student Strategy Plan should be developed, and necessary legislative and regulatory / regulatory mechanisms should be established in order to implement this plan in a sound manner.

5. The national policy at the national level of the process and strategies based on goal-oriented core principles are to be correctly defined and required application principles should be developed.

6. The candidate student should be exposed to the student's thoughts about the application process.

**REFERENCES**


Web Page


Primary School Teacher Candidates and 21st Century Skills

Fatih Mehmet Ciğerci
Harran University

Abstract

In this study, the aim is to determine the effect of digital storytelling on the primary school teacher candidates' 21st century skills. Since digital storytelling contains many skills like information, media and technology skills, communication and collaboration skills, group works, etc within itself, it can be defined as a good way for individuals to gain and develop 21st century skills. A digital storyteller, during the process of making his/her digital stories, is to research and access information, analyze, evaluate and give decision on what s/he has researched, solve problems, use his/her creativity, be capable of using technology, applications and/or programs and have digital, technology, visual and information literacy. In order to collect data, 21st Century Skills and Competences Scale Directed at Teaching Candidates, digital storytelling rubric and structured interviews were used. According to results of the study, posttest scores of the candidate teachers' on 21st Century Skills and Competences Scale were higher than those of on the pretest. There was a meaningful difference between digital storytelling rubric scores the teacher candidates got from the three digital stories and the scores got higher on every following digital story, which can be said to support the result that the posttest scores of the candidate teachers' on 21st Century Skills and Competences Scale were higher than those of on the pretest. This situation is also supported by the fact that the scores obtained from the digital stories explain the variability of the scores on 21st Century Skills and Competences Scale by about 40% and that the scores obtained from the digital stories are the predictor of 21st century skills and competences of the teacher candidates. The participants also mentioned at the interviews that digital storytelling contributed to their 21st century skills development.

Keywords: Learning and Innovation Skills, ICT Skills, Life and Career Skills, Digital Storytelling, Teacher Candidates

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INTRODUCTION

The constant changes and progresses in science and technology have necessitated new expectations and requirements in many fields. While it was acceptable and sufficient for the individuals to have certain knowledge on any subject in the previous century, the 21st century has required individuals to go beyond having knowledge on a certain subject or subjects and gain new skills, called 21st century skills, to be able to keep up with the dazzling changes and progresses and adapt those skills to their daily lives.

Various institutions and organizations have defined and identified what the 21st century skills (EnGauge 21st century skills, OECD competencies, The ISTE Educational Technology Standards, World Economic Forum, National Research Council, Partnership for 21st Century Skills -P21-, the European Union, Assessment & Teaching of 21st Century Skills -ATCS-, Technological Literacy Framework for the 2012 National Assessment of Educational Progress (NAEP)). The reports by such institutions and organizations show that 21st century skills are outlined as cognitive skills, socio-cultural skills, self-efficacy skills and technology skills. While such skills as creativity, innovation, critical thinking, problem solving are outlined under the cognitive skills, being aware of the sub-skills under cognitive skills and having intrinsic motivation to use such skills are listed under self-efficacy skills. Besides, socio-cultural skills are composed of such sub-skills as collaboration, communication, working with diverse groups and technology skills are composed of information, media and technology literacy. Though these skills are explained in different headings, they are interconnected and interacted and all these skills develop dependently. In Table 1, the similarities and differences of the frameworks by Voogt and Pareja Roblin (2010) are given.

<table>
<thead>
<tr>
<th>Mentioned in all frameworks</th>
<th>Mentioned in most frameworks (i.e., P21, EnGauge, ATCS and NETS/ISTE)</th>
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<tr>
<td>- Collaboration</td>
<td>- Creativity</td>
<td>- Learning to learn (ATCS, EU)</td>
<td>- Risk taking (En Gauge) - Manage and solve conflicts (OECD) - Sense of initiative and entrepreneurship (EU) - Interdisciplinary themes (P21) - Core Subjects: economics; geography; government and civics (P21)</td>
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<td>- Communication</td>
<td>- Critical thinking</td>
<td>- Self-direction (P21, En Gauge, OECD)</td>
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<td>- ICT literacy</td>
<td>- Problem solving</td>
<td>- Planning (En Gauge, OECD)</td>
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<td>- Social and/or cultural skills; citizenship</td>
<td>- Develop quality products / Productivity (except in ATCS)</td>
<td>-Flexibility and adaptability (P21, EnGauge) Core Subjects: - Mathematics; communication in mother tongue; science (EU, P21, ATCS); - History and arts(P21 and ATCS)</td>
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In order to educate citizens who are qualified and equipped with various skills, many countries have updated their education programs and integrate 21st century skills in their education systems. As one of these countries, Turkey has been making necessary adjustments and updates in teaching programs and has published 2023 Education Vision. It can be seen in the 2023 Education Vision and teaching programs by the Turkish Ministry of National Education that the development of 21st century skills is an indispensable global norm and that all the expectations in teaching programs at all levels are to be consistent with 21st century skills. In the 2023 education vision report, 21st century sills are listed in various headings within the context of the Turkish Qualifications Framework (https://www.myk.gov.tr/TRR/File6.pdf).
In order for countries to adapt themselves to the changing world and emerging new skill areas and to educate citizens equipped with 21st century skills, they have to have educators and teachers who have developed their skills and can raise students to be capable of having and using their skills. Therefore, the education and teaching programs for both pre-service and in-service training of teachers and teacher candidates should be in accord with 21st century and its requirements, by which they can gain and develop their skills. According to the report by OECD (2018), the pressure on the governments to provide their citizens with right skills through high-quality education has been increasing. At this point, teachers have a crucial role to build more successful education systems. However, it is also mentioned in the report that rapid changes in the world challenges the nature of teaching itself and that teachers in the information and technology age are expected to go beyond traditional development of content knowledge and cognitive skills. They are expected to develop strategies to meet the demands and requirements of 21st century skills. Being aware of the rapid and constant technological advancement, teachers are to keep up with such changes and update skills to use their technology in their classroom. In the new age, teachers should be able to inspire their students to innovate, be creative, think critically and work collaboratively with diverse groups.

**Digital Storytelling and 21st Century Skills**

Digital storytelling is a new way of traditional storytelling by using multimedia or technical tools such as images, videos, music, sound effects, voice and narrative (Digital Storytelling Association, 2012; McGeoch, 2010; Porter, 2004; Robin, 2008). The digital stories can be in the form of personal narratives, narratives on historical figures or events, and content area stories (Robin, 2006).

There are seven elements to produce such multimedia stories which are all dynamic and interconnected to each other (Bull & Kajder, 2004, Fields & Diaz, 2008, Lambert, 2010, Jakes & Brennan, 2005, Robin, 2006, Satterfield, 2007):

- Point of view: the main point and the message of the story.
- Dramatic question: a key question to attract the attention of the audience.
- Emotional content: the emotion to be conveyed to the audience
- The gift of the voice: the effect of voice on conveying the feelings, the message and the emotional content of the story.
- Economy: the numbers and the length of the music, effects, images, pictures etc. and the length of the story itself which is generally limited to 2-5 minutes.
- The soundtrack: the use of music and other sounds.
- Pacing: the rhythm of the story.

As Yılmaz and Ciğerci (2018) define, there are five stages of producing digital stories. The first step is writing the story. The storyteller, at this stage, decides on what to tell in the story. The second step is voice recording. The storyteller should perform voice recording in a silent place like a studio. The third step is collecting visuals like photographs, pictures, videos etc. to be used in digital story. The fourth step is making the digital story, during which all the components (the story, visuals, voice recording) are gathered using programs such as Photo Story, iMovie, Movie Maker, etc. The last step is exporting and sharing the digital story. At this step, the digital story created by using any kind of programs are saved and then shared on a platform like YouTube.

Since digital storytelling contains many skills like information, media and technology skills, communication and collaboration skills, group works, etc within itself, it can be defined as a good way
for individuals to gain and develop 21st century skills. A digital storyteller, during the process of making his/her digital stories, is to research and access information, analyze, evaluate and give decision on what s/he has researched, solve problems, use his/her creativity, be capable of using technology, applications and/or programs and have digital, technology, visual and information literacy (Dogan, 2012; Duman and Göçen, 2015; Göçen, 2014; Green, 2011; Gregory and Steelman, 2008; Karakoyun, 2014).

Digital storytelling can be used in teaching and learning environment effectively as it provides an opportunity to integrate technology into the education (Educause Learning Initiative, 2007). Robin (2006) states that digital storytelling develops many of the students' skills like research, writing, organization, technology, presentation, problem solving, evaluation and communication.

Robin (2008) and North Central Regional Educational Laboratory (NCREL) draw attention on the fact that digital storytelling can develop such 21st century skills as digital, global, technology, visual and information literacy. Besides these skills, NCREL also states that digital storytelling is an effective tool for students to progress their creative thinking and creativity, meta-cognitive skills, communication, collaboration and group work skills. Moreover, Kajder (2004) mentions that digital storyteller not only use their technology literacy but also act as a listener, interpreter, reader, writer, artist, and thinker.

When the researches, the samplings of which are teacher candidates are examined, there are the ones which conclude that digital storytelling is an effective method to develop creativity, technology and all language skill areas (Erten, Özdemir, Gğüllü Egin and Palabıyık, 2018; Brenner, 2014), other studies show that teacher candidates find digital storytelling joyful, educative, an artistic and reflective tool to develop their creativity (Uslu Pehlivan, Kurtoğlu Erden and Cebesoy, 2017; Erten, Özdemir, Gğüllü Egin and Palabıyık, 2018; Brenner, 2014).

The aim of this research is to determine the effects of digital storytelling on the development of 21st century skills of teacher candidates. The following questions will be answered in the study:

1- Is there a meaningful difference between the pre and post test scores of the teacher candidates in 21st Century Skills and Competences Scale Directed at Teaching Candidates?

2- Is there a meaningful difference in the rubric scores of the teacher candidates for the three digital stories they created?

3- Are the digital storytelling rubric scores of the teacher candidates predictor of the scores of 21st Century Skills and Competences Scale Directed at Teaching Candidates?

4- How do the teacher candidates view the effects of digital storytelling on 21st century skills?

**METHOD**

Explanatory sequential design, one of the mixed methods, was used in the study. The first step of the design is to collect and analyze quantitative data and it is followed by the collection of and analysis of qualitative data. The aim in the second stage, qualitative data collection and analysis, is to follow the results of the first stage. In this mixed design, the aim is to interpret how the qualitative results explains quantitative results (Creswell, 2014).

The first quantitative phase of the study was designed on one group pre and post test design. The reason to use this design in this research is that the study was done with 42 teacher candidates in Turkish Language Teaching lesson who were all in one section. In the qualitative phase of the study, structured interviews were held with 15 participants individually.
In this study, the 42 teacher candidates were requested to create 3 digital stories within the context of Turkish Language Teaching lesson. Two of the digital stories were prepared on the themes (art, national culture, health and sport, nature and universe, science and technology, emotions, time and space, the world of children, etc.) listed in 3rd and 4th grade primary education Turkish teaching program and one digital story was in the form personal narrative. Two different themes were given to each of the participants. Before the study, the lecturer of the lesson, who is also the researcher, took necessary research permission from the administration of Education Faculty in Harran University. Then, the researcher gave the participants detailed information about the research and the participants fill up a voluntary participation form. The 12-week research consisted of 4 stages.

At the first stage, the researcher and teacher candidates made lessons, designed workshops on digital storytelling and wrote literature review. At the end of the third week, 21st Century Skills and Competences Scale Directed at Teaching Candidates was conducted to the group.

The second stage of the study lasted 8 weeks, during which the participants prepared their digital stories. This stage was held with both in and out of classroom activities. The participants attended a virtual classroom opened on Edmodo by the researcher and shared their stories, storyboards, visuals, sound recordings and finally their digital stories in the virtual classroom. The digital stories were scored by using a digital storytelling rubric (www.educatorstechnology.com). The scores of the participants are given in Table 2.

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</tbody>
</table>

At the third stage of the research, week 12, 21st Century Skills and Competences Scale Directed at Teaching Candidates were conducted as post-test and then interviews were held with 15 voluntary participants. At the final stage, the researcher analyzed quantitative and qualitative data and wrote the report.

**Participants**

As mentioned above, all the 3rd grade students attend Turkish Teaching lesson in just one section. The number of the students taking the lesson was 42 and all participated in the study. 29 of the participants were female, while 13 of them were male. All the participants filled an consent form to participate in the study.
Data collection instruments

The following data collection instruments were used to collect qualitative and quantitative data for this study.

21st Century Skills and Competences Scale Directed at Teaching Candidates

In this study, 21st century skills and competences scale, which was developed by Anagün, Atalay, Kılıç and Yaşar (2016), was used to measure 21st century skills of the teacher candidates after taking the consent of the researchers. In order to confirm the scale structure and validity, an Exploratory Factor Analysis (EFA) followed by a Confirmatory Factor Analysis (CFA) was performed. The EFA results suggested 42-item and three-factor structure, in which factors were called: Learning and Renewal Skills, Life and Career Skills, and Information Media and Technology Skills by using CFA results. Also, reliability analysis showed that Cronbach's α value for the whole scale was .889, which was highly acceptable. Similarly, Cronbach's α values were .845, .826, and .810 for single factor base for factor 1, factor 2, and factor 3 respectively.

Further, in order to evaluate the digital stories created by the teacher candidates, "an analytic rubric for digital stories" was used.

Structured Interviews

In order to get the opinions of the participants about the effects of digital storytelling on the development of 21st century skills, the researcher developed a structured interview form consisting of 3 questions aiming to determine the effects of digital storytelling on teacher candidates' life and career skills, learning and innovation skills, information, media and technology skills. These skills were adopted from the ones in P21 (Figure 2). The answers of the participants to the questions were recorded. The following interview questions were asked to the participants:

1) What do you think about the effects of digital storytelling on your learning and innovation skills?

2) What do you think about the effects of digital storytelling on your information media and technology skills?

3) What do you think about the effects of digital storytelling on your life and career skills?

Fig. 2 The Framework of 21st century skills (source: www.p21.org)
Data Analysis

The analysis of the quantitative data started with a normality test. The data showed normal distribution, so the assumptions were set for the first three related research questions. In this respect, related measurements for first research question was analyzed by using t-test results. Following, single-factor ANOVA used for related measurements of second research question. Last, the third research question was interpreted by using simple linear regression analysis for related measurements.

As to the qualitative data analysis, a descriptive analysis was used for the interviews after the recordings were transcribed into computer files and checked independently by the researcher and an expert in the department of primary education. 21st century skills listed in P21 were accepted as the themes and sub-themes. Besides, the characteristics listed in P21 Framework Definitions (2009) were adopted as the codes. Therefore, a descriptive analysis was applied for the analysis of the qualitative data in the study. For presenting the findings obtained from the descriptive analysis, the researcher decided on the selection of illustrative quotations to be included in the research report. The quotations were translated into English by the researcher and rather than using names or nicknames for the students while taking quotations, giving numbers to each of the 15 participants in the interview like P1(Participant 1), P2 (Participant 2), P3(Participant 3) was preferred.

FINDINGS

In this part, the findings of the study were presented depending on research questions respectively.

1- Findings on the experimental group

In the first part of the results, the 21st century skills competence perceptions of the teacher candidates were investigated. Teacher candidates’ perceptions at beginning of the study versus at the end of the study was examined by the pre-and post-test differences in the experimental group. The data was analyzed using independent samples t-test, and the results were given in Table 3.

Table 3 Results on 21st century skills and competences

<table>
<thead>
<tr>
<th>Scale</th>
<th>Measure</th>
<th>N</th>
<th>S</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole scale</td>
<td>Pre-test</td>
<td>42</td>
<td>172.976</td>
<td>12.996</td>
<td>41</td>
<td>5.361</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>42</td>
<td>184.786</td>
<td>16.400</td>
<td>41</td>
<td>4.311</td>
</tr>
<tr>
<td>Learning &amp; innovation skills</td>
<td>Pre-test</td>
<td>42</td>
<td>71.381</td>
<td>7.381</td>
<td>41</td>
<td>4.311</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>42</td>
<td>76.405</td>
<td>8.603</td>
<td>41</td>
<td>7.406</td>
</tr>
<tr>
<td>Information, Media and Technology Literacy</td>
<td>Pre-test</td>
<td>42</td>
<td>31.857</td>
<td>4.448</td>
<td>41</td>
<td>7.406</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>42</td>
<td>36.810</td>
<td>2.787</td>
<td>41</td>
<td>1.534</td>
</tr>
<tr>
<td>Life &amp; career skills</td>
<td>Pre-test</td>
<td>42</td>
<td>69.738</td>
<td>4.516</td>
<td>41</td>
<td>5.361</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>42</td>
<td>71.571</td>
<td>7.899</td>
<td>41</td>
<td>1.534</td>
</tr>
</tbody>
</table>

*p<.05

Table 3 shows the pre-and post-test comparisons of teacher candidates’ on 21st century skills competence perceptions. According to the results, there was a significant difference between pre-and post-test scores overall \( \bar{X}_{pre} = 172.976, \bar{X}_{post} = 184.786; t = -5.361; p < .05 \). Further, the scale was examined on three-factor basis. The first factor; (a) learning and innovation skills, shows significantly different scores \( \bar{X}_{pre} = 71.381, \bar{X}_{post} = 76.405; t = -4.311; p < .05 \) between the teacher candidates’ perceptions through time. Similarly, the second factor; (b) information, media and technology literacy scores significantly differ between pre-and post-test as well \( \bar{X}_{pre} = 31.857, \bar{X}_{post} = 36.810; t = -7.406; p < .05 \). On the other hand, in the third factor; (c) life and career skills, there was no significant score differences \( \bar{X}_{pre} = 69.738, \bar{X}_{post} = 71.571 \) through the time period.
2- Findings on rubric scores of digital storytelling activities

In the second part of the analysis three digital stories, created by the candidates, were examined by using rubric scale scores. Descriptive statistics of digital stories depending on the rubric scores were given in Table 4 below.

Table 4 Descriptive statistics on digital story rubric scores

<table>
<thead>
<tr>
<th>Rubric scales</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital story-1</td>
<td>42</td>
<td>10.404</td>
<td>1.106</td>
</tr>
<tr>
<td>Digital story-2</td>
<td>42</td>
<td>12.000</td>
<td>1.343</td>
</tr>
<tr>
<td>Digital story-3</td>
<td>42</td>
<td>13.142</td>
<td>1.555</td>
</tr>
</tbody>
</table>

According to the results in Table 4, the mean scores of the teacher candidates on digital stories rubric scale increased gradually with the values of \( \bar{X}_1 = 10.404; \bar{X}_2 = 12.000; \) and \( \bar{X}_3 = 13.142 \) for each digital stories respectively. Further, Table 5 presents single-factor ANOVA results for three measurements, to determine whether the rubric scores of the digital stories differ significantly.

Table 5 ANOVA results on digital story rubric scores

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean of squares</th>
<th>F</th>
<th>p</th>
<th>Bonferroni test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between the groups</td>
<td>189.468</td>
<td>41</td>
<td>4.621</td>
<td>192.752</td>
<td>.000*</td>
<td>3&gt;1;3&gt;2;2&gt;1</td>
</tr>
<tr>
<td>Within the groups</td>
<td>158.873</td>
<td>2</td>
<td>79.437</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>33.794</td>
<td>82</td>
<td>.412</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>382.125</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* \( p < .05 \)

Further, the mean score differences on three digital stories created by teacher candidates’ state that the differences were significant (\( F_{(2.41)} = 192.752; \ p < .05 \)). Moreover, the group differences precisely show that teacher candidates’ digital story scores were highest on the 3\(^{rd}\), also the 2\(^{nd}\) digital story score was higher than the 1\(^{st}\) one significantly. Thus, the digital story scores of teacher candidates progressively increased through the three activities. Consequently, we could state that teacher candidates developed throughout the process.

3- Prediction of 21st century skills competence perceptions by digital storytelling activity scores

In order to find out if the teacher candidates’ digital story scores were a significant predictor of the 21st century skills competence perceptions, simple linear regression analysis was conducted. The results were presented in Table 6.

Table 6 Regression analysis for digital story rubric and 21st century skills competence perception

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Standard error</th>
<th>( \beta )</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>96.460</td>
<td>17.005</td>
<td></td>
<td>5.672</td>
<td>.000*</td>
</tr>
<tr>
<td>Rubrics</td>
<td>6.720</td>
<td>1.285</td>
<td>.637</td>
<td>5.230</td>
<td>.000*</td>
</tr>
</tbody>
</table>

\( R=0.637 \) \( R^2=0.406 \) \( F_{(1.40)}=27.348 \) \( p=.000* \)

According to Table 6, we could state that digital story scores, that were obtained from the last digital story created by the candidates, were a significant predictor of the 21st century skills competence perceptions, that were obtained from the post-test results of teacher candidates (\( F_{(1.40)} = \)
27.348; p < .05). Further, we could conclude that the digital story scores of teacher candidates explain 40.6% of the variability in 21st century skills competence perception scores.

4- Opinions of The Teacher Candidates about The Effect of Digital Storytelling on 21st Century Skills

The opinions of the teacher candidates about the effects of digital storytelling on 21st century skills were obtained from the structured interviews and the findings were outlined as "learning and innovation skills", "information, media and technology skills" and "life and career skills"

The Effects of Digital Storytelling on Learning and Innovation Skills

The opinions of the teacher candidates about the effects of digital storytelling on learning and innovation skills include "creativity and innovation", "critical thinking and problem solving", "communication and collaboration" sub-themes. In the following table themes, sub-themes, codes and quotations from the interviews are given (Table 7).

Table 7 Themes, Sub-themes, Codes and Quotations on Learning and Innovation Skills

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Codes</th>
<th>f</th>
<th>Sample quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity and innovation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Think creatively</td>
<td>15</td>
<td></td>
<td>Writing the story is new and unfamiliar product form me. While writing a story, we</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>reveal our creativity, analyze and evaluate our own thoughts (P8)</td>
</tr>
<tr>
<td>Work creatively with others</td>
<td>12</td>
<td></td>
<td>When you face a problem during the process, you prefer to have a collaboration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>with friends and family members, you see people having diverse thoughts and you</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>get different point of views (P3).</td>
</tr>
<tr>
<td>Implement innovations</td>
<td>11</td>
<td></td>
<td>Making digital stories in itself prompts you to productivity and this gives you</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the sense &quot;Yes, I did it, I,hmm I can succeed and can do more from now on&quot; (P1).</td>
</tr>
<tr>
<td>Critical thinking and problem solving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason effectively</td>
<td>3</td>
<td></td>
<td>I believe that digital storytelling develops inductive and deductive thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>skills on a subject. By this way, you can, oh you can make predictions about the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>results and we can criticize and interrogate (P 13).</td>
</tr>
<tr>
<td>Use systems thinking</td>
<td>9</td>
<td></td>
<td>We shared every, each one of the steps one by one: our stories, storyboards,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>digital stories. Therefore, everything we did was seen by our friends and we</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>were criticized about negative and positive things we did... We made revisions on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>what we were criticized. And this, how can I say, this developed our creative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>thinking. I mean problems occurred and we directly tried to produce solutions (P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9).</td>
</tr>
<tr>
<td>Make judgments and decisions</td>
<td>15</td>
<td></td>
<td>We got the opportunity on hmm on looking at the things from the point of views</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>of others and we learnt to be open to new thoughts (P 10).</td>
</tr>
<tr>
<td>Solve problems</td>
<td>15</td>
<td></td>
<td>Our teacher and friends helped us to solve problems. Sometimes, I, rather than</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>asking to somebody, preferred to find solutions on the Internet (P 15).</td>
</tr>
<tr>
<td>Communication and collaboration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicate clearly</td>
<td>15</td>
<td></td>
<td>We shared our stories, storyboards, visuals, sounds and effects; we shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>everything; we shared our digital stories with our teacher and friends on Edmodo.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>We communicated with each other face-to-face, on WhatsApp and Edmodo at any time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>This was very good for communication and collaboration skills (P 7).</td>
</tr>
<tr>
<td>Collaborate with others</td>
<td>12</td>
<td></td>
<td>I can say that I am not very good at using technology tools like some of my friends.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sometimes I had some difficulties. But I want to thank to my friends and my teacher</td>
</tr>
</tbody>
</table>
Creativity and Innovation

During the interviews, all the participants were of the opinion that writing their own stories was the main sign of the creativity and that while writing the stories, they had a chance of creating their own ideas and analyzing and evaluating those ideas. They also focused on the fact that by sharing all the stages of their work on Edmodo, they made recommendations, gave feedback on each other’s works, shared their experiences with each other and they were open and responsive to new and diverse perspectives of their classmates, which meant that all the participants worked creatively with each other. As for implementing innovations, 11 of the participants stated that they had not had such an experience before. As they stated, creating digital stories gave them a sense of success.

Critical Thinking and Problem Solving

At the interviews, only 3 participants mentioned explicitly about their using different types of reasoning. Especially, one of the participant told that she used both inductive and deductive reasoning while writing her stories. 9 of the participants mentioned that they analyzed how parts of a whole story interact with each other by making comments on the stages of the digital storytelling (story writing, storyboard, using media, etc) face to face or/and on Edmodo, which they believed to have contributed to their critical thinking. All the participants thought that they only analyzed and evaluated not their own work but also the works of the others, which helped them make judgments and decisions on the whole process of digital storytelling, and tried to solve all kinds of problems they faced.

Communication and Collaboration

At the interview, all the participants were of the opinion that they did not have any communication problems with their friends and the researcher, as well. By attending the virtual group and class, they did not have to wait for the weekly lessons to get the opinions of their teacher (the researcher) and friends. While only 3 participants stated that they did not have to make too much collaboration with the others as they regarded themselves as capable of using technology and producing media easily, the rest of the participants expressed that they helped each other, they learnt from each other and solved the problems easily by creating a collaborative environment. Some of the participants underlined a fact that before this study they, as a whole class, had not had that much sharing and communication and thanks to this study, they established good relationships with each other.

The Effects of Digital Storytelling on Information, Media and Technology Skills

The opinions of the teacher candidates about the effects of digital storytelling on information, media and technology skills include "information literacy", "technology literacy" and "media literacy" sub-themes. In the following table themes, sub-themes, codes and quotations from the interviews are given (Table 8).

<table>
<thead>
<tr>
<th>Table 8 Themes, Sub-themes, Codes and Quotations on Information, Media and Technology Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-theme</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Information literacy</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Media literacy

<table>
<thead>
<tr>
<th>Media literacy</th>
<th>Analyze media</th>
<th>5</th>
<th>With digital storytelling activities, we can analyze media and can be aware of harmful and helpful sides of them. We can learn how to use media for the sake of our students (P 2).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create media products</td>
<td>10</td>
<td></td>
<td>While preparing our digital stories, we create our own media. Doing this is new thing for us. Doing this means using our creativity. Since we produce photos, sounds recordings, sound effects, music via media. This develops our media literacy (P 15).</td>
</tr>
</tbody>
</table>

Technology literacy

<table>
<thead>
<tr>
<th>Technology literacy</th>
<th>Apply technology effectively</th>
<th>15</th>
<th>We learn to use new programs and applications and we use various technology tools. This expands our horizon on technology use. Of course, we face some problems while using technology, but we overcome this problem by again making use of technology (P 7).</th>
</tr>
</thead>
</table>

**Information Literacy**

All of the participants mentioned that while they were creating their digital stories, they searched for information for almost every stage of digital storytelling. During this information access process, they tried to reach appropriate and right sources and examine and evaluate the information critically. They were also of the opinion that the information to be given in a digital story to the audience had a crucial importance; therefore, they had to be so careful and use their critical thinking to reach a decision on the use of any kind of information in their digital stories. Besides, some of the participants added that while using information, they had to be careful about the copyright, legal, social, political and cultural issues, which meant that they were aware of the ethical and legal issues while accessing and using information.

**Media Literacy**

About the media literacy, 5 participants mentioned about analyzing the media. They stated that during the digital storytelling process, they reached different media and they tried to figure out how media can influence the beliefs and thoughts of others, how prejudicial and unfavorable or helpful, beneficial and educatory messages can be given via media and how they could critically analyze the message they took from different media sources. 10 participants, on the other hand, expressed their thoughts on how they managed to create media products. They emphasized that while creating their own media products, they made use of various technology tools ranging from voice recording to internet, applications and video making programs. They were of the opinion that digital storytelling process contributed to their media literacy and that they used various source to create their media creation tools.

**Technology Literacy**

Digital storytelling process by nature requires effective use of information, communications and technology. A digital storyteller examines and uses various technology tools to research, organize, evaluate and communicate information. The participants believed that by searching for information on various media resources, creating their own media, using digital storytelling experience contributed to development of their technology skills. Some of the participants also emphasized that when they faced technology problems, they managed to overcome them by again using technology. They also mentioned that as future teachers, they should have information, communications and technology literacy and that they should use and teach their students how to use them in their teaching career.

**The Effects of Digital Storytelling on Life and Career Skills**

The opinions of the teacher candidates about the effects of digital storytelling life and career skills include flexibility and adaptability”, “initiative and self-direction” and “social and cross-cultural skills” and “productivity and accountability” sub-themes. In the following table themes, sub-themes, codes and quotations from the interviews are given (Table 9).
Table 9 Themes, Sub-themes, Codes and Quotations on Life and Career Skills

<table>
<thead>
<tr>
<th>Sub-theme</th>
<th>Codes</th>
<th>Z</th>
<th>Sample quotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility and adaptability</td>
<td>Adapt to change</td>
<td>10</td>
<td>When we needed collaboration, we took parts in various and diverse groups. We tried to adapt to this (P 6).</td>
</tr>
<tr>
<td></td>
<td>Be flexible</td>
<td>13</td>
<td>Digital storytelling provides us with working diverse groups and develop empathy with them (P 4).</td>
</tr>
<tr>
<td>Manage goals and time</td>
<td></td>
<td>15</td>
<td>The stress and anxiety and the fear that I will not be able to do the things on time put my skills into background (P 5). While working on making our digital stories, our teacher gave us deadlines for each stage, so we personally had to manage our goals and set times. We prepared our own schedules to do the things in an order (P 1).</td>
</tr>
<tr>
<td>Work independently</td>
<td></td>
<td>15</td>
<td>We tried to manage self-direction and set goals to put concrete products forth. We all did this by ourselves (P14).</td>
</tr>
<tr>
<td>Be self-directed learners</td>
<td></td>
<td>15</td>
<td>Thanks to such kinds of activities, we had a chance to show our initiative skills. All the control during all the stages were in our hand, so our self-direction skills developed and we found a chance to know ourselves (P 9).</td>
</tr>
<tr>
<td>Interact effectively with others</td>
<td></td>
<td>14</td>
<td>For our digital stories, all of us got the opinions and comments of the others. By this way, we gave a shape to our work and our stories. By caring about the others' comment and feedback, we did a good job. We produced our own digital stories (P 2).</td>
</tr>
<tr>
<td>Work effectively in diverse teams</td>
<td></td>
<td>13</td>
<td>I found an environment in which I were able to work with friends from different cultures. We learnt to respect to each other (P 10).</td>
</tr>
<tr>
<td>Manage projects</td>
<td></td>
<td>15</td>
<td>Making our digital stories in itself is a project. As the goal of this project is to put our digital stories forth, this developed our creativity and productivity (P 12).</td>
</tr>
<tr>
<td>Produce results</td>
<td></td>
<td>15</td>
<td>We got an opportunity to make our own digital stories and to manage the process by ourselves. It also provided me with a sense of responsibility to produce unique stories (P 9).</td>
</tr>
<tr>
<td>Guide and lead others</td>
<td></td>
<td>5</td>
<td>During this process, I tried to show and guide some of my friends how to use moviemaking programs easily. Helping them was also very important form me (P 11).</td>
</tr>
<tr>
<td>Be responsible to others</td>
<td></td>
<td>12</td>
<td>There were two important factors in the digital stories we prepared. The first one was that these stories should be suitable for the level and interest of primary school students. The second one that as we shared our digital stories on the Internet, we should take value judgment of the audience from different cultures into account (P 1).</td>
</tr>
</tbody>
</table>

**Flexibility and Adaptability**

At the interviews all of the participants expressed that digital storytelling process led them to have a sense of responsibility, make schedules to do the jobs on time, react positively and respect diverse feedback, recommendations of their classmates and lecturer on their digital stories, adopt themselves to work effectively and collaboratively in multi-cultural environments, be decisive in finding solutions to any problems rather than giving up in any failure and develop empathy to understand others’ views or opinions.

**Initiative and Self-direction**

According to the participants, one of the most important gains of digital storytelling process to develop their skills in managing goals and time, working independently and being self-directed learners. They stated that they made their own schedules, put deadlines, tried to complete the tasks in a given time, expanded their learning and obtained new opportunities to express themselves, had a sense of commitment to creating digital stories and planning to use digital storytelling in their future teaching careers. However, one of the important findings is that one participant stated she felt stress and anxiety to perform scheduled job responsibilities on time like writing the story, forming the story.
board, accessing and making media, combining all they had in hand to create a digital story, which she believed kept her initiative and self-direction skills in background.

**Social and Cross-cultural Skills**

The participants stated that they had a remarkable chance of interacting with each other and working in diverse teams in virtual environments and in classroom. As they pointed out, the classroom consisted of students from various socio-cultural backgrounds and from different cities, which they believed was a great chance to work with friends from different cultures. This situation also led them to respect each other's social and cultural differences while interacting and working in group work.

**Productivity and accountability**

The participants stated that digital storytelling adventure in itself was a great project during which they had to use and develop their productivity and accountability skills effectively while working both independently and with diverse groups. They stated that thanks to this project, they developed a sense of responsibility first and then they tried to manage the stages of making digital stories. As they pointed out they had deadlines on every stage and they had to make and manage their own schedules to fulfill their responsibilities and reach the final result. However, some of the participants thought that they sometimes got stressed and nervous and had a fear about not being able to keep up with the deadlines.

**Leadership and responsibility skills**

During the interviews, some of the participants stated that they were capable of using information, communications and technology tools and of using various applications and programs before this study began. The recommendations and feedbacks given on Edmodo by such participants was a sign of the fact some of the participants already had well-developed ICT skills. During the process, it was clearly observed that these participants felt a responsibility to help their friends, guide and lead them. At the interviews while these participants stated that they helped their friends for any kinds of problems or difficulties that the others experienced and they felt themselves responsible for this and that they were very happy to guide and lead their friends whenever necessary. Some of the students, on the other hand, pointed out that they were responsible to the primary school students and those who would watch their digital stories on the Internet.

**CONCLUSION, DISCUSSION AND RECOMMENDATIONS**

This research examined the effect of digital storytelling on the development of 21st century skills of teacher candidates.

It was concluded in the study that the posttest scores of the candidate teachers' on 21st Century Skills and Competences Scale were higher than those of on the pretest. There was a meaningful difference between digital storytelling rubric scores the teacher candidates got from the three digital stories and the scores got higher on every following digital story, which can be said to support the result that the posttest scores of the candidate teachers’ on 21st Century Skills and Competences Scale were higher than those of on the pretest. This situation is also supported by the fact that the scores obtained from the digital stories explain the variability of the scores on 21st Century Skills and Competences Scale by about 40% and that the scores obtained from the digital stories are the predictor of 21st century skills and competences of the teacher candidates.

Another result obtained in the study on learning and innovation factor is that the posttest scores the teacher candidates got on the scale were meaningfully higher than the scores in pretest. This result is also supported by the statements of the participants at the interviews. They thought that writing their own stories, sharing their products on Edmodo and giving feedbacks and recommendations on each others' work, working with their classmates developed their creativity and
innovation skills. Daigle (2008) pointed out that digital storytelling requires technology use, writing skill and creativity, while Jenkins and Lonsdale (2007) stated that digital storytelling helps students to develop their problem solving and creativity skills. Likewise, Karakoyun (2014) and Amlan, Berber and Amlan (2018) found out that digital storytelling process developed teacher candidates’ creativity. Besides, similar results can be seen in other studies (Dupain and Maguire, 2005; Jakes, 2006; Ohler, 2008; Yuksel, Robin and McNeil, 2011).

The participants also stated that digital storytelling affected their critical and problem solving skills and communication and collaboration skills, as well. P21 (2009) uses the term "learning and innovation skills" in order to “separate students who are prepared for a more complex life and work environment in the 21st century, and those who are not.” According to P21 (2015), these skills necessitates looking at any problem in a new and different way, linking learning across subjects and disciplines, thinking creatively, working creatively with others and implementing innovations. During the application process, they used different types of reasoning while writing their stories, analyzed, evaluated, made judgments and decisions on not only their works but also on the other participants'. The participants also mentioned that they had not had that much sharing and communication and thanks to this study, they established good relationships with each other. Karakoyun (2014) mentioned that as the participants made comments on the scenarios of the digital stories and they helped each other while making digital stories, the communication and collaboration skills of the participants developed. Sadik (2008) also stated that long-term digital storytelling projects, like in the current study, is believed to develop students’ communication and collaboration skills. Robin (2006) stated that when digital stories are shared on the Internet, students have a chance to criticize and make comments on both their own and their peers’ digital stories, by which they can develop their social learning. Besides, Behmer (2005), Foley (2013), Ohler (2008), Yang and Wu (2012) stated that participants need to use their critical thinking and problem solving skills, communication and collaboration skills at almost every stage of digital storytelling.

The posttest scores the teacher candidates got on the second factor of the scale (information, media and technology skills) were meaningfully higher than the scores in pretest. At the interviews, all the participants expressed that they searched for information and media from different types of sources and either individually or collaboratively, examined and evaluated the information critically in terms of the audience, copyright, ethical and legal issues. They also produced their own media by making use of various technology tools ranging from voice recording, camera, to internet, applications and video making programs. Finally, as to technology literacy, the participants used various technology tools and though some of the participants drew attention on the difficulties while using technology, they overcame them by again applying to technology. They also stated that they are expected not only to use technology in their future career as teachers but also to teach their students how to use them. Similar to these findings, Karakoyun (2014), Koltuk and Kocakaya (2015) in their studies found out that digital storytelling helped teacher candidates and students to develop their information, media and technology skills. Likewise, Dogan (2007) believed that digital storytelling especially develops media and technology skills. Also, Robin (2008) stated that if an individual is directed to participate actively in digital storytelling, his/her information, visual and technology skills will certainly develop. Other researchers like Czarnecki (2009), Gakhar (2007), Yuksel, Robin and Mcneil (2011) underlined the fact that digital storytelling is an effective way to develop technology skills.

When it comes to the last factor of the scale, which is life and career skills, it can be seen that there is not a statistically meaningful difference between the posttest and pretest scores the participants obtained on the third factor. This can be due to the fact that life and career skills need longer time to develop. However, there are some certain findings from the interviews that 12-week digital storytelling project supported the life and career skills of the teacher candidates. Most of the participants were of the opinion that they took responsibility and made schedules to do the jobs till deadlines. During the process, they believed that they reacted positively and respected diverse opinions and feedbacks of their friends and the lecturer and that they adapted themselves to work in a self-directed way and collaboratively in multi-cultural environments, and had sense of commitment to
what they were doing. Most of them also thought that they found a chance to develop and show their productivity. But some of the participants mentioned that they sometimes got nervous and afraid of not being able to keep up with the deadlines. On the other hand, some of the participants were seen to have a leadership responsibility. Such participants helped to overcome any problems that their classmates were experiencing. Finally, most of the participants thought that they were responsible to the audience and that they tried to take the needs, levels and interests of the audience into consideration. The findings of this research on the development of life and career skills correspond to the findings of Karakoyun (2014) and Koltuk and Kocakaya (2015), who concluded that digital storytelling develops students and teacher candidates life and career skills. Likewise, Robin (2008) stated that as the students are actively engaged in digital storytelling, they take responsibility and produce a product, while Yuksel, Robin and Mcneil (2011) concluded that the students developed such life skills as having sense of community, establishing empathy, having collaboration and social interaction and communication via digital storytelling. Zhao (2004) also mentioned that the use of technology in digital storytelling is a way to develop problem solving, meta-cognitive and research skills.

Considering the above discussion points and the importance of digital storytelling on the development of 21st century skills derived from the relevant literature, some suggestions for future are as follows:

- This study was limited to the candidate teachers in primary education department. Researchers can make studies with teacher candidates studying at other departments in faculty of education.

- The digital stories to be prepared by teacher candidates can be applied in classroom environments in schools and the effects of digital stories on learners' skill development can be analyzed.

- Future studies can focus on in-service teachers. Researchers can design studies using digital storytelling as method to develop 21st century skills of in-service teachers.

- Apart from the studies to be held with candidate teachers and in-service teachers, students at primary, secondary, high and university students can be given workshops on digital storytelling and 21st century skills and they can be encouraged to create their own digital stories. Then, the effects of digital storytelling on skill development of students can be studied by researchers.

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Associations between Emotional States, Self-Efficacy for and Attitude towards Using Educational Technology

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Abstract

The purpose of this study was to investigate the associations between alternative certification preservice teachers’ levels of depression, stress, educational technology anxiety, self-efficacy for educational technology, and attitude towards using technology in education to provide insight into the interplay between intrinsic factors affecting technology integration. Participants were 451 preservice teachers enrolled in the alternative certification program at a public university in the southwestern part of Turkey (N=451). Data were collected using the Educational Technology Standards Self-Efficacy Scale, Attitude towards Using Technology in Education Scale, Educational Technology Anxiety Scale, Perceived Stress Scale, and Beck’s Depression Inventory. In addition to descriptive techniques, Pearson’s product-moment correlation coefficient and multiple linear regression were used for data analysis. Findings revealed that preservice teachers suffer from stress, depression, and anxiety, even more so than other undergraduate students. Age did not correlate with any of the parameters. Stress and depression did not differ according to gender; however, females were more anxious about using educational technology. Additionally, findings indicated bidirectional and cyclical relationships between emotional states, self-efficacy, and attitude. Finally, using educational technology for instructional purposes and for secondary purposes such as classroom management were associated with different sets of self-efficacy beliefs, and attitudes. Findings of the research were discussed and suggestions were made.

Keywords: Alternative Certification; Pedagogical Formation; Teacher Training; Technology Acceptance; Technology Integration.


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1. INTRODUCTION

Since most teachers struggle to use (Rebora, 2016), misuse (Fox, 2018; Glendinning, 2018; Hyndman, 2018), or do not use technology in meaningful ways (Guzey & Roehrig, 2012) for educational purposes, despite record amounts of funds being invested in educational technology (Adkins, 2018; Shulman, 2018), it is a matter of great interest to increase knowledge of the factors that affect successful implementation of educational technology, in order to better understand the dynamics influential in the adoption and successful integration of technology. Haddad and Draxler (2002) state that teachers are underpaid and ill-prepared, yet accountable for successfully teaching poorly prepared students in unsafe and inadequately equipped schools while also being expected to satisfy the needs of students, parents, administrators, society, the present, and the future. In the context of this stressful and challenging condition, educators face significant barriers or obstacles to the adoption and integration of technology (Al-Senaidi, Lin, & Poiriot, 2009; Johnson, Jacovina, Russell, & Soto, 2016). Integration of technology is not simply a technical issue (Al-Senaidi et al., 2009). Adoption and integration of technology is affected by personal, social, economic, environmental, and emotional factors. Ertmer (1999) classifies the barriers to technology integration into two types: first-order barriers, which are extrinsic to teachers, and second-order barriers, which are intrinsic to teachers. First-order barriers are inadequacies in resources, time, training or support, while second-order barriers are attitudes and beliefs such as self-efficacy beliefs (Beri & Sharma, 2019; Ertmer et al., 2003; Gürer, Tekinarslan, & Gönültaş, 2019; Johnson et al., 2016), affective processes, and emotional states (Al-Awidi & Alghazo, 2012; Beaudry, & Pinsonneault, 2010; Beri & Sharma, 2019; Shank, 2014) such as stress (Joo, Lim, & Kim, 2016; Kurt & Atay, 2009; Saravanan & Nagadeepa, 2017), anxiety (Chatzoglou, Sarigiannidis, Vraimaki, & Diamantidis, 2009; Redmann & Kotrlik, 2009) and depression (Tweed, 2013).

First-order (external) barriers are considered to be reduced (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012), tackled (Johnson et al., 2016) or overcome through investment (Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014; Gürer et al., 2019). Second-order barriers are considered to pose the greater challenge (Ertmer et al., 2012); they also create more difficulties than the first-order ones (Hew & Brush, 2007) and are more difficult hurdles (Johnson et al., 2016). There is a need for research to examine barriers of technology integration in greater detail (Hew & Brush, 2007). In addition to the intrinsic and extrinsic barriers, the way teachers are educated and certified is another major concern regarding technology integration. The relationship between teacher education and teacher effectiveness has been hotly debated (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005). Some argue that alternatively certified teachers are underprepared (Berry, 2001; Darling-Hammond, Chung, & Frelow, 2002; Darling-Hammond et al., 2005; Kee, 2012; Laczko-Kerr & Berliner, 2003; Nagy & Wang, 2006; Washington, 2016), more likely to experience stressors (Schonfeld & Feinman, 2012), and lacking in pedagogical content knowledge (Berry, Montgomery, & Snyder, 2008; Brindley & Parker, 2010; Grossman & Loeb, 2010; Washington, 2016). Yet, there is a lack of knowledge about alternatively certified teachers (Roberts & Dyer, 2004). Therefore, in order to provide insight into the interplay between intrinsic factors affecting technology integration, this study investigates associations between alternative certification preservice teachers’ levels of depression, perceived stress, educational technology anxiety, self-efficacy for educational technology, and attitude towards using technology in education.

1.1. Technology Acceptance

Implementation of technology for educational purposes requires the acceptance of that technology by learners and teachers in the first place. Promoting a more comprehensive use of educational technology for learning and teaching requires knowledge of the factors contributing to the acceptance of technology (Wong, 2015). To measure the degree of acceptance and satisfaction for any technology, and to predict the behavior of individuals in this context, technology acceptance theories and models were designed (Momani & Jamous, 2017). One of the models for technology acceptance is the Technology Acceptance Model (TAM), which was first introduced by Davis (1985) (Davis,
The TAM can be applied to teachers’ use of educational technologies (Holden & Rada, 2011). The model is depicted in Figure 1.

![Figure 1. Technology Acceptance Model (Davis, 1989, p. 985).](image)

The TAM postulates that actual use of a technology is determined by behavioral intention to use the technology. Behavioral intention to use, in turn, is determined by attitude towards using the technology and perceived usefulness of the technology. Attitude towards using technology is influenced by perceived usefulness and perceived ease of use of the technology (Davis, 1985; Holden & Rada, 2011). Perceived usefulness and perceived ease of use are two particular beliefs that are of primary relevance for computer acceptance behavior (Davis et al., 1989). Perceived ease of use influences attitude by the mechanism of self-efficacy (Davis et al., 1989; Legris, Ingham, & Collerette, 2003). Teachers’ beliefs about and attitudes towards technology are crucial for teachers to pedagogically adopt technology (Somekh, 2008). In addition to the TAM, attitude and self-efficacy belief have critical roles in the formation of intention to use technology according to behavioral intention models such as the Theory of Reasoned Action (Ajzen & Fishbein, 1980), which have been widely used in technology adoption research and studies (Otieno, Liyala, Odongo, & Abeka, 2016). Theory of reasoned action presupposes a causal sequence leading from beliefs to attitude, and from intention to behavior (Sarver, 1983). Therefore, attitude and self-efficacy seem to play a determinant role in the acceptance and, hence, the actual use of technologies.

### 1.2. Attitude

Attitude is a psychological construct that can direct individuals’ behavior. Fishbein and Ajzen (1975) define attitude as an individual’s degree of evaluative affect towards the target behavior (p. 216). Attitude is composed of cognitive, emotional, and behavioral elements that are assumed to have internal consistency with each other (İnceoğlu, 2010) and is usually formed through direct experience, imitation, reinforcement, and social learning (Kağıtçıbaşı, 2006). Attitude is not conceived as a constant state or a fixed condition, but rather a variable psychological construct. According to Fishbein and Ajzen’s model, which is an influential paradigm for research on technology acceptance, “individual’s intention to perform a given behavior is the immediate causal determinant of his or her overt performance of that behavior” (Davis, 1985, p. 15). On the other hand, intention is determined by attitude towards that behavior (Dishaw, Strong, & Bandy, 2002) as well as the perceived social influence of people who are important to the individual (Davis, 1985; Fishbein, & Ajzen, 1975), which is in parallel with Bandura’s view that verbal persuasion is a source for self-efficacy. Previous research reveals that attitude is the strongest factor influencing the intention to use technology (Chau & Hu, 2002; Cheung & Vogel, 2013; Davis, 1993; Hussein, 2015; Liu, Liao, & Pratt, 2009; Louho, Kallioja, & Oittinen, 2006; Sánchez-Mena, Martí-Parreño, & Aldás-Manzano, 2019; Schaper & Pervan, 2007; Tosuntaş, Karadağ, & Orhan, 2015; Wu & Chen, 2017). Attitude towards using technology is a barrier to technology integration for teachers (Beri & Sharma, 2019; Hew & Brush, 2007; Ünal, Yamaç, & Uzun, 2017).
1.3. Self-Efficacy

Self-efficacy is an individual’s belief about his or her capability in successfully performing required behaviors to produce an outcome or effectively accomplish a certain goal or task (Bandura, 1977, 1995; Pintrich, 1999). Cobb (2003) defines self-efficacy as one’s confidence to learn or accomplish a task and as a central mechanism of intentional human action, which regulates motivation and action. Individuals with high self-efficacy show greater persistence in maintaining and achieving the job, even in the face of difficulties (Schunk, 1981, 1985), and are more effective and persistent in their efforts (Bandura, 1995; Bouffard-Bouchard, 1990; Pajares & Schunk, 2002; Schunk, 1981). Kanadlı (2017) states that “teacher self-efficacy is associated with the efforts a teacher makes toward teaching, the goals set and the persistence and resilience shown in the face of difficulties when things go wrong” (p. 1851). According to Bandura (1995), mastery experiences, vicarious experiences, verbal persuasion, and physiological and emotional states are sources of self-efficacy beliefs. Experiences during student teaching and the induction year are among the most powerful influences on the development of teachers’ self-efficacy (Hoy & Spero, 2005; Eryaman, et al., 2013). Self-efficacy influences teachers’ thoughts and actions regarding technology in the classroom (Abbitt, 2011). In addition to its effect on technology, self-efficacy has been shown to influence behavioral intention to use (Schwarzer & Fuchs, 1995; Venkatesh, Morris, Davis, & Davis, 2003; Wong, 2015), actual use (Compeau, Higgins, & Huff, 1999; Oye, Lahad, & Rahim, 2012), and acceptance of technology (Holden & Rada, 2011; Oye, Lahad, & Rahim, 2012).

Significant positive relationships have been reported between self-efficacy for and attitude towards using technology (Arslan, 2008; Kutluca & Ekici, 2010). Regarding the relationship between attitudes and beliefs, Fishbein & Ajzen (1975, p. 216) argue that, “as a person forms beliefs about an object, he automatically and simultaneously acquires an attitude toward that object”. Moreover, Davis (1985) argues that “attitudes are altered only through changes in the individual’s belief structure” (p. 17). Hence, there seems to be a possible path towards contributing to the successful implementation of educational technology. It seems that strengthening self-efficacy beliefs may contribute to the development of (more) positive attitudes towards computers, information technology, and/or educational technology in general. As a consequence of stronger self-efficacy for and more positive attitude towards educational technology, teachers may better implement educational technology in learning environments. Holden and Rada (2011) state that self-efficacy for technology may be increased by training and “creating an environment where teachers can collaborate about their experiences with the technology” (p. 365). Previous research indicates that increasing self-efficacy for using technology leads to increases in teachers’ acceptance of technology (Holden & Rada, 2011), their actual use of technology in the classroom (Abbitt, 2011), their potential to positively influence students’ performances (Kanadlı, 2017), and to positive ideas about technology integration (Albion & Ertmer, 2002; Ertmer et al., 2003).

1.4. Stress, Anxiety, and Depression

Teaching is one of the most challenging professions in the world (Haddad & Draxler, 2002). Stress, anxiety, and depression are the most common negative emotional states that teachers experience (Uzman & Telef, 2015) and are intricately tied to use of technology (Shank, 2014). Emotional state is defined as changes in somatic, biochemical, and neurological activity (Lewis & Saarni, 1985), and in the mode of processing within the brain that supports cognition (Damasio, 2000). Emotional states influence the perception of information (Rivers & Brackett, 2010) and decision making (Neto & da Silva, 2012), cause approach or avoidance behaviors (Pengnate, 2013), and have a crucial role in human-computer interaction (Wang & Guan, 2008), e-learning (Juutinen & Saariluoma, 2010) and technology integration (Al-Awidi & Alghazo, 2012). Emotional feedback, which regulates emotional states, has a direct effect on perceived usefulness, perceived ease of use, and behavioral intention to use computer based assessment (Terzis, Moridis, & Economides, 2012). Emotional states affect self-efficacy for technology integration (Ünal et al., 2017). In order to increase self-efficacy,
Educators should try to reduce negative emotional states (Kauppinen, Kiili, & Coiro, 2018; Tweed, 2013; Usher & Pajares, 2008).

Stress is reported to affect self-efficacy for technology integration (Kurt & Atay, 2009; Ünal et al., 2017), intention to use technology (Chatzoglou et al., 2009; Joo et al., 2016), and integration of new digital ICT tools and web systems into the educational environment (Saravanan & Nagadeepa, 2017). Anxiety is reported to influence computer self-efficacy (Compeau et al., 1999; Thatcher & Perrewe, 2002), self-efficacy for technology integration (Ünal et al., 2017), attitude towards using technology (Beri & Sharma, 2019; Brown, Fuller, & Vician, 2004; Venkatesh, 2000), intention to use technology (Chatzoglou et al., 2009; Venkatesh et al., 2003), technology use (Beaudry & Pinsonneault, 2010; Compeau et al., 1999), and teachers' technology adoption (Redmann & Kotrlik, 2009). Depression is also argued to influence technology use patterns (Shank, 2014) and self-efficacy (Tweed, 2013). On the other hand, stress, anxiety, and depression are influenced by self-efficacy (Bandura, 1995; Jerusalem & Mittag, 1995).

2. METHOD

The study was designed as a piece of correlational research. Throughout the study, the Ethical Principles of Psychologists and Code of Conduct have been observed (American Psychological Association, 2002).

2.1. Participants

The participants were 451 preservice teachers enrolled in the alternative certification program at a public university in the southwestern part of Turkey (N=451). Participants were determined through convenience sampling at the university where the researcher is also a member of the faculty. There were 283 (62.7%) female and 168 (37.3%) male students. Participants' ages ranged between 19 and 46 (x̄ =24.51, median=22). Only consenting individuals participated in the research.

2.2. Data Collection Tools

2.2.1. Educational technology standards self-efficacy scale

The educational technology standards self-efficacy scale (ETSSES) was developed by Şimşek and Yazar (2016) to measure self-efficacy for educational technology in accordance with the educational technology standards for teachers set by the International Society for Technology in Education (2014). The ETSSES is a 5-point Likert-type scale consisting of 40 items and five dimensions (1=Strongly Disagree, 5=Strongly Agree). The sub-dimensions (SE1 to SE5) and Cronbach’s α values of the scale are as follows: facilitating and inspiring student learning and creativity (α=0.90); designing and developing digital age learning experiences and assessments (α=0.93); modelling digital age work and learning (α=0.88); promoting and modelling digital citizenship and responsibility (α=0.82); and engaging in professional growth and leadership (α=0.91).

2.2.2. Attitude towards using technology in education scale

The attitude towards using technology in education scale (ATUTIES) was developed by Öztürk (2006). It is a 5-point Likert-type scale consisting of 39 items and three dimensions (1=Strongly Disagree, 5=Strongly Agree). The sub-dimensions (AT1 to AT3) and Cronbach’s α values of the scale are as follows: reflection of using technology in education on instructional processes (α=0.90); improving oneself in using technology in education (α=0.90); and using technology in education and classroom management (α=0.89).
2.2.3. Educational technology anxiety scale

The educational technology anxiety scale (ETAS) was developed by Yalçınalp and Cabi (2015) to measure anxiety about using technology on their courses. The ETAS is a 5-point Likert-type scale consisting of 24 items and five dimensions (1=I am not worried, 5=I am very worried). The sub-dimensions (AX1 to AX5) and Cronbach’s α values of the scale are as follows: workplace (α=0.89); technological disadvantage-restriction (α=0.81); technology integration (α=0.83); technology management (α=0.92); and technical (α=0.70) anxiety.

2.2.4. Perceived stress scale

The perceived stress scale was developed by Cohen, Kamarck, and Mermelstein (1983) to measure the degree to which situations in one’s life are appraised as stressful. The scale is a 5-point Likert-type scale consisting of 10 items (0=Never, 4=Very often). The score range is 0 to 40, and higher scores indicate more perceived stress. Cronbach’s α of the scale is 0.84.

2.2.5. Beck’s depression inventory

The inventory was developed by Beck, Ward, Mendelson, Mock, and Erbaugh (1961) for measuring the severity of depression; it consists of 21 items. The score range is 0 to 63, and higher scores indicate more severe depressive symptoms. Questions are answered by one of the four forced choices. Every choice of the rating scale is unique. For the standard cut-off scores: 0-9 represents minimal depression; 10-18 represents mild depression; 19-29 represents moderate depression; and 30-63 represents severe depression. Cronbach’s α of the scale is 0.86.

2.3. Procedure

Initially, a paper-and-pencil instrument was prepared comprised of the five scales and a demographics form. Permissions required for being able to conduct the research were received from institutional authorities. Data were collected in the classrooms during the lessons and were analyzed by statistical measures.

2.4. Data Analysis

Initially, the completed survey instruments were transferred to a computer. Statistical analyses were performed using the IBM SPSS Statistics computer program (IBM SPSS Statistics version 25). Data were analyzed by Cronbach’s α estimate, t-test, Pearson’s product-moment correlation coefficient and multiple linear regression.

3. FINDINGS

After calculating scores, descriptive analyses were conducted. The results of descriptive analyses are depicted in Table 1.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Min.</th>
<th>Max.</th>
<th>x̄</th>
<th>s</th>
<th>s²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>0</td>
<td>4</td>
<td>2.06</td>
<td>0.682</td>
<td>0.465</td>
</tr>
<tr>
<td>Depression</td>
<td>0</td>
<td>2</td>
<td>0.62</td>
<td>0.405</td>
<td>0.164</td>
</tr>
<tr>
<td>Anxiety (ETAS)</td>
<td>1</td>
<td>5</td>
<td>2.90</td>
<td>0.756</td>
<td>0.571</td>
</tr>
<tr>
<td>AX1</td>
<td>1</td>
<td>5</td>
<td>3.35</td>
<td>1.047</td>
<td>1.096</td>
</tr>
<tr>
<td>AX2</td>
<td>1</td>
<td>5</td>
<td>3.27</td>
<td>0.828</td>
<td>0.685</td>
</tr>
<tr>
<td>AX3</td>
<td>1</td>
<td>5</td>
<td>2.62</td>
<td>1.093</td>
<td>1.194</td>
</tr>
<tr>
<td>AX4</td>
<td>1</td>
<td>5</td>
<td>2.68</td>
<td>0.916</td>
<td>0.839</td>
</tr>
<tr>
<td>AX5</td>
<td>1</td>
<td>5</td>
<td>2.26</td>
<td>0.971</td>
<td>0.943</td>
</tr>
</tbody>
</table>
Self-Efficacy (ETSSSES) | 2 | 5 | 3.97 | 0.572 | 0.327
SE1 | 1 | 5 | 3.98 | 0.665 | 0.443
SE2 | 2 | 5 | 3.90 | 0.657 | 0.432
SE3 | 1 | 5 | 3.98 | 0.684 | 0.467
SE4 | 1 | 5 | 3.95 | 0.646 | 0.417
SE5 | 2 | 5 | 4.03 | 0.664 | 0.441
Attitude (ATUTIES) | 1 | 5 | 2.66 | 0.351 | 0.124
AT1 | 1 | 5 | 1.93 | 0.619 | 0.383
AT2 | 1 | 5 | 3.86 | 0.661 | 0.437
AT3 | 1 | 5 | 2.11 | 0.850 | 0.722

Note: AX1 to AX5, SE1 to SE5, and AT1 to AT3 are sub-dimensions of ETAS, ETSSSES, and ATUTIES, respectively.

Subsequently, Pearson’s product-moment correlation coefficients were computed in order to investigate whether age correlated with stress, depression, total scale scores or sub-dimensions of ETAS, ETSSSES, and ATUTIES. The results of the computations revealed that age did not correlate with stress, depression, total scale scores or sub-dimensions of ETAS, ETSSSES, and ATUTIES (p>0.05). After Pearson’s computations, a series of independent samples t-tests were performed in order to compare the levels of stress, depression, attitude, self-efficacy, SE1, SE2, SE3, or AX3 for males and females (p>0.05). However, there were statistically significant differences between male and female preservice teachers in the levels of anxiety, SE4, SE5, AX1, AX2, AX4, AX5, and all sub-dimensions of ATUTIES, even though scale-scores did not differ according to sex. It should be noted that all effect sizes were small. Table 2 depicts the results of t-test analyses.

Table 2. Results of t-test analyses.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x̄</td>
<td>s</td>
</tr>
<tr>
<td>Stress</td>
<td>2.11</td>
<td>0.70</td>
</tr>
<tr>
<td>Depression</td>
<td>0.63</td>
<td>0.40</td>
</tr>
<tr>
<td>Anxiety (ETAS)</td>
<td>2.98</td>
<td>0.76</td>
</tr>
<tr>
<td>AX1</td>
<td>3.43</td>
<td>1.03</td>
</tr>
<tr>
<td>AX2</td>
<td>3.35</td>
<td>0.83</td>
</tr>
<tr>
<td>AX3</td>
<td>2.68</td>
<td>1.07</td>
</tr>
<tr>
<td>AX4</td>
<td>2.77</td>
<td>0.95</td>
</tr>
<tr>
<td>AX5</td>
<td>2.36</td>
<td>0.99</td>
</tr>
<tr>
<td>Attitude (ATUTIES)</td>
<td>2.64</td>
<td>0.31</td>
</tr>
<tr>
<td>AT1</td>
<td>1.86</td>
<td>0.56</td>
</tr>
<tr>
<td>AT2</td>
<td>3.91</td>
<td>0.61</td>
</tr>
<tr>
<td>AT3</td>
<td>2.04</td>
<td>0.81</td>
</tr>
<tr>
<td>Self-Efficacy (ETSSSES)</td>
<td>4.01</td>
<td>0.53</td>
</tr>
<tr>
<td>SE1</td>
<td>4.00</td>
<td>0.62</td>
</tr>
<tr>
<td>SE2</td>
<td>3.94</td>
<td>0.62</td>
</tr>
<tr>
<td>SE3</td>
<td>3.97</td>
<td>0.62</td>
</tr>
<tr>
<td>SE4</td>
<td>4.04</td>
<td>0.62</td>
</tr>
<tr>
<td>SE5</td>
<td>4.08</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Note: *p <0.001, **p <0.01, ***p <0.05. Sample consisted of 283 females and 168 males. AX1 to AX5, SE1 to SE5, and AT1 to AT3 are sub-dimensions of ETAS, ETSSSES, and ATUTIES, respectively.

3.1. Attitude

Three multiple linear regression analyses were applied using stress, depression, and sub-dimensions of ETAS and ETSSSES as independent variables (IV), and one of three sub-dimensions of ATUTIES as the dependent variable (DV). The results of these regression analyses are depicted in
Table 3. The first regression model was used to test if the IVs significantly predicted “reflection of using technology in education on instructional processes” (AT1). The results of the analysis indicated that 23.3% of the variance in AT1 was explained by SE1, SE5, AX1, and AX3 ($R^2=0.233$, $F(12, 430)=10.87$, $p=0.000$). The second regression model was used to test if IVs significantly predicted “improving oneself in using technology in education” (AT2). The results of the analysis indicated that 48.9% of the variance in AT2 was explained by SE1, SE5, AX1, and AX5 ($R^2=0.489$, $F(12, 429)=34.176$, $p=0.000$). The third regression model was used to test if IVs significantly predicted “using technology in education and classroom management” (AT3). The results of the analysis indicated that 28.2% of the variance in AT3 was explained by SE5 and AX5 ($R^2=0.282$, $F(12, 428)=13.985$, $p=0.000$).

Table 3. Results of regression analyses on the sub-dimensions of ATUTIES.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>B</th>
<th>Std. Error</th>
<th>Stand. β</th>
<th>t</th>
<th>p</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT1</td>
<td>SE1</td>
<td>-0.141</td>
<td>0.058</td>
<td>-0.167</td>
<td>-2.44</td>
<td>0.015***</td>
<td>0.38</td>
<td>2.60</td>
</tr>
<tr>
<td></td>
<td>SE5</td>
<td>-0.168</td>
<td>0.068</td>
<td>-0.197</td>
<td>-2.47</td>
<td>0.014***</td>
<td>0.28</td>
<td>3.55</td>
</tr>
<tr>
<td></td>
<td>AX1</td>
<td>-0.079</td>
<td>0.032</td>
<td>-0.146</td>
<td>-2.45</td>
<td>0.014***</td>
<td>0.50</td>
<td>1.97</td>
</tr>
<tr>
<td></td>
<td>AX3</td>
<td>0.078</td>
<td>0.035</td>
<td>0.150</td>
<td>2.23</td>
<td>0.026***</td>
<td>0.39</td>
<td>2.54</td>
</tr>
<tr>
<td>AT2</td>
<td>SE1</td>
<td>0.277</td>
<td>0.053</td>
<td>0.288</td>
<td>5.25</td>
<td>0.000*</td>
<td>0.39</td>
<td>2.52</td>
</tr>
<tr>
<td></td>
<td>SE5</td>
<td>0.269</td>
<td>0.061</td>
<td>0.277</td>
<td>4.39</td>
<td>0.000*</td>
<td>0.30</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td>AX1</td>
<td>0.079</td>
<td>0.030</td>
<td>0.129</td>
<td>2.64</td>
<td>0.008**</td>
<td>0.50</td>
<td>1.99</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>0.096</td>
<td>0.031</td>
<td>0.146</td>
<td>3.12</td>
<td>0.002**</td>
<td>0.54</td>
<td>1.82</td>
</tr>
<tr>
<td>AT3</td>
<td>SE5</td>
<td>-0.304</td>
<td>0.091</td>
<td>-0.250</td>
<td>-3.34</td>
<td>0.001*</td>
<td>0.30</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>0.136</td>
<td>0.046</td>
<td>0.164</td>
<td>2.98</td>
<td>0.003**</td>
<td>0.55</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Note: *p <0.001, **p <0.01, ***p <0.05. Sample consisted of 283 females and 168 males. AX1 to AX5, SE1 to SE5, and AT1 to AT3 are sub-dimensions of ETAS, ETSSES, and ATUTIES, respectively. “Std.” and “Stand.” refers to “standard” and “standardized”, respectively.

3.2. Self-Efficacy

Five multiple linear regression analyses were conducted using stress, depression and sub-dimensions of ETAS, and ATUTIES as independent variables (IV), and one of five sub-dimensions of ETSSES as the dependent variable (DV). The results of these regression analyses are depicted in Table 4. The first regression model was used to test if IVs significantly predicted “facilitating and inspiring student learning and creativity” (SE1). The results of the analysis indicated that 36.3% of the variance in SE1 was explained by AT2, AX1, and AX5 ($R^2=0.363$, $F(10, 437)=24.874$, $p=0.000$). The second regression model was used to test if IVs significantly predicted “designing and developing digital age learning experiences and assessments” (SE2). The results of the analysis indicated that 29.5% of the variance in SE2 was explained by AT2, AX1, and AX5 ($R^2=0.295$, $F(10, 439)=18.354$, $p=0.000$). The third regression model was used to test if IVs significantly predicted “modelling digital age work and learning” (SE3). The results of the analysis indicated that 38.5% of the variance in SE3 was explained by AT2, AT3, and AX5 ($R^2=0.385$, $F(10, 431)=26.985$, $p=0.000$). The fourth regression model was used to test if IVs significantly predicted “promoting and modelling digital citizenship and responsibility” (SE4). The results of the analysis indicated that 38.5% of the variance in SE4 was explained by AT2, AT3, and AX5 ($R^2=0.385$, $F(10, 431)=26.985$, $p=0.000$). The fifth regression model was used to test if IVs significantly predicted “engaging in professional growth and leadership” (SE5). The results of the analysis indicated that 47.4% of the variance in SE5 was explained by stress, AT2, AT3, AX1, and AX5 ($R^2=0.474$, $F(10, 432)=38.895$, $p=0.000$).
Table 4. Results of regression analyses on the sub-dimensions of ETSSES.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>B</th>
<th>Std. Error</th>
<th>Stand. β</th>
<th>t</th>
<th>p</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE1</td>
<td>AT2</td>
<td>0.426</td>
<td>0.046</td>
<td>0.424</td>
<td>9.25</td>
<td>0.000*</td>
<td>0.694</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>AX1</td>
<td>0.175</td>
<td>0.033</td>
<td>0.277</td>
<td>5.32</td>
<td>0.000*</td>
<td>0.538</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>-0.081</td>
<td>0.035</td>
<td>-0.118</td>
<td>-2.28</td>
<td>0.023***</td>
<td>0.547</td>
<td>1.83</td>
</tr>
<tr>
<td>SE2</td>
<td>AT2</td>
<td>0.368</td>
<td>0.048</td>
<td>0.369</td>
<td>7.62</td>
<td>0.000*</td>
<td>0.685</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>AX1</td>
<td>0.147</td>
<td>0.034</td>
<td>0.234</td>
<td>4.29</td>
<td>0.000*</td>
<td>0.539</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>-0.088</td>
<td>0.037</td>
<td>-0.130</td>
<td>-2.38</td>
<td>0.018***</td>
<td>0.539</td>
<td>1.85</td>
</tr>
<tr>
<td>SE3</td>
<td>AT2</td>
<td>0.457</td>
<td>0.047</td>
<td>0.449</td>
<td>9.76</td>
<td>0.000*</td>
<td>0.675</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>AT3</td>
<td>-0.092</td>
<td>0.039</td>
<td>-0.119</td>
<td>-2.35</td>
<td>0.019***</td>
<td>0.555</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>-0.095</td>
<td>0.035</td>
<td>-0.140</td>
<td>-2.71</td>
<td>0.007**</td>
<td>0.537</td>
<td>1.86</td>
</tr>
<tr>
<td>SE4</td>
<td>AT2</td>
<td>0.357</td>
<td>0.047</td>
<td>0.372</td>
<td>7.57</td>
<td>0.000*</td>
<td>0.675</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>AT3</td>
<td>-0.086</td>
<td>0.040</td>
<td>-0.116</td>
<td>-2.14</td>
<td>0.032***</td>
<td>0.556</td>
<td>1.79</td>
</tr>
<tr>
<td></td>
<td>Stress</td>
<td>-0.121</td>
<td>0.042</td>
<td>-0.126</td>
<td>-2.87</td>
<td>0.004**</td>
<td>0.630</td>
<td>1.58</td>
</tr>
<tr>
<td>SE5</td>
<td>AT2</td>
<td>0.483</td>
<td>0.043</td>
<td>0.478</td>
<td>11.35</td>
<td>0.000*</td>
<td>0.688</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>AT3</td>
<td>-0.078</td>
<td>0.036</td>
<td>-0.102</td>
<td>-2.15</td>
<td>0.032***</td>
<td>0.539</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>AX1</td>
<td>0.133</td>
<td>0.031</td>
<td>0.211</td>
<td>4.34</td>
<td>0.000*</td>
<td>0.515</td>
<td>1.94</td>
</tr>
<tr>
<td></td>
<td>AX5</td>
<td>-0.068</td>
<td>0.032</td>
<td>-0.101</td>
<td>-2.13</td>
<td>0.034***</td>
<td>0.542</td>
<td>1.84</td>
</tr>
</tbody>
</table>

Note: *p <0.001, **p <0.01, ***p <0.05. Sample consisted of 283 females and 168 males. AX1 to AX5, SE1 to SE5, and AT1 to AT3 are sub-dimensions of ETAS, ETSSES, and ATUTIES, respectively. “Std.” and “Stand.” refers to “standard” and “standardized”, respectively.

3.3. Anxiety

Five multiple linear regression analyses were conducted using stress, depression, and sub-dimensions of ETSSES and ATUTIES as independent variables (IV), and one of five sub-dimensions of ETAS as the dependent variable (DV). The results of these regression analyses are depicted in Table 5. The first regression model was used to test if IVs significantly predicted “workplace related anxiety” (AX1). The results of the analysis indicated that 16.9% of the variance in AX1 was explained by stress, AT2 and SE5 (R²=0.169, F(10, 437)=8.87, p=0.000). The second regression model was used to test if IVs significantly predicted “technological disadvantage-restriction related anxiety” (AX2). The second regression analysis did not produce a significant model (R²=0.013, F(10, 439)=1.61, p=0.101). The third regression model was used to test if IVs significantly predicted “technology integration related anxiety” (AX3). The results of the analysis indicated that 12.9% of the variance in AX3 was explained by stress and AT2 (R²=0.129, F(10, 439)=6.507, p=0.000). The fourth regression model was used to test if IVs significantly predicted “technical anxiety” (AX5). The results of the analysis indicated that 11.3% of the variance in AX5 was explained by stress, AT2 and AT3 (R²=0.113, F(10, 438)=5.567, p=0.000).

Table 5. Results of regression analyses on the sub-dimensions of ETAS.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>B</th>
<th>Std. Error</th>
<th>Stand. β</th>
<th>t</th>
<th>p</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX1</td>
<td>Stress</td>
<td>0.342</td>
<td>0.083</td>
<td>0.223</td>
<td>4.13</td>
<td>0.000*</td>
<td>0.653</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>AT2</td>
<td>0.193</td>
<td>0.091</td>
<td>0.122</td>
<td>2.11</td>
<td>0.035***</td>
<td>0.572</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>SE5</td>
<td>0.331</td>
<td>0.128</td>
<td>0.211</td>
<td>2.59</td>
<td>0.010**</td>
<td>0.286</td>
<td>3.49</td>
</tr>
<tr>
<td>AX3</td>
<td>Stress</td>
<td>0.336</td>
<td>0.148</td>
<td>0.125</td>
<td>2.27</td>
<td>0.024***</td>
<td>0.658</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>0.332</td>
<td>0.088</td>
<td>0.207</td>
<td>3.77</td>
<td>0.000*</td>
<td>0.659</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>AT2</td>
<td>0.233</td>
<td>0.098</td>
<td>0.141</td>
<td>2.38</td>
<td>0.018***</td>
<td>0.568</td>
<td>1.76</td>
</tr>
<tr>
<td>AX4</td>
<td>Stress</td>
<td>0.259</td>
<td>0.075</td>
<td>0.193</td>
<td>3.44</td>
<td>0.001*</td>
<td>0.659</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>SE3</td>
<td>-0.223</td>
<td>0.105</td>
<td>-0.166</td>
<td>-2.11</td>
<td>0.035***</td>
<td>0.338</td>
<td>2.96</td>
</tr>
</tbody>
</table>
4. DISCUSSION

The purpose of this study was to investigate the associations between alternative certification preservice teachers’ levels of depression, stress, educational technology anxiety, self-efficacy for educational technology, and attitude towards using technology in education in order to provide insight into the interplay between intrinsic factors affecting technology integration. First of all, it was found that the mean perceived stress level (20.55) was higher than previously reported norms (14.2), with a general population sample ranging in age from 18 to 29 (Cohen, 1994). The mean level of severity of depression (13.00) was also higher than the norm mean value (9.14), as reported by Whisman and Richardson (2015). The proportion of preservice teachers who scored 19 and above on Beck’s Depression Inventory, and were therefore showing indications of moderate to severe depression, was 22.6%. This percentage was considerably higher than the proportion of undergraduate students (12%), as reported by Whisman and Richardson (2015). Hence, alternative certification preservice teachers, to a large extent, seem to suffer from stress and depression. Alternative certification programs are beneficiary for those individuals with an undervalued profession, which does not provide them with satisfactory job opportunities (Gülbağcı Dede & Akkoç, 2016; Erol, Özdemir, Turhan, Özan, & Polat, 2017; Polat, 2014). Unemployable graduates who enroll in those programs suffer intense anxiety about the future (Sezgin Nartgün & Gökçer, 2014); they see the program as a source of hope (Erol et al., 2017) to “get rid of the burden on the family by gaining economic independence as soon as possible” (Sezgin Nartgün & Gökçer, 2014, p. 64). Considering the influence of negative emotional states on learning, attitude towards and intention to use technology, technology adoption, and self-efficacy for and attitude towards technology integration, teacher training institutions should consider designing and providing resources to help preservice teachers suffering from negative emotional states.

Findings revealed that age did not correlate with stress, depression, total scale scores and sub-dimensions of ETAS, ETSSES, and ATUTIES. Considering the diversity of the bachelor’s degrees that participants hold, and that the participants’ ages ranged between 19 and 46, the insignificance of all associations between age and the parameters were remarkable. Possible influence of age on parameters may have been overshadowed by the effects of negative emotional states, which were intensified by social and economic factors. It is also possible that the effect of studying educational technology at teacher training institutions on self-efficacy for and attitude towards educational technology may be much stronger than any possible effect of training in or gaining experience in other fields. Without formal training, the variances in self-efficacy and attitude seem to have remained low in a narrower band, thus ruling out a correlation with age.

Mean levels of stress and depression did not differ according to gender. Neither did mean levels of ATUTIES, ETSSES, self-efficacy for “facilitating and inspiring student learning and creativity”, “designing and developing digital age learning experiences and assessments”, and “modelling digital age work and learning”, or anxiety about “technology integration”. However, females were more anxious about using educational technology. Remarkably, all of the sub-dimensions of ATUTIES differed according to gender even though total scale scores did not. While females had more positive attitudes towards “improving oneself in using technology in education”, males had a more positive attitude towards “reflection of using technology in education on instructional processes” and “using technology in education and classroom management”. Moreover, females also had a stronger self-efficacy for “promoting and modelling digital citizenship and responsibility” and “engaging in professional growth and leadership” even though the ETSSES scale scores did not differ according to gender. Therefore, female preservice teachers have a stronger self-efficacy for and more positive attitude towards professional improvement and leadership even though
they suffer more from workplace, technical and management related anxieties. The contrast between gender differences in total scale scores and sub-dimensions indicate that gender differences may exist in the details even though they may not be visible on a macro level. A nuanced understanding of self-efficacy for and attitude towards using educational technology may help teacher training to be more successful regarding technology integration.

Workplace and technical anxiety, as well as self-efficacy for “facilitating and inspiring student learning and creativity” and “engaging in professional growth and leadership”, explained attitudes towards “improving oneself in using technology in education”. Additionally, workplace and technology integration related anxiety, as well as self-efficacy for “facilitating and inspiring student learning and creativity” and “engaging in professional growth and leadership”, explained attitudes towards “reflection of using technology in education on instructional processes”. Remarkably, same predictors explained an increase in “improving oneself in using technology in education” and a decrease in “reflection of using technology in education on instructional processes”. Moreover, attitudes towards “using technology in education and classroom management” was predicted by self-efficacy for “engaging in professional growth and leadership” and technical anxiety. Self-efficacy for “engaging in professional growth and leadership” was the strongest predictor among the IVs. However, an increase in that sub-dimension of self-efficacy gave way only to attitude towards improving oneself. Negative association of professional-growth related self-efficacy with instructional processes and classroom management related attitudes indicate that the relationship between self-efficacy and attitude is not a unidirectional one. Findings revealed that strengthening self-efficacy beliefs may also weaken the attitude. In a similar way, those who were more anxious about the workplace had a more positive attitude to “improving oneself in using technology in education” and a more negative attitude towards “reflection of using technology in education on instructional processes”. On the other hand, those who suffered more from technical anxiety had a more positive attitude towards both “improving oneself in using technology in education” and “using technology in education and classroom management”. It seems that anxiety may both hinder and promote desired attitudes. Anxiety about social phenomena such as the workplace seem to motivate individuals to improve themselves, while also making it difficult for them to perform. Anxiety about capabilities such as technical anxiety seems to move the individuals away from primary purposes such as “instructional processes” and closer to secondary purposes such as “classroom management” and self-improvement.

Attitudes towards “improving oneself in using technology in education” was the strongest predictor of self-efficacy for using educational technology, which explains all of the sub-dimensions. Having a more positive attitude towards improving oneself seems to indicate that a certain level of competence already exists. Attitude towards “using technology in education and classroom management” was the second strongest predictor, which explains a decrease in self-efficacy for “modelling digital age work and learning”, “promoting and modelling digital citizenship and responsibility”, and “engaging in professional growth and leadership”. This finding indicates that attitude towards using technology for management, which was predicted by higher technical anxiety, may cause individuals to question their capacities to successfully use educational technology, especially in the context of rapidly-advancing modern technologies. Technical anxiety predicted a decrease in all sub-dimensions of ETASSES with the exception of self-efficacy for “promoting and modelling digital citizenship and responsibility”. Remarkably, workplace anxiety predicted an increase in self-efficacy for “facilitating and inspiring student learning and creativity”, “designing and developing digital age learning experiences and assessments”, and “engaging in professional growth and leadership”. Similar with the case in attitude, anxiety about the workplace seems to orient individuals to self-improvement. The same social anxiety explains a stronger belief in the capability in inspiring, designing and developing. Moreover, stress was also a predictor of self-efficacy for “engaging in professional growth and leadership”. In contrast with anxiety, stress predicts a decrease in individuals’ belief in the capability for self-improvement and leadership.

Stress was the strongest predictor of anxiety about using technology, which explains an increase in all sub-dimensions of ETAS, with the exception of technological disadvantage-restriction.
related anxiety. Attitude towards “improving oneself in using technology in education” explains an increase in workplace, technology integration, and technical related anxieties. This echoes the findings from the regressions on sub-dimensions of ATUTIES, which indicate an association of self-improvement with workplace and technical anxieties. Moreover, while self-efficacy for “engaging in professional growth and leadership” predicted an increase in workplace anxiety, self-efficacy for “modelling digital age work and learning” predicted a decrease in anxiety about technology management. These findings indicate that the associations of negative emotional states with self-efficacy for and attitude towards using educational technology are bidirectional.

5. CONCLUSION

Alternative certification programs were developed to help remedy teacher shortages stemming particularly from teacher drop-outs. The findings of this study revealed that alternative certification preservice teachers suffer from stress, depression, and anxiety, even more so than other undergraduate students. They are individuals with an undervalued profession, who are having trouble finding a job and are, therefore, suffering from negative emotional states; thus, they see the programs as a source of hope and enroll in them in order to eradicate the overwhelming social and economic problems that cause the negative emotional states in the first place. It should be noted that teacher shortages are also, to a large extent, a result of social and economic problems with regards to teachers’ salaries and working conditions. It seems that teachers who are overwhelmed by the social and economic burdens of being a teacher are being replaced by other poorly-trained teacher candidates, who are willing to bear the ‘burden’ to save themselves from even more overwhelming problems. This may give way to an increase in the number of in-service teachers suffering from negative emotional states. Teacher training institutions may be provided with better resources and capabilities, which they can utilize to help preservice teachers cope with negative emotional states.

The findings of the study revealed that, rather than a linear sequence leading from emotional states, through beliefs and then to attitude, as suggested in the TAM, there may be bidirectional and cyclical relationships between emotional states, self-efficacy, and attitude. Sub-dimensions of attitude were predicted by sub-dimensions of self-efficacy, and vice versa. In a similar vein, sub-dimensions of attitude and self-efficacy were predicted by negative emotional states while sub-dimensions of anxiety were predicted by sub-dimensions of attitude and self-efficacy. Workplace anxiety seems to orient preservice teachers to improve themselves in using educational technology while making it more difficult for them to actually use educational technology. Additionally, technical anxiety seems to move the individuals away from using educational technology for instructional purposes and closer to using it for classroom management and self-improvement. On the other hand, findings revealed that attitude towards using technology for classroom management, may cause individuals to question their capacities to successfully use educational technology with regards to rapidly-advancing technologies of the digital era. Finally, the findings indicate that both self-efficacy and attitude have a dichotomous nature regarding using educational technology. Using educational technology for instructional purposes in the classroom and for secondary purposes such as classroom management and self-improvement are associated with different sets of self-efficacy beliefs and attitudes. Remarkably, self-efficacy beliefs for self-improvement may adversely affect the attitudinal factors that are in a positive relationship with self-efficacy beliefs for actually using educational technology, and vice versa. Developing a more rigorous and elaborate program on educational technology, which addresses all modern aspects of using educational technology, can help teacher training institutions strengthen the preservice teachers’ self-efficacy for and attitudes towards using educational technology that is needed for successful technology integration.

REFERENCES


The Role of Self-Esteem in Adolescents' Perception of Parents and Social Anxiety Levels

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Abstract

The purpose of this study is to examine whether the relationship between adolescents' perceptions of parents and their social anxiety levels is mediated by self-esteem. The sample of the study consisted of 694 (324 female and 360 male) volunteer high school students selected with a simple random sampling method from different high school types in Mersin province during the 2017-2018 academic year autumn term. The following tools were used in this study: "Perception of Parents Scale" which was developed by Robbins (1994) and adapted to Turkish by Kocayörük (2009); "Rosenberg Self-Esteem Scale" developed by Rosenberg (1965) and translated into Turkish by Çuhadaroğlu (1986); "Social Anxiety Scale for Adolescents" was developed by La Greca and Lopez (1998) and adapted to Turkish by Aydın and Tekinsav (2007). Multiple regression analysis was used to analyze the data. The results show that there is a negative relationship between adolescents' social anxiety levels and their perception of their parents and self-esteem. In addition to these results, it was concluded that self-esteem had a full mediating effect on the relationship between the perception of both mothers and fathers of their adolescents and their social anxiety levels.

Keywords: Adolescence, Perception of Parents, Social Anxiety, Self-Esteem

INTRODUCTION

In the process of growth, children begin to form self-perception through messages they receive from their parents through various channels. This concept, called self, is the emotions and thoughts of people about their abilities, behaviors and worthiness (Atkinson et al., 2006). Rogers states that the concept of self is in a certain coherence. This need for consistency affects the way people perceive their surroundings (Gündüz, 2017).

While the individual's thoughts about themselves as a person about their personal characteristics constitute the concept of self (Burger, 2016); self-esteem is the extent to which the individual rewards, values, endorses or loves themselves in the general success of the individual or in areas of life that are particularly meaningful to the individual (Mruk, 2013). Rosenberg treats self-esteem, which is also conceptualized as self-respect, as a positive or a negative attitude of the individual towards themselves. If the self-evaluation of the individual is positive, their self-esteem will be high; and if it contains negativity, it will be low (Torucu, 1990). The common point that humanitarian psychologists have focused on is what people think about themselves, and self-esteem is seen as an important structure that affects their relationship with themselves and others (Burger, 2016). People's well-being is positively affected by self-esteem, which has a close relationship with many human variables (Neff, 2011); otherwise, the level of depression and learned helplessness may increase (Orth and Robins, 2013; Yücel, 2013; Orth, Robins, & Roberts, 2008). Individuals with low self-esteem exhibit overeating behaviors more (Martyn et al., 2009) and there are generally negative relationships between self-esteem and adaptation and behavioral disorders (Zeigler-Hill, 2011).

Teachers and parents contribute to the development of self-esteem by identifying their superiority and distinguishing their children from others (Burger, 2016). In the conducted research, the positive relationships that parents have with their children is reported to be effective on emotional intelligence (Bozdemir, 2015), self-perception (Sezer, 2010), and self-esteem (Erbil, Divan and Önder, 2006). According to research, it is seen that the individuals who grow with democratic parental attitudes have high self-esteem (Sezer, 2010; Ersoy, 2013). According to the research results of Yücel (2013), students' self-esteem is positively related with the perceived democratic parental attitudes and negatively related with the perceived protective and authoritarian parental attitudes.

According to Bowlby, the closeness between the caregiver and the child serves as "a safe base" that the child can use to discover his environment and "a strong shelter" where the child can be protected in case of danger (Sümer and Güngör 1999a). Undoubtedly, these foundations, which were set in the early childhood, also affect the processes of adolescence and after. Parents' attitudes can be vital in this process. Especially in a period such as adolescence when both physical and emotional changes are happening, and academic and professional preferences are shaped, it is important to develop perception of parents and healthy relationships. In other words, the family has an important impact on the development of the child's personality and behavior through being an important institution with its economic, cultural and social dimensions, as well as the successful completion of a critical development process such as adolescence. It can be concluded that parents' support contributes to the basic psychological needs of adolescents, their development of independent sense of self, self-esteem and well-being (Kocayıroğlu, 2012).

For a positive sense of self and a high level of self-esteem, the family in which children grow up and the social environment they interact with are important. Adolescents with positive attachment to their parents have high self-esteem (Bayraktar, Sayılı and Kumru, 2009). According to Arslan (2018), there is a positive and significant relationship between perceived acceptance and interest from parents and self-esteem.

The relationships between parents and adolescents are associated with many important structures and variables. Many positive and negative characteristics gained in the family can affect the relationships with other people in their social life. The child uses the patterns they have gained from their parents in their relationship with the outside world and others. Adolescence, which includes an
important process in the human life, represents an important period in which many changes and developments occur, as well as social anxiety. Adolescence is a period when acceptance by friend groups have the highest importance and when one realizes how important the impressions individuals leave on others truly are (Sübaşı, 2007). Social anxiety is defined as anxiety caused by negative affect, anxiety and negative psychological stimulation in social situations, including the possibility of being evaluated or the possibility of being evaluated by others (Schlenker & Leary, 1982). In this context, adolescents start to avoid social environments with the fear of being evaluated negatively.

Although people, as social beings, pay attention to how they are seen by others at almost every age, this sensitivity can be maximized in adolescents whose identity and personality have not yet been settled. Attitudes, especially when raising children in a family environment, can be seen as determining factors in terms of social anxiety. Erkan (2002) stated that the students with high social anxiety level were exposed to a predominantly authoritarian and protective attitude in their families. On the other hand, it is seen that there is a similar result in the studies that reveal the relationships between the perception of parents and attachment styles of the individuals and their social anxiety levels. Manning et al. (2017) reported a positive relationship between insecure attachment and social anxiety in twenty-eight of the thirty studies they examined in the screening study. In another screening study, Brook and Schmidt (2008) found that over-control in the parent and family interaction and the psychopathology of the parents were the main determinants of social anxiety problems in children. There are many studies reporting that attitudes and atmosphere created by anxious parents raise children's anxiety levels (Festa and Ginsburg, 2011; Crosby Budinger, Drazdowski, and Ginsburg, 2013; Knappe, Beesdo, Fehm, Lieb and Wittchen, 2009).

Studies in literature also show that there is a relationship between self-esteem and social anxiety. While social appearance anxiety was low in those with high self-esteem (Şirin, 2015; Kılıç, 2015), low self-esteem was seen in children who participated less in social events (Çevik Büyükşahin and Atıcı, 2009). According to Sübaşı (2007), the most important predictors of social anxiety are the variables of self-esteem and loneliness. In many studies, self-esteem was negatively and significantly correlated with social anxiety (Kocovski and Endler, 2000; De Jong, 2002; Rasmussen & Pidgeon, 2011; De Jong, Sportel, De Hullu and Nauta, 2011). On the other hand, there are few studies examining the three variables in the present study; self-esteem, parental attitudes and social anxiety. One of them, Eroglu (2018), found a negative correlation between social anxiety and self-esteem, and positive correlation with protective attitudes; and a positive relationship was determined between self-esteem and democratic attitudes.

Self-esteem is an important concept found in direct relationships with many variables as outlined above. In addition to direct relationships, self-esteem was shown to have significant impact as an intermediary variable in some studies. According to this, the mediating role of self-esteem, between social anxiety and awareness (Rasmussen & Pidgeon 2011); problem solving and parental attitudes (Kayaalp and Gündüz, 2018); life satisfaction and social support (Kong, Zhao and You, 2013); automatic thoughts and hopelessness (Çakar, 2014), problem solving skills and loneliness (Karataş, 2014) has been shown.

As seen in the related research, it is seen that there are important relationships between the perception of parents, self-esteem and social anxiety variables developing on the basis of parental relations. When examined, no studies were found that examined these three variables and tested the mediation of self-esteem. It is thought that the findings will provide a scientific basis for school-based psychological counseling for adolescents and their parents. The aim of this study is to examine the role of self-esteem in the relationship between perception of parents and social anxiety.
METHODOLOGY

Models of Research

This descriptive correlational research was conducted with the aim of examining the mediator role of self-esteem in the relationship between adolescents’ perception of parents and social anxiety levels.

Research Group

In order to create the research group, data was collected from 694 volunteer high school students selected with a simple random sampling method from different high school types in Mersin province during the 2017-2018 academic year autumn term. 324 (46.7%) of the students were female and 360 (53.3%) were male. Of the participants from seven high schools in Mersin, 223 (32.1%) were 9th grade, 178 (25.6%) were 10th grade, 170 (24.5%) were 11th grade and 123 (17.7%) were 12th grade students.

Data Collection Tools

Personal Information Form: In order to define the study group and to determine the independent variable of the study, Personal Information Form prepared by the researchers was used.

Perceptions of Parents Scale (POPS): In order to measure the perceptions of adolescents towards their parents, the Perceptions of Parents Scale form developed by Robbins (1994) and adapted to Turkish by Kocayörük (2009) was used. With POPS, measurements in three sub-dimensions (participation, support for autonomy and closeness) can be made after making inverse scoring, and the total score of perception towards the parent can be obtained by combining these dimensions. A high score indicates that the parent has a high level of autonomy support and a low score indicates that the parent has more control. The scale consists of 21 items and it is a 7-point Likert type (1 = completely wrong, 7 = completely correct) scale. In the adaptation study, while the Cronbach alpha internal consistency coefficient for the total score of the mother form of the scale was .91, the Cronbach alpha internal consistency coefficients of the sub-dimensions were reported between .58 and .90. In the adaptation study, while the Cronbach alpha internal consistency coefficient for the total score of the father form of the scale was .93, the Cronbach alpha internal consistency coefficients of the sub-dimensions were reported between .62 and .92. In this study, total scores obtained from the scale were evaluated and Cronbach alpha internal consistency coefficient was found to be .94 according to the total score obtained from the mother form; and the Cronbach alpha internal consistency coefficient was found to be .94 according to the total score obtained from the father form.

Rosenberg Self-Esteem Scale (SES): The Rosenberg Self-Esteem Scale (Short Form), which was developed by Rosenberg (1965) and translated to Turkish by Çuhadaroğlu (1986), was used in order to determine the perceptions of individuals about their self-worth. The scale consists of five positive and five negative items for a total of 10 items and it is a 4-point Likert-type scale. The lowest score that can be obtained from the measurement tool is 10 and the highest score is 40. A high score from the measuring tool indicates a high self-esteem. Çuhadaroğlu (1986), who performed the adaptation study of the scale, reported that the scale had a Cronbach α coefficient of .76. In this study, Cronbach's alpha internal consistency coefficient of the scale was .84.

Social Anxiety Scale for Adolescents (SAS-A): It was developed by La Greca and Lopez (1998) in order to measure the social anxiety of adolescents. The adaptation of the scale to Turkish was performed by Aydin and Tekinsav (2007). The scale is a five-point Likert type (1 = Never, 5 = Always) scale. 18 items of the scale, which consists of 22 items, are taken as scale items and the other 4 items are about other topics and not included in the scoring. In this case, the lowest possible score from the scale is 18 and the highest score is 90. While a total score can be obtained from the scale, the scale can also be taken into consideration in 3 sub-dimensions (Fear of negative evaluation, fear and restlessness in new social situations and fear and restlessness in general social situations). In the
adaptation study, the Cronbach alpha internal consistency coefficient for the total score of the scale was .88, whereas the Cronbach alpha internal consistency coefficients of the sub-dimensions were reported between .68 and .83. In this study, total scores obtained from the scale were evaluated and Cronbach alpha internal consistency coefficient was .89.

Procedure

After obtaining the permission from the necessary institutions, the measurement tools were applied during class hours. The participants were informed about the purpose of the study and application was performed with volunteer individuals. The application of measuring tools took approximately 15-20 minutes.

Data Analysis

Data were analyzed using SPSS 20.00 software. Multiple regression analysis was used to analyze the data. The mediation effect was based on the model proposed by Baron and Kenny (1986). The assumptions of multiple regression analysis were tested before data analysis was performed. The test results showed a normal and linear distribution of data.

FINDINGS

The relationships between the variables in this study where social anxiety is predicted in high school students and the mean and standard deviation values of the variables are given in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Sd</th>
<th>α</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perception of Mother</td>
<td>78.59</td>
<td>14.08</td>
<td>.92</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perception of Father</td>
<td>77.41</td>
<td>17.84</td>
<td>.94</td>
<td>.53**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Self-Esteem</td>
<td>20.07</td>
<td>5.79</td>
<td>.84</td>
<td>.31**</td>
<td>.27**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Social Anxiety</td>
<td>39.24</td>
<td>11.66</td>
<td>.89</td>
<td>-.19**</td>
<td>-.14**</td>
<td>-.42**</td>
<td>1</td>
</tr>
</tbody>
</table>

**p<.01

When Table 1 is examined, it is seen that there is a significant positive relationship between the perception of mother and perception of father (r = .53; p <.01) and self-esteem (r = .31; p <.01); and a significant negative relationship with social anxiety (r = -.19; p <.01). There was a significant positive correlation between the perception of father and self-esteem (r = .27; p <.01) and a significant negative correlation with social anxiety (r = -.14; p <.01). However, there was a significant negative correlation between self-esteem and social anxiety (r = -.42; p <.01). The internal consistency coefficients of the variables are between .84 and .94.

<table>
<thead>
<tr>
<th>Steps of Mediating Variable Test</th>
<th>B</th>
<th>Sh</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Perception of Mother (P)</td>
<td>Social Anxiety (C)</td>
<td>-.16</td>
<td>.03</td>
<td>-.19</td>
<td>-5.01</td>
</tr>
<tr>
<td>R= .19, R²= .04, F= 25.083</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Perception of Mother (P)</td>
<td>Self-esteem (C)</td>
<td>.13</td>
<td>.02</td>
<td>.31</td>
<td>8.63</td>
</tr>
<tr>
<td>R= .31, R²= .10, F= 74.473</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Perception of Mother (P)</td>
<td>Social Anxiety (C)</td>
<td>-.05</td>
<td>.03</td>
<td>-.06</td>
<td>-1.75</td>
</tr>
<tr>
<td>Self-esteem (M)</td>
<td>Social Anxiety (C)</td>
<td>-.80</td>
<td>.07</td>
<td>-.40</td>
<td>-10.92</td>
</tr>
<tr>
<td>R= .42, R²= .18, F= 74.252</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p<.01 and *p<.05 (P)= Predictor, (M)= Mediator (C)=Criteria, Dependent Variable
The regression analysis of predicting the mediating role of self-esteem in the relationship between adolescents' perception of their mothers and their social anxiety levels was carried out in three steps as suggested by Baron and Kenny (1986). The results obtained from the analysis are shown in Table 2. In the first step, adolescents' perception that their mothers support their autonomy was seen to reduce their social anxiety levels ($B = -.16; \beta = -.19; P<.001$) and explains 19% of the variance. In the second step, adolescents' perception that their mothers support their autonomy was seen to increase their self-esteem ($B = .13; \beta = .31; P<.001$) and explains 31% of the variance. In the third step, self-esteem determined as a mediator variable was seen to decrease social anxiety levels ($B = -.80; \beta = -.40; P<.001$). Perception of mother and self-esteem together explain 42% of the variance. In addition, when the mediator variable, self-esteem, is taken into consideration, the perception of mother does not significantly predict social anxiety levels ($B = -.05; \beta = -.06; P>.05$). When the mediator variable and the predictive variable are analyzed together, the reduction or disappearance of the meaningful relationship between the predictor and the predicted variable is considered to be the last criterion indicating the mediating effect. Therefore, in this study, it can be said that there is a full mediating effect of self-esteem on the relationship between perception of mother and social anxiety.

When the table is examined, perception of mother's support of autonomy increases self-esteem and self-esteem decreases the level of social anxiety ($B = .13*-.80=-.10; \beta = -.73; P=.00$). This effect can also be interpreted as follows; each unit increase in perception of mother scores, leads to an increase of .13 units in self-esteem scores and -.80 of this increase affects the social anxiety level. The indirect effect of perception of mother on the level of social anxiety is (.13 *-.80) -.10.

Table 3. Regression Analysis Results of the Predictive Role of Self-Esteem among Adolescents’
Perceptions of Fathers and Social Anxiety Levels

<table>
<thead>
<tr>
<th>Steps of the Mediating Variable Test</th>
<th>B</th>
<th>Sh</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of Father (P)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social anxiety (C)</td>
<td>-.09</td>
<td>.03</td>
<td>-.14</td>
<td>-3.73</td>
<td>.00**</td>
</tr>
<tr>
<td>$R= .14, R^2= .02, F= 13.907$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of Father (P)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-esteem (C)</td>
<td>.09</td>
<td>.01</td>
<td>.27</td>
<td>7.48</td>
<td>.00**</td>
</tr>
<tr>
<td>$R= .27, R^2= .08, F= 55.956$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of Father (P)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social anxiety (C)</td>
<td>-.02</td>
<td>.02</td>
<td>-.03</td>
<td>-.80</td>
<td>.43</td>
</tr>
<tr>
<td>Self-esteem (M)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social anxiety (C)</td>
<td>-.82</td>
<td>.07</td>
<td>-.41</td>
<td>-11.36</td>
<td>.00**</td>
</tr>
<tr>
<td>$R= .42, R^2= .17, F= 72.791$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p<.01 and *p<.05 (P)= Predictor, (M)= Mediator (C)=Criteria, Depending Variable

The results obtained from the analysis of adolescents' perception of their fathers are shown in Table 3. In the first step, adolescents' perception that their fathers support their autonomy was seen to reduce their social anxiety levels ($B = -.09; \beta = -.14; P<.001$) and explains 14% of the variance. In the second step, adolescents' perception that their fathers support their autonomy was seen to increase their self-esteem ($B = .09; \beta = .27; P<.001$) and explains 27% of the variance. In the third step, self-esteem determined as a mediator variable was seen to decrease social anxiety levels ($B = -.82; \beta = -.41; P<.001$). Perception of father and self-esteem together explain 42% of the variance. In addition, when the mediator variable, self-esteem, is taken into consideration, the perception of father does not significantly predict social anxiety levels ($B = -.02; \beta = -.03; P>.05$). When the mediator variable is analyzed together with the predictor variable, with the removal of the significant relationship between the predicting and predicted variable, it can be said that there is a full mediating effect of self-esteem in the relationship between perception of father and social anxiety.

When the table is examined, perception of father's support of autonomy increases self-esteem and self-esteem decreases the level of social ($B = .09*-.82=-.07; \beta = -.62; P=.00$). This effect can also be interpreted as follows; each unit increase in perception of father scores, leads to an
increase of .09 units in self-esteem scores and -.82 of this increase affects the social anxiety level. The indirect effect of perception of father on the level of social anxiety is (.09 * -.82) -.07.

RESULTS, DISCUSSION AND SUGGESTION

In this study, the mediating role of self-esteem among the parental perception levels of high school students and their social anxiety levels was examined. According to the results obtained from the first correlation analysis, there was a positive correlation between the perception of the mother and the perception of father and self-esteem. According to this, it is observed that the self-esteem of adolescents with healthy parental connections are also higher. According to another result, the social anxiety of the students decreases as their perception of or bond with parents becomes stronger. These obtained results support the study findings that show a positive relationship between positive perception of parents and the self-esteem of the child (Erbil, Divan and Önder, 2006; Yücel, 2013; Arslan, 2018); and a negative relationship with social anxiety (Erkan, 2002; Festà and Ginsburg, 2011). Considering that the child's self-perception is formed primarily by the interactions taken from the parents, it can be said that the self-esteem of the individuals whose basic needs are met in a healthy way, will increase. First the family in which they were born and raised in, and then the teachers, are important people who make efforts to develop children's self-esteem (Burger, 2016). It can be concluded that parents' support contributes to the basic psychological needs of adolescents, their development of independent sense of self, self-esteem and well-being (Kocayörük, 2012). For a positive sense of self and a high level of self-esteem, the family in which children grow up and the social environment they interact with are important. Adolescents with positive attachment to their parents have high self-esteem (Bayraktar, Sayil and Kumru, 2009).

Similarly, social anxiety levels of children with positive relationships with their parents are also low. According to the attachment theorists, in the normal conditions, the relationship between the mother, who is the child's first caregiver, is the determinant of the future relationship-building behavior (Bowby, 1988). In other words, it is more likely for individuals who have a negative perception of parents to experience problems in their interaction with other people in the following years. According to this, there is a parallelism with the studies reporting that the social anxiety of children who have insecure attachment to their mothers and whose parents are anxious, is also high (Manning et al., 2017; Festà and Ginsburg, 2011; Crosby Budinger, Drazdowski, and Ginsburg, 2013; Knappe, Beesdo, Fehm, Lieb and Wittchen, 2009).

Studies in literature also show that there is a relationship between self-esteem and social anxiety. While social appearance anxiety was low in those with high self-esteem (Şirin, 2015; Kılıç, 2015), low self-esteem was seen in children who participated less in social events (Çevik Büyükşahin and Atıcı, 2009). In many studies, self-esteem was negatively and significantly correlated with social anxiety (Kocovski and Endler, 2000; De Jong, 2002; Rasmussen & Pidgeon, 2011; De Jong, Sportel, De Hullu and Nauta, 2011).

On the other hand, when the results of the analysis on mediation are examined, it is seen that self-esteem has mediating effect on perception of mother and social anxiety. According to this, while the perception of mother's support of autonomy increases self-esteem, this increase in self-esteem also decreases the level of social anxiety. In other words, every increase in perception of mother scores leads to an increase in self-esteem scores and this decreases the level of social anxiety. When the dimension of the study which deals with the father-adolescent relationship is examined, it is seen that similar results have been reached. Again, while the perception of father's support of autonomy increases self-esteem, this increase in self-esteem also seen to decrease the level of social anxiety. In other words, every increase in perception of father scores leads to an increase in self-esteem scores and this decreases the level of social anxiety. In short, it can be said that the self-esteem of adolescents with a positive and healthy perception of their parents increases and consequently their social anxiety decreases significantly. Although there is no study investigating the mediating effect of self-esteem on the parental perception and social anxiety relationship; it has been reported that this concept has a
mediating effect on the relationships of different variables (Rasmussen & Aileen M. Pidgeon 2011; Kayaalp and Gündüz, 2018; Kong, Zhao and You, 2013).

Based on the results of the study, school based training and support can be conducted aimed at parents to strengthen adolescents’ perception of parents. In this regard, intervention studies can be conducted within the framework of PSG services in each school. Similarly, individual or group work can be carried out on students who have problematic parental relationships. Efforts can be made to increase the self-esteem of students and to reduce their social anxiety.

"We thanks to Öymen Gündüz for his contributions to the data collection process."

REFERENCES


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Identification of Differential Item Functioning on Mathematics Achievement According to the Interactions of Gender and Affective Characteristics By Rasch Tree Method

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Abstract

Mathematical knowledge and skills are needed to find solutions to the problems encountered in daily life. Although individuals are given the opportunity to receive equal education, it is seen that there are differences in the achievement of individuals. Individual-based factors can affect the achievement of individuals. One of the most important of these individual-based factors is the gender factor. It is important to examine the reasons behind the items of mathematics test showing the Differential Item Functioning (DIF) by gender. In this research, the interaction of gender and intrinsic motivation, instrumental motivation, self-efficacy, and anxiety variables on mathematics test items was examined in terms of DIF to understand the reasons of gender differences in the mathematical achievement of students who participated in PISA 2012. The study group of this research constituted 1084 students who participated in the application in Turkey, who answered booklets 3, 5 and 11 in the PISA 2012 mathematics literacy test. The data was analyzed by Iterative Hybrid Ordinal Logistic Regression (IHOLR) in the Lordif package program and Rasch Tree Method (RTM) in Psychotree package program and items showing DIF according to gender were determined. According to the findings, some mathematics test items showed DIF according to gender. It was found that items also showed DIF according to gender and intrinsic motivation interaction, and gender and self-efficacy interaction. It was observed that status of items showing DIF changed according to a certain threshold value of the girls’ intrinsic motivation and self-efficacy score. It was found that mathematics items did not show DIF according to gender and instrumental motivation interaction, and gender and anxiety interaction. As a result, it was observed that status of items showing DIF according to gender could change according to gender and affective characteristics interaction.

Keywords: Differential Item Functioning, Mathematical Literacy, PISA, Rasch Tree Method

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INTRODUCTION

Scientific and technological developments affect societies. Societies follow developments in the world and design their education accordingly. In today's rapidly developing world, the knowledge and skills expected from individuals can change. It is not enough for individuals only to have knowledge and they are expected to use the knowledge they have in daily life.

Societies want to nurture individuals who solve problems in their life and raise individuals to sustain their life. The fulfillment of these requirements which the societies expect from individuals requires them to have many basic knowledge and skills. One of these skills is the skill of mathematics. Mathematical knowledge and skills given to individuals increase the importance of mathematics teaching. Recent reforms in mathematics education are described with published documents in 1989, 1991, 1995 and 2000 by the National Council of Teachers of Mathematics (NCTM). It is stated in Assessment Standards for School Mathematics, one of the documents, that individuals should receive mathematics education equally regardless of gender, race, ethnicity and socioeconomic status (NCTM, 1995).

There are differences in the achievements of individuals who are considered to have mathematics education under equal conditions. Differences in mathematics achievement are also mentioned in international assessment projects. One of these projects is Programme for International Student Assessment (PISA). Since gender equality in education is important in terms of social justice and human rights, it has always been one of the most popular areas in international reports and studies. When examining gender differences in mathematics, boys show higher achievement than girls in 28 out of 31 participating countries in PISA 2000 and in 38 out of 40 countries in PISA 2003 (OECD, 2000 and 2004). In PISA 2000 and PISA 2012, in 38 out of 65 countries, boys show higher success than girls, while in only 5 countries this situation is reverse. In the remaining 22 countries, the achievements of girls and boys are similar (OECD, 2014). In PISA 2003 Turkey data, there are significant differences of 15 points in favor of boys in terms of mathematical literacy, whereas in PISA 2012 Turkey data, there are significant differences of 6 points in favor of boys.

When the differences according to gender are considered in terms of item type, it is seen that boys have higher achievement than girls in multiple-choice items (Bolger and Kellaghan, 1990; DeMars, 2000; Gipps and Murphy, 1994). Researches have shown that, as a cause of this condition, boys tend to take more risk and do not refrain from responding to items even if they are not sure, whereas girls prefer to leave the items blank (Ben-Shakhar and Sinai, 1991; Hanna, 1986). In addition, Liu and Wilson (2009a) illustrate that boys are superior to girls in complex multiple-choice mathematics items in PISA 2003. However, a different situation is observed in terms of constructed response items. DeMars (2000) and Gipps and Murphy (1994) found that girls show higher achievement than boys in constructed response items. As a reason for this situation, Bolger and Kellaghan (1990) and Bell and Hay (1987) state that girls express their thoughts more effectively because their language skills are higher. Lane, Wang and Magone (1996) emphasize that the mathematical processes required in constructed response tasks are explained in more detail by girls, whereas boys tend to focus on the results and tend to skip processes.

In PISA 2012, that the main subject of the project is the mathematics literacy, questionnaires consisting of some items on the attitudes and engagements with learning in mathematics have been applied. The questionnaire also aims to measure variables; intrinsic motivation (how much fun students have while learning mathematics), instrumental motivation (students’ perceptions of using mathematics in their future studies and careers), self-efficacy (how much students trust their abilities in performing mathematical tasks), anxiety (how much students worry about their mathematics performance). It is thought that these variables have effects on mathematics achievement and affect individuals’ differentiation in mathematics achievement (OECD, 2015).

Education Reform Initiative (ERI) (2014) published a report based on the PISA 2012 data for Turkey. In the report, they showed that girls were lower intrinsic motivation than boys, whereas girls
were higher instrumental motivation than boys in mathematics. In terms of self-efficacy, it is stated that boys generally had higher self-efficacy than girls. Girls had higher self-efficacy than boys when answering the items included equations, whereas girls had lower self-efficacy than boys when answering the items included calculating the gasoline consumption rate of the car. They also stated that increasing self-efficacy beliefs of individuals with low self-efficacy may have an important role in preventing gender differences in mathematics achievement. When the role of anxiety variable in the gender differences in mathematics achievement is examined, they found that anxiety did not play an important role in the gender differences in mathematics achievement. However, socioeconomic status and type of program had an important role in mathematics success according to findings which were stated in their reports.

As can be seen, the achievements of individuals can be affected by psychological characteristics. The success of individuals in test items can be affected by secondary factors instead of the ability levels measured (Vi-Nhuan, 1999). There are three major sources of test bias for a particular group. The first is the bias that focuses on the content of the test. For example, items in the test may contain words which may be in favor of a group. The second is external bias. It refers to factors such as gender, race, language, the attitude of the individual, test anxiety, success, motivation and self-esteem. In addition, the type of items (such as multiple-choice, constructed response items), test time and individuals speed for answering the items are also sources of external bias. The third source of bias is the inappropriate use of tests (bias or injustice in choice) in selection and placement tests (Diamond, 1976; Green, 1981; Shinyoung, 1992; as cited in Eid, 2002).

In order to determine the bias, DIF analyzes are performed first. The methods of detecting differential item functioning are collected under the titles of Classical Test Theory (CTT) and Item Response Theory (IRT). Ellis and Raju (2003) state that Mantel-Haenszel (MH), Logistic Regression (LR) and delta plot (SIBTEST) methods are under CTT methods, whereas Lord's chi-square, Raju's area measures and likelihood ratio test methods are under IRT methods. Afterwards, different methods of detecting DIF have emerged. The Iterative Hybrid Ordinal Logistic Regression (IHOLR) and Rasch Tree (RT) methods are used in this study are some of the other methods. While IHOLR method is used because of combining logistic regression with the properties of IRT, RT method is used in terms of allowing multiple variables to be considered together to determine DIF in the items. Another advantage of RT method is that it does not need to specify the focus and reference groups as a prerequisite compared to most methods of determining DIF. RT method addresses the parameters of the item in all covariates when determining the groups and identifies the groups according to the covariate that gives the strongest instability (the inconsistency of the item parameters in the groups). For example, if it is desired to determine whether there is DIF in terms of gender and intrinsic motivation, it can be differentiated according to gender and then differentiated according to intrinsic motivation score. Whereas the covariate that gives the strongest item instability is gender, intrinsic motivation score is the second strongest one.

In addition, RT method has a superior feature in determining cut score than other methods. In methods that use predefined groups with continuous variables, arithmetic mean or median value is preferred as cutting points. In RT method, while grouping continuous variables, the value that gives the highest item parameter difference as the cutting point is considered. For example, some items show DIF by students’ intrinsic motivation scores. When determining the focus and reference group, instead of the arithmetic mean or the median value of the intrinsic motivation scores of individuals, the cut-off point where the parameter difference is highest in RT method is taken into account. When the arithmetic mean or median value is chosen as the cut-off point, this selection is an arbitrary choice and may differ from the actual parameter difference which indicates the strongest parameter change. This may cause the actual parameter difference to be hidden by another cut-off point (Strobl, Kopf & Zeileis, 2015).

In this study, Rasch tree method is used because it is a new method in determining the individual traits behind DIF and it has some advantages from other methods. The aim of this study is to examine the mathematics items included in the PISA 2012 application within the context of the
differential item functioning, depending on the interaction of motivation (intrinsic and instrumental), self-efficacy and anxiety variables with gender. For this purpose, the following questions were sought:

Do PISA 2012 mathematics items show the differential item functioning with respect to:

1. gender,
2. a combination of the covariates gender and intrinsic motivation,
3. a combination of the covariates gender and instrumental motivation,
4. a combination of the covariates gender and self-efficacy and
5. a combination of the covariates gender and anxiety.

**METHOD**

**Research Model**

The research is a descriptive research model in order to determine whether PISA 2012 mathematics test items show DIF according to the predefined variables and, it aims to describe the current situation as it exists (Karasar, 2010).

**Study Group**

PISA 2012 application includes 15-year-old students from 65 countries. 4848 students attend PISA 2012 Turkey application. These students are chosen randomly at 176 schools from 57 provinces representing the 12 regions determined by the Statistical Region Units Level 1 (Ministry of Education-MEB, 2015). The study group in this research consists of 1084 students participated in PISA 2012 mathematics applications from Turkey and answered only numbered 3, 5 and 11 test booklets from 13 test booklets. These booklets are preferred because the rate of missing data in these three booklets in Turkey application is less than other booklets.

**Data Analysis**

The study is carried out on 84 items in booklets 3, 5 and 11. The number of items in each booklet ranges from 11 to 37. IRT assumptions, whether speed test, unidimensionality, local independence and model-data compliance are examined. It is found that the test is not a speed test and it provides one-dimensional and local independence.

In order to determine whether PISA 2012 mathematics test items show gender-based DIF, the data are analyzed by RT method included in the psychotree package, and IHOLR method included in Lordif package in the R program. The data are analyzed with RT method in the Psychotree package program in the R program to determine DIF items according to combinations of the covariates gender and intrinsic motivation, self-efficacy, and anxiety variables.

The likelihood ratio chi-square test at significance level of .01 for IHOLR method, 5% differences in $\beta_1$ coefficient from Models 1 and 2 as a practically meaningful effect (Crane et al. 2004), and magnitude measures ($\Delta R^2$) at least .035 are taken as the DIF determination criterion. Jodoin and Gierl (2001) indicate DIF levels as $\Delta R^2 < .035$ DIF is absent or negligible, $$.035 \leq \Delta R^2 < .070$ DIF is moderate, $\Delta R^2 \geq .070$ DIF is large. The significance level of .05 is considered as the DIF determination criterion for RT method.
FINDINGS

The findings obtained from the analysis of the data are given considering the order of the research questions.

Findings about whether PISA 2012 mathematics items show DIF by gender

In the DIF analysis performed by logistic regression likelihood ratio method, the 5th item (PM446Q01), 11th item (PM828Q01), 19th item (PM923Q01) and 25th item (PM995Q03) in the booklet 3, and the 26th item (PM955Q03) and 30th item (PM982Q04) in the 11th booklet show DIF by gender. In the booklet 5, there is no DIF by gender. Findings of DIF analysis are given in Table 1.

Table 1. DIF Analysis Findings Determined by IHOLR

<table>
<thead>
<tr>
<th>Item number</th>
<th>Gender</th>
<th>Uniform DIF</th>
<th>Non-uniform DIF</th>
<th>Total DIF effect</th>
<th>Differences in regression coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$p(\chi^2_{12,1})$</td>
<td>$\Delta R^2$</td>
<td>$p(\chi^2_{23,1})$</td>
<td>$\Delta \beta$</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>.000</td>
<td>.0416</td>
<td>.0465</td>
<td>.0084</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>.000</td>
<td>.041</td>
<td>.1539</td>
<td>.0057</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>.000</td>
<td>.0254</td>
<td>.4602</td>
<td>.0011</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>.0043</td>
<td>.0166</td>
<td>.0296</td>
<td>.0006</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>.0033</td>
<td>.1245</td>
<td>.7641</td>
<td>.0013</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>.1663</td>
<td>.0039</td>
<td>.000</td>
<td>.0223</td>
</tr>
</tbody>
</table>

As can be seen in Table 1, DIF for 19th, 25th and 30th items can be negligible because of their effect sizes and differences in regression coefficient ($\Delta R^2 < .035, %\Delta \beta < .05$). For 5th and 11th items, DIF is moderate ($0.35 > \Delta R^2 < .070, %\Delta \beta > .05$) and DIF for 26th item ($\Delta R^2 > 0.070, %\Delta \beta > .05$) is large. The properties of these items are presented in Table 2.

Table 2. Properties of DIF items determined by IHOLR

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Format</th>
<th>Content</th>
<th>Context</th>
<th>Process</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Constructed Response</td>
<td>Change and Relationships</td>
<td>Scientific</td>
<td>Formulate</td>
<td>Girls</td>
</tr>
<tr>
<td>11</td>
<td>Constructed Response</td>
<td>Change and Relationships</td>
<td>Scientific</td>
<td>Employ</td>
<td>Girls</td>
</tr>
<tr>
<td>19</td>
<td>Multiple Choice</td>
<td>Quantity</td>
<td>Scientific</td>
<td>Employ</td>
<td>Boys</td>
</tr>
<tr>
<td>25</td>
<td>Multiple Choice</td>
<td>Quantity</td>
<td>Scientific</td>
<td>Formulate</td>
<td>Boys</td>
</tr>
<tr>
<td>26</td>
<td>Constructed Response</td>
<td>Uncertainty and data</td>
<td>Societal</td>
<td>Employ</td>
<td>Boys</td>
</tr>
<tr>
<td>30</td>
<td>Multiple Choice</td>
<td>Uncertainty and data</td>
<td>Societal</td>
<td>Formulate</td>
<td>Boys</td>
</tr>
</tbody>
</table>

As shown in Table 2, the items which are in favor of girls are constructed response items, and the items which are in favor of boys (except for the 26th item) are multiple choice items. In constructed response items, girls express their ideas more effectively and their language skills are higher than that of boys. In multiple choice items, boys can take more risks while answering the items even they are not sure the correct answers.

The 25th item in the test is based on real life situations and requires using mathematical knowledge. The OECD (2015) report shows that girls are more successful than boys in solving mathematical problems similar to ordinary problems, but they are less successful than boys in defining a problem that can be encountered in everyday life as a mathematical problem in PISA (OECD, 2015). These findings can be shown as an important reason for the fact that item 25 shows DIF in favor of boys.
Although the 26th item is a constructed response item, it shows DIF in favor of boys. The fact that item 26 is in favor of boys is likely to be due to the higher achievement of boys in items that include probabilities, statistical events and situations.

The instability statistic values and p values for the booklet number 3 as a result of DIF analysis with RT are given in Table 3.

Table 3. Instability Statistical Value and p Value for Booklet Number 3 by Gender

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Instability</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>.000</td>
</tr>
</tbody>
</table>

As seen in Table 3, the gender as covariate is considered because the instability statistical value is significant (p<.05). This indicates that some items show DIF by gender. Item difficulty parameters of DIF-displaying items are given in Table 4 and the tree condition is shown in Figure 1.

Table 4. Difficulty Parameter Values of Items by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Items</th>
<th>5.</th>
<th>10.</th>
<th>11.</th>
<th>16.</th>
<th>19.</th>
<th>21.</th>
<th>25.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy</td>
<td></td>
<td>-1.190</td>
<td>-3.676</td>
<td>1.598</td>
<td>-3.922</td>
<td>-0.579</td>
<td>1.830</td>
<td>-0.700</td>
</tr>
<tr>
<td>Girl</td>
<td></td>
<td>-2.101</td>
<td>-3.083</td>
<td>0.729</td>
<td>-4.755</td>
<td>0.346</td>
<td>2.833</td>
<td>0.035</td>
</tr>
</tbody>
</table>

Figure 1. Rasch Tree for Booklet Number 3 by Gender

As seen in Figure 1, 5th, 10th (PM800Q01), 11th, 16th (PM918Q01), 19th, 21st (PM923Q04) and 25th items show DIF between girls and boys. Strobl, Kopf and Zeileis (2015) indicate that high value of item means item is difficult whereas low value of item means item is easy. The 5th, 11th and 16th items are in favor of girls, while the 10th, 19th, 21st and 25th items are in favor of boys. The properties of these items are presented in Table 5.

Table 5. Properties of DIF items determined by RT

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Format</th>
<th>Content</th>
<th>Context</th>
<th>Process</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Constructed Response</td>
<td>Change and Relationships</td>
<td>Scientific</td>
<td>Formulate</td>
<td>Girls</td>
</tr>
<tr>
<td>10</td>
<td>Multiple Choice</td>
<td>Quantity</td>
<td>Personal</td>
<td>Employ</td>
<td>Boys</td>
</tr>
<tr>
<td>11</td>
<td>Constructed Response</td>
<td>Change and Relationships</td>
<td>Scientific</td>
<td>Employ</td>
<td>Girls</td>
</tr>
<tr>
<td>16</td>
<td>Multiple Choice</td>
<td>Uncertainty and data</td>
<td>Societal</td>
<td>Interpret</td>
<td>Girls</td>
</tr>
<tr>
<td>19</td>
<td>Multiple Choice</td>
<td>Quantity</td>
<td>Scientific</td>
<td>Employ</td>
<td>Boys</td>
</tr>
<tr>
<td>21</td>
<td>Constructed Response</td>
<td>Change and Relationships</td>
<td>Scientific</td>
<td>Formulate</td>
<td>Boys</td>
</tr>
<tr>
<td>25</td>
<td>Multiple Choice</td>
<td>Quantity</td>
<td>Scientific</td>
<td>Formulate</td>
<td>Boys</td>
</tr>
</tbody>
</table>
As shown in Table 5, 5th and 11th items are constructed response items and there are DIFs in favor of girls. The 19th and 25th items are multiple choice items and DIFs are found in favor of boys. In addition, according to gender by RT, it is found that 10th, 16th and 21st items show DIF. When the 10th item is examined, it is seen that the item is in multiple choice format and in favor of boys.

The 16th item is a multiple choice item and shows DIF in favor of girls. When the 16th item is examined, it is seen that the matter is related to music groups in terms of context. 21st item is a constructed response item and shows DIF in favor of boys. When the 21st item is examined, it is seen that the item is related to the consumption of vehicles in terms of context and it is an item which is identified with male roles. The comments about 16th and 21st are given in more detail below, in terms of intrinsic motivation and self-efficacy.

Instability statistic values and p values for the booklet 5 and 11 as a result of DIF analysis by using RT are given in Table 6.

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Booklet 5</th>
<th></th>
<th>Booklet 11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instability</td>
<td>Node 1</td>
<td>Instability</td>
</tr>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>54.1061216</td>
<td>Statistics</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>0.3037928</td>
<td>p value</td>
</tr>
</tbody>
</table>

When Table 6 is examined, there is no difference between boys and girls (p>.05). This shows that Booklet 5 and 11 do not contain DIF items by gender.

Findings about whether PISA 2012 mathematics items show DIF by a combination of the covariates gender and intrinsic motivation

According to the gender and intrinsic motivation interaction using RT for booklet 3, instability statistics values and p values are given in Table 7 as a result of DIF analysis.

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Instability</th>
<th>Node 1</th>
<th>Node 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Intrinsic Motivation</td>
<td>Statistical value</td>
<td>51.95183561</td>
<td>50.60542014</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>0.04980374</td>
<td>0.03482394</td>
</tr>
</tbody>
</table>

As seen in Table 7, gender is found to have the strongest instability value and it is observed that there is a significant instability (p <.05). The intrinsic motivation covariate is considered after the covariate of gender and it is found to have significant instability (p<.05). This indicates that items that exhibit DIF by gender also show DIF according to the intrinsic motivation covariate. Item difficulty parameters of DIF items are given in Table 8 and the tree is given in Figure 2.

| Covariates | Gender | Intrinsic Motivation Score | Item 5 | Item 10 | Item 11 | Item 16 | Item 19 | Item 21 | Item 25 |
|-----------|-------|---------------------------|-------|--------|--------|--------|--------|--------|--------|-------|
|           | Boy   | ≤10 | 1.190 | -3.676 | 1.598 | -3.922 | -0.579 | 1.830 | -0.701 |
|           | Girl  | >10 | -1.931 | -2.822 | 0.448 | -4.637 | 0.649 | 3.006 | -0.227 |

Table 8. Difficulty Parameter Values of Items with respect to a combination of the covariates gender and intrinsic motivation
When Figure 2 is examined, it is seen that there are some differences between boys and girls who have intrinsic motivation scores of 10 points and less than 10 points and girls who have that of more than 10 points. In this case; (i) item 5 which is in favor of girls is easier for them with an intrinsic motivation score of more than 10 points, (ii) item 10 which is in favor of boys is more difficult for girls with intrinsic motivation score of 10 points and less than 10 points, (iii) item 11 which is in favor of girls is easier for girls with an intrinsic motivation score of 10 points and less, (iv) item 16 which is in favor of girls is easier for girls with an intrinsic motivation score of more than 10 points, (v) item 19 which is in favor of boys is more difficult for girls with intrinsic motivation score of 10 points and less, (vi) item 21 which is in favor of boys is more difficult for girls with intrinsic motivation score of 10 points and less, (vii) item 25 which is in favor of boys is more difficult for girls with intrinsic motivation score of 10 points and less. It is also observed that item 25 is in favor of girls with an intrinsic motivation score of more than 10 points compared to boys.

While 5th and 11th constructed response items are in favor of girls; 10th, 19th and 25th multiple choice items are in favor of boys. This situation may be explained by that boys’ intrinsic motivations are higher than girls’ on multiple choice items. While boys may exhibit more risky and responsive behavior even they are not sure the answers because of their intrinsic motivation, girls tend to leave blank instead of responding to the items.

In terms of context, item 16 is related to music groups. Simpkins, Fredricks, Eccles and Simpkins-Chaput (2012), in their longitudinal studies, have modeled on how families’ beliefs affect the performance of adolescent children. It is observed that families support their boys in sports activities, computer use, mathematics and science, and support their girls in music. In this case, they state that the girls give more importance to music and they are interested in music more. The 16th item may show DIF in favor of girls because of the higher interest of high school girls than boys and their intrinsic motivation.

The 21st item, the constructed response one, shows DIF in favor of boys. In the Education Reform Initiative-ERI (2014) report, it is stated that the self-efficacy of boys is higher than that of girls in items identified with boys’ roles. Item 19 and item 21 relate to gasoline consumption of vehicles. Considering the finding in the ERI report, the sample status used in the relevant items may have increased the self-efficacy perception of boys. An increase in self-efficacy perceptions may increase intrinsic motivation so that items may show DIF in favor of boys.
Findings about whether PISA 2012 mathematics items show DIF by a combination of the covariates gender and instrumental motivation

According to the gender and instrumental motivation interaction using RT for booklet 3, instability statistics values and p values are given in Table 9 as a result of DIF analysis.

**Table 9. Instability Statistical Value and p Value for Booklet Number 3 by Gender and Instrumental Motivation**

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Instability</th>
<th>Node 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>.000</td>
</tr>
<tr>
<td>Instrumental Motivation</td>
<td>Statistical value</td>
<td>45.9628447</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>0.1933588</td>
</tr>
</tbody>
</table>

As seen in Table 9, gender is found to have the strongest instability value and it is observed that there is a significant instability (p<.05). The instrumental motivation covariate is considered after the covariate of gender and it is found that it does not have significant instability (p>.05). This may be interpreted as there is no instrumental motivation variable among the possible sources of items that show DIF according to gender.

Findings about whether PISA 2012 mathematics items show DIF by a combination of the covariates gender and self-efficacy

For the booklet used in PISA 2012, according to the interaction of gender and self-efficacy perceptions using RT, instability statistic values and p values are given in Table 10 as a result of DIF analysis.

According to the gender and self-efficacy interaction using RT for booklet 3, instability statistics values and p values are given in Table 10 as a result of DIF analysis.

**Table 10. Instability Statistical Value and p Value for Booklet Number 3 by Gender and Self-Efficacy**

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Instability</th>
<th>Node 1</th>
<th>Node 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>Statistical value</td>
<td>38.2705845</td>
<td>50.6945309</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>0.6463309</td>
<td>0.0340753</td>
</tr>
</tbody>
</table>

As seen in Table 10, gender is found to be the covariate, giving the strongest instability value and it is a significant instability (p <.05). The self-efficacy covariate is considered after the covariate of gender and it is found to have significant instability. This indicates that items that display DIF according to gender also show DIF according to self-efficacy variable. Item difficulty parameters of DIF items are given in Table 11 and the tree is shown in Figure 3.

**Table 11. Difficulty Parameter Values of Items with respect to a combination of the covariates Gender and Self-Efficacy**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Self-Efficacy Score</th>
<th>Item 5</th>
<th>Item 10</th>
<th>Item 11</th>
<th>Item 16</th>
<th>Item 19</th>
<th>Item 21</th>
<th>Item 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy</td>
<td></td>
<td>-1.190</td>
<td>-3.676</td>
<td>1.598</td>
<td>-3.923</td>
<td>-0.579</td>
<td>1.830</td>
<td>-0.701</td>
</tr>
<tr>
<td>Girl</td>
<td>≤13</td>
<td>-1.930</td>
<td>-2.482</td>
<td>0.332</td>
<td>6.474</td>
<td>0.536</td>
<td>-0.792</td>
<td>-0.035</td>
</tr>
<tr>
<td></td>
<td>&gt;13</td>
<td>-2.482</td>
<td>-3.206</td>
<td>1.014</td>
<td>-4.463</td>
<td>0.281</td>
<td>2.566</td>
<td>-5.773</td>
</tr>
</tbody>
</table>
Figure 3 shows that there are differences among boys and girls who have self-efficacy scores of 13 points and less than 10 points and girls who have that of more than 13 points. In this case; (i) 5th item which is in favor of girls is easier for girls with a self-efficacy score of more than 13 points, (ii) item 10 which is in favor of boys is more difficult for girls with a self-efficacy score of 13 points and less than 13 points, (iii) item 11 which is in favor of girls is easier for girls with a self-efficacy score of 13 points and less than 13 points, (iv) item 16 which is in favor of girls is easier for girls with a self-efficacy score of more than 13 points. In addition, it was observed that 16th item is in favor of boys due for girls with self-efficacy score of 13 points and less than 13 points. (v) item 19 which is in favor of boys is more difficult for girls with self-efficacy score of 13 points and less than 13 points. (vi) item 21 which is in favor of boys is more difficult for girls with self-efficacy score of more than 13 points. In addition, it was observed that the 21st item was in favor of girls with self-efficacy score of 13 points and less. (vii) Item 25 which is in favor of boys is more difficult for girls with self-efficacy score of 13 points and less. In addition, it is seen that the 25th item is in favor of girls with a self-efficacy score of more than 13 points.

While the 5th and 11th items, the constructed response ones, are in favor of girls, 10th, 19th and 25th items, the multiple choice ones, are in favor of boys. The DIF source in multiple choice items can be explained by that the intrinsic motivation and the self-efficacy perception of boys is higher than that of the girls. Individuals with high self-efficacy perceptions enjoy working with mathematical tasks, and exhibit more persistent behaviors to perform the task (Zimmerman, 2000).

The 21st item, constructed response one, shows DIF in favor of boys. In the ERI (2014) report, it is stated that the expression of calculating the gasoline consumption rate of a car is explained by the boys’ roles and the self-efficacy of the boys in these items is higher than the girls. Items 19 and 21 may be interpreted as increasing the self-efficacy perception of boys as they are related to gasoline consumption and thus may have shown DIF in favor of boys.

Findings about whether PISA 2012 mathematics items show DIF by a combination of the covariates gender and anxiety

According to the gender and anxiety interaction using RT for booklet 3, instability statistics values and p values are given in Table 12 as a result of DIF analysis.
Table 12. Instability Statistical Value and p Value for Booklet Number 3 by Gender and Anxiety

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Instability</th>
<th>Node 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Statistical value</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>.000</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Statistical value</td>
<td>42.1323713</td>
</tr>
<tr>
<td></td>
<td>p value</td>
<td>0.3864828</td>
</tr>
</tbody>
</table>

As seen in Table 12, gender is found to have the strongest instability value and it is observed that there is a significant instability (p<.05). The anxiety covariate is considered after the covariate of gender and it is found that it does not have significant instability (p>.05). This may be interpreted as there is no anxiety variable among the possible sources of items that show DIF according to gender.

**CONCLUSION AND DISCUSSION**

In this study, firstly, it is examined whether the mathematics items in booklet number 3, number 5 and 11 in PISA 2012 application show DIF with respect to gender. Item 5, 11, 19, and 25 show DIF according to gender analyzing by both IHOLR and RT, while item 10, 16 and 21 show DIF according to gender only analyzing by RT. Item 5 and 11 are in favor of girls in both IHOLR and RT, while items 19 and 25 are in favor of boys in both IHOLR and RT. In general, constructed response items show DIF according to gender by both IHOLR and RT are in favor of girls while multiple choice items show DIF according to gender by both IHOLR and RT are in favor of boys. However, some multiple choice items are found to show DIF in favor of girls and some constructed response items are favorable to boys. It can be concluded that the reasons underlying the display DMF by gender are not solely dependent on item properties like items’ contents, contexts and thinking processes.

Liu and Wilson (2009b) have reached the conclusion that boys is slightly superior to the girls and multiple choice items are in favor of boys in PISA 2000 and PISA 2003 mathematics literacy. Bolger and Kellaghan (1990) examine the gender differences in school mathematics achievement in their studies, and state that boys are more successful in multiple choice items while girls are more successful in constructed response items. Garner and Engelhard (2009) also have found that multiple choice items show DIF in favor of boys, constructed response items show DIF in favor of girls. When they consider the items as mathematical content, they have found that algebra-containing items show DIF in favor of girls, and geometry and measurement, probability and statistics, data analysis and proportion-containing items show DIF in favor of boys. In this study, it is seen that in general, constructed response items are in favor of girls and multiple choice items are in favor of boys. In addition, boys are more successful in terms of uncertainty and data-containing items. This is consistent with the results of Bolger and Kellaghan (1990) and Garner and Engelhard (2009).

In this study, it is seen that some multiple choice items are in favor of boys and some constructed response items are in favor of girls. This suggests that it is not enough to explain the sources that underlie the items showing DIF by gender only with the properties of items, and that the affective characteristics of individuals may be DIF sources by gender. In this context, items showing DIF by the gender also show DIF a combination of the covariates gender and intrinsic motivation. The threshold value of the girls' intrinsic motivation score is found to be 10 points. This shows that there are differences in success among girls with an intrinsic motivation score of 10 points and less and that of more than 10 points. Similarly, it is seen that DIF items by gender also show DIF by the interaction of gender and self-efficacy perceptions. The threshold value of the girls' self-efficacy score is found to be 13 points. This shows that there are differences in success among girls with a self-efficacy score of 13 points and less and that of more than 13 points. On the other hand, there is no DIF according to a combination of gender and instrumental motivation and a combination of gender and anxiety. In the ERI (2014) report, it is stated that the expressions associated with the boys’ roles in the items increase the self-efficacy of boys and that items can be in favor of boys. It is also stated in the report that it is important to encourage girls to be motivated by mathematics and to increase their self-confidence.
this study, it has been stated that some items in favor of boys have increased the self-efficacy perception of boys because they contain statements that are identified with boys’ roles. In addition, it can be seen that the success of girls can be increased by increasing their intrinsic motivation and self-efficacy perceptions.

As a result of this study, examining gender-DIF sources of mathematics items not only in terms of item properties, but also in terms of affective properties, it can contribute to writing more qualified items. As another result of this study, it can be seen that affective characteristics may cause differences in mathematics achievement. Teachers can be reminded that both boys and girls are supported by affective characteristics based on their ability to succeed in mathematics. It can be suggested that teachers should carry out their lessons in this context to support experiences to meet the needs of boys and girls students and support these courses with appropriate materials.

In this study, mathematics intrinsic motivation, mathematics instrumental motivation, mathematics self-efficacy and mathematics anxiety which are some affective characteristics are examined as gender-DIF sources of mathematics items. Apart from these, it can be suggested to examine the affective features such as mathematical self-perception, mathematical behavior, and problem solving determination, mathematics working ethics, and openness to problem solving. In addition, this study focuses on the underlying causes of items that display DIF by gender in mathematics. The variables such as socioeconomic status and school type can affect mathematics achievement. Therefore, it may be suggested that researchers investigate the underlying causes of DIF items such as socioeconomic status and school type.

REFERENCES


The Effect of Chance Success on Equalization Error in Test Equation Based on Classical Test Theory*

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Alanya Alaaddin Keykubat University

Abstract

The aim of this study was to determine the effect of chance success on test equalization. For this purpose, artificially generated 500 and 1000 sample size data sets were synchronized using linear equalization and equal percentage equalization methods. In the data which were produced as a simulative, a total of four cases were created with no chance success, and three different levels (20%, 25%, 33%) of chance success and the default chance success were corrected by the correction formula. In the simulated data, four different scenarios have been created that do not include chance success and contain three different success rates (20%, 25%, 33%). Accordingly, the test equalization was performed by using linear equalization and equipercentile equalization methods under two different sample sizes and four different chance success conditions. Weighted mean square error of equating methods was found for each situation, and the method with the lowest weighted mean square error was accepted as the most suitable equating method. At the end of the study, it was found out that; while linear equating is the most suitable method for equating test points with chance success; equipercentile equating is the most suitable method for equating test points without chance success.

Keywords: Test Equating, Linear Equating, Equipercentile Equating, Single Group Design, Chance Success.

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INTRODUCTION

Nowadays, exams are applied for many purposes, especially in the recruitment of students and staff to various institutions. Different and more various forms are developed to ensure that the validity and reliability of the tests do not fall below a certain level and to protect the confidentiality of tests, which is applied as regularly (Turgut, 1971). The questions in different forms were prepared with similar content and statistical characteristics. At the end of the application, it is seen that there is a difference between item difficulty levels of the tests. In other words, although the structure measured in the tests is the same, the difficulty of the substances and, therefore, the difficulty of tests differ. This prevents direct comparison of the scores obtained from the tests. The comparison of scores from different forms of tests that measure the same feature is of great importance in education (Tsai, 1997).

In order to make this comparison, it is necessary to establish a statistical relationship between the scores obtained from different forms of the same test, and this statistical relationship is called test equating. Felan (2002) defines test equalization as establishing a statistical relationship between the scores obtained from two forms measuring the same structure. Angoff (1971) describes the test equalization as the conversion of the unit system of one test into the unit system of another test that measures the same property. One of the aims of test equalization is to prevent bias among individuals taking different forms, and another is to report scores from different forms on the same scale and maintain the meaning of the reported scores (Barnard, 1996). Test scores are equalized in order to examine the change of an individual's ability and knowledge level over the years.

The test equalization can be used to test scores obtained from different test forms are equating observe the development of individuals, and compare the performance of individuals (Bozdağ, 2007; Crocker & Algina, 1986). Depending on the difficulty level of the forms to be equalized and the skill distribution of the applied group, horizontal equalization can be performed between groups with similar ability distribution and between tests with similar difficulty levels, and two different equalizations can be made, namely vertical equalization between different skill groups and tests with different difficulty levels. In addition, different equating methods can be used for equalization as depending on the theories based on the development of the tests (Crocker & Algina, 1986; Felan, 2002). Parallelism, symmetry, and independence from the group must be ensured in order to make the equalization. (Angoff, 1971; Gulliksen, 1967; Hambelton, 1985; Kelecioğlu, 1993; Şahhüseyinoğlu, 2005; Woldbeck, 1998). Parallelism is achieved when the test scores that are obtained from two different test forms are equal; hence, the forms must be one-dimensional, and the forms must be measured the same structure (Woldbeck, 1998). The symmetry is that the conversion between the unit systems of the two forms can be achieved by a single equation and that this transformation can be done by a single formula for both two-way tests (Angoff, 1971; Felan, 2002; Tanguma, 2000). The fact that the scores obtained as a result of equalization is independent of the group from which the conversion is made is expressed as independence from the group (Angoff, 1971; Felan, 2002; Kelecioğlu, 1993). The reliability, mean difficulties and variances of both forms should be the same (Angoff, 1971; Crocker & Algina, 1986; Kelecioğlu, 1993; Şahhüseyinoğlu, 2005; Tanguma, 2000; Turgut, 1971).

Angoff (1971) and Thorndike (1982) stated that the scores of the test with more errors would not be equal to the scores of the test with fewer errors, and the forms would not equalize significantly if the reliability was not high and similar. As can be seen from rules of equalization, many conditions must be met for equalization. Without these assumptions, equalization will be meaningless, and the equalization error will increase. The concept of error in test equalization is explained by the difference between the ability level of the individual and the predicted ability level for the test that he did not take. In the less error equalization, the ability levels obtained by different tests are expected to be equal (Cook & Eignor, 1991). In order to determine the error amount of the points obtained by the equalization methods, the raw score and the equalized scores corresponding to the raw scores are compared. For this comparison, the Weighted Mean Squares Error (WMSE) is used (Skaggs & Lissitz, 1986):
\[ WMSE = \sum_{i=1}^{k} f_i (X_{E} - X_{crit})^2 / \sum_{i=1}^{k} f_i S^2 Y \]

\( k \): Number of items in the Y test.

\( S^2 Y \): Variance of Y test.

\( X_{crit} \): the raw score of i in the Y test.

\( X_{E} \): The score obtained by the equalization methods equal to the raw score in the X test.

\( f_i \): The frequency of the raw score i in the Y test.

Equalization errors are divided into two as random equalization error and systematic equalization error. The random equalization errors may be caused by the test statistics such as standard deviation from the sample, mean or percentage order (Felan, 2002; Kolen, 1988). The systematic equalization error is mainly due to the deterioration of the equalization conditions (Kolen, 1988; Zeng, 1991). Test features, item features, and group features directly affect equalization errors. The most commonly used item type is the multiple-choice item in large-scale test applications. This item type has many advantages, which make it preferable. The major disadvantage of this type of item that negatively affects the psychometric features of the item and the test is that it contains chance success. The chance success is that the responder who takes the test finds the correct answer in the multiple-choice test by guessing (Turgut, 1971). Depending on the number of options of the multiple-choice item, the item includes chance success in different proportions. Item scores and test scores; hence, the psychometric properties of the test affect chance success (Araz, 2001; Çelen, 2002; Telli, 1993; Şahhüseyinoğlu, 1998). The validity and reliability increase in the tests that chance success is eliminated because it is predicted that corrected scores are estimated better than uncorrected scores in measuring an individual's ability (Çelen, 2002). In the test that chance success was eliminated, the average decreases, and the standard deviation increases (Koçak, 2013). Considering that the random error is caused by item and test parameters and the chance success is an item parameter, and it has an effect on the equalization error in the process of test equalization. It is thought that the chance success will have an effect on the equalization error in the test equalization process.

**Significance of the Study and Research Questions**

Relevant studies reveal that the properties of the equalized tests and items affect test equalization. Bozdağ (2007) states that a 20% chance of success will increase test equalization error. Considering that, the option number can be different in the multiple-choice item that is used in applied tests, and as a result of that, the proportion of chance success is different. It is thought that equalization errors can be different on the different proportion of the chance success. According to this, how the equalization error is affected by different levels of chance success and determining under which conditions the equalization method with lower error will be conducted will guide the researchers in the applications. Bozdağ (2007) considered only a 20% chance of success in the study. There are different chance successes in a test, depending on the number of choices. Therefore, considering other rates of chance success will increase the accuracy of the decisions to be made. This study differs from other studies that it deals with all percentages of chance success. In light of these discussions, the aim of this study is to determine the effect of different chance success levels on equalization error. For this purpose, the answers to the following questions were sought:

1. How does the equalization error obtained by equal percentage equalization method change according to sample size and chance success rate?

2. How does the equalization error obtained by linear equalization method change according to sample size and chance success rate?
METHODOLOGY

In this study, the effect of chance success on equalization error was determined by using simulated data by using linear and equal percentage equalization methods.

Data Generation

In this study, data generation and test equalization were based on Classical Test Theory. A total of 4 data sets of 25 items are scored in two categories, 500 and 1000 test lengths were artificially generated by the Monte Carlo simulation method. The R program (2011) “psych” package was used to generate the data. The data produced are scored in two categories (1-0), and the data are in the form of multiple-choice items. The test equalizations were made between data that have the same sample size as 1000-1000 and 500-500.

Test equalization was performed under four different conditions: In the first case, it was assumed that the tests do not have chance success, in the second case it was assumed that the tests contain 20% chance success, in the third case it was assumed that the tests contain 25 % chance success, in the last case it was assumed that the tests contain 33% chance success, The correction formula was used to eliminate the chance success on the tests that contain the chance success. Accordingly, in the fiction where the questions in the test are considered to have three options, two wrong answers are deleted correct answers. In the fiction, where the questions have four options, three wrong answers delete one correct answer are deleted. In the fiction where the questions have five choices, four wrong answers delete one correct answer.

Data Analysis

In order to make the equalization, the forms that are to be equalized must measure the same structure and be one-dimensional (Angoff, 1971; Felan, 2002; Gulliksen, 1967; Tanguma, 2000; Thorndike, 1982; Woldbeck, 1998) and the reliability, mean of difficulties and variances of both forms should be the same (Angoff, 1971; Crocker & Algina, 1986; Kelecioğlu, 1993; Şahhüseyinoğlu, 2005; Tanguma, 2000; Turgut, 1971). Besides, the correlation between the forms that are equalized must be high (Dorans, 2000; Masse, Allen, Wilson & Williams, 2006). Table 1 provides statistics on these conditions.

Table 1 Factor Structure of Data Produced.

<table>
<thead>
<tr>
<th>Test</th>
<th>Factors</th>
<th>Eigenvalue</th>
<th>Explained Variance Ratio</th>
<th>Explained Total Variance Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1</td>
<td>16.531</td>
<td>61.064</td>
<td>61.064</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.917</td>
<td>3.387</td>
<td>64.451</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.911</td>
<td>3.365</td>
<td>67.816</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>15.437</td>
<td>54.126</td>
<td>54.126</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.978</td>
<td>3.429</td>
<td>57.555</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.902</td>
<td>3.162</td>
<td>60.717</td>
</tr>
<tr>
<td>A2</td>
<td>1</td>
<td>18.001</td>
<td>55.025</td>
<td>55.025</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.980</td>
<td>2.995</td>
<td>58.02</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.955</td>
<td>2.919</td>
<td>60.939</td>
</tr>
<tr>
<td>B1</td>
<td>1</td>
<td>16.208</td>
<td>59.808</td>
<td>59.808</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.991</td>
<td>3.656</td>
<td>63.464</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.970</td>
<td>3.346</td>
<td>66.81</td>
</tr>
</tbody>
</table>

Table 1 contains the results of the factor analysis of the produced data. For the factor analysis of the data that are scored in two categories, the R program “polycor” package was used. The tests appear to consist of a single and dominant dimension.
Table 2 Values for Correlation Between Tests to be Equalized

<table>
<thead>
<tr>
<th>Scores</th>
<th>r_{A1-A2}</th>
<th>r_{B1-B2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chance success was not eliminated on the test scores</td>
<td>0.78</td>
<td>0.81</td>
</tr>
<tr>
<td>20% chance success was eliminated on the test scores</td>
<td>0.79</td>
<td>0.82</td>
</tr>
<tr>
<td>25% chance success was eliminated on the test scores</td>
<td>0.79</td>
<td>0.81</td>
</tr>
<tr>
<td>33% chance success was eliminated on the test scores</td>
<td>0.79</td>
<td>0.80</td>
</tr>
</tbody>
</table>

The correlation between the forms that are equalized must be high to perform the equalization. When Table 2 is examined, it is seen that the correlations between the equalized tests are high.

Table 3 Comparison of The Test Difficulties.

<table>
<thead>
<tr>
<th>N</th>
<th>Test</th>
<th>\text{P}</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>A1</td>
<td>0.579</td>
<td>0.089</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.576</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.525</td>
<td>0.135</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.528</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.456</td>
<td>0.095</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.453</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.413</td>
<td>0.045</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.414</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.426</td>
<td>0.064</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.424</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.386</td>
<td>0.095</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.388</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.380</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.378</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.333</td>
<td>0.300</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.339</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows whether there is a significant difference between the difficulties of equalized tests. Whether the difficulties of the tests were equal as examined by the ratio test for independent groups. When comparing difficulties, data having the same sample size were compared among themselves, and there is no significant difference between the difficulties of the tests.

Table 4 Comparison of The Test Reliability.

<table>
<thead>
<tr>
<th>N</th>
<th>Test</th>
<th>KR-20</th>
<th>Z_{r}</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>A1</td>
<td>0.812</td>
<td>1.125</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.804</td>
<td>1.109</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.865</td>
<td>1.312</td>
<td>0.931</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.875</td>
<td>1.353</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.831</td>
<td>1.191</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.826</td>
<td>1.175</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.872</td>
<td>1.341</td>
<td>0.886</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.881</td>
<td>1.380</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.853</td>
<td>1.267</td>
<td>0.301</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.848</td>
<td>1.248</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.889</td>
<td>1.417</td>
<td>0.886</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.897</td>
<td>1.456</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>0.886</td>
<td>1.403</td>
<td>0.682</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>0.895</td>
<td>1.446</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>0.917</td>
<td>1.569</td>
<td>0.454</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>0.920</td>
<td>1.589</td>
<td></td>
</tr>
</tbody>
</table>

First, the KR-20 internal consistency coefficient of each test was calculated to examine whether the reliability of the equalized tests was equal. The internal consistency coefficients obtained from equaled tests were transformed from Fishers to Z. It was investigated whether there was a
significant difference between the two reliability coefficients. When the statistics in Table 4 are examined, it is seen that there is no significant difference between the reliability of the tests.

### Table 5 Comparison of The Test Means and Variances.

<table>
<thead>
<tr>
<th>N</th>
<th>Test</th>
<th>X</th>
<th>t</th>
<th>p</th>
<th>S²</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>A1</td>
<td>14,475</td>
<td>0,219</td>
<td>0,099</td>
<td>28,398</td>
<td>1,23</td>
<td>0,159</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>14,402</td>
<td></td>
<td></td>
<td>27,457</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>13,145</td>
<td>0,263</td>
<td>0,105</td>
<td>33,907</td>
<td>1,11</td>
<td>0,191</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>13,214</td>
<td></td>
<td></td>
<td>35,988</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>11,400</td>
<td>0,159</td>
<td>0,122</td>
<td>47,527</td>
<td>1,22</td>
<td>0,180</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>11,331</td>
<td></td>
<td></td>
<td>46,076</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>10,336</td>
<td>0,103</td>
<td>0,101</td>
<td>56,055</td>
<td>1,10</td>
<td>0,244</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>10,371</td>
<td></td>
<td></td>
<td>59,259</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>10,674</td>
<td>0,129</td>
<td>0,123</td>
<td>51,279</td>
<td>1,18</td>
<td>0,205</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>10,616</td>
<td></td>
<td></td>
<td>49,702</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>9,668</td>
<td>0,099</td>
<td>0,082</td>
<td>63,968</td>
<td>1,10</td>
<td>0,280</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>9,703</td>
<td></td>
<td></td>
<td>60,497</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>A1</td>
<td>9,508</td>
<td>0,101</td>
<td>0,089</td>
<td>59,089</td>
<td>1,20</td>
<td>0,217</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>9,459</td>
<td></td>
<td></td>
<td>57,289</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>B1</td>
<td>8,627</td>
<td>0,122</td>
<td>0,101</td>
<td>69,622</td>
<td>1,08</td>
<td>0,292</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>8,673</td>
<td></td>
<td></td>
<td>71,876</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The average and variance of the tests to be equalized should be equal. The difference between means was tested by the t-test, and the difference between variances was tested by the F test. When the values in Table 5 are examined, it is seen that there is no significant difference between the means and variances of the tests to be equalized.

After testing whether the equalization conditions were fulfilled in the generated data, equalized scores were obtained using equalization methods. Then, the mean error frames for each equalization method and condition were calculated, and the equalization errors were compared.

**FINDINGS**

In the following, firstly, the results obtained from equalization using the equal percentage equalization method, and then the results obtained from equalization using the linear equalization method are presented. Equalization was performed using the translation formula that is suggested by Livingston (2004) because the scores of the equalized tests have not coincided with the same percentage order in the equal percentage equalization method.
Figure 1. Graphs of equalization with equal percentage equalization.

Figure 1 shows the distribution of raw scores and equalized scores equalized by the equal percentage equalization method. In the tests in which chance success was eliminated, equalization was made with higher errors at low skill levels. Accordingly, it can be stated that there is a relationship between ability level and elimination error. Livingston (2004) and Taguma (2000) state that the level of individuals' ability affect the equalization error. The fact that the equalized score and raw score pairs in the presented graph are frequent indicates that the equalization error is low. Accordingly, as the chance success rate increases, the graph becomes more frequent except for low skill levels. The equalization error is, therefore, reduced.

The minimum values of the scores that chance success was eliminated have a lower value than the scores that chance success was not eliminated because the correction formula that was used to
eliminate the chance success has an algorithm that reduces the individual's total test score. Therefore, after applying the correction formula, the scores that chance success was eliminated can be negative. According to this, it can be said that equalization was realized with higher error in sub talent groups in the scores that chance success was eliminated. However, the error is lower as talent distribution becomes more frequent in data where chance success is eliminated. Şahhüseyinoğlu (2005) states that there is less equalization error in the tests that chance success is eliminated.

Figure 2. Graphs of equalization with linear equalization method

Figure 2 shows the distribution of raw scores and equalized scores equalized by the linear equalization method. When the graphs are analyzed, it is seen that the equalized score distribution
obtained by the equalization of the data that chance success was eliminated is more linear. The more linear the distribution, the less the error of the equalization error. Accordingly, as the eliminated chance success rate increases, equalization error decreases. Şahhüseyinoğlu (2005) states that there is less equalization error in the tests that chance success was eliminated.

Table 6 Means of Error Squares Obtained Using Equal Percentage and Linear Equation Method.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Means of Error Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linear Equating</td>
</tr>
<tr>
<td></td>
<td>N=500</td>
</tr>
<tr>
<td>Chance success was not eliminated on the test scores</td>
<td>0.007</td>
</tr>
<tr>
<td>20% chance success was eliminated on the test scores</td>
<td>0.0069</td>
</tr>
<tr>
<td>25% chance success was eliminated on the test scores</td>
<td>0.0065</td>
</tr>
<tr>
<td>33% chance success was eliminated on the test scores</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Table 6 presents the equalization errors (Weighted Error Squares Mean) obtained from the equalization using the linear equalization method and the equal percentage equalization method. It is concluded that the equalization method, which gives the lowest error in all conditions, is the linear equalization method. As the sample size increases, it is seen that equalization error decreases both in linear equalization method and equal percentage equalization method. In the literature, it is stated that equalization error decreases with increasing sample size (Kim & Cohen, 2002; Lee & Ban, 2010; Tsai, 1997).

It is seen that equalization error decreases when chance success is eliminated in each sample size. The lowest equalization error was obtained from the equalization, which chance success was eliminated from the points of the test in the case of the highest chance achievement (33%). Accordingly, it can be stated that chance success increases the equalization error, and therefore the scores are eliminated from chance success can be equalized with lower error. Şahhüseyinoğlu (2005) states that there is less equalization error in the tests in which chance success is eliminated. The results obtained support this.

The research findings point to three main points: first, the equalization error decreases as the sample size increases. Second, the scores eliminated from the chance success are equalized with lower error, and as a result, chance success increases the equalization error. The third, linear equalization method, performs equalization with lower error than the equal percentage equalization method.

DISCUSSION

In this study, it is aimed to determine the equalization errors to be obtained from linear and equal percentage equalization methods in the artificially generated data at different levels of chance success. Classical test theory is used in the research. Although the use of Item Response Theory has been increasing in recent years, Classical Test Theory is still prevalent, especially in classroom measurement and evaluation activities. More than one test is administered throughout the semester to monitor the progress of students' in-class achievement. Test equalization is used to compare the scores obtained from these tests. For this reason, in this study, two basic equalization methods that can be used in the comparison of these tests, which are mostly developed based on Classical Test Theory, are discussed. In this study, it is aimed to determine the effect of chance success on test equalization error by considering the widespread use of multiple-choice items and the effects of chance success on psychometric features of the test. It is thought that the results of the research will guide teachers, researchers, and test developers in practice.

As a result of the research, it is seen that the linear equalization method makes equalization with fewer errors under all different sample sizes and chance success conditions. According to this, the
linear equalization method is more successful than the equal percentage equalization method. The linear equalization method was found to be the method with the least error squares in all chance success rates when equalizing the data. Skaggs and Lissitz (1986) indicate that there is no statistical test to determine the significance of error squares means and that the values for this error may be meaningful in practice if the values are 0.05 or greater. It is seen that the mean values of error squares for both methods are less than 0.05 and close to each other. It is thought that equalization errors take close values because the distributions of data are similar (Felan, 2002). Since the error of linear equalization is smaller, it can be said that linear equalization is a more appropriate method for equalization when the chance success was not eliminated. This finding is consistent with Budescu's (1987) findings.

Angoff (1971) and Woldbeck (1998) stated that the distribution of scores should be frequent and tense for the equal percentage equalization method. Thus, each point that is a raw score in the score distribution will correspond to one point that is an equalized point in the other score distribution. It can be said that the equalization error of equal percentage method decreases because the score range of the equalized scores decreases and becomes frequent after the chance success was eliminated. The results obtained are in agreement with the results of Bozdağ (2007). The very low equalization errors obtained by both methods can be related to the similarity of the distributions of data that are equalized data. Under conditions where chance success is eliminated, the equalization error is higher at low skill levels. Woldbeck (1998) states that the frequency of the score distribution points to the skill range and that there is greater equalization error at low ability levels. The findings of the study support this.

In both equalized methods, as the sample size increased, the equalization error decreased. Accordingly, it can be stated that the sample size reduces the equalization error. In the literature, it is stated that equalization error decreases with increasing sample size (Kim & Cohen, 2002; Lee & Ban, 2010; Tsai, 1997). Zimmerman and Williams (2003) state that chance success negatively affects reliability in small samples. As a result of the research, more equalization errors were obtained when the sample size was 500 under similar conditions. It can be stated that this is due to the fact that chance success affects the reliability of the tests negatively.

**Suggestions for applications and future research**

In the study, it was obtained that the equalization error decreased with increasing sample size. Accordingly, it is recommended to use data to be obtained from a large sample as possible as for equalization. In multiple-choice items, it is seen that equalization error is higher when chance success is not eliminated. Therefore, in the case of using multiple-choice items, the chance success was eliminated by correcting formula that can provide error-free equalization. In this study, the distribution characteristics of the equalized data are similar, and in this condition, the linear equalization method has equalized with lower errors. Therefore, if the distributions of data to be equalized are similar, the linear equalization method is recommended.

In this study, the effect of chance success on equalization error was investigated. The effect of features such as item difficulty distribution and item discrimination distribution on test equalization can be investigated in future researches. In this study, the sample sizes were determined as 500 and 1000. Equalization errors can be examined in smaller samples and different test length. In addition to the effect of the features of the test and the items on the equalization error, the equalization error can be examined depending on the cognitive level measured by the test and the items. In the study, only the chance success variable was manipulated from the item features, and other features of the items could be considered in future researches. It has been shown that chance success affects equalization error in tests developed and equalized on the basis of Classical Test Theory; a similar study can be performed with Item Response Theory.
REFERENCES


A School Choice Experience at the Age of “Parentocracy”: Impressions from a Public Primary School in Turkey

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Abstract
This article investigates the school choice practices of middle-class parents. It aims to find out what kind of strategies and practices parents have in the school choice process. For this aim, data were obtained through interviews with parents of students attending a primary school in an affluent area in Ankara. The results of the study show that parents with adequate economic, social and cultural capital are influential in their children's educational processes and develop various strategies for school choice. They strive to choose the best school they think will contribute to their children in gaining a better position in the labour market in the future. It is noteworthy that the most important factor in primary school choice is teacher quality. This is followed by features such as the location of the school, teacher-student relationship, security and the physical facilities in the school. The social capital of parents has an important part in the school choice process and the social networks in which they are involved determine the school choice processes considerably. Since the enrolment of students in primary schools in Turkey is address-based, parents wishing to enrol their children in other schools develop various strategies during the enrolment process, notably “address change”.

Keywords: School Choice, Parentocracy, Inequality, Social Capital

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1Although defining middle class is quite difficult and controversial, an operational definition can be made with reference to lifestyle, education, occupation, income, culture and consumption habits. In this study, middle class refers to people who are educated, having a profession, having middle income, living in an affluent area and joining cultural activities.
INTRODUCTION

In the labour market, competition has been increasing in accessing jobs that require high-quality features, provide status and yield more income. Parallel to increasing competition, parents who have various opportunities and wish their children to gain a better position in the future tend towards educational institutions that enable access to these positions. There is a competition between students and their families who claim qualified schools in the education market which operates in a similar way to the labour market. This competition has led parents to develop various strategies and to invest in their children to help them enter better educational institutions since the beginning of basic education. Although this process seems to be functioning rationally, school choices are closely related to the social class of the parents. Because, parents’ efforts and school choice strategies depend on the amount of economic, cultural and social capital they have.

Brown (1990) argued that, in parallel with the reforms implemented in education in Anglo-Saxon societies, the education of the child was not shaped according to the efforts and abilities of the child, but according to the wishes and wealth of the parents and defined this change as a transition from meritocracy to parentocracy. According to this approach, which assumes that education functioned in accordance with the meritocracy idea in the pre-reform period, parents' resources play active role in determining the quality of education received in the parentocratic period. However, it can be said that social inequalities led to inequalities in access to education in the past and the socio-economic level of the family was decisive for the level and quality of education. Yet, due to the relatively low social demand for jobs requiring qualifications, it was also possible for individuals from different segments of society to access to quality education, which provides access to these positions parallel to the massification of education. Although there were many social inequalities in education, the expansion of education, especially in industrialized countries, which have welfare state policies, has increased the number of individuals from different social classes who could receive quality education (Duru-Bellat and Kieffer, 2000; Schofer and Meyer, 2005). This relative improvement in access to education has led to the development of the idea of meritocracy, which argues that talented individuals from different segments of society can receive qualified education and thus obtain qualified jobs, social status and good income in the labour market. However, inequalities in education continued. Especially in the 1960s and 70s, these inequalities were drawn to attention and it was suggested that meritocracy thesis actually legitimized social inequalities in education (Bourdieu and Passeron, 1990; Bowles and Gintis, 1976).

Although there are arguments that meritocracy is still functioning today, educational inequalities have become more visible than in the past. In many countries, there is a rivalry for a limited number of different types and levels of educational institutions that allow the transition to higher education institutions providing access to qualified professions in parallel with the growing demand for these professions. It is suggested that educational inequalities can be reduced by opening schools to competition, increasing the quality of schools through school development activities and enabling parents to access qualified schools (Balci, 2014; Harris, 2002; Hopkins, 2004). These theses are mainly based on the understanding that market forces in education will bring about an increase in quality. It is among the main claims that opening schools to competition and parents’ choice between schools will both improve the quality of education and provide equal opportunities for families (Levin, 2002; Smrerkar and Goldring, 1999; Woods, 1993). However, this claim ignores the social origins of the students and hides the role of the economic, social and cultural capital of the parents in the education of the child. This study first discusses Brown's thesis, which is about the transition from meritocracy to parentocracy, and parents’ role in the education of the child in the context of social inequalities in education. Then, in the view of these discussions, it attempts to reveal the school choice practices of middle-class families in Turkey with the qualitative research approach.
Inequalities in Education from Meritocracy to Parentocracy

Meritocracy thesis is based on the assumption that all individuals in society have equal opportunities in accessing social resources, and it includes the claim that those who are capable and those who endeavour can benefit from public spending equally. On this axis, education opportunity is offered to everyone, but those with some inborn characteristics such as talent and intelligence and those showing enough effort can take the full advantage of the educational opportunities. Therefore, they can have a better position in terms of social status and income compared to other individuals thanks to the qualified education they receive. Education serves as a tool to distinguish talented individuals in society and to ensure that those who are competent and determined has the highest position (Swingewood, 2000). This makes some people in a privileged position compared to others and creates a functional stratification in society (Turner, 1997).

It is assumed that the backgrounds of the parents, their economic, social and cultural capital do not play an active role in education taken in a social system functioning according to meritocratic principles. Because, in such a process, it is accepted that all sections of the society will have access to education provided by the state and that those who are capable and those who get sufficient efforts will obtain a good social position in parallel to the education they receive. However, meritocracy thesis has been the subject of criticism in many ways, and arguments have been made that education does not operate on the basis of meritocratic principles. An individual's social status and income can be determined by structural dynamics such as economic and social conditions, labour market characteristics, and can also be shaped according to the individual's class, religious and ethnic characteristics. Therefore, besides the ability and effort, many different factors can play a role in determining the education and social status of the individuals. One of the main criticisms of the functioning of the educational process was expressed in the reproduction theories. According to Bourdieu and Passeron (1970), the school privileges the dominant cultural form in society on the basis of social class differentiation and contributes to the reproduction of cultural tendencies in accordance with the cultural capital of the children close to this culture. Therefore, the cultural codes transmitted in the school lead to an increase in the educational achievement of children with sufficient cultural capital. Bernstein (1971) emphasizes that students from different social classes use different speech codes and this use reproduces social inequalities through education. As schools convey middle-class cultural codes, children from middle-to-upper social classes have no difficulty in adapting to detailed speech codes, while children from lower social classes have difficulty adapting to these codes and fail at school. Bowles and Gintis (1976, 102) argue that education plays a role in the reproduction of existing social inequalities and that the meritocracy thesis legitimizes this unequal functioning. Because the education system legitimizes existing inequalities by creating the impression that individuals have access to unequal economic positions through an open, objective and meritocratic mechanism, and strengthens the thesis that economic success depends on skill and ability. Many studies show that despite the prolongation of schooling time for all students, educational inequalities continue to climb upward, and in some countries, the gap between the most advantageous and disadvantaged groups has widened (Duru-Bellat, 2000).

Brown (1990) argues that the third wave has started in the socio-historical development of education because of the reforms implemented in the UK education system in the last quarter of the 20th century. He calls the ideology of this age as parentocracy because of the emphasis on the role of parents in education. According to Brown, in the meritocratic period, the state implemented policies to ensure equality of opportunity in education. The parentocratic period, on the other hand, points to a process when equal opportunity policy in education is abandoned and replaced by school choice freedom and that accelerate policies in this direction (Waldow, 2016). According to Brown (1990), the

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1 In France, Bourdieu and Passeron (1970/1990), Baudelot and Establet (1971), Bernstein (1971) in the UK, Bowles and Gintis (1976) in the United States, in some of their researches, have reached conclusions that the inequalities in society and existing social relations are reproduced in the family and school, and they are legitimized through education.
inability of the state to provide equal opportunities in education by providing a standard in educational institutions has brought about the parents to be more involved in the education process of their children. Parents' wishes and resources are much more effective in education and the subsequent life of the children than before.

The role of the state in the provision of educational services has started to change globally along with neoliberal policies. Financing for social services such as education and health care previously provided by the state largely has been limited, different financing models in the provision of services has been searched. In addition, a series of transformations have taken place in the educational organization. Instead of traditional administration, new public management has been adopted (Clarke et al., 2000). The main thesis behind this paradigmatic change is that with the new approach, the central power in the field of education will be weakened and market-specific practices will bring about effective and efficient service delivery (Fusarelli and Johnson, 2004). Many changes have been implemented in public schools with structural arrangements that may differ according to countries and local dynamics from the perspective of new public management. Regulations highlighting performance, focusing on decentralization of schools and enabling parents to control more their education processes as a customer have been accelerated (Dempster et al., 2001). In many countries, school choice policy has been strengthened on the grounds that it provides access to qualified education for all social groups in parallel with privatization practices, and parents have been able to choose schools under given conditions. Attractive words such as “choice”, “freedom”, “competition”, “standards” have played important part in establishing the market forces in education (Brown, 2000).

Theoretical Context of School Choice Practices

Parents’ school choice practices vary according to their socio-economic levels (Evans, 2014; Lareau and Weininger, 2003; Lareau, 2011). Choosing a school and having this skill are often associated with the middle-class identity (Reay et al, 2013). Because middle-class parents have the necessary economic, cultural and social capital to increase their children's chances of success and to reproduce their class positions (Bourdieu, 2006). It should be emphasized that parents' habitus plays an important part in school choice. As Bourdieu (2006) emphasizes, differentiated habitus gives rise to segregated and divergent practices. In this context, parents with different habitus behave differently in choosing schools. Each parent develops educational strategies in line with its cultural capital to reproduce its current accumulation. In this context, the school operates in accordance with a complex mechanism that plays a role in the distribution and reproduction of cultural capital. The more important the cultural capital of the family and the larger the volume, the more importance it attaches to education and expands its investments (Bourdieu, 2006, 35). In the context of the long-term preparations, parents as the knowing actors implement the strategies they have developed based on the plans they have made for their children's education.

The social capital of the parents is another important determinant in school choice. Coleman (1994) draws attention to the positive relationship between the family background and the education supporting the individual by using the concept of social capital. The social capital of the family is formed in the axis of relations with various groups and communities and this advantage is reflected in children. Fine (2001) states that Coleman's social capital approach is rooted in the rational choice theory, and suggests that his approach revives the individual in rational choice theory. According to Fine, Coleman makes use of an analytically fixed social capital concept in his work in terms of the ability to overcome market imperfections. In Bourdieu's approach, on the other hand, the unit of analysis is not an individual directly. Undoubtedly, the individual is positioned as a social actor in the field. However, in order to understand the strategies and positions of individuals, the knowledge of the field should be used. Therefore, an actor must have a minimum level of capital in order to be involved in the game and to have a say in the field (Wacquant, 2007, p. 63). Actors' participation in the game is directly proportional to the amount of capital they have. The struggle in the field may lead to the reproduction or deterioration of the capital distribution. People enter the struggle for power in areas
with their own game rules with their different capital (Wacquant, 2007). Therefore, the actors act in different ways according to social class characteristics and they are stratified on the axis of their capital. This stratification leads to inequalities in access to educational resources.

Various researches have suggested that school choice is largely dependent on the social class, cultural and social capital of the parents. Researches on school choice in industrialized countries have shown that parents who actively choose schools are well educated and have a higher income than those who do not choose a school (Bosetti, 2000; Hatcher, 1998; Whitty et al., 1998; Gewirtz et al., 1995; Smrekar and Goldring, 1999). However, it cannot be said that these families who can be described as middle class are homogeneous. Stating that the priorities and strategies of parents differ in the school choice, Vincent et al. (2012) classify them into four groups according to these differences. The first group consists of parents who plan for long terms, take private lessons for their children and who can move their house for their child's school when necessary. The other two groups in the middle were labelled as "watchful" and "warrior". These two groups vary in terms of occupation, income, educational qualifications and their class identity. Although they attach importance to success, they are not as stable as the first group. The third group, called warriors, sometimes goes beyond the boundaries of the routine practice of most schools, often in connection with their own children, but also by challenging the school directly on more general issues such as inequality. The last group is pro-active with regard to education and the success of their children, but is less concerned with schooling. Ball, Bowe and Gewirtz (1996), on the other hand, gather the parents who choose school in three groups as ideal types. The first of these types, which includes various social groups, is the disconnected choosers, usually composed of working-class families; the latter is privileged/skilled choosers, almost entirely composed of professionals, middle-class families; the third is semi-skilled choosers with various class backgrounds. The privileged choosers manage the school choice process by investigating different possibilities, exchanging views with teachers and other parents and making plans for the future of their children. Semi-skilled choosers are actively involved in school choice but do not dominate the rules as much as the first group. This group, which has less social capital and therefore cannot get enough information about the functioning of the system, usually gets the information about schools from newspaper news or rumours. Unplanned or disconnected choosers are less interested in the education market, although they are interested in their children's future, and therefore generally prefer the school closest to home (Giddens, 2008, 739). Ball, Bowe and Gewirtz (1996) emphasize that school choice is directly and strongly related to social class differences, and that this choice is also a factor that increases class divisions and inequalities. Parents with some qualifications and resources can always operate the system, use the private school option and create conditions for their children to benefit from. In addition, the current school choice system allows privileged choosers to guarantee their reproduction via their cultural, economic and social capital and at the same time brings about social segregation.

Focusing on the decision-making process of parents in school choice, Cucchiara & Horvat (2014) argue that the choice is not only a way of looking for the best school but also a means of building and expressing a particular identity. Hence, parents act politically and symbolically in school choice. Raveaud and Van Zanten (2007), in their study on school choice in the UK and France, reveal that all parents' definitions of good education such as "intellectual development", and "a happy and successful school at the individual level" have common characteristics. On the other hand, in order to minimize the negative effects of choosing a local school, the middle classes are considering using their cultural and social resources. Bussell (1999) emphasizes that there is a consensus among parents that the decision is important in primary school choice, and that the most prominent factors in the decision-making process are the child's happiness and safety. In addition, school location, standards and organizational issues are also important. Çimen (2015), on the other hand, reached the finding that the most important factor in the primary school choice is the qualified teacher and that the selected public school should be like a private school. Some studies show that the variation between socioeconomic groups is quite low in terms of school choice criteria (Coldron and Boulton, 1991). However, middle-class parents have higher expectations than the opportunities offered by the school. Bussell (1999), in her study, states that issues such as class size, teacher-student ratio and disciplinary are expressed only by middle-class parents. Schools try to attract more middle-class parents, and middle-class parents
who know how the system works due to their cultural capital also act earlier than working-class parents (Bussell, 1999).

In the school choice process, information about schools can be distributed in formal and informal forms. Contrary to the official one, the information spreading in networks and local areas through rumours is distributed among different social groups and used in different ways during the school choice process (Ball and Vincent, 1998). Parents respond to rumour-based information in three categories; doubt, suspicion, and acceptance, which are not directly related to the social class. Ball and Vincent (1998) argue that those who are sceptical of rumour-based information are either the professional middle class with cultural capital or working-class parents who feel that there is not so much difference between schools to use this information. Those who are indecisive despite using information are defined as privileged/skilled or semi-skilled. The third group, on the other hand, accepts rumour-based information. Other parents’ choices are influential in the school choices of this group, which is defined as semi-skilled choosers who make the most of this information. The majority of parents receive information from social networks, school visits and interviews with teachers when deciding on the choice of school (Bosetti, 2004). Social networks, which are highly effective in the circulation of informal knowledge, are mostly composed of educated professionals who are more knowledgeable about the education system.

**METHOD**

This study is planned to reveal the school choice experiences of middle-class parents whose children attending primary school. Hence, it adopts the case study design, which is one of the qualitative research approaches. Merriam (1998) states that the case study provides in-depth knowledge about the research topic of interest and aims to understand the event in every aspect. Thus, the most prominent feature of the case study is that it allows for in-depth examination by allowing focusing on facts, situations, individuals, groups, and programs (Yin, 2002). The situation to be enlightened by this method can be understood, described and interpreted within its limits, in its original environment.

**Participants**

The study group consists of parents of a public primary school located in a central location where generally middle-class families live, largely receiving students from outside the region. Among these parents, I determined twenty-four of them by means of convenience sampling and snowball sampling. While convenience sampling gave speed and practicality to the research, snowball sampling provided great convenience in reaching the study group (Creswell, 2007). The group is mainly composed of middle-class professionals (See table 1). School choice is not permitted in Turkey and can only be achieved using various strategies. Thus, middle classes usually apply such strategies. It is also known, however, that parents with good economic conditions or sufficient cultural and social capital tend to choose a better school to send their children, even though they reside in a lower-class neighbourhood.

**Data Collection and Analysis**

The basic technique used for the collection of qualitative data is the interview. I conducted interviews by using a semi-structured interview form to ensure the active participation of the parents, to give flexibility to the research and in order to get in-depth information. The first part of the form includes questions about demographic information and the second part contains questions about parents’ school choice experiences. The questions to be answered in relation to the subject of the research are as follows: What are the socioeconomic characteristics of the parents who make school choice? Which factors influence school preference? How and where do parents get information about schools when choosing a school? What kind of strategies do parents develop to enrol in their chosen school? I analysed the data of the research by descriptive analysis method. Şimşek and Yıldırım (2006) propose to follow four stages in the descriptive analysis process, including creating a thematic framework, processing the data according to it, describing and interpreting the findings. I utilized
research questions and the conceptual framework during the thematic frame-building phase of the analysis. In addition, the data emerging from the analysis of the interview records allowed new themes to be added or removed. Thematic topics can be listed as parents' characteristics, factors affecting school choice, sources of information in school choice and school enrolment strategies.

**Validity and Reliability**

I have followed various strategies to increase the validity and reliability of the study. In qualitative research, the credibility and transferability of the research are important factors to increase the quality. Lincoln and Guba (1985) propose strategies such as long-term interaction, diversification, and peer debriefing to achieve credibility. In this study, I attempted long-term interaction with the participants and spent time in the study area to enable observation. Two basic strategies that increase the transferability of the research results can be mentioned (Patton, 2002; Simsek and Yildirim, 2006). One is detailed description and the other is purposive sampling. In this study, I arranged the data under appropriate themes and transferred them directly by quotations in order to provide detailed descriptions. Peer debriefing in qualitative research is an important strategy that increases the reliability of the research (Creswell, 2007). For this reason, I shared data, analysis, and my comments with a colleague from the field and the suggestions were effective in shaping of the study.

**FINDINGS**

In this section, I have classified the school choice practices of parents who can be defined as middle class, seeking an education that will ensure that their children gain a good job and social position in the future, under four themes. The first theme focuses on the parents' characteristics, the second one includes the factors affecting school choice; the third consists of the information sources in the school choice process, and the last theme deals with the enrolment strategies for the chosen school.

**Some notes on parents and the school**

**Table 1. Parent Characteristics**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Edu. Level of Part.</th>
<th>Participant Profession</th>
<th>Education Level of the Partner</th>
<th>Profession of the Partner</th>
<th>Income of the Family (TL/Month)</th>
<th>Number of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Master's</td>
<td>House-wife</td>
<td>PhD.</td>
<td>Chief of police</td>
<td>7,500</td>
<td>1</td>
</tr>
<tr>
<td>P2</td>
<td>High school</td>
<td>House-wife</td>
<td>Bachelor's</td>
<td>Tourism</td>
<td>10,000</td>
<td>3</td>
</tr>
<tr>
<td>P3</td>
<td>Master's</td>
<td>Civil servant</td>
<td>Master's</td>
<td>Civil servant</td>
<td>7,000</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>Bachelor's</td>
<td>Manager</td>
<td>8,500</td>
<td>1</td>
</tr>
<tr>
<td>P5</td>
<td>High school</td>
<td>Store manager</td>
<td>High school</td>
<td>Butcher</td>
<td>8,000</td>
<td>1</td>
</tr>
<tr>
<td>P6</td>
<td>Bachelor's</td>
<td>Financial advisor</td>
<td>High school</td>
<td>Notary's clerk</td>
<td>10,000</td>
<td>2</td>
</tr>
<tr>
<td>P7</td>
<td>Master's</td>
<td>Academic</td>
<td>Bachelor's</td>
<td>Self-employment</td>
<td>8,500</td>
<td>1</td>
</tr>
<tr>
<td>P8</td>
<td>Master's</td>
<td>Lawyer</td>
<td>Master's</td>
<td>Lawyer</td>
<td>15,000</td>
<td>2</td>
</tr>
<tr>
<td>P9</td>
<td>Bachelor's</td>
<td>Lawyer</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>9,000</td>
<td>1</td>
</tr>
<tr>
<td>P10</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>High school</td>
<td>Driver</td>
<td>7,000</td>
<td>2</td>
</tr>
<tr>
<td>P11</td>
<td>Bachelor's</td>
<td>Not working</td>
<td>Bachelor's</td>
<td>Not working</td>
<td>10,000</td>
<td>2</td>
</tr>
<tr>
<td>P12</td>
<td>Master's</td>
<td>Art director</td>
<td>Bachelor's</td>
<td>Agency owner</td>
<td>12,000</td>
<td>1</td>
</tr>
<tr>
<td>P13</td>
<td>Bachelor's</td>
<td>Insurer</td>
<td>Bachelor's</td>
<td>Insurer</td>
<td>9,000</td>
<td>1</td>
</tr>
<tr>
<td>P14</td>
<td>Bachelor's</td>
<td>House-wife</td>
<td>Bachelor's</td>
<td>Engineer</td>
<td>9,000</td>
<td>1</td>
</tr>
<tr>
<td>P15</td>
<td>Secondary school</td>
<td>House-wife</td>
<td>school</td>
<td>Pastry cook</td>
<td>4,000</td>
<td>2</td>
</tr>
<tr>
<td>P16</td>
<td>Bachelor's</td>
<td>Engineer</td>
<td>Bachelor's</td>
<td>Engineer</td>
<td>13,000</td>
<td>2</td>
</tr>
<tr>
<td>P17</td>
<td>Bachelor's</td>
<td>Broadcaster</td>
<td>Bachelor's</td>
<td>Broadcaster</td>
<td>12,000</td>
<td>2</td>
</tr>
<tr>
<td>P18</td>
<td>High school</td>
<td>House-wife</td>
<td>Bachelor's</td>
<td>Educationist</td>
<td>6,500</td>
<td>1</td>
</tr>
<tr>
<td>P19</td>
<td>Bachelor's</td>
<td>Teacher</td>
<td>PhD.</td>
<td>Academic</td>
<td>9,500</td>
<td>1</td>
</tr>
<tr>
<td>P20</td>
<td>Bachelor's</td>
<td>House-wife</td>
<td>Bachelor's</td>
<td>Self-employment</td>
<td>13,000</td>
<td>1</td>
</tr>
<tr>
<td>P21</td>
<td>Bachelor's</td>
<td>Teacher</td>
<td>Bachelor's</td>
<td>Doctor</td>
<td>11,500</td>
<td>1</td>
</tr>
<tr>
<td>P22</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>Bachelor's</td>
<td>Engineer</td>
<td>10,000</td>
<td>2</td>
</tr>
<tr>
<td>P23</td>
<td>High school</td>
<td>Civil servant</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>8,500</td>
<td>2</td>
</tr>
<tr>
<td>P24</td>
<td>Bachelor's</td>
<td>Civil servant</td>
<td>Master's</td>
<td>Self-employment</td>
<td>9,000</td>
<td>1</td>
</tr>
</tbody>
</table>
When the profile of the parents is examined, it is seen that almost all of them have a bachelor’s degree and they belong to professional groups called white collars such as engineers, designers, journalists, insurers, and teachers. These parents, who usually have one or two children, reside close to the school in terms of transportation, but are largely not in the school enrolment area. Parents’ narratives about their living conditions are similar. P21, for example, expressed their life as follows:

*We have a house. Do not have a lot of financial trouble. My partner and I work. That is why we usually rush on weekdays. In the evenings, we try to spend as much time as possible with the whole family. We are a family that cares about education. (...) Ali goes to various courses at the weekends. We usually take care of him. Sending him to sports classes. He also takes music lessons once a week. We try to go to the cinema or the theatre with the whole family when we find a chance (P21).*

Similarly, P19 pointed out that they did not have any financial difficulties, but they were trying to survive as salaried people. Saying, "I didn't have these opportunities when I was a child", P19, indicated that it is possible for her child to be educated in better conditions.

*In fact, one of the main reasons why we have one child is to give her the best opportunities. I continued my education in difficult conditions and became a teacher. Of course, teaching is not bad, but I could have a better position. (...) We could have preferred a private school by forcing ourselves a bit more for our daughter, but I think public school is better in primary school. There are experienced teachers. (...) We are doing some things for the cultural development of her. At the weekends, she attends an English course, as well as takes tennis lessons. (P19)*

As can be seen from Table 1, it is noteworthy that some of the participants who are mostly women do not work even though they have high levels of education. When I asked them why they did not have a job, they stated that this was a conscious choice.

*We talked a lot with my partner and reached a decision. I had two choices: Either I would do my job and I would not be able to give enough care to Enes and his education or I would give all my energy to my son. I preferred the second one and now I spend a great deal of time for Enes. (P1)*

*Actually, I cannot say I am not working. I go to school every day. In the morning, we leave home with Naz. After leaving her, we sit in a café near the school with other parents. (...) We usually talk about school-related issues about our children. Sometimes we criticize teachers. We talk about the things we do about our kids. This is also very instructive. I am interested in feeding my daughter when it's noon. If she has a problem at school, I'm interested in with the issue, etc. (P11)*

Similarly, it is possible to talk about the volunteers working in the school, instead of sitting in a café every day.

*Burak and I go to school every day. I leave Burak to school and I like to help with schoolwork. At first, I was not doing anything for school. However, I was helping with Burak's class teacher. One day, the principal asked me if I could help with photocopying. There was a photocopier at the school, but there was no one to make copies. From that day on, I started working in the library. I am not paid for it, it's a voluntary work. (P2)*

*I am a "class mother". I am responsible for organizing class activities, raising money and organizing all kinds of activities. At first, I accepted this job to take care of my daughter. So I could be closer and help her when she needed me. Then I liked to care for kids. I am like a teacher's assistant. She tells me when she needs something, and I try to do it. Of course, I should be at school every day. (P18)*
Some parents who are active in the school and who come to school every day as part of the school work in school-parent association. The head of the school-parent association and his assistants carry out some school works such as financial affairs, the relationships between school and parents, the needs of the teachers, various management roles. In all these processes, active members of the school-parent association develop close relations with the school administration and teachers.

Factors Affecting School Choice

Table 2. Prominent Features in School Choice

<table>
<thead>
<tr>
<th>Features</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>School location</td>
<td>15</td>
</tr>
<tr>
<td>School success</td>
<td>18</td>
</tr>
<tr>
<td>Experienced teachers</td>
<td>23</td>
</tr>
<tr>
<td>Close to home</td>
<td>14</td>
</tr>
<tr>
<td>Having a rooted history</td>
<td>3</td>
</tr>
<tr>
<td>Close to the workplace</td>
<td>12</td>
</tr>
<tr>
<td>Discipline</td>
<td>8</td>
</tr>
<tr>
<td>Profile of the parents</td>
<td>9</td>
</tr>
<tr>
<td>Security</td>
<td>11</td>
</tr>
<tr>
<td>Physical facilities in the school</td>
<td>10</td>
</tr>
<tr>
<td>Good school administrators</td>
<td>2</td>
</tr>
<tr>
<td>Class size</td>
<td>5</td>
</tr>
<tr>
<td>Sport activities</td>
<td>2</td>
</tr>
<tr>
<td>Teacher-student relationship</td>
<td>13</td>
</tr>
<tr>
<td>Like a private school</td>
<td>4</td>
</tr>
</tbody>
</table>

Many factors play a role in the school choice process of the parents. As can be seen from Table 2, the main characteristics highlighted by parents are related to school success. Particular emphasis has been placed on the teacher's being qualified and experienced. Almost all of the parents attending the interviews pointed out that the main factor in choosing the school was teacher quality.

The most important reason for choosing this school is that the teachers are experienced and successful. The more experienced the teacher is, the higher he has knowledge and experience. (P1)

I received very positive information about teachers. Many people talked about how good the teachers are. I came and saw them, all experienced teachers. That is why we decided to choose this school. (P14)

More emphasis on teacher quality compared to other factors may be related to conducting the research in a primary school. This is because primary school teacher plays an important role in the future education of the child and is effective in determining the other schools he/she will go. Stating that he preferred the school because of the classroom teacher and that he had donated a significant amount to the school in order to choose that teacher, P20 described his child's teacher as follows:

Our teacher is one of the most popular teachers in the school. Many parents coming to this school want to give their children to this teacher. How is it going to be? The school management says, "If you want to choose this teacher, you have to donate to the school". A very dedicated and very experienced teacher. She cares for all the kids without getting tired. We are very happy with our teacher. (P20)

Another prominent factor that has been mentioned most is school success, which is also related to the quality of teachers. In Turkey, the evaluation of school success is usually associated with the performance of the school in centralized examinations. There is currently no central examination after primary school. However, the previous achievements of the school are known in the vicinity and expressed by parents.
School success is very important! Ultimately, this is Turkey; children can come to a place with exams. The school has a very good image. Especially parents whose children have graduated from this school are telling very nice things. Students have always gone to good schools after graduation. (P10)

In addition to mentioning the qualifications and experiences of teachers in the school, another factor expressed is the quality of the relationship between teachers and students. In a sense, these relations, which shape the culture and atmosphere in the school, play an important role in the formation of the school image. The fact that school graduates often visit their teachers shows the quality of this relationship and at the same time allows their success to be known. Another reason stated mostly for the school choice is the location of the school. This is sometimes expressed as being close to home or work, while sometimes it is pointed out that the school has a central location.

Our house is normally close to the school, but not in the area where the school receives students. The school we have to send our child is different. If we compare the schools, of course, this school is of better quality and not far from home, so we preferred it. (P17)

My wife and I both work. Our workplaces and home are close to the school. If anything happens, you have access to school immediately. Otherwise, our mind would always be in the child. (P13)

Among the factors influencing the choice of school, the physical facilities of the school were frequently mentioned. Although the school did not provide much space and buildings at first glance, it was often stated that the buildings were well cared for, a new additional building was built and care was taken for cleaning. Some parents even indicated that they chose the school because it was like a private school.

The school is very regular. What I mean by this is that the buildings of the school are beautiful, the paint is new and the garden is well maintained. School layout is immediately noticeable when you look at it. (...) There is no gym, but there is an area inside the school that can be used as a hall. (P23)

Before enrolment, I came to the school with my partner and we visited the classes. The organization was very nice. The desks, tables, the children's cabinets were all decent. The walls were clean and painted. It attracts the attention of man. (P3)

Donations made by previous or current parents to the school have an important role in the formation of physical conditions in the school. After the school starts, parents have a meeting at the request of the class teacher or spontaneously; they renew classrooms, modify materials or revise to provide a better educational environment.

After enrolling in school, our teacher said that the tables and desks in the classroom should be overhauled. She had a meeting at the beginning of the year, classroom mother was determined. An immediate calculation was made, and the amount per person was determined. The tables and desks of the class, the floor tiles and the curtains were renewed in a short time. (P22)

Parents also expressed the importance of school safety and discipline in school selection. Today, the increasing number of violence in schools and the insecurity of the school environment make the parents more sensitive. For this reason, many schools have an agreement with security firms or, if not possible, try to assign existing staff to this end.

Safety is the most important thing we care about. There are some schools where it is not clear who goes. We searched this out before the enrolment. They said that this school had an agreement with a security firm. (...) We are comfortable while our son is in school. (P7)
There are addicts and glue sniffers around the schools. God bless children, anything can happen at any moment. However, this school is very good in this respect. The teachers observe the students carefully and see them at break times. Security is also good. (P15)

One of the issues that the parents emphasized in the interviews was the parent profile of the school. Parents with similar socio-economic characteristics prefer the schools where there are parents with similar characteristics. One of the main reasons for this is to improve the physical facilities in the school together so that their children can have an education in better conditions.

You want the class renewed, someone else might not. You want children to sit on better benches, breathe in clean places, and use the smart board. Someone may not accept them. Therefore, it is much better for children if parents agree (P17).

Everyone needs to attend to do something for school and class. I give money, another one does not give anything. Then it is hard to get anything done. Our class is very good in this respect (P8).

Of course, there is a belief that the quality of education will be better at a school with high socioeconomic status. Because, especially in the middle classes, parents with higher education place more emphasis on education and training and thus can play a role in the implementation of a range of activities, from improving physical conditions at school to planning social activities. This is evident in the words of P15, whose economic conditions are not as good as the others.

When it was time for the enrolment, we thought about where to register our daughter. Because the enrolments were address-based, there was not much choice. However, the success of the school we had to attend was not very high, and there was not a lot of students going to that school from the vicinity. In addition, what I know is that education is not given much importance in the neighbourhood. We decided that we should send her to a better school in an affluent area. (P15)

In addition to these factors, it can be said that other factors playing a role in school choice are related to the history of the school, classroom size, and sports activities.

**Information sources in school choice**

The cultural capital of the parents is an important factor in getting out of the school district for a better school. Because, as Ball, Bowe and Gewirtz (1996) described, in order to be a privileged chooser it is necessary to know that there is such a situation and make an effort in this direction. As Bourdieu (2006) points out, parents with sufficient cultural capital read the game and turn to educational options that will make their children privileged in the education market. Thus, they develop mechanisms to reproduce their own class positions. Parents who are aware of the inequalities between schools and who can use their capital for education either look for the schools that can offer better opportunities or they create better opportunities for their children’s education at the current school.

**Table 3. Information Sources in the School Choice Process**

<table>
<thead>
<tr>
<th>Knowledge Sources</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents</td>
<td>18</td>
</tr>
<tr>
<td>Friends</td>
<td>14</td>
</tr>
<tr>
<td>Internet</td>
<td>3</td>
</tr>
<tr>
<td>School management</td>
<td>3</td>
</tr>
<tr>
<td>Acquaintances</td>
<td>12</td>
</tr>
<tr>
<td>District</td>
<td>10</td>
</tr>
<tr>
<td>Nursery school</td>
<td>8</td>
</tr>
<tr>
<td>Teachers of the school</td>
<td>7</td>
</tr>
<tr>
<td>School visits</td>
<td>11</td>
</tr>
<tr>
<td>Neighbourhood</td>
<td>5</td>
</tr>
</tbody>
</table>
Parents whose children are of school age are involved in a research process as knowing agents. As can be seen in Table 3, the main source of information in school choice is the parents of other students.

When choosing the school, I paid attention to the success of the school and the percentage of success. I especially received information from the parents of students in this school. Our home is not far from school; we searched around, and reached just like that. (P1)

We started searching before the enrolment time. We investigated the surrounding schools. We consulted with the neighbours as we lived in a close neighbourhood. (...)The recommendations of the friends sending their children to this school, their positive thoughts about the school, what they said about the teachers were effective in our choice. (P3)

Another way of getting information about the school is to gather information from the parents of upper-class students who are still attending school. For this purpose, places such as cafes and teahouses, where parents are present, are used. Because some of the primary school parents spend a lot of time in the surrounding of the school. This period is transformed into a process of exchanging information about the educational process, as well as the preparation stage for determining the next educational level of the child.

While chatting with my friends about school choice, someone told me to go to the cafes around the schools. Because parents usually wait for their children in these cafes. That's what I did. I got a lot of information about schools and teachers. (P20)

Social networks around the school, which have evolved over time, have an important role in the school choice process and then create opportunities for parents to act together and exchange information in organizing the school process. In addition to the parents having students in the school, the second source of information that guides the parents in the choice process is the friends and acquaintances defined as the environment. Sometimes the neighbours give information about the school and sometimes the colleagues can guide the parents.

Since we have been living in (...) district for many years, we have many friends there. Of course, when the children come to the school age, the topic of the chats is about their schools. We have always heard positive things about both the school and the staff, so we preferred. (P9)

The place I work is close to the school. My colleagues who had information about the school before helped me. What they said made me think positively about the school. I also contacted with the school administration and got information about it. (P6)

In the school choice process, the most basic information sources are composed of parents whose children had education at that school before, friends, neighbours, acquaintances, and relatives. Therefore, the social capital of the family plays an important part in determining the school where the child will go.

School administrators and teachers who we can define as school staff can be the main source of information for parents. While teachers sometimes can provide guidance to the parents from neighbourhood, sometimes give parents with information during school visits.

One of the teachers was a close neighbour. He said that he would help us enrol at this school. According to him, the school was very good. Thus, we enrolled in this school with his help. (P15)

At first, I looked at the success of the school. I researched the teachers, the area and the principal. I consulted the people around me. Then we visited the school with my wife. We
had a meeting with the headmaster. We also had the opportunity to meet some teachers. That is how we decided. (P8)

Some parents, in the kindergarten years, begin to plan where their child's school will be. Aware of the importance of pre-school education in the education process, parents look for a kindergarten suitable for the child. In fact, the kindergarten is able to provide a source of information for the child's next level of education. For example, P13 stated that they had been chatting with other parents about the primary school where they could send their children and that he preferred this school on a recommendation.

We used to talk with parents about which school we were going to send the children from time to time. However, I got the real information from nursery school employees. The nursery is not far from this school. We had an idea what the school was, including teachers. (P13)

I heard from a parent in the nursery school that the school staff is very good. I also researched from National Education. I asked other friends who knew about the school. Then we decided. (P17)

An important detail to note here is that some private kindergartens also function as private tutoring centres. Students from surrounding schools go to these centres and some teachers of these schools are able to work in these centres although it is prohibited. Therefore, nursery or centre employees know the teachers of the surrounding schools, so that a commercial relationship can develop between kindergartens and schools. Therefore, because of their relationship with schools, these kindergartens in a sense constitute the student potential of the primary education classes of the schools.

In the school choice process, some schools become popular thanks to circulating information among the parents having similar concerns in a short time. Parents having similar experiences and are involved in the game by following similar paths gather in similar schools, so the capacity of the schools with the students they receive from outside of their surroundings increases gradually and gets crowded. In fact, overcrowded classrooms are one of the major complaint issues about the preferred schools. At that time, parents coming together through the networks, start to search for non-crowded schools. Parents who act together and agree to improve the physical conditions of the school or to provide additional activities to the existing ones play an active role in changing school conditions.

**School enrolment strategies**

Enrolment in primary schools in Turkey is done via the e-school system on the basis of address information in the national address database established by the provisions of the Population Services Law. For this reason, parents who choose schools outside of the school's enrolment area follow various strategies in order to enrol their children in those schools. It is possible to classify these strategies under three main headings. The first is to change the address by receiving an official letter from the neighbourhood unit indicating that the child's residence is in the school enrolment area.

We thought about how to enrol after we set the school. There was not much choice anyway. We were going to move in there or make it look like we were residing there. That is the way our neighbour enrolled his child in a school last year. I asked them how they did. They went to the mukhtar of that neighbourhood and they paid some money. He showed as if they were sitting there for a short time. We went to the mukhtar, too. We asked, and he said he could do. We also paid an amount. We changed the address on paper. Otherwise, it is very difficult to enrol. (P4)

There was also a parent stating that he made the address change through an acquaintance working in the registry office, but another way of appearing in the school district is to be a guest next
to a family already living there. Thus, the child may appear to live in that region until the school enrolment.

We have a friend residing in the school enrolment area. She lives alone. I asked her if we could change the address as if we were guests. The child had to be done early to appear in that area during the registration period. We went to the registry office together. My daughter and I registered as a guest at my friend’s house by deleting our registration from our own address. This has some drawbacks. They could have come to control, but that did not happen. After school enrolment, we went back to our own address (P6).

Some parents who do not proceed in this way may temporarily rent a house in the school area. The rental of the house until the enrolment period ends allows the child to be enrolled in the school according to the address-based enrolment system. In addition to the rental option, there were parents stating that they purchased houses to enrol in their targeted schools. This orientation, which is part of longer-term planning, was expressed by P16 as follows:

After we decided to move to Ankara, we thought a lot. Because Emre’s school enrolment was approaching. At that moment, we started looking for a school. After looking for a large number of schools, we decided on this school. So first, we found the school, and then we bought the house (P16).

Following these strategies, the parents who cannot enrol in the schools they want do not give up immediately. First, the enrolment of the child is made to the school that is in the region where the parents reside according to the address-based enrolment system. However, after this registration, parents try to transfer their children to the school they are targeting.

We could not enrol Zeynep in this school, and started school in the neighbourhood, but we followed this. Because I did not want her to go to that school. The ambiance was not very good. We have decided to transfer, but either home or work will be in the school district. (...) There was a small restaurant in the region. We talked to them, agreed. They made me look like I have been working for a while. Then we were able to transfer the child (P14).

The close proximity of the workplaces of the mother or father to the school creates the possibility of enrolling in the targeted school. However, this process is not as easy as the one based on home addresses. The speeches of a teacher struggling to enroll her child in the school where she works sum up the situation.

Since I was a teacher of this school, I thought we could easily enrol. I have a friend who enrolled her child in this school last year. When I talked to her, I realized there might be some problems. Anyway, I talked to the principal: “What about Reyhan's enrolment?” The principal told me not to worry. Then, it was time to enrol, lists occurred or something like that but Reyhan's name was absent. They said that the excuse enrolments would be later. I was shocked. I had a friend residing in this region. We were registered immediately next to her as a guest. Anyway, we finally solved the enrolment problem. (P21)

Depending on the educational policies implemented in Turkey school choice is not allowed in primary and secondary levels. However, parents who want to choose a school do so using various strategies indirectly. Therefore, it is possible to talk about school choice practices even if it is not official. These practices are largely based on the amount of capital owned by parents.

DISCUSSION AND CONCLUSION

Parallel to the commercialization of education, while the responsibility and role of parents increase in the education process, the belief that the child cannot receive qualified education develops if the parents do not intervene. In the development of this ideology called parentocracy, reducing the
educational expenditures of the state with neo-liberal policies, increasing the role of standardized tests in the functioning of education, and expanding the market in education are important factors. As the role of the state in raising the quality of education decreases, parents try to fulfil this role.

Parents who want their children to be in a good position and status in line with the increasing competition in the labour market mobilize their economic, cultural and social capital to make their wishes come true. Therefore, the social class of parents is the main determining factor in the school choice. While it is not possible to choose a school for parents with insufficient capital, as shown in this study, middle-class parents develop various strategies to reproduce their class positions and ensure that their children are at least in the same class position. Choosing a school is one of these strategies. They associate providing their children with a privileged position with the educational process they think plays an important role in achieving this position. Aware of the increasing risks in the labour market and therefore in the education market, parents want to plan every stage of their children's educational process. School choice is the first and most important stage of planning. Because the chosen school plays an active role in determining the child's educational route. Teacher qualification, school location, quality of education, class size, activities and safety are important factors in primary school choice. The characteristics of the teacher, who play an important role in educational activities, are more prominent than other factors and are a determining factor in primary school choice. Çimen (2015) also found that primary school teacher qualification was an important factor in the school choice process. The fact that the characteristics of the primary school teacher are the main determining factor is related to the idea that these characteristics will determine the next educational route of the child. The cultural capital of the parents is an important factor in tending out of the school region. Because, as Ball, Bowe and Gewirtz (1996) classify, it is necessary to know that such a situation exists and efforts should be made to make a privileged choice. As Bourdieu (2006) points out, parents with sufficient cultural capital read the game and turn to educational options that make their children privileged in the education market. Thus, they develop mechanisms to reproduce their own class positions. Therefore, parents who are aware of the inequalities between schools and who can use their capital in this direction tend to schools that will provide better facilities or where they can create better opportunities for their children's education.

Parents who seek schools receive information from various sources. At the top of these resources, parents who experience this process take the first place. Sources of information sometimes consist of neighbours and sometimes parents with children at school. Therefore, the social capital of the parents has an important role in this process and the social networks in which they are involved guide them. Because, as Wacquant (2007) points out, an actor must have a minimum level of capital to be involved in the game and to have a voice on the field. Networks within and around the school not only determine the individual movements of parents, but also enable them to develop a collective movement. Parents with similar socioeconomic characteristics are gathered in similar schools so that they can build their school environment more comfortably. In addition, a popular school can be preferred too much. Parents with similar conditions then move together and look for alternatives. However, competition, on the other hand, sometimes provides a basis for parental practices that will hide information from others or not disseminate information about schools.

Since the enrolment for primary and secondary schools in Turkey is made address-based, parents who wish to choose a school outside the school region develop various strategies. The first of these strategies is that they appear to be registered at an address in the area temporarily where the school accepts students. This is sometimes possible as a guest to a friend residing in the school district, sometimes with the help of the district headman. Another strategy is to rent a house in the school region during the enrolment period. In addition, some parents can plan for longer and buy a house in the area. The fact that parents' workplace is in the school region allows the child to enrol in that school. Therefore, as an enrolment strategy, some parents appear to work temporarily in a workplace or they start a business in the region.

School choice is presented as a solution to social inequalities in education and is recommended to be implemented in the education system based on the assumption that everyone can
make rational choices. Various studies have shown that school choice is directly related to the economic, cultural and social capital of the parent. However, this study demonstrates how middle classes choose schools even though they are not allowed, and their school choice practices. While school choice causes social segregation between schools, some schools provide an increase in resources and differentiate their conditions from others. Thus, inequalities in education are reproduced. If it is desired to prevent parents from choosing schools using various strategies, disadvantaged schools should be supported to be qualified like advantageous schools.

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Investigating Direct and Indirect Effects of Social Media Addiction, Social Media Usage and Personality Traits on FOMO

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Abstract

In this study, it is aimed to investigate direct and indirect effects of Social Media Addiction (SMA), Social Media Usage (DSMU) and Personality Traits beyond BIG 5 on Fear of Missing Out (FOMO). The research was based on quantitative research methods conducted in accordance with the relational survey model and 845 prospective students studying at Sakarya University Faculty of Education were included by stratified sampling method. The path analysis was performed to examine the direct and indirect effects of the variables by AMOS and SPSS. The results show that FOMO directly and positively predicted by SMA, and DSMU had a significant and positive effect on SMA while DSMU having no effect on FOMO. Finally, the results on personality traits and FOMO indicated that agreeableness (AGR) personality trait had a positive effect on FOMO while other personality traits did not. In the study, results were discussed within the framework of the literature.

Keywords: FOMO, personality traits, social media addiction, social media usage, prospective teachers.

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INTRODUCTION

Social media is defined as web 2.0 skills such as creating and sharing contents and collaborating online (Kuss and Griffiths, 2017). Accordingly, when it comes to social media usage, a wide range of social applications such as collaborative projects, blogs, content communities, social networking sites, virtual game worlds come to mind, all of which form social media (Kaplan and Haenlein, 2010). Social networking sites as some of the most well-known tools of social media are widely used especially by young people via mobile applications that can be accessed fast and easily with the development of mobile technologies (Zheng & Lee, 2016). In general, social networking sites are defined as virtual communities where users can create their individual profiles, interact with real-life friends and meet other people depending on their common interests (Kuss and Griffiths, 2011). According to the We are Social (2018) report, 42% of the world’s population actively uses social media, and 39% of them use social media actively on mobile devices. While there used to be 51 million active social media users, which amount to 51% of the population in Turkey, it has been reported that there are now 54 million active social media users, which amount to 54% of the population, with smartphones having become popular. Furthermore, regarding the actively used social network applications stated in the report, the most actively used social media platform is YouTube, which is followed by Facebook, Instagram particularly for story and photo posting, Twitter and Google+, respectively.

Wide range of features provided by social networking sites to users causes them to use these tools for different purposes. Facebook and Instagram, two of the most commonly used ones, seem to be used more by adolescents and university students. As Howe and Strauss (1991) stated, the use of social networking sites in the Y and Z generation is more common and popular. Although social networking sites are used among university students for different purposes, it is seen that the use of applications such as Instagram, Facebook and WhatsApp are more common than others (Gezgin, Hamutoglu, Gemikonakli and Raman, 2017; Lambić, 2016). Among the university students, social networking sites are used rather for video and photo posting, following up the posts, communication with new acquaintances or current friends, following up family members / friends and for entertainment (Cheung et al., 2011; Lee and Long, 2012; Lenhart and Madden, 2007). Furthermore, social networks are also used frequently to make new friends, kill time, get information, chat online, exchange ideas and have fun (upload photos to the profile, play games) (Solmaz, Tekin, Herzem & Demir, 2013; Vural & Bat, 2010). It is also stated that university students often use social networks for educational-instructional purposes such as sharing the course content, communicating with instructors and friends in writing or verbally, participating in educational activities, making plans, expressing opinions in common study platforms (forums), getting motivated during homework, and having academic discussions (Barczyk and Duncan, 2013; Calvo-Armengol, Patacchini, Yves, 2008; Paul, Baker and Cochran, 2012; Kabilan, Ahmad and Abidin, 2010). The study conducted by Rosen et al. (2013) showed that the students preferred Facebook more when it came to using social media for educational purposes, and the university students were more likely to see Facebook as a tool for education. Moreover, universities and institutes are already using social networking sites such as Facebook and LinkedIn to communicate with potential people and groups to make academic exchanges (Paul, Baker, Cochran, 2012). Eren-Şişman (2014) stated that social networks are used for interpersonal interaction and course preparation, and Karal and Kokç (2010) observed that that social networks are used for familiarization/recognition and education as well as for social interaction-communication purposes. Consequently, social network users introduce themselves to the people and institutions they are connected to through a profile they create, establish friendship relations through this profile, participate in groups and activities that they are interested in and share their experiences by discussing their thoughts with other group members. It is accordingly observed that university students use social networking sites for different purposes.

Common and intensive use of social media especially by adolescents and university students may bring about adversities such as problematic social media usage, social media addiction, and fear of missing out. Social media addiction, which is defined as the inability to control the use of social media and the disruption of other activities in an individual’s life due to excessive use (Ryan, Chester,
Reece, & Xenos, 2014), is regarded as a sub-factor of Internet addiction (Young, 2009). Social media addiction can affect individual’s life negatively due to consequences such as weakened interpersonal communication skills and decreased quality of communication (Nyland et al., 2007; Tokunaga, 2011), decreased self-efficacy (Valkenburg et al., 2006; Hawi and Samaha, 2017) and adversely affected well-being and mental health (Pantic, 2014). Studies in the literature show that women are more likely to be social media addicts than men (Andreasen, 2015; Griffiths, Kuss, & Demetrovics, 2014) and younger people have higher tendency to have social media addiction compared to older people (Kuss, Griffiths, Karila, & Billieux, 2014). Daily social media usage is an important variable that can be used to predict social media addiction (Yang and Tung, 2007; Al-Menayes, 2015) and social media addiction tend to be affected by experience (Al-Menayes, 2015) and daily social media usage (Al-Menayes, 2015; Kırık, Arslan, Çetinkaya, & Mehmet, 2015). In addition, it is stated that social media addiction can be caused by social drives, severe depression, anxiety and insomnia (Koc and Gulyagci, 2013), but it may also be due to fear of missing out (FOMO) the developments in these environments (Blackwell et al., 2017).

FOMO is defined as a new type of addiction which causes individuals to spend much longer time on social networks as they are afraid of missing out the developments and failing to be informed of developments on social networking sites (Buglass, Binder, Betts and Underwood, 2017; Dossey, 2014 Oberst, Wegmann, Stodt, Brand and Chamarro, 2017; Przybylski, Murayama, DeHaan and Gladwell, 2013). FOMO has also been reported to increase social media usage among young people (Alt, 2015; Przybylski et al., 2013). Moreover, Chamarro and Oberst (2016) reported that FOMO triggers problematic social networking and is associated with social media addiction. Considering that social media is mostly used via mobile devices, several studies also showed that FOMO causes problematic smartphone usage (Alt, 2015; Clayton et al., 2015; El Hai et al., 2016; Przybylski, 2013). Kuss and Griffiths (2017) stated in the light of the relevant literature that FOMO can be a strong predictor of social media addiction. There are more and more studies on FOMO in Turkey. Göklör et al. (2016) found in their study on university students that the students using social network accounts intensively and with many social media accounts had higher FOMO levels. In the said study, they stated that there was a positive relationship between FOMO levels and increased social network usage. Gezgin et al. (2017) showed in their study on preservice teachers that that the preservice teachers using social media actively for longer than seven hours during the day had higher FOMO levels. The same study reported that the preservice teachers using Twitter, Instagram, Swarm and Snapchat applications also had higher FOMO levels. Another study observed that the university students with a tendency of FOMO were spending at least 7 hours on social media actively every day and had 4 different accounts on 4 different social networking sites (Hosgör, Tütüncü, Hosgör and Tandoğan, 2017). In the light of these findings, it is obviously important to explore the relationship between social media addiction, daily social media usage and FOMO, which would contribute to the literature. Studies in the literature indicate that the FOMO variable should be addressed in studies on social media usage and social media addiction (Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017).

Besides FOMO, personality traits are some of the variables that can affect the use of social media. The five-factor personality model is one of the most widely used models (Judge et al., 1999). It is a broad model that tries to explain conditions related to personality structures (McCrae & Costa, 1987; Digman, 1990). The model, which was adapted to Turkish language and culture as “Beş Faktörlü Kişilik Ölçüğü” (“Big Five Personality Traits Scale”), consists of five personality traits which are extraversion, agreeableness, conscientiousness and neuroticism and openness to experience (Horzum, Ayas, & Padir, 2017). Extravert individuals are friendly people who are eager to establish social relationships (Lounsbury and Gibson, 2009). Agreeable individuals are polite, trustworthy, cooperative and tolerant (Glass, Prichard, Lafortune, & Schwab, 2013). Conscientiousness means that individuals are planned, organized, responsible and have high self-control (Barrick, & Mount, 1991). Neuroticism is about whether an individual is angry, anxious, depressive, insecure or nervous and refers to being inclined to such emotions (Barrick, & Mount, 1991). Openness to experience refers to imagination, being sophisticated, curiosity, aesthetics, sensibility, intelligence and being broad-minded (Barrick, & Mount, 1991). Studies show that personality traits are important in predicting technology use, technology acceptance and use of social media (Jeong, & Kim, 2016; Xay et al., 2016; Deveraj,
Easly, & Crant, 2008; Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017). The five-factor personality model is considered a variable that is used to explain social media addiction. For instance, a positive relationship is observed between individuals’ social media addiction tendencies and extraversion (Ryan, & Xenos, 2011; Wilson, Fornasier, & White, 2010). On the other hand, a negative relationship was observed between individuals’ social media addictions and personality trait of conscientiousness (Wilson, Fornasier, & White, 2010). While some studies argue a positive relationship between neuroticism and social media usage frequency (Correa, Hinsley, & Zungia, 2010), other studies have observed a negative relationship between Facebook addiction and personality traits of conscientiousness and openness to experience (Andreassen et al., 2013).

This study aimed to investigate direct and indirect effects of Social Media Addiction (SMA), Social Media Usage (DSMU) and Personality Traits beyond BIG 5 on Fear of Missing Out (FOMO). It is thought that identifying the effects of social media addiction, daily social media usage, and personality traits on FOMO may have important outcomes academically, socially and educationally. It is accordingly anticipated that discussing the integration of social networking sites into courses via usage in educational-instructional processes within the framework of social media addiction and FOMO will provide beneficial suggestions.

**Purpose of Research and Research Questions**

This study discussed “Social Media Addiction” “FOMO”, “Daily Social Media Usage” and “Personality Traits” which are known to be positively interrelated in the literature and sought answers to the following questions for identifying their direct and indirect effects on FOMO with a path analysis:

1. How does Social Media Addiction affect FOMO?
2. How does Daily Social Media Usage affect Social Media Addiction?
3. How does Daily Social Media Usage affect FOMO?
4. How do personality traits of EXT, AGR, CON, NER and OE affect FOMO?

**METHOD**

This study mainly aimed to investigate the direct and indirect effects of variables that affect FOMO. The participants of the research were included in the study group with the stratified sampling method, and the research was planned and conducted in accordance with the relational survey model of quantitative research methods. Survey studies summarize the characteristics of participant individuals, groups or physical environments (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2017) rather than the causes of opinions and characteristics regardless of the effort to change and influence the situation in question (Fraenkel & Wallen, 2006). Relational survey models aim to measure the presence and degree of the change between two or more variables (Karasar, 2008, p. 81).

**Participants**

Participants were 845 prospective students being educated at Sakarya University Faculty of Education, and participants age ranged from 18 to 26 (M=4.54; sd=1.64). It was asked to participants that voluntarily complete the questionnaire. Stratified sampling method was used for the selection of participants from all departments and grade level. 845 students was selected based on 3% confidence interval from 3547 students (Anderson, 1990). Detailed information presented at Table 1.
Table 1. Participants of the study selected by stratified sampling method

<table>
<thead>
<tr>
<th>Departments</th>
<th>Total number of students</th>
<th></th>
<th></th>
<th></th>
<th>Total (obtained)</th>
<th>Total (valid)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Grade</td>
<td>2. Grade</td>
<td>3. Grade</td>
<td>4. Grade</td>
<td></td>
<td></td>
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<td>Computer Education &amp; Instructional Technologiess</td>
<td>10</td>
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<td>18</td>
<td>22</td>
<td>68</td>
<td>64</td>
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<td>Mathematics Education</td>
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<td>18</td>
<td>16</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>English Language Teaching</td>
<td>15</td>
<td>11</td>
<td>11</td>
<td>10</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>Preschool Education</td>
<td>18</td>
<td>25</td>
<td>16</td>
<td>16</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Preschool Education (Evening Education)</td>
<td>19</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>64</td>
<td>139</td>
</tr>
<tr>
<td>Special Education</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td>-</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Guidance and Psychological Counselling</td>
<td>17</td>
<td>25</td>
<td>23</td>
<td>30</td>
<td>74</td>
<td>155</td>
</tr>
<tr>
<td>Guidance and Psychological Counselling (Evening Education)</td>
<td>20</td>
<td>25</td>
<td>22</td>
<td>15</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Elementary Education</td>
<td>21</td>
<td>19</td>
<td>20</td>
<td>12</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Social Studies Education</td>
<td>17</td>
<td>16</td>
<td>16</td>
<td>14</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Turkish Language Education</td>
<td>16</td>
<td>17</td>
<td>19</td>
<td>16</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>Teaching for Mentally Handicapped</td>
<td>-</td>
<td>5</td>
<td>10</td>
<td>14</td>
<td>29</td>
<td>63</td>
</tr>
<tr>
<td>Teaching for Mentally Handicapped (Evening Education)</td>
<td>-</td>
<td>9</td>
<td>13</td>
<td>12</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>226</td>
<td>225</td>
<td>189</td>
<td>850</td>
<td>845</td>
</tr>
</tbody>
</table>

Procedure

The path analysis of structural equation models was performed to examine direct and indirect effects of the variables that are theoretically interrelated in the study. Path analysis operates only through the observed variables (Raykov & Marcoulides, 2006) and is a method which allows for examining the causation between two or more variables. Path analysis enables analyses that can be performed using multiple regression analysis techniques for causative modelling (Bordens & Abbott, 2011) to be conducted only on a chart. Effect size values were also calculated for each structural equation. Permission for conduct was obtained from the administration of Sakarya University Faculty of Education. The test model is shown in Figure 1.

![Path Analysis Diagram]

Figure 1. Model examined with Path Analysis

Data Analysis

The data were collected on voluntary basis, and SPSS 23 and AMOS 23 software packages were utilized in the analysis. Furthermore, the effect size was calculated using the Microsoft Excel software package in the research.
The path analysis which is a type of structural equation modeling was used to test the model developed in the study. The analysis examined the relationships between “FOMO”, “SMA”, “DSMU” and different personality traits of “EXT”, “AGR”, “CON”, “NER” and “OE” and identified direct and indirect effects between these variables. Table 1 summarizes the mean, standard deviation and correlation values, and Table 2 sums up the fit values achieved in regard to the path analysis.

**Table 2. Mean, Standard Deviation and Correlation Values of Data**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean.</th>
<th>sd</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOMO</td>
<td>845</td>
<td>12</td>
<td>46</td>
<td>29.06</td>
<td>5.99</td>
<td>.192</td>
<td>.239</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMA (2)</td>
<td>845</td>
<td>32</td>
<td>80</td>
<td>56.84</td>
<td>8.33</td>
<td>-.185</td>
<td>.037</td>
<td>.487**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSMU (hour)(3)</td>
<td>845</td>
<td>0</td>
<td>6</td>
<td>3.16</td>
<td>1.47</td>
<td>.015</td>
<td>-.561</td>
<td>.234**</td>
<td>.419**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXT (4)</td>
<td>845</td>
<td>3</td>
<td>9</td>
<td>5.96</td>
<td>1.03</td>
<td>.303</td>
<td>.864</td>
<td>.061</td>
<td>.069</td>
<td>.027</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGR (5)</td>
<td>845</td>
<td>4</td>
<td>10</td>
<td>6.92</td>
<td>1.19</td>
<td>.237</td>
<td>.058</td>
<td>.121</td>
<td>.081</td>
<td>.020</td>
<td>.130**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CON (6)</td>
<td>845</td>
<td>3</td>
<td>10</td>
<td>6.51</td>
<td>1.28</td>
<td>.165</td>
<td>.401</td>
<td>.044</td>
<td>.028</td>
<td>-.036</td>
<td>.113</td>
<td>.122</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NER (7)</td>
<td>845</td>
<td>2</td>
<td>10</td>
<td>6.40</td>
<td>1.51</td>
<td>-.049</td>
<td>-.216</td>
<td>.003</td>
<td>.044</td>
<td>.003</td>
<td>.002</td>
<td>.164</td>
<td>.048</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OE (8)</td>
<td>845</td>
<td>3</td>
<td>10</td>
<td>6.25</td>
<td>1.28</td>
<td>.184</td>
<td>.132</td>
<td>.065</td>
<td>.051</td>
<td>-.038</td>
<td>-.003</td>
<td>.090</td>
<td>.125</td>
<td>.113</td>
<td>1</td>
</tr>
</tbody>
</table>

FOMO: Fear of missing out; SMA: Social media addiction; DSMU: Duration of daily social media usage; EXT: Extraversion; AGR: Agreeableness; CON: Conscientiousness; NER: Nervousness; OE: Openness to experience

*p < .05 ** p < .01

As seen in Table 2, the relationships between the variables were significant and at the expected level. These results also argue that there were important and significant effects between the variables. Tolerance (>0.2) and VIF (<10) values were examined to identify the problem of multicollinearity between the variables in the data analysis, and no problem was detected whatsoever. Furthermore, the data were normally distributed according to the skewness and kurtosis values in the table (Mertler & Vannatta, 2005). Given the relationships between the variables, it was observed that rFOMO-SMA = 0.487; rFOMO-DSMU = 0.234; rSMA-DSMU = 0.419; and rAGR-FOMO = 0.121. Accordingly, it can be argued that there were moderate positive relationships between FOMO and SMA, and SMA and DSMU but low positive relationships between FOMO and DSMU, and AGR and FOMO (Davis, 1971).
Table 3. Perfect and acceptable fit values in regard to the path analysis

<table>
<thead>
<tr>
<th>Fit indices</th>
<th>Perfect Fit indices</th>
<th>Accepted fit indices</th>
<th>Achieved values</th>
</tr>
</thead>
<tbody>
<tr>
<td>(χ²/df)</td>
<td>≤ 3</td>
<td>≤ 4.5</td>
<td>1.63</td>
</tr>
<tr>
<td>AGFI</td>
<td>≥ 0.90</td>
<td>≥ 0.85</td>
<td>0.98</td>
</tr>
<tr>
<td>GFI</td>
<td>≥ 0.90</td>
<td>≥ 0.85</td>
<td>0.99</td>
</tr>
<tr>
<td>CFI</td>
<td>≥ 0.97</td>
<td>≥ 0.90</td>
<td>0.99</td>
</tr>
<tr>
<td>RMSEA</td>
<td>≤ 0.05</td>
<td>0.06-0.08</td>
<td>0.03</td>
</tr>
<tr>
<td>SRMR</td>
<td>≤ 0.05</td>
<td>0.06-0.08</td>
<td>0.02</td>
</tr>
</tbody>
</table>

According to the fit values in Table 2, the model has acceptable and perfect fit values (χ² = 16.321, sd = 10 χ²/sd = 1.63; RMSEA = 0.03; SRMR = 0.02; CFI = 0.99; GFI = 0.99; AGFI = 0.98) (Arbuckle, 2007; Baumgartner & Homburg, 1996; Bentler & Bonett, 1980; Bollen, 1990; Browne & Cudeck, 1993; Byrne, 2001; Hu and Bentler, 1999; Joreskog & Sorbom, 1993; Kline, 2011; Marsh, Hau, Artesl, Baumert & Peschar, 2006; Steiger, 2007; Schermelleh-Engel & Moosbrugger, 2003; Tanaka & Huba, 1985). The developed and tested path analysis is shown in Figure 2. The information on direct and indirect effects on the variable tested in the model is provided in Table 4.

Figure 2. Findings Achieved in the Path Analysis

Table 4. Direct and indirect effects on the variables of FOMO and SMA

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Total effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Standard error</th>
<th>Critical ratio (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMA</td>
<td>FOMO</td>
<td>0.46</td>
<td>0.46</td>
<td>-</td>
<td>0.034</td>
<td>14.024***</td>
</tr>
<tr>
<td>DSMU</td>
<td>FOMO</td>
<td>0.24</td>
<td>0.04</td>
<td>0.19</td>
<td>0.033</td>
<td>1.266</td>
</tr>
<tr>
<td>DSMU</td>
<td>SMA</td>
<td>0.42</td>
<td>0.42</td>
<td>-</td>
<td>0.031</td>
<td>13.390***</td>
</tr>
</tbody>
</table>
In the model, the independent variable “Daily Social Media Usage- DSMU” had no significant effect on “FOMO” ($\beta = 0.04, p > 0.05$) while affecting the variable “Social Media Addiction- SMA” ($\beta = 0.42, p < 0.001$) directly and positively. It can also be said that the independent variable SMA had a direct and positive effect ($\beta = 0.46, p < 0.001$) on FOMO. Moreover, the independent variable AGR ($\beta = 0.08, p <0.001$) had a direct, positive and significant effect on the dependent variable of FOMO whereas the independent variables of EXT ($\beta = 0.02, p> 0.05$), CON ($\beta = 0.02, p> 0.05$), NER ($\beta = -0.04, p> 0.05$) and OE ($\beta = 0.04, p> 0.05$) did not affect FOMO significantly. Accordingly, $24\% (R^2 = 0.24)$ of FOMO was explained by the independent variables of SMA and AGR. On the other hand, the independent variable of DSMU alone explained the dependent variable of SMA at $18\% (R^2 = 0.18)$.

**Effect Size**

To test whether the result achieved in the research was significant and its significance in practice, the standardized ($f^2$) value was calculated, which was suggested by Cohen (1988) for regression analyses and linear models. $f^2$ value is calculated by the division of multiple correlation coefficient ($R^2$) by its subtraction from 1 ($1-R^2$) ($f^2 = R^2 / (1 - R^2)$). Accordingly, $0.02 \leq f^2 < 0.15$ refers to small effect, $0.15 \leq f^2 < 0.35$ to medium effect and $0.35 \leq f^2$ to large effect (Cohen, 1988). The research concluded a medium effect size ($R^2 = 0.18; f^2 = 0.22$). The effect sizes calculated for each variable in the equation are shown in Table 5.

<table>
<thead>
<tr>
<th>Structural Equation</th>
<th>$R^2$</th>
<th>$f^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOMO</td>
<td>0.24</td>
<td>0.31</td>
</tr>
<tr>
<td>SMA</td>
<td>0.18</td>
<td>0.22</td>
</tr>
</tbody>
</table>

FOMO: Fear of missing out; SMA: Social media addiction

As seen in Table 5, the independent variables of SMA and AGR had a medium effect on FOMO ($R^2 = 0.24; f^2 = 0.31$) and DSMU had a small effect on SMA ($R^2 = 0.02; f^2 = 0.02$).

**CONCLUSION AND DISCUSSION**

The findings of this study examining the relationship between social media addiction, FOMO and personality traits showed social media addiction’s effect on FOMO. The literature indicates that FOMO causes problematic and intensive social media use (Alt, 2015; Beyens, Frison and Eggermont, 2016; Przybylski et al, 2013; Al-Menayes, 2016). Nonetheless, individuals may become addicted due to the intensive social media usage caused by FOMO (Gil, Chamarro and Oberst, 2015). The idea that the addicted individual may have increased FOMO levels can be considered in the light of the results of this study because the SMA variable had a positive effect on FOMO in the study. It can be accordingly implied that increased social media addiction can make students more curious about...
events and posts on social media, therefore increasing their FOMO levels. It is thought that addiction may reinforce FOMO, and then, social media offering rewarding experiences will an effect on the drive to check individuals’ own profile and friends’ profiles and spend time on social networks by building up the desire to be in connection with what others do (Dossey, 2014; Przybylski et al., 2013) in the mechanism of drive, behavior and reward in regard to addiction. This mechanism and the suggested mutual effects of SMA and FOMO are shown in Figure 3.

![Figure 3. Place of FOMO in the Cycle of Social Media Addiction](image)

Some of the studies in the literature support this finding (Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017; Al-Menayes, 2016). It is, however, mentioned in the literature that high FOMO levels are associated with high Facebook engagement and may have consequences such as social media usage when using tools during courses (Przybylski, Murayama, DeHaan, & Gladwell, 2013). In addition, FOMO is considered an important variable in predicting problematic social media use (Al-Menayes, 2016).

Regarding the findings on daily social media usage, the DSMU variable had a significant and positive effect on SMA. This is a finding frequently mentioned in the literature (Yang and Tung, 2007; Al-Menayes, 2015; Kirik, Arslan, Çetinkaya, & Mehmet, 2015) and expected by researchers and experts of the field. Furthermore, the analyses made in regard to the relationship between FOMO and DSMU indicated that DSMU was effective on SMA while having no effect on FOMO. Even though there are studies showing that the students with high levels of FOMO had higher DSMU (Alt, 2015; Gezgin et al., 2017; Gökler et al., 2017; Przybylski et al., 2013), the analysis performed on the data obtained in the research concluded no effect of DSMU on FOMO levels.

The findings achieved in the analysis for identifying the relationship between personality traits and FOMO indicated that AGR had a positive effect on FOMO while other personality traits (EXT, CON, NER, OE) did not. On the other hand, Stead & Bibby (2017) reported a negative relationship between FOMO and CON and a positive relationship between FOMO and CON. Hadlington & Scase (2018) stated in their study on individuals at the age of 18-65 that there was a negative relationship between FOMO and CON, and on contrary to the findings of this research, a negative relationship between FOMO and AGR.

Acknowledgement

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Declaration

Availability of data and material

Not applicable.

Funding

I hereby this study is not funded by any companies or institutions. Not applicable.

Competing interests

The authors declare that they have no competing interests.

Statements on open data and ethics

This research was carried out considering Committee on Publication Ethics’ (COPE) the ethical guidelines. The participants consist of prospective teachers and they participated to the study voluntarily. The participants informed about the privacy of the study and ensured their names were not taken. The views taken from the participants do not match with any of their demographics in case of not being disadvantaged.

REFERENCES


What Messages a Documentary and Biographical Film Give About the Nature of Science to Prospective Science Teachers?

Davut Sarıtaş
Nevşehir Hacı Bektaş Veli University

Abstract

In this study, the experience of prospective science teachers, who watched a cinema film adapted from the life story of a well-known scientist for the first time in an informal environment, was examined. Answers of two questions were sought in the study; (1) what aspects of the nature of science did the prospective science teachers experience through which scenario elements of the film? (2) how do pre-service teachers interpret these experiences? In this study, being conducted based on hermeneutic phenomenology design; the data were collected through focus group interviews with semi-structured questions prepared by taking into consideration the aspects of the nature of science. Participants were 29 (23 girls, 6 boys) prospective science teachers. The collected data were analyzed by qualitative methods. The findings showed that the participants experience and interpret some aspects of the nature of science through specific scenario elements (representations). It was determined that participants highlighted certain sections (e.g. process of discovery, social reaction) in the story. It was observed that the participants correlated these sections with the nature of science in a positive or negative way and interpret them. The results show that these kinds of films adopted from history of science, which are recommended in the literature, can give positive messages about the nature of science. In addition, it was observed that the film caused misconceptions about the nature of science, especially due to the scenario. Therefore, it can be said that such films produced for different purposes may lead to some problems in the teaching of the nature of science. From this point of view, even if such films are used, it is obvious that rather than an informal environment, it is necessary to integrate these films into a more structured learning environment where inappropriate messages given by the film can be seen critically.

Keywords Nature of Science, History of Science, Prospective Science Teachers, Documentary and Biographical Film, Hermeneutic Phenomenology

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INTRODUCTION

The quality of the science education of the countries is the clearest indication of importance given to the science. Giving importance to science is only possible through understanding and appreciation of it. Apart from doing science to understand science, it is necessary to evaluate science in a historical, philosophical, sociological and even psychological context (McComas, Clough and Almazroa 1998). Science in the most general sense, operationally, can be described as “what scientists do”. Therefore, history of science can be a unique tool in this respect. Besides, it is also necessary to look at science not only from a scientist’s view but also from a more external perspective (Yıldırım 2008). What stands out here is the philosophy of science. Rather than studying science as an object of its history, a philosophical approach to the HOS may be more effective in understanding and appreciation of science. Therefore, the combination of history and philosophy of science and a philosophical view towards the historical adventure of science reveal many important products that are milestones in understanding science. For instance, K.R. Popper, T. Kuhn, P.K. Feyerabend and others, bringing out books that were effective on shaping today’s understanding of science, always defined science through examples from the history of science and philosophical approaches to science.

Understanding the nature of science in science education has been emphasized as a goal for a long time. According to this, scientifically literate individuals should have an understanding and act about some features and aspects of science and scientific knowledge (American Association for the Advancement of Science [AAAS] 1990, 1993; National Research Council [NRC] 1996, 2007, 2013; Ministry of Turkish National Education [MONE] 2005, 2006). There are different views on how the nature of science should be addressed in science education literature (e.g. “consensus / family resemblance / integrated” Niaz, 2016, p. 7). When the literature is examined, it can be said that the most widely accepted view is consensus view. According to this view, the nature of science in school science should be dealt with its aspects that include general knowledge and that are least controversial (Lederman, Abd-El-Khalick, Bell and Schwartz 2002; Smith, Lederman, Bell, McComas and Clough 1997; Smith and Scharman 1999). These aspects are as follows: (1) scientific knowledge, which includes “facts,” “theories,” and “laws” is both reliable and tentative, (2) empirically based, (3) subjective and/or theory-laden, (4) partly the product of human imagination and creativity, (5) subject to a distinction between observations and inferences, (6) and influenced by social and cultural factors (7) and theories and laws are different types of knowledge (Lederman 2007). On the other hand, within the framework of the standards of science (Next Generation Science Standards; NRC 2013) taught in schools in the United States recently, the assumptions of science are expressed as follows: (1) scientific research uses a variety of methods, (2) scientific knowledge is based on empirical evidence, (3) scientific knowledge is open to change in the light of new evidence, (4) scientific models, laws and mechanisms and theories disclose natural phenomena, (5) science is a way of knowing (6) scientific knowledge assumes an order and consistency in natural systems, (7) science is a humane activity, (8) science deals with questions about the natural and material world.

Science is one of the most frequently used concepts in educational environments and daily life. It is also quite normal to attribute different meanings to such a frequently used concept. Many inaccurate assumptions related to science are expressed as myths of science (McComas 1996, 1998). Perhaps one of the greatest obstacles to understand the nature of science correctly is these myths about science. McComas (1998) lists the myths of science as follows; (1) hypotheses become theories that in turn become laws, (2) scientific laws and other such ideas are absolute, (3) a hypothesis is an educated guess, (4) a general and universal scientific method exists, (5) evidence accumulated carefully will result in sure knowledge, (6) science and its methods provide absolute proof, (7) science is procedural more than creative, (8) science and its methods can answer all questions, (9) scientists are particularly objective, (10) experiments are the principal route to scientific knowledge, (11) scientific conclusions are reviewed for accuracy, (12) acceptance of new scientific knowledge is straightforward, (13) science models represent reality, (14) science and technology are identical, (15) science is a solitary pursuit. Considering the literature about how to teach the nature of science, it is seen that three different approaches namely historical, implicit, and explicit-reflective approaches are used (Khishfe and Abd-El-Khalick 2002; Duschl and Grandy 2012). Among these, historical approach
aims to teach the aspects of NOS through events that took place in the history of science (Abd-El-Khalick and Lederman 2000). Essentially, the need for philosophical and historical perspectives in the understanding of science in science education is not a new idea (e.g. Niaz 2016; Matthews 2015; Schwab 1964). However, although the integration of HOS into the teaching process is difficult (Abd-El-Khalick and Lederman, 2000), it is known that this approach is effective for PST to understand the nature of science (Lin and Chen 2002). A possible opportunity to integrate HOS into science teaching can be the informal learning environments.

Informal learning can be defined as learning outside the classroom in its most general form (Gerber and Marek, 2001). The effective role of media in informal learning, creating perception, developing views and understanding is an undeniable fact. Films that are one of the media channels convey ideas and knowledge more effectively than written texts (Cohen 1999 ‘as cited in Trier 2002). In this aspect, media can be an effective tool especially in teaching processes aiming at understanding, vision and awareness. Use of films in teaching (Dale, Fannie, Charles and Etta 1937; O’Connor 1987) and teacher training has been suggested for a long while (Öztürk 2017; Robertson 1995; Tan 2006; Trier 2002). In this context, it can be said that films can be used in teaching difficult but important phenomena such as developing an understanding of science. Films are one of the tools indirectly affecting people’s cultural views (Vidal 2018; Moylan 2018; Jarvie 1970) and science is a human activity like culture (Driver, Leach, Millar and Scott, 1996). Therefore, films can be used to develop the public understanding of science. Films and television programs affect science learning informally (Shaw and Dybdahl 2000; Dhingra 2003). When the literature is examined, it is seen that science fiction films are used in science education (Cavanaugh and Cavanaugh 2004; Segall 2002; Sürmeli 2012). Although the results obtained are generally positive, some researchers reported that science fiction films cause misconceptions (Bixler 2007; Barnett, Wagner, Gatling, Anderson, Houle and Kafka 2006). On the other hand, there are also suggestions that biographies and historical documentary films can be effective in science education, especially on developing NOS (Özcan, 2013; Kapucu, 2016; Yenice, 2015). There are also studies suggesting that scenes from documentary films that encourage thinking are useful in explicit-reflective teaching of certain dimensions of nature of science in a context-based learning environment, allowing the open discussions on historical processes and practices (Seçkin Kapucu, Çakmakçı and Aydoğdu, 2015; Çakmakci, 2017).

The purpose of the study

In brief, the debate on NOS in science education (e.g. Irzik and Nola 2016; Niaz, 2016; Mathews, 2015) shows the importance of philosophy of science. On the other hand, the studies on philosophy of science show that in order to understand science, guidance of HOS is needed. Historical approach used in teaching of NOS can perform this task in science education. In this context, for the understanding of NOS in a society, science teachers should be aware and knowledgeable on history and philosophy of science. More importantly teachers should have a sophisticated view on nature of science. In order to achieve this goal, it is possible to make use of HOS because it has the potential to be a peerless tool in understanding science. One of the ways that can be used to integrate HOS into science education is the use of films about scientists and scientific events. Both formal and informal effects of the films produced by inspiring from history of science on the nature of science is important. It is also known that such films are not produced with specific didactic purposes, such as the teaching of the nature of science. No studies have been found on the informal effect of such films on the nature of science. Therefore, it is important to examine the individual experiences in the informal use of such films.

Aim of the study and Research Questions

The aim of this study is to examine the experience of prospective science teachers, who watched a cinema film adapted from the life story of a well-known scientist for the first time in an informal environment. The following research questions have been determined for this aim;
1. What aspects of the nature of science have the prospective science teachers experienced through which scenario elements of the film?

2. How did prospective science teachers make sense of their experiences?

METHOD

Considering the purpose, the focus of the study is on the experiences of the prospective teachers. For this reason, this study is a hermeneutical phenomenology research conducted within the framework of qualitative research paradigm (Denzin and Lincoln, 2000). Like phenomenology, hermeneutical phenomenology is also concerned with human experiences and focuses on reaching to an understanding about meanings of experiences. However, the main difference between these two approaches is methodological. In the phenomenology, the researcher's self-reflection on the process is limited to the preparation stage. In the research process, the researcher does not include his / her assumptions and prejudices but enclose them in parentheses. On the other hand, hermeneutical phenomenology is an interpretive process. Therefore, the prejudices and assumptions of the researcher are not included in the parenthesis or put aside but are embedded and essential for the interpretation process. In this respect, the results of the research are revealed by the researcher's interpretation (Allen, 1996; Polkinghorne, 1989, as cited in Laverty, 2003). On the other hand, in all phenomenological researches, questions are asked in two ways in order to understand what and how the participants experience; first, what they experience about the phenomenon and the second, which environment or cases affect the experience of the phenomenon (Moustakas, 1994). The phenomenon experienced by the participants in this study is the depiction of science and scientific knowledge in the film.

Participants

This study was carried out with the third-year prospective (in 5th semester) science teachers attending to science education department of a university in Turkey. A total of 29 (6 man and 23 women) PST participated to the study. Participants were selected from PST who haven’t taken HOS and NOS courses. PST with high, medium and low-grade averages participated to the study. In addition, the participants were selected among the pre-service teachers who could not have any knowledge and experience about the film.

Data collection

Semi-structured interview questions

A self-report form consisting of semi-structured questions prepared by researcher was used to collect data. While preparing the questions, literature about nature of science was examined (“consensus view”, Lederman 2007; Mc Comas et al. 1998). In the interview form, the aspects of the nature of science were also taken as dimensions. There are seven main questions each of which is a main dimension, and some sub questions. The general structure of the interview-form is as follows;

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1. Scientific knowledge is reliable and tentative</td>
<td>What did you experience in the film you watched about the reliability and tentativeness of scientific knowledge?  • What happened in the film about this?  • Can you justify it?  • Which stage is the reason for your idea? (etc.)  • Did you experience something different?</td>
</tr>
</tbody>
</table>

Figure 1. General structure of the questionnaire

Other dimensions in the form are;
D2. **scientific knowledge is empirical** (based on and/or derived from observations of the natural world); D3. **scientific knowledge is subjective and/or theory-laden**; D4. **scientific knowledge is partly the product of human imagination and creativity**; D5. **scientific knowledge is influenced by social and cultural factors**; D6. **scientific knowledge is subject to a distinction between observations and inferences**; D7. **theories and laws are different types of knowledge**.

**Procedure**

The film was watched at the beginning of the semester (2017-2018) before the beginning of nature and philosophy of science course. In order to create an informal environment, the film was watched at the weekend and a comfortable environment was created for the participants.

In the study, the film named “Einstein and Eddington”, which was broadcasted in 2008 and was not broadcasted in Turkey, was watched. This film is both biographical and documentary (Martin, 2008). The film was chosen because it was not a science fiction. Science fiction movies can hamper individuals’ ability of understanding and critical thinking about science (National Science Foundation [NSF] 2000). It was also reported and advised that this film is about some aspects of the nature of science (Kapucu 2016; Yenice 2015). Scenarist Peter Moffat, who writes science fictions, wrote about the process of Einstein’s developing general relativity theory in the context of that period’s social and political environment (Martin 2008). The film was watched with Turkish subtitles. The subtitle was checked by an expert (English native speaker) who knows Turkish and necessary corrections were made.

Approximately one hours after the watching the film, focus groups interviews were conducted with prospective science teachers in a suitable classroom. PSTs were divided into three groups (10-10-9 PSTs) and interviews were conducted with each group one after the other. The interviews were in semi-structured form and took about one hour for each group. The interviews were recorded in the video.

**Data Analysis**

Data analysis was conducted in two stages depending on the research questions. First, participants' responses about the relationship between the conventional aspects of NOS and the film scenario were analyzed qualitatively. In this way, it is determined which scenario elements (representations) of the film are related to which conventional aspect of the nature of science (1st research question). In qualitative analysis, codes were determined by assigning meaningful units to descriptive and interpreted knowledge. Coding is a process required to reduce and present data, initiating a qualitative analysis and continuing at different stages throughout the analysis (Miles and Huberman 1994). In this study, it is aimed to determine whether there are scenario elements belonging to the film in the explanations of the participants. If there are certain elements of the film in the explanations of the participants, they were tried to be determined. Since it was not possible to obtain a specific code list related to the scenario elements of the film from the literature, codes for determining the elements of the film were obtained inductively from the data (Strauss and Corbin 1998). Significant data units have been open coded. Then the data carrying the same and similar codes were combined and categorized. Thus, codes were combined to form a pattern and more abstract pattern codes (or categories) were obtained (Patton 2002). An exemplary coding process is given in a quotation as follows;
Figure 2. An example of the qualitative analysis

These categories correspond to scenario elements that enable participants to experience the conventional aspects of NOS associated with the film, or corresponds to the representations that participants interpret. In the second stage, a thematic descriptive analysis was performed to understand how the participants interpret these representations (question 2). Descriptive analysis is a type of qualitative data analysis which includes summarizing and interpreting data according to predetermined themes (Yıldırım and Şimsek, 2003). In the descriptive analysis, the themes were determined by taking into account the dimensions of the interview form (conventional aspects of NOS) and the data were organized according to the sub-themes (interpretations) obtained under these main themes.

Validity and reliability

The semi-structured interview questions were prepared based on experts’ opinions. After the study, qualitative analysis of some of the data (N: 9) were graded by a different researcher. Following these two-independent evaluations, it was observed that there was a complete agreement on quantitative scoring. In the analysis, the concordance in most of the code list was found to be about 93% according to Miles and Huberman (1994)’ formula. In addition, in phenomenological studies, it is an important aspect to confirm the findings by returning to participants (Laverty, 2003). Therefore, participants were provided with the opportunity to verify the representations and the themes regarding how they interpret these. This verification was done by presenting the relationships obtained between the scenario elements of the film and the thematic propositions of the nature of science. As a result of this process, some of the relations were revised and rearranged according to the opinions of the participants.

FINDINGS

The findings were given under two headings depending on the research questions;

Scenario elements associated with NOS (Representations)
The scenarios that the participants associate with the nature of science, in other words, elements of the film which represents some aspects of the nature of science according to the participants are given in the table below.

**Table 1. Categories of scenario elements obtained from qualitative analysis**

<table>
<thead>
<tr>
<th>Main Categories</th>
<th>Sub-Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery (E-1)</td>
<td>The process of development of Einstein’s theory</td>
</tr>
<tr>
<td></td>
<td>Recognizing the anomaly</td>
</tr>
<tr>
<td></td>
<td>Alternative explanation and process</td>
</tr>
<tr>
<td></td>
<td>Presenting a new proposal</td>
</tr>
<tr>
<td>Reaction (E-2)</td>
<td>British Academy of Science – German University scientists’ response</td>
</tr>
<tr>
<td></td>
<td>Social environment affecting science societies</td>
</tr>
<tr>
<td></td>
<td>Commitment to current theory</td>
</tr>
<tr>
<td>Testing (E-3)</td>
<td>Determining methods for new suggestions</td>
</tr>
<tr>
<td></td>
<td>Observation</td>
</tr>
<tr>
<td></td>
<td>Success of the proposal</td>
</tr>
<tr>
<td>Acceptance (E-4)</td>
<td>Acceptance of Einstein’s claims by scientists and others (British Academy of Sciences-German University)</td>
</tr>
<tr>
<td></td>
<td>Adoption of the result by different scientific societies</td>
</tr>
<tr>
<td></td>
<td>Universal announcement of the result</td>
</tr>
</tbody>
</table>

The conventional aspects of NOS to which the participants relate these representations are given as follows;

![Diagram](image)

**Figure 3. The relationship between representations and conventional aspects of NOS experienced over them**

In the figure, the black arrows show that the representation is mostly interpreted as supporting the conventional aspects of NOS, while the red arrows show they are interpreted in a way not to support them. In addition, frequently preferred relationships by the participants were expressed in full arrows, less preferred relationships with dashed arrows.

When the figure is examined, the most effective representation between which a positive correlation is established in conventional aspects of NOS is “Discovery” (E1. Einstein’s process of
developing the theory). On the other hand, the relationship between the "Acceptance" (E4. Acceptance of Einstein’s claims by scientists and others (British Academy of Sciences-German University) and D7 has been established frequently with a negative interpretation. In addition, the representation “Test” (E3. Eddington's experimental method for Einstein’s theory to be determined and tested and positive results) was also positively associated with more than one NOS aspect. Participants did not make any evaluations in the interviews for other NOS aspects D3 (Scientific knowledge is subjective and / or theory-laden) and D6 (Scientific knowledge is subject to a distinction between observations and inferences). This means participants have not experienced any representations in terms of these two aspects of the nature of the science.

**Interpretations for representations**

Below are the findings on how participants interpret the representations they experienced from the film. The findings are presented with the “interpretation themes” under the main themes (NOS conventional aspects) and quotations. The quotations are coded with Q.

**D1. Scientific knowledge is tentative**

**Interpretation 1. An anomaly recognized in the existing scientific knowledge indicates that scientific knowledge is subject to change and correction.**

According to most of the participants, the most important indicator of the tentativeness of scientific knowledge is the recognition of the “mistake” (with the expression of the participant) / anomaly (Newton) in the current scientific knowledge given in the film and a new alternative scientific proposal (Einstein) (E1). For example;

“Scientific knowledge may change, may be incomplete or wrong but it can be corrected over time, Yes, as we’ve seen the mistake in Newton’s theory, which is corrected by Einstein who found the mistake” (Q1)

**Interpretation 2. Scientific knowledge is eventually universally verified.**

The participants who received a different message from the film, although very few, have interpreted that the change of scientific knowledge was a temporary situation and that it would ultimately come to an unchanging format. The reason for this is that the new alternative proposal is successful when tested (Edington) and it is accepted by everyone (British and German Science Society) (E3, E4). For example;

“There may be times when scientific knowledge should be accepted unchangeably. As we have seen in the film, Einstein’s idea, which explained some things about the universe without any doubt, was finally proven and confirmed. Everyone agreed.” (Q2)

**D4. Scientific knowledge is partly product of imagination and creativity**

**Interpretation 3. Creativity as well as imagination can contribute to scientific discovery**

Accordingly, it is seen that the participants were influenced by the presentation of a new alternative scientific proposal in the film (Einstein) and the scenes related to the nature of the discovery process. It is stated that they understand the effect of imagination more clearly (E1). For example;

“...because; to make a scientific suggestion, it is necessary to think creatively and have a good imagination. In science, imagination has also contributed a great deal, Einstein
is setting up his theory by imagination and then it is proved. This is something very different.”

(Q3)
Interpretation 4. In science, the accuracy of knowledge obtained by imagination can only be determined by logic and method.

It is seen that a few of the participants have expressed the success of the new alternative proposal (Edington) as it is in the D1 given above (E3). These participants suggest that other skills such as logic and observation are more important in scientific knowledge. For example;

“I think more important than imagination is logic and observation. The theory would be invalid if Einstein’s theory had not been proved by observation and experiment.” (Q4)

D5. Science is socially and culturally embedded

Interpretation 5. Wars, forms of government, and ideologies of society can influence scientists’ preferences and thus science.

Most of the participants interpreted the reflection of the war in the film and the reaction of scientists and scientific societies (British Science Academy-German University) (E2) as a signifier of this NOS aspect. For example;

“The social structure of each state is different; it can affect the viewpoints of scientists. People who rule society, rather than the wishes of society, can influence science, it is difficult to be an objective scientist at the time of war. Cultural differences, national feelings and wars can adversely affect science.” (Q5)

Interpretation 6. Although initially influenced by local factors, scientific knowledge can become immediately acceptable and universal by observations and proofs.

However, a few participants have adopted the view that this situation is temporary and does not have a significant effect on science. According to their explanation, it is seen that the acceptance of the new alternative proposal by everyone (British and German Science Society) at the end of the film (E4) is the reason for this view. For example;

“In my opinion, science, as in the film, should attain the results that everyone would eventually accept. Science is universal. My idea is that even if science is affected (by social and cultural factors) for a while, this effect is eliminated when it comes to a place, it is not affected (by social and cultural factors).” (Q6)

D2. Scientific knowledge has an empirical nature (based on observation of the natural world)

Interpretation 7. Observation is the best way to demonstrate the correctness of a scientific idea of the working principles of the universe.

Majority of the participants thought successful testing of the proposal (Edington) as evidence that scientific knowledge is based on observation (E3). For example;

“Einstein theory is first created in the film. It's hard to make people believe it. Couldn't be proved without Eddington's observation. However, this is ensured by appropriate observation” (Q7)
Interpretation 8. The important thing is that the natural world can inspire people. Observation only indicates the accuracy of this.

However, few participants interpret Einstein's process of developing the theory (E1) as an indication that scientific knowledge is more pre-observational. For example;

"Observing things is not enough. I think theory does not fully rely on observation, as seen in the film, observation can be made later, and important thing is imagination and thinking well. Because scientific knowledge can sometimes only be revealed theoretically, it does not have to be experimental. Just like Einstein" (Q8)

D7. Scientific theory and the law are different kinds of knowledge

Interpretation 9. Although the theories and laws are initially different, the theories are sooner or later turn into laws with empirical evidence.

The majority of the participants commented that positive results of testing (E3) the experimental method and acceptance of Einstein's theory by scientists and other authorities (E4) are the indicators of the idea that scientific theories would eventually have the same nature with the scientific laws. For example;

"A theory could emerge and become law. In fact, some theories cannot be proved; it's the only difference between them. In other words, theories become laws by being proved sooner or later."(Q9)

"If scientists work at the desired level, theories can be like laws. Just like Einstein did, it is more to think and practice. Einstein is a great scientist. Edington's observation results showed everyone that Einstein is right." (Q10)

"If scientific knowledge is proven, for example, if the theory becomes law, it must be the same for everyone and (scientific knowledge) becomes objective through more comprehensive observations” (Q11)

DISCUSSION

The findings of the study supported studies showing that media tools, especially films, can influence attitudes, understanding, perceptions and views related to science (Laprise and Winrich 2010; Sürmeli 2012; Cavanaugh and Cavanaugh 2004; Segall 2002). In this study, the analysis of the film was done through the statements of the participants. The messages that this film gives to a viewer rather than a researcher are examined. In general terms, it can be said that the film gives messages that can be interpreted as meaningful in a positive way for the nature of science aspects accepted in the literature. On the other hand, they also have negative consequences.

When the literature is examined, it is seen that this film is suggested by Kapucu, (2016). Kapucu (2016) emphasized in his study, where he examined the scenario of this film in term of philosophy, that the film could be used for teaching the nature of science in certain dimensions (scientific knowledge is tentative; that it includes logical, mathematical, and empirical inferences; that it is subjective; that it is partly the product of human imagination and creativity; and that it is influenced by social and cultural factors). Although the findings obtained in this study are not for formal education, they seem to support Kapucu (2016)’s prediction partly.

Considering the positive interpretations, it can be said that some parts of the scenario are effective. For example, the scenario representations for process of the discovery (E1) and social reaction (E2) are frequently seen in the positive views of the participants. However, it is also clear that the scenario causes negative interpretations (e.g. acceptance (E4)). From this point of view, it can be
thought that the two factors are effective on negative interpretations. Primary factor is the fictional nature of the film scenario and the seconder factor is misconceptions and mythical acceptances of the participants.

**The fictional character of the scenario**

In studies where films are used in science teaching; it is stated that science fiction films can develop misunderstandings depending on the scripts of the films (Dhingra 2003; Bixler 2007; Barnett et al. 2006). Although the film used in this study is a documentary, it was filmed for a different purpose. The goal of the filmmakers is to inform the public about science or to portray it in a funny and engaging way-not to tell the truth of science (Logan 2001). In this respect, the lack of a direct formal effect while watching the film may have caused informal effects. Therefore, it can be said that the participants received different messages on the same scenario. For example, it can be seen that some of the participants drew a different interpretation in context of D4. *Scientific knowledge includes imagination and creativity*”- by focusing on a different message depending on the scenario of the film (e.g.A4).

It is also possible that one of the reasons for the interpretation on the film’s scenario is the effect of well-known character (Einstein) in the film. According to the findings, it is seen that in the themes for the changing views related to the NOS and in the participant quotations, individuals focus on this scientist who they know from textbooks or other sources. This situation caused participants to be more willing to accept the ideas of this character. In short, the influence of the characters in the film increases the acceptability of the message given over them. For example, this is observed in the following descriptions. (e.g. A10).

On the other hand, another reason could be the historical section given in the film. The limitation of the historical section given in the film or reconstructed form of the story may have a negative effect on the views of the participants about the features of science. It is seen that the story which is about the process of the discovery, the presentation, testing and widespread acceptance of a theory, leads to unintended interpretation about the aspects of the nature of science (e.g.A6).

Therefore, the findings indicate the importance of historical context. A holistic approach should be adopted in preparing the historical context of the activities for the teaching of NOS. Thus, desirable interpretation can be achieved in all dimensions of NOS. Otherwise, while a desired result in one aspect of NOS can be achieved, undesirable results can be reached on the other aspects. Someone who considers imagination as an important and desirable factor in science may oppose to another intended view with the effect of the limitation of historical context. (e.g. A8).

**Possible pre-mythical assumptions / misconceptions**

Another important factor is the lack of prior knowledge of the participants related to the concepts of science. This effect is highly possible since there is no guidance in the film. The lack of prior knowledge of the participants related to some concepts (theory, hypothesis, etc.) may cause some myths of science (McComas, 1996; 1998). According to the view of the participants who reached to only negative interpretation about the conventional aspects of the NOS (D7), theories and laws were in an evolutionary relation throughout historical process rather than they are different types of knowledge (e.g.A9).

The participants have come to an unintended and profound conclusion that “an observation supporting a theory turn theory into a law” since there is no explicit guiding about the difference between theory and law. This shows that the classical misunderstanding or myth (McComas, 1996; 1998) “theories become law over time” is hidden in the explanations. In short, the fact that participants accept these two types of knowledge differently does not mean they accept the idea that theories and laws will not turn into each other. Also, point is that such a misconception arising from the
misunderstandings in concepts such as theory, hypothesis and law affects other interpretation as well (e.g. A11).

**CONCLUSION AND IMPLICATION**

Apart from the fictional character of the film scenario and possible pre-mythical assumptions / misconceptions of the participants, it can be said that there are possible didactic limitations of the study that are effective in the results of the study. These limitations can be listed as: not watching the film in a teaching program or in a teaching environment, lack of discussions while watching the film, watching the film for the first time.

In this context, the first thing that comes to mind is that the use of such films in teaching the nature of science may be appropriate to use in the context of a more structured method to avoid misleading subjective interpretations. Thus, it is stated that the film contributes to conventional understandings of NOS in the activities prepared within the scope of some studies related to the nature of science (Özcan 2013; Yenice, 2015). In this respect, results of the study are in line with the literature. However, it is difficult to say that this film, which was examined by Kapucu (2016), is a good teaching tool, although it is recommended for the teaching of the nature of science. At best, it can be used by comparing with real historical sources. This use may also contribute to participants’ skills in media literacy and critical thinking in the context of the nature of science in addition to developing understanding of the nature of science through film criticism. The use of the film as an instructional material can cause many problems if it is not integrated into a structured teaching environment.

However, some scenario elements (representations) appear to have the potential to give positive messages about NOS. Considering the fact that not cinema films but some short documentaries are effective in teaching NOS (Seçkin Kapucu, Çakmakçı and Aydoğdu, 2015). It is possible to use the scenario sections corresponding to the representations obtained in this study (e.g. E1, E2) more effectively in a suitable teaching environment. However, the integrity of the historical context must be ensured in a way as stated above.

Beyond that, there are some questions that come to mind even if such films are used in a teaching process where these limitations are formally exceeded. For example, even if it is a biography, should a historical story in a certain period of time be given as it is? Or should a historical story with fictions be used? The answer to the first question may be yes if the good examples from real history of science are chosen and used in continuously. As a matter of fact, the absence of a story about what happened before and after the historical section, as seen in the findings, caused the science myths in individuals.

On the other hand, it is necessary to be selective in the preferred history of science. Hence, as Allchin (2003) expresses, many historical narratives are influential in myth formation and share a rhetorical myth structure that misleads them. For this reason, we need a different history type that conveys the nature of science in a more effective way rather than have more history in science education. A positive answer to the second question requires more attention in the selection of history of science. Because if the concepts presented through combination of science and fiction have some wrong aspects, there can be seen unintended effects (Dhingra 2003).

For both preferences, using the history of science in the philosophical discussion environments of contemporary teaching methods can give positive results. These philosophical discussions about science lead students not only to understand concepts but also to develop their ability to think critically and analyze the world (Settlage 2007). To overcome this handicap, students should be given opportunity to justify their argument and exemplify their point. Indeed, even in science fiction films, a proposed approach at this point is to discuss how certain scientific concepts are used in a story (Smith, Scott and Coskrey 1990). Furthermore, the nature of science understandings given in the propositional form in the teaching environments can be misleading. What is essential is to
make sure that the content of formal acceptances should be justified with examples. Therefore, it is also possible to give concepts related to the nature of science through historical films. This approach can be used, similar to the integrated approach expressed by Niaz (2016), with the integration of reflective approach (Duschl and Grandy 2012) and the historical approach (Khishfe and Abd-ElKhalick 2002) in which films are used.

Lastly, for the history of science to be meaningful, the philosophy of science must be considered in the teaching process because the philosophy of science emerges spontaneously in the usual teaching environments (Matthews 2015). As seen in the findings (figure 3), the discovery category (E1) had a positive interpretation of the NOS of the participants, while the test category (E3) had a negative interpretation. In fact, these categories correspond to an important distinction highlighted in the philosophy of science. According to Reichenbach (2006) in order to understand science from a methodological point of view, it is necessary to separate the contexts of discovery and justification. Therefore, it is advised to take into account this distinction while developing activities to teach the nature of science. On the other hand, it can be argued that there may be advantages and disadvantages depending on the use of the elements of the history of science (e.g. E1 vs. E4). In this respect, the use of the history of science in a structured way can open the door to possible methods which can eliminate disadvantages and make advantages more effective. In summary, the history of science has a unique value for understanding the nature of science. Therefore, the methods of using history of science in teaching environments should be appropriate to this value.

All of these implications can be valid not only for films but also for textbooks or popular science history books. Research results showed that it is necessary to be careful in the use of history of science. It is clear that a holistic and relational history of science reading is required.

REFERENCES


Academically Gifted & Albino: A Narrative Study of a Twice-Exceptional

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Abstract

This research focuses on the educational and daily life of a gifted individual with albinism. The purpose of this current research was to determine the difficulties faced by this twice-exceptional individual in his education life and how these difficulties have been overcome. The study has been conducted by narrative study design of the qualitative method. Research data were collected through semi-structured interviews conducted with the individual himself, his mother and one of his friend. Data analyses revealed four different themes, such as: difficulties due to visual impairment and strategies to cope with these difficulties, difficulties experienced due to physical disadvantages and ways of overcoming them, being gifted and socio-emotional difficulties. More specifically, the twice-exceptional individual, who has visual impairment due to albinism (90%), continued his formal education throughout the whole education life without attending inclusion classes, and encountered many difficulties specific to those who see little, such as having difficulty in following the course and course notes. In addition to these, the twice-exceptional individual is an unrecognized gifted student (academically) who exhibited early development in the childhood period and who has achieved outstanding academic success at undergraduate and postgraduate level after having been in the 0.01% portion among the students taking the university entrance exam. As gifted, he has not received any special support in the education system. It is seen that the support of his family throughout his education life is an effective factor playing an important role in the shaping of the education life of the twice-exceptional individual, who has been confronted with many social-psychological difficulties because his difference from others as a gifted individual with albinism.

Keywords: Giftedness, Albinism, Gifted and Disadvantaged, Twice-Exceptionality, Dual Exceptionality

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INTRODUCTION

Within the field of giftedness, which is under the umbrella of special education, one of the subjects that have been on the agenda for nearly fifty years and that have attracted more attention in the last thirty years is individuals who have identification of both giftedness and a different special need or disability. Because, some cases that were seen in the past and are still seen today show us that having both a giftedness and a disadvantage or a different special need can have significant effects on society if discovered and their existing potential is supported (Johnson, Carnes & Carr, 1997). Ludvig van Beethoven, Helen Keller, Albert Einstein, Michael Faraday, Thomas Edison, Vincent van Gogh, Frida Kahlo, Temple Grandin, etc. can be given as examples to such individuals.

For these individuals of such potential with more than one special need, the term “twice exceptional” (2E) has been used. This term, that is 2E, was first introduced by Maker (1977) in her book “Providing Programs for the Gifted Handicapped” and Johnsen, Karnes & Carr (1997) defined this book as the first book written for individuals both disadvantaged and gifted. However, according to Baldwin, Baum, Pereles, and Hughes (2015), cases of twice exceptionality became subject to book chapters between 1961 and 1973 and began to emerge more concretely in the article written by Elkkind (1973) on being both gifted and experiencing learning difficulties. Since then, one of the headings in the 2E field that researchers have focused on has been the definition of it.

In general terms, the diagnosis of 2E means that an individual is identified as both gifted and disadvantaged at the same time (Assouline & Whiteman, 2011). Moreover, in relation to this situation which seems to be in conflict with being gifted, Gallagher (2009) answers the question of whether a student can be both gifted and disadvantaged as follows:

Such students have been called “twice exceptional” and have received much recent attention. Students can clearly be both gifted and learning disabled, with specific blocks in auditory or visual perception or the ability to master some mathematical processing or even spelling. Other students have been identified as having Asperger’s syndrome, a form of autistic spectrum disorder that interferes with social skill development and communication, with the student clearly being outstanding in some areas of learning. Twice exceptional students need to have individual plans and special programming to help them reduce their disability and free their high abilities for more effective use. Obviously gifted students who have conditions of visual or auditory impairment have achieved impressive results when recognized and stimulated. (pp.175)

Because it is possible for an individual to have both giftedness and a disadvantage simultaneously. This situation of being disadvantaged emerging together with being gifted has been generally focused on as learning difficulties (LD), autism spectrum disorders (ASD), and attention deficit/hyperactivity disorder (ADHD) (Assouline, Nicpon & Doobay, 2009; Foley-Nicpon, Allmon, Sieck & Stinson, 2011; Gallagher, 2009; Lupart & Toy, 2009; Reis, Baum & Burke, 2014). For instance, when the research conducted on the issue of twice exceptionality between 1990 and 2010 is reviewed, it is seen that there are a total of 43 empirical studies and five of these studies focused on giftedness and ASD; seventeen of them focused on giftedness and ADHD and twenty of them focused on giftedness and LD (Foley et al., 2011). However, it is possible to rarely encounter studies focusing on 2E cases different from these. For example, as a different case of 2E, a gifted person diagnosed with impulse control disorders and depression was encountered and this individual became the subject of a study (Gök, Bašt & Avšar-Tuncay, 2018). In addition, there are also findings related to gifted individuals with visual impairment, hearing impairment/deafness, social, emotional and behavioural disorders (Lupart & Toy, 2009; Sisk, 2003; Starr, 2003; Winstanley, 2003).

The definition of being 2E is also influenced by the lack of common definitions of both giftedness and being disadvantaged; thus, it is defined as a type of identification on which no agreement has been reached and is attempted to be explained with the model of being 2E (Ronksley-Pavia, 2015). According to this model, it is suggested that evaluating the concept of being
disadvantaged under the roof of learning disabilities, mental disability, physical disability and neuro-developmental disorders and considering giftedness in intellectual, creative, social, sensory and muscular dimensions would be more useful in defining what being 2E is. According to Reis et al. (2014), being technically 2E means having one or more identifications or diagnosis from the special education categories defined by the IDEA (Individuals with Disabilities Education Act) besides being identified as gifted. However, in a different functional definition developed by Reis et al., being 2E is defined as follows:

Twice-exceptional learners are students who demonstrate the potential for high achievement or creative productivity in one or more domains such as math, science, technology, the social arts, the visual, spatial, or performing arts or other areas of human productivity AND who manifest one or more disabilities as defined by federal or state eligibility criteria. These disabilities include specific learning disabilities; speech and language disorders; emotional/behavioral disorders; physical disabilities; Autism Spectrum Disorders (ASD); or other health impairments, such as Attention Deficit/Hyperactivity Disorder (ADHD).

A definition that was agreed upon was developed by twenty-three participants who participated in the 2E CoP Summit in 2013 representing twenty-four different organizations (Baldwin et al., 2015). According to this definition, being 2E is defined as follows:

Twice exceptional individuals evidence exceptional ability and disability, which results in a unique set of circumstances. Their exceptional ability may dominate, hiding their disability; their disability may dominate, hiding their exceptional ability; each may mask the other so that neither is recognized or addressed. 2e students, who may perform below, at, or above grade level, require the following:

a) Specialized methods of identification that consider the possible interaction of the exceptionalities,

b) Enriched/advanced educational opportunities that develop the child’s interests, gifts, and talents while also meeting the child’s learning needs,

c) Simultaneous supports that ensure the child’s academic success and social-emotional well-being, such as accommodations, therapeutic interventions, and specialized instruction, and working successfully with this unique population requires specialized academic training and ongoing Professional development.

In addition to these definitions, being identified as disadvantaged for a gifted child may result in a situation that may mask his/her giftedness, which points to the need for the revelation of both identifications (Rinn, 2009). Otherwise, the disadvantage’s coming to the fore may lead to a problem of never discovering the talent. This may lead student to failure. Perhaps most of the students showing unexpected failures are actually 2Es.

Furthermore, 2E students are included in the risk group due to their inability to develop their potential, which makes it necessary to investigate the factors that affect their success (Neumeister, Yssel and Burny, 2013). Because, although educators may not be aware of being twice-exceptional, those who experience this particular situation themselves are aware of it. Although 2E students can also be regarded as paradoxical students / learners, they may lack some basic skills, although they have the ability to comprehend complex problems and materials (Silverman, 1989). In addition, these students can avoid tasks including the risk of failure and raise concerns about school and school expectations (Silverman, 2009).

When the distribution of these students in general student population is examined, it is seen that two different types of information are emphasized. According to data from the United States
schools, the number of students likely to be identified as 2E reached 360,000 by 2000 (National Education Association, 2006). On the other hand, according to Foley-Niepon, Assouline and Colangelo (2013), 2% to 5% of students are twice-exceptional students. When these students whose number is too huge to be neglected and when the area of 2E in general are evaluated, it is seen that it is not much possible for teachers to notice these students. As cited by Davis, Rimm and Siegle (2013) from Eisenberg and Epstein (1981), when gifted students with some disadvantages are nominated for giftedness by their peers or by themselves rather than by their teachers, they find the nomination more valuable and in nine out of ten situations in which these students were nominated for giftedness by themselves were identified as gifted. In support of this, research findings have also revealed that teachers are less inclined to nominate students with disadvantages for giftedness. For example, Bianco (2005) and, Bianco and Leech (2010) reported that teachers of special education, gifted students and general education are affected by the disadvantage of the student such as learning difficulties and emotional-behavioral disorders in their preferences and are more inclined to prefer to nominate normal students for giftedness when compared to disadvantaged students. In this context, examination of gifted individuals diagnosed with one or more special needs will make some contributions to the literature, particularly to the recognition of 2E individuals and to the development of educational applications and practices for these individuals.

**Giftedness**

Although it is accepted that the concept of giftedness was first mentioned by Plato, it is known that serious scientific studies could not be carried out on it until Sir Francis Galton. It is known that many definitions of giftedness have been made since Terman (1925), who proposed the first definition of the concept in his longitudinal study. In these definitions, components and criteria such as high intelligence (Terman, 1925), field-specific exceptional performance (Matthews and Foster, 2005; Witty, 1958), leadership, creativity and productivity (Marland, 1971; Renzulli, 1986; Sternberg and Zhang, 1995), motivation to succeed (Feldhusen, 2005), higher intelligence over the general intelligence (Tannenbaum, 1997; VanTassel-Baska, 2005) and field-specific extraordinary reasoning ability (Brody and Stanley, 2005) have been included. Giftedness to be considered, which has more than three hundred definitions (Anderson, 2000) and yet not one widely agreed on; as the ability of exhibiting an extraordinary performance compared to peers in one or more field(s), will make the concept possible to evaluate from a wider perspective.

**Albinism**

It is a genetic condition caused by a lack of pigment in the eyes, skin and hair of individuals and is caused by a recessive gene from both parents. Although the incidence is 1 in 17,000, it is known that one out of every 70 people is a carrier of recessive gene of a type of albinism. It has two common types called oculocutaneous albinism and ocular albinism (NOAH, 2015). Oculocutaneous albinism has different subtypes (OCA1a, OCA1b, OCA2) and is generally known as eye and skin albinism. Visual acuity generally ranges from 20/100 to 20/400. In ocular albinism, only pigment deficiency is seen in the eyes and visual acuity of these individuals varies between 20/60 and 20/100. In addition, individuals with albinism may experience photophobia, strabismus and nystagmus (Corn and Lusk, 2018).

**The Purpose of the Study**

This current study focuses on an individual with albinism who can also be described as academically gifted and his education life. The difficulties that this individual has faced during his education life and how he has coped with them have been examined. In this regard, first focus was on the individual’s high school life. However, education life of individuals is a whole. On the basis of the research questions, the educational life of the individual from elementary to post-graduate education has been examined in detail and details of the individual's educational life have been tried to be put forward.
Individuals with special needs face different levels of difficulties in their real lives and throughout their education lives. While some individuals can overcome these difficulties, some students may have left behind. Especially in countries like Turkey, where the educational options for both gifted students and students with special needs remain limited in the general education system, investigation of the achievements accomplished by a 2E individual born to an average family with a medium level of income is believed to shed light on special needs students’ training processes and family education. The findings of the current study may provide different ideas about how to realize and support a gifted with albinism or visually impaired 2E student to overcome the difficulties in his/her education life. In addition, these findings will provide important insights as to how 2E students’ families, teachers, and counselling units will support them in this process. In this context, the following two research questions guided the current study:

- What kind of educational difficulties did the gifted individual with albinism (2E) experience in his education life from elementary school to post graduate?
- How did the gifted individual with albinism (2E) overcome these difficulties he experienced?

**METHODOLOGY**

**Research Design**

The current study used the narrative study design, one of the qualitative research methods. In narrative studies, stories about the experiences of people are collected and analyzed with qualitative analysis techniques. In the current study, the main focus is on the difficulties that are reflected in the whole life and particularly in the education life of Akın (a pseudonym), who is a 2E as a gifted person with albinism, and how he has overcome these difficulties.

**Participant’s Profile: Akın with 2E**

Akın is the youngest son of a family who was born after two daughters. One of his sisters is also with albinism. As he is the second child with albinism in the family, the family is experienced about how to handle the issue. His father is a civil servant and his mother is a housewife. As Akın is an individual with albinism, he has a different skin colour. In addition, he has 90% visual loss due to albinism. He has used different lenses and eye-relieving devices from early childhood until his PhD training years. However, there is no treatment to completely heal his condition. In addition, because of nystagmus in his eyes, he cannot focus on the same thing for a long time. He suffers from headaches that reduce the quality of life due to this eye problem. The biggest fear of Akın is to be completely become blind one day. He says that he always knows that this will happen one day and tries to prepare for it.

Akın was a precocious child. He crawled at the age of five months and began to speak in full sentence structure at the age of one. Doctors have repeatedly reiterated that he has developed early and is a very intelligent child. He was a very successful student at the elementary school and he passed the central high school entrance exam held in the whole Turkey and was accepted to an Anatolian High School. In this exam, he was in the top 1% of the student population taking the exam. He graduated from high school as the second top scoring student. Then he took the university entrance exam, and he was ranked within the first 2000 students (0.1%) out of 1,500,000 students taking the exam. After he had graduated from the English medium engineering department of one of the best universities of Turkey as the third top scoring student, he started his master’s studies and then PhD studies in the same university. Now, he is working as a senior executive in an international company in Turkey. He has been married for two years.
Akın sees himself as talented in music. He tried to play a musical instrument as a child but gave up because he could not read musical notes. He joined a dance group at the university and performs tango and waltz. He performed in many shows with the dance group. One day in a conversation with the researcher he said, “You don’t have to see to dance.” In addition, he made a radio program on the university radio for eight years. This program was finished as he had to move to another city because of his job. Akın, who loves to travel, makes use of every short and long break with his current wife and travels around the world; he is a good traveller.

Before elementary school, Akın tried individual sports such as gymnastics and taekwondo. The sport he has been engaged in for a long time is cycling. He has been riding bike since elementary school. Cycling is a way of commuting and a sport for him. He also likes skiing. He stated that he was moving only by feeling his muscles while skiing.

He has been interested in web design since his high school years. In 1996, he tried to create social awareness and consciousness about Albinism through his website and blog. He translated and issued English documents in his blog. This internet site and blog are still active after this internet site started its broadcasting, it appeared in the first ranks in Google search on albinism in Turkey for a long time. In 2009, he established Albinism Association with highly conscious families and took an active role in its management. Under the leadership of the Association, many small and large scale projects aiming to raise awareness of families and increase social awareness were conducted. These projects attracted attention and were featured in national channels, and these national channels interviewed Akın several times. He also worked as the editor in the translation of a book called “Raising a Child with Albinism” from English to Turkish and then got it published by the association. The book is still the only Turkish book in the literature about albinism.

When we asked different people around him to describe Akın, his teacher described him as “very intelligent, successful, constantly improving and respectful, funny, cheerful” while his mother described him as “sensitive, intelligent, successful, self-confident, hardworking, respectful”. One of his friends described him as “very intelligent, hardworking, ambitious, funny, motivated, sensitive and respectful”. The most frequently emphasized feature of Akın by his closest acquaintances is his being intelligent and entertaining.

All of these features mentioned above are a proof that Akın is a gifted person. He showed the characteristics of early development specific to gifted children in his early childhood. In addition, in all the exams he has taken, he has always been within the 1% to 0.1% of the student population taking these exams without requiring any special support or extra time despite his visual impairment. In this regard, in line with the findings obtained from all the above data, Akın was considered as academically gifted in the current study. He has also been interested in art and sports. Moreover, with the projects he has conducted through the association and internet site, he has brought individuals with albinism and families having children with albinism together and all these acts of him have brought his leadership characteristic to the fore.

Data Collection

In the data collection process, data were collected through semi-structured interviews from Akın himself, his mother and one of his friends from high school. In addition to this, the traces, memories and notes of the first author as a researcher from the common life with Akın were added to the qualitative data set of the current study.

In the context of the current study, a total of three interviews were conducted with Akın each of which lasted for one and a half hours on average, an interview of nearly one hour with his mother, one and a half hour interview with a close friend and a half-hour interview with a high school teacher.
(physics teacher). In addition, medical reports archived by his family, school reports, results of the general examinations of entry in Turkey were included in the study. Yet, the main data source of the current study is the interviews.

Data Analysis

The interview data collected during the research process were transcribed by the researchers. The obtained data were subjected to descriptive analysis on the basis of the research questions. All the interviews were transcribed and these transcriptions were analysed by two researchers separately. During the research process, together with the education life of the participant, some other sections of his life have also been mentioned because education life is a part of his life. Thus, a total of four themes emerged from the coding of the data. These themes are: visual impairment, being gifted, physical handicaps, and other handicaps. The difficulties experienced by the individual in his life particularly in his education life and how he has overcome them will be explained in detail under the heading of “themes”. It has been attempted to come up with a holistic picture through descriptive analysis by classifying the themes and codes emerging from this analysis.

Researcher’s Role

In a qualitative research, researchers can be part of the research, subject, participant, participant observer and active participant. In this context, the first author of this article is directly a part of this narrative study because he/she has a long-term friendship relationship with the participant of the current study dating back to adolescence years. The researcher lived in the same site as the participant during high school period and went to the same school using the same school service. Their friendship, which started in the first years of high school, is still continuing even though they don't meet very often because they live in different cities.

In this context, it is necessary to describe what the participant looked like in the eye of the first author of the research before this friendship relationship. The sentences used by the first author to describe Akın are given below:

Akın was different. His appearance was particularly different. You may notice the appearance of someone the first time you meet, but when you get to know a person's personality, his/her appearance loses its importance. But the most prominent feature of Akın was his cheerful personality. I remember Akın constantly making us laugh on all our trips to school. Spending time with Akın was very enjoyable at that time, still very enjoyable. Akın was no different to me from my other friends. His eyes could see a little less. His skin colour was different, but Akın was a very normal person to me. Even his image in my mind was that he was very intelligent, hardworking and very successful. I was aware that he had difficulty in some situations during his school years, but Akın was certainly able to handle every situation. That's why I didn't realize that Akın was a person with special needs until I talked to Akın about a project about other Albino students. [The researcher-research notes]

In addition, we need to point out that the first author of the article knew more or less the other participants in the immediate vicinity of Akın. Akın's mother was not completely unfamiliar to the researcher because she lived in the same environment. In addition, the researcher knew Akın's friends directly as the researcher attended the same high school. Furthermore, the trust-based relationship the researcher has established with Akın since their childhood was an important factor in making this study easier. This close relationship has created an environment for us to easily guide the questions in the interviews we have conducted during the research and also for Akın to answer these questions sincerely. Moreover, in the current study, there are traces of the common life of the researcher with Akın.
Validity & Reliability

In order to ensure the internal validity of the study, all the data of the study were recorded with a voice recorder. All data were analysed by the researchers simultaneously. All the transcribed data were shared with Akın, his mother, his friend and his teacher for the confirmation of the participants. After this analysis, the researchers cross-coded all the data and created the sub-codes. After a long while, these codes were coded once more. Thus, consistency was accomplished with the first codes. In order to ensure the trustworthiness of the research, the data obtained from the interviews were given in the text by means of the direct quotation method.

FINDINGS

The findings of the current study are collected under four themes. These themes are; difficulties experienced by him due to his visual impairment and the strategies he has developed to cope with these difficulties, difficulties experienced due to his physical disadvantages and ways of overcoming them, being gifted and socio-emotional difficulties.

Difficulties Experienced due to Visual Impairment

According to Akın’s health reports, he has 90% visual loss due to albinism. Thus, Akin is a person who can see a little. Therefore, he needs to develop some strategies to overcome the difficulties caused by his visual impairment. The solutions he has developed for the difficulties he has experienced are given in Table 1. These difficulties can be gathered under four different main headings. These headings are; difficulties experienced by a student in following classes, reading difficulties, health problems due to visual impairment, and psychological difficulties (motivation, the sense of being dependent etc.).

Table 1. Solutions Developed for Difficulties Resulting from Akın’s Visual Impairment

<table>
<thead>
<tr>
<th>Difficulties</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulties experienced in following classes</td>
<td>Informing teachers by his mother and himself so that teachers’ awareness could be raised</td>
</tr>
<tr>
<td></td>
<td>Provision of the course materials by the teacher (Akin generally wanted the teacher to provide the lesson notes before the lesson.)</td>
</tr>
<tr>
<td></td>
<td>Standing up in the class and coming to the board to read what is written there</td>
</tr>
<tr>
<td></td>
<td>Wanting help from his classmates sitting next to him</td>
</tr>
<tr>
<td>Reading difficulties, not being able to read</td>
<td>Wanting big font and bold text</td>
</tr>
<tr>
<td></td>
<td>Using lenses, binoculars, glasses</td>
</tr>
<tr>
<td></td>
<td>The family’s reading the lecture notes at home and copying them to larger papers</td>
</tr>
<tr>
<td></td>
<td>Developing his own strategies (such as turning the paper and then counting to read zeros, strategies not to fall behind in the exam)</td>
</tr>
<tr>
<td>Other health problems resulting from visual impairment (Headache)</td>
<td>Constantly using medication for headache and trying to manage pain with effective time management</td>
</tr>
<tr>
<td>Psychological difficulties (thinking that he will be unsuccessful and sense of being dependent)</td>
<td>Taking the risk of trying even the things he thinks he can't make</td>
</tr>
<tr>
<td></td>
<td>Trying new ways and producing solutions in order not to ask others continuously for help</td>
</tr>
</tbody>
</table>

The above-mentioned difficulties may be described as the common problems of the visually impaired. In general, suggestions proposed in the literature to support visually impaired individuals to deal with the above-mentioned difficulties through teacher education, notifications, regulations and laws are now considered in Turkey. However, given that the first legal regulation on the disabled was made in 2005, it can be said that this awareness was quite limited during the periods when Akin was a student. Therefore, for all the difficulties experienced, Akın himself or his family had to find solutions. His mother was always in contact with the school. She was a classroom mother (a term used for the voluntarily supporting mother of a student in the regular classroom) in Akin’s elementary school, and was an active member of the school-parent association in middle and high school. His mother always
observed his son from afar during school. Generally, the mother was the first person to explain the special needs of Akin to teachers. In addition, Akin stated that he himself had to give information to teachers about his visual impairment many times in the school and that he had to remind his special issue. However, he explains that he often hesitates to ask for something in order to remove the limitation of his visual impairment at school or in life. This psychological difficulty experienced by Akin has an impact on his whole life.

It’s very uncomfortable to demand something from others; I would only ask once or twice for something and explain my situation, then ask them (teachers) to understand, remember and act accordingly. Yet, they sometimes used to forget it. In the sixth grade’s English exam, although I reminded the teacher that I needed a paper written in large sized typing and with good printing, a faint paper came to me. I couldn’t do anything; I remember getting a very low mark, crying too much. [Akin - Interview 1]

Some of the teachers at the school also helped him to overcome the difficulties he experienced at school. Akin states that he cannot especially forget the support given by the chemistry teacher throughout his school life. Throughout the whole process, this teacher gave him all his lecture notes, all his worksheets, and the extra questions he prepared on a larger sheet, without waiting for him to specifically request it. In addition, he also states that he met with teachers who caused him to lose his motivation. For example, when he told a teacher about his desire to become an engineer and study at one of the best universities in Turkey, he remembers painfully that the teacher commented, “Maybe you won’t succeed” by reminding him of his visual impairment. He says that when he encounters such situations, he is very hurt, emotionally worn and crying. It can be said that teachers’ approach to all students affects student’s motivation but more profoundly the students with special needs.

As a visually impaired individual, Akin is not able to read an article written on an A4 sized paper and typed in size of 12 points. He has to use large lenses, binoculars and a special digital eyeglass, which he had acquired when he was an adult. He has to look at the A3 sized paper with 24 points typing sized from 5 to 10 cm away with lenses. He can read the blackboard with binoculars.

He had binoculars and lenses; he always had binoculars and lenses in his hands; in turn he used binoculars and then lenses in the lesson … He used to keep the lenses very close to the paper, there was 5 cm distance between the lenses and the paper… Now I look back and realize that Akin did something wonderful . [His Friend- Interview-1]

In addition to the difficulties directly associated with the visual impairment mentioned above, Akin has another problem caused by Albinism. Besides being able to see little, his eyes have the problems of nystagmus and not being able to focus on something. Nystagmus deteriorates his visual capacity more. He needs to find different solutions to this problem. He explains how he has found a solution to his problem of reading numbers as follows: “As I have the problems of nystagmus and focusing, I cannot read large numbers having many zeros. Then I turn the paper and count them by marking with a pencil.” [Akin- Interview-1]. His problem of focusing (nystagmus) resulting from his visual impairment causes severe headaches. However, he describes his intrinsic motivation by saying “I can’t stand aside because of my headache, it’s part of my life, I have to go on.” In the last semester of high school close to the university entrance exam, his family bought him “glasses” specially developed for individuals with albinism. However, he had to attend a three-month course to learn how to use the glasses. Akin practiced with the glasses every day until the exam. Simply, wearing these glasses was also very tiring and it took time to get used to them. Unfortunately, he gave up trying to use glasses until the exam and focused on his lessons. He later learned to use these glasses by himself.

Akin stated that the most difficult period in his life was the process of preparing for university. For admission to the university in Turkey, it is necessary to take the university entrance exam and obtain a score from this standardized test(s). All students are admitted to the university according to their score taken from this exam. This is a multiple-choice itemed test with all students entering at the
same time within a given limited period of time. Akın was also required to take this exam in order to attend the university. In this exam, readers are only provided for students who are visually impaired. However, he did not ask for a privilege appropriate to his situation in the university exam because he did not succeed in a previous exam in which he received the support of a reader and explains this situation as follows:

At that time, after elementary school, the Anatolian high school exam was taken. Then we asked for an assistant teacher. But getting used to his/her reading, understanding his/her tone of voice, asking him/her to read it again, and so on, was difficult, I did not get the result I wanted in the exam. [Akın, Interview-3]

As can be seen, requesting something from someone was difficult for Akın. Therefore, he did not ask for a reader and did not ask for extra time in spite of his visual impairment. Thus, like average students, he had to answer a total of 180 questions within 180 minutes. While preparing for the exam, Akın also practiced coding every day. Here coding refers to marking of the answers on an optic form. The exam consists of verbal and computational sections.

Reading took a lot of time. In fact, the verbal section is easy for many students if you can read, because it is just reading and understanding. However, it takes me more time to read small writings. Therefore, I focused more on the computational section in the exam and in a short time I finished this section by solving some problems in my mind; thus, I had more time for the verbal section. [Akın, Interview 3]

Akın, as an individual with visual impairment, stated that reading skill was a more difficult skill for him; thus, he accelerated more in the computational section and overcame this difficulty because he devoted more time to the verbal section because reading was more difficult for him than solving a mathematical problem in his mind. Akın, who was able to overcome these difficulties in any case, gained the right to receive engineering education in an English-medium state university.

**Being a Gifted Student**

Given all the things accomplished by Akın, although he is a visually impaired student (scores from standard tests, academic achievements, characteristics of early development), he can be regarded as gifted. Throughout his education, he loved school and learning. Although he was good at subjects such as history, geography, literature, he was more successful in computational subjects such as mathematics, physics, and chemistry. One of his close friends described Akın as follows in this regard: “When I close my eyes, I always remember Akın on the blackboard, solving the physics and mathematics problems and explaining their solutions to us. While we were just looking at the problems, he used to solve the problems immediately.”

It can be said that the most important difficulty for Akın related to his giftedness is his not being able to receive education at his own pace. Particularly, the most important difficulty faced by Akın in his school life was the limitation of the teaching techniques used by teachers. Most teachers used to deliver their lessons with a strategy that highlights operational information. His most important feature is that he can construct all the information in his mind with conceptual knowledge, even though he is visually impaired. He explains this as follows: “Physics, chemistry; such courses have logic. They can be understood through construction in the mind.” One memory of Akın related to geometry course is a good example of this:

My geometry was very bad when I was in the second grade in high school; once I got a grade 4 out of 100. The teacher used to teach the subjects by telling “do this, do that”; thus, I could not construct them in my mind; then I myself studied, I created connections. Then I had no problem with geometry. [Akin- Interview 2]
As mentioned above, although he is virtually impaired, he could meet his educational needs at home on his own that could not have met by his teachers at school. In addition to all this, he says that he does not easily forget something he has learned, and that he has become more advantaged than other students have, because he has built it in his mind. For example;  

I was able to solve the problems that other students could solve after completing 10 steps of process in 4-5 steps. I could solve some parts of the problem in my mind. In this way, I made myself less dependent on tools such as paper, lens. Moreover, I do not need to see everything; if someone explains it to me; I can visualize it as three-dimensioned in my mind. [Akin, Interview 2]

When we asked about the process in which his education was best supported in his school life, Akin talked about the process of university preparation courses taken in an out-of-school education environment. His family sent him to a private course to help him prepare for the university entrance exam. Akin continued his university preparation courses in this private course when he was in the second and third grade of high school. In this private course, he was instructed together with students who were much better than his high school classmates. He is of the opinion that his maths teacher in this course was a very special teacher. He defined this teacher as “Very rhythmic, dynamic and teaching many things in short time”. Thus, it seems that Akin felt better when he took lessons in a better class than his class at the school and in a pace close to his own learning pace. In this respect, although it was attempted to meet his educational needs with the support of his family, it is difficult to say that as a gifted student he received an appropriate education at exactly his own pace, his talents were discovered and supported consciously.

Physical Difficulties Caused by the Sensitivity of his Skin

Since individuals with albinism are white and do not have colour pigment on their skin, their skin is damaged when exposed to direct sunlight and burns. Therefore, since early childhood years, he should not be exposed to direct sunlight, should not be outdoors when the sun’s rays are upright, and should use sunscreen even at short times when he is outdoors. This makes his life more restricted and obliges him to be more careful. Therefore, he needs to be careful when he is outside because his sun sensitivity will last forever. This bad situation has also been alleviated with the support of the family. For example, when they go on holiday, the whole family spends time together at home when the sun’s rays are steeper. Akin explains this as follows: “I used to stay at home yet I was never alone; the whole family was with me; we used to play card games or okey game and we used to swim when the sun was just rising or setting”. At other times, his mother was always with Akin and supported him. When he was at school, he used to put his sunscreen before going out in each break and he did not go out in some breaks.

Socio-Emotional Difficulties

Dealing with Negative Reactions related to Physical Appearance

One of the most important disadvantages that Akin has experienced throughout his life is that he looks physically different. The whole body of people with Albinism is white; therefore, they always attract attention with their physical appearance. This situation has brought with it some emotional and social difficulties (struggling with negative reactions, fear of being embarrassed, and limitations of sun sensitivity) throughout their lives. This explained by Akin as follows:  

It has become the routine of my life since the first years of my life. Children on the streets, teenagers, people you don't know stare at you, you feel that people are looking at you in any environment. Other children, young people call you as “light bulb, grandfather, white head ...” They make fun of you. The people around frequently ask “why are you so white?, why do you look like this?”. [Akin, Interview -2]
His friend states that when Akın experiences such situations, he usually ignores, seems to be unconcerned or indifferent. He is generally known as a person who is not nervous, calm and nonaggressive. However, Akın states that it is not always easy to cope with such situations. He stated that when he was younger, he fought with a child living on the same street and that he battered a child from a lower class when he was in high school. His family tried to offer him a life free from violence from early ages.

Akin states that situations including negative reactions can sometimes be very annoying and infuriating and that he is not upset when he experiences such situations within his close circle, but that he is uneasy when he is with someone he has just met and does not know how to behave. At this point, the family plays an active role in the school-parent association and provides the teachers with the necessary information. The family closely monitors his development, but allows him to solve his own problems. They do not directly intervene in the problems and try to help only by offering psychological support. Akin summarizes this situation as follows: “I felt the support of my family but I didn't feel that they intervened in my problems, I was solving my own problems myself.” Yet, his reactions vary according to different social environments. Since he has such problems less in the districts where the education level is higher, he prefers these districts more for social activities. He also states that he did not experience much exclusion as a child. He stated that although children remained a little distant from him, being in a socio-cultural environment with educated families was an advantage.

**Fear of Being Embarrassed**

Akin says that as he is different, he is much more noticed. When he misbehaved in his childhood, it was easy to find him. Thus, he always avoided misbehaving because according to him, it is possible for people not to forget him forever when they have seen him even once. He summarizes his relevant experiences as follow.

When I go somewhere I'm very afraid of making any mistakes, for example, accidentally entering the girls' bathroom because I know I am different and everybody remembers me. I can be remembered as “the boy doing this silly thing”. Though I'm not a shy person, this makes me feel some concerned. Moreover, when I need to meet someone in a place, I can't find the person I will meet. Even if they are sitting just in front of me, I cannot recognize them. They need to find me; they need to recognize me. If they don’t recognize me, walking around in the place makes me really frustrated because I am already eye-catching, different; while I am walking around I draw more attention. It is a highly disturbing situation. [Akin, Interview -3]

First of all, it is necessary to state that Akin does not wear glasses, does not use a cane, and it is not possible to find out that he has some problems in his eyes when seen from outside. As he emphasizes, it is possible for a visually impaired individual to make many mistakes by accident. Even a situation like entering the wrong toilet, which seems to be a very common mistake, seems to be a source of stress for him because such individuals can both make mistakes and be noticed by everyone and thus be remembered. I, the first author, remember that Akin told me about such experience in our previous conversations as follows: “There are thousands of students at the university; but I am the most famous one.” In fact, it was really easy to notice him among thousands of people. Such a figure is recognized mostly because of his physical features and remembered when seen again.

**Competences, Limitations and Motivation**

Being disadvantaged brings with it some limitations. Any ordinary thing that any child can do can be a major challenge for children with special needs. At this stage, one of the most important findings of this study is to realize that Akin lived a life in which he realized his own limitations and difficulties from his childhood onwards because he always emphasizes that his family is his supporter.
and that they never tell him “You cannot do it, you cannot succeed”. For example, his family gave him binoculars and a lens at an early age to support his vision as a “present”. These things are defined as “present” by Akın himself. This definition of Akın is highly remarkable. We can say that his family has never made him feel needy, but rather they have given their support by giving presents and given this support kindly without hurting him.

It is also possible to give more examples that are specific. For example, Akın wanted to be an officer during his secondary school years. For someone to be an officer, he/she should not have any physical defects and must be completely healthy. Although his father was a non-commissioned officer, he never told Akın that he could never be an officer. When he finished high school, he got the necessary document for applying to the military school and when he read the conditions himself, he realized that he could never become an officer. Like all boys aged 15, he wanted to drive. This event is an important proof of how Akın's family supported him. Akın explains this as follows.

I really wanted to drive. One day my father took me to a completely empty land to drive. When I got behind the wheel and did what I was told, I realized that this is not something I could ever do. This is not safe for me and for other people. I am sure that my parents knew that I couldn't drive and I couldn't get a driver's license, but they didn't tell me that either. I realized myself that I could never drive. This is very important actually, I discovered it myself. My parents didn't say what I couldn't do - my limits. I determined my own limits; I noticed what I could be and couldn't be. I was confronting myself. [Akın, Interview-1]

Throughout his life, Akın has been on his way to discover his boundaries and realize himself. For example, he joined them when he wanted to play football with his friends. He wasn't a goalkeeper in football, but he joined his friends as a defender. He explains how he played football or basketball as “I played by feeling”. It is possible to say that their schoolmates also supported him without making him realize. Below is an excerpt from Akın's friend about an incident:

Akin was, to me, very normal; most of the time we would forget that he was different, one day we would play basketball at school and there were 11 of us... He was playing basketball but he wasn’t so good … Akin remained outside the teams, while we were playing, I realized that Akin wasn’t there. When I found him, he was carrying… We felt remorse … Of course, we never did it again …We tried to be more sensitive... [His Friend, Interview-1]

Aside from this, it is also possible to say that Akın is a highly motivated individual because he has drawn a personality pattern that never gives up despite all the difficulties.

I was doing gymnastics in preschool period. Once I could not see the baguettes and fell, but I did not give up and continued. Then I did karate in elementary school. I used to play basketball and football at school with friends. I didn't withdraw myself from anything. I was doing as much as I could. I tried playing the guitar but I couldn't see the music. I became a DJ at university. I joined the Latin dance group. You don't have to see very well to be a DJ or to dance.[Akın, Interview-2]

He is aware of his own limits and competences. In this context, he tries to realize his dreams, to be the best; not to be left behind in life. This is something that he himself expresses in his daily conversations. In the conversation below, his friend reflects this awareness:

One day he told me that he was visually impaired and physically disadvantaged and if he could not go to a good school and get a good education, he could not find a job when he had graduated from an ordinary school. [His Friend, Interview-1]
Akın, who works hard and tries to develop himself rejects some of the opportunities provided by the state for the disadvantaged. For example, he has never taken special exams for people with disabilities. He explains this in his own words.

I have thought a lot about the opportunities offered to the disadvantaged, but I cannot accept this. I say I can fight as much as I can. However, one day I can lose all my sight and lose all of this because of all this effort. I am afraid, but I cannot confess this even to myself. [Akın, Interview]

He is an inquiring, questioning, criticising and conscious person. As mentioned above, he is concerned about losing his sight completely one day. However, despite all these concerns, he clings to life. The main reason why he wanted to get a PhD degree is that if he cannot work so intensely due to health problems in the future, he will somehow want to continue his life by giving part-time lectures as a part-time staff at universities. In fact, since the early years of his life, he has spent all his life planning meaningfully. His mother has the most important role in that period. It is his mother who directs Akın to earn a PhD degree, provides guidance for his future plans, and who is in constant contact with Akın like a friend. Akın is a good example for any 2E student and individual with his/her accomplishments, self-actualization, courage and perseverance in his life.

**DISCUSSION & CONCLUSIONS**

The most striking finding of the current study is the support given by his family to Akın’s development. Neumeister et al. (2013) and Trail (2006) pointed out that parents have distinct roles in supporting their twice-exceptional children. In the current study, it is seen that Akın's family has always been supportive. Akın's family's approach has led him to explore his own boundaries, to dare, to try repeatedly. It is seen that especially his mother plays an important role in helping his child to draw his own limits and ask for help when he needs it. His mother supported Akın's development by participating in the school-parent association, monitoring the school life of her son without being noticed by him, informing the people around him when she deemed important and always making life easier for him. Thus, we can conclude that for 2E students, having a part of a supportive family and/or an ongoing family support is a game changer.

Another important finding of the current study is the socio-cultural environment of Akın, which was mainly shaped by his family, and the support and acceptance he received from this environment. In their study investigating the effect of the support of parents, teachers and peers on the academic achievement or failure of twice-exceptionals, Wang and Neihart (2015) emphasized that peer support is the most frequently mentioned support. The result of the current study also concurs with this finding reported by Wang and Neihart (2015) because, despite being different and disadvantaged, Akın has been accepted socially and completed his development by receiving support from his friends without being excluded in an educated and sensitive environment in many respects. His friends in particular have emphasized that they see Akın as a normal individual and that they generally forget his visual impairment. Barber and Mueller (2011) and Neihart (2008) have suggested to foster twice-exceptionals’ psychological and behavioural well-being, which in turn will positively affect their learning and motivation. In this context, the current study may show that access to peers among which 2E children are accepted and a positive social environment in which awareness of and sensitivity towards such children are high can contribute to the provision of the social support needed by many disadvantaged students throughout their lives.

In addition, Dare and Nowicki (2015) found that 2E students have extremely weak and strong sides. Once they have been identified with 2E, educators focus on supporting their weak sides. These children experience an intense sense of being different yet they desire to be accepted and that their parents support them well and they go outside the school system to find the answers they need. The current study has also revealed that Akın has received the support he has needed mainly from his family. It is seen that his family has contributed to the fulfilment of both his psychological and educational needs outside the school. However, as research findings revealed that teachers are less
likely to meet gifted potentials when student is disadvantaged (Bianco, 2005; Bianco & Leech, 2010); there is a need for teachers to be focused on 2E students’ both weak and strong sides, simultaneously. Therefore, students like Akın may have a better chance receiving supports from both family and school.

Furthermore, in order to seek for potentially gifted students in regular classrooms; teachers need to have trained about 2E students and they need to apply specific tools focusing on nominating the potentially gifted 2E students for identification practices. Apart from this, as research suggested that there is a strong probability (9/10) of being identified as gifted when potential 2E students are nominated by their peers or themselves (Davis, Rimm & Siegle, 2013; Eisenberg & Epstein, 1981). Current study partially supported this finding on the basis of Akın’s friend’s awareness of Akın’s potential and gifts. Thus, authors of this article strongly recommend applying self-peer-parent nominations with teacher nominations to uncover the potentially 2E students more effectively.

Twice-exceptional students may experience behavioural and emotional problems (Baum, Cooper & Neu, 2001). The findings of the current study partially overlap with these problems. It has been seen that Akın has not generally experienced behavioural problems but has had to struggle with emotional problems. It is also seen that although Akın is highly motivated and his academic success is quite high, he has had some psychological difficulties and emotional problems. However, Akın has always developed different strategies to overcome these problems, thus his problem solving skill is highly developed. Therefore, despite all his disadvantages, Akın has been able to become a happy adult with satisfaction in his private and business life with the support he has received from his family and his close environment.

In case of frustration or lack of effective external support, twice-exceptional students may become vulnerable to situations such as discouragement, depression, anxiety, withdrawal or unexpected failure (Neihart, 2008). However, it is seen that Akın has been able to carry his whole life to a very successful line with the strong support from his family and the acceptance and approval from his environment throughout his life. Thus, with the right approach and family support, it is possible for gifted but disadvantaged individuals to overcome negative situations in their lives and become strong and successful individuals. When Akın’s whole educational life is examined, it is seen that Akın has achieved a successful career by overcoming all difficulties with the support of his family. In this respect, it is seen that strengthening of family and social environment can make important positive contributions to the lives of 2E students. Even if they are disadvantaged, gifted students can be successful in a social environment where awareness is high.

Last but not least, when 2E definitions examined, it is possible to say that definitions mostly focus on identifications with ASD, LD and ADHD (Assouline, Nicpon & Doobay, 2009; Foley-Nicpon et al., 2011; Gallagher, 2009; Lupart & Toy, 2009; Reis, Baum & Burke, 2014). However, few research findings adressed gifted individuals with different special needs such as visual impairment, hearing impairment/deafness, social, emotional and behavioural disorders, impulse control disorders and depression (Gök, Baş & Avşar-Tuncay, 2018; Lupart & Toy, 2009; Sisk, 2003; Starr, 2003; Winstanley, 2003). Current study also revealed that gifted potential is likely to occur with some of the rare genetic diseases or disadvantages such as albinism. Therefore, students’ potential of being gifted and his/her disadvantages have to be included in 2E definitions and being 2E is supposed to have examined separately in order not to let the disadvantage cover the potential of being gifted.

REFERENCES


Preparation Before Class Or Homework After Class? Flipped Teaching Practice in Higher Education

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Abstract

Advanced learning in education needs an effective educational set-up, which allows students to practice what they have learned. In order to realize this, various arrangements are made in educational environments. A blended approach (flipped teaching) is arranged in this study on technology and face-to-face education. This study examines the effectiveness of flipped teaching in higher education and the opinions of students about this practice. The pre-test post-test design for this study was formed with the students enrolled in the Faculty of Education. In the control group, the traditional way of teaching was implemented, where the teacher first lectured in the class and then assigned an homework at the end. In the experimental group, the students were asked to examine the theoretical part of the classroom material before attending the class, while the teacher conducted a more practical training on the subject. In the achievement tests applied afterwards, students from the experimental group performed better than the control group. Students from the experimental group stated that the flipped teaching practice makes them attend to class as prepared and thus ensures an effective learning. Additionally, the students find videos entertaining and catchy; the method encourages active class participation; course notes can be easily accessed; the online interaction with the teacher motivates the students; and different ways of approach to the course draws more interest. However, some students experienced problems in reaching the internet and the online activities (e.g. quizzes and course preparation) created some tension. Other negative aspects stated by the students include short and insufficient course lecture, not feeling comfortable with the online teaching practice and the difficulty of reading a material online.

Keywords: Flipped Teaching, Higher Education, Teacher Training

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INTRODUCTION

Factors like changing living conditions, globalization, economic pressures and rapidly spreading technologies changed expectations from the education process. Traditional methods of education now falls behind the needs as the information penetrates every space and access to it has become much easier (Kardaş and Yeşilyapрак, 2015). In order to keep pace with the changing conditions of the time, there is a need to bring education up to the desired level and to act with a special concern for quality. The quality education means equipping learners with the capacity to think by questioning, discuss and solve problems and reach further knowledge (Özden, 1998; Kalaycı, 2001; Erktin, 2002; Aslan, 2011; Aydın and Yılmaz, 2010; Erdem and Demirel, 2002; Saçlı and Demirhan, 2008, Kurbanoğlu and Akkoyunlu, 2001). Innovative teaching practices are needed to acquire these skills whose importance has increased much in our age. Traditional teaching practice, where the teacher is only an information transferer, fails to impart these characteristics and make the education environments boring (Hançer, Yıldırım and Şensoy, 2003). One of the most important steps in achieving the goals of contemporary education is to understand the students. Today's students see the Internet as a part of their lives, and think that using it in educational settings helps them understand and embody the issues and facilitate peer collaboration. However, they think that technology-only educational environments will be inadequate, teacher presence and socialization are necessary. (Oblinger and Oblinger, 2005).

In the current status in teaching practice, a teacher transfers information to students in class and practices in the remaining time. The time left for practice might vary depending upon the content of the course and the readiness level of the students. In most cases, practice part is either moved to the next class or given to the students as a homework. This mode of teaching is not in compliance with the contemporary teaching concept that focuses on developing high-level thinking skills. The “flipped class” teaching model, on the other hand, is a practice to be recognized as an “up to date approach”. The model is considered as capable of responding to the changing learning needs of students and, at the same time, includes the face-to-face teaching (Kardaş and Yeşilyapрак, 2015). The flipped teaching model can be considered as a type of the blended learning model (Demiralay, 2014; Görü Doğan, 2015). In the flipped teaching model, a course subject is presented to students in an online platform before the class, together with some practices such as discussions on the subject, mini-tests, etc. During the face-to-face class time, the teacher performs practice-oriented activities through teacher-student interaction. Hence, it can be defined as a model, which is blending face-to-face learning with distant learning (Demiralay, 2014). The flipped teaching is essentially a practice where the lower domains in the Bloom’s taxonomy, such as knowledge and comprehension, are left to students while they are at home. Whereas, higher domains that are more difficult for students to cover alone, such as application, analysis and synthesis, are addressed in class under the guidance of the teacher (Sams and Bergman, 2013; Kara, 2016). It is considered that the flipped teaching practice, may provide a more efficient use of the class time in terms of active learning, ways to respond to individual learning needs of students, support a better digestion of knowledge and its transfer to real conditions (Sever, 2014; Aydin and Demirer, 2017; Turan and Göktas, 2017; Görü Doğan, 2015; Kocabatmaz, 2016; Göğebakan Yıldız, Kryiec and Altuntaş, 2016).

It is possible to come across with some studies on flipped teaching model in the relevant literature. Sever (2014) used flipped class model in violin lessons and concluded that this model saves time in class by making it possible to spend more time to high-level skills and also making the students feel more comfortable in the class. Turan and Göktas (2015) collected the opinion of students attending pre-school teaching department concerning the flipped teaching practice in a computer course. The results indicate that a large majority of students have positive thoughts about the model and define it as a flexible and effective learning model while ensuring permanence. The students included in that study stated that they dislike watching long pre-class videos, but they enjoy playing games in online learning platforms. Similarly, the study by Görü Doğan (2015) indicates that flipped teaching in the higher education computer course is positively assessed by students. In a different study, Kocabatmaz (2016) stated that students mainly evaluated the flipped teaching practice as positive; however, they had difficulties in accessing the internet and they thought that watching videos
before class was time consuming. A study by Göğebakan Yıldız, Kıyıcı and Altıntaş (2016) indicates that flipped class model used in a general chemistry class in higher education has affected the achievement of students significantly and the students stated positive opinions concerning this model. Similarly, another study by Karaca (2016) concludes that flipped teaching is a method that improves student performance. The study by Göğebakan Yıldız and Kıyıcı (2016) was conducted with science teacher candidates in their class of “Nature and History of Science”. The study indicates that flipped class model positively affected the achievement of students and the levels of metacognition, but had no effect on their epistemological beliefs.

Based on the previous results, the question arises if the flipped class model fits for any course/subject or not. According to Sams and Bergman (2013), flipped teaching may not be appropriate for courses, which do not require intensive theoretical knowledge or allow socratic questioning and exploratory learning. The main objective in flipped teaching is to have students learn the fundamental knowledge, which requires more time when taught in class, at home and use the saved class time more efficiently for higher-level learning. Many courses included in a university-level teacher training programme contain dense theoretical information. However, this theoretical background needs to be supported by practice to enhance the professional competencies of teachers (Özdemir, 2008). A study by Bozpolat et. al. (2016) points out that lecturers often prefer giving direct instruction in classes, without giving enough attention to practice while student participation in class remains limited. The same study suggests shifting the weight to practice oriented activities in class. The study by Kutluca, Birgin and Çatlıoğlu (2007) indicate that practical activities in a teaching profession course contribute to the development of candidate teachers in various areas. Then, it facilitates their learning while also suggesting the integration of theory and practice in other courses as well. At this point, it can be thought that the practice of flipped teaching can provide students with the opportunity to put what they have learned theoretically into practice and move away from the traditional methods such as direct instruction, question and answer. And it can also be said that this practice will be particularly suitable for teaching vocational courses that require a combination of theory and practice. This study examines comparatively the effectiveness of flipped teaching and post-class assignments. It is believed that the outcomes of this study may be useful in understanding innovative approaches and contribute to the creation of further opportunities for flipped teaching in various courses. Answers to the following questions were examined in this context:

1. What is the performance of students when they come to class as prepared or they study after the class?

2. What are the effects of flipped teaching practice and homework assignment approaches on the student performance?

3. What are the opinions of students on the flipped teaching practice?

**METHODOLOGY**

This study was conducted with freshmen students in Educational Psychology class of 2016-2017 who are enrolled in the department of primary school mathematics teaching. The process totally took 8 weeks, while allocating the first and last week to pre and post-tests. Below, research model, data collection tools and analysis, and empirical procedure of the study are explained in detail.

**Research Model**

In the research, an experimental design with pre-test post-test control group was used. In addition, the opinions of students on the flipped teaching practice were collected. The study group of the research consists of the 2nd grade students enrolled in Elementary Mathematics Education Department who took the Educational Psychology course in 2016-2017 academic year. There were two sections for this course and the groups were randomly assigned as experimental and control groups among these two sections. Indications related to the equivalence of the groups are included in
the findings section. In addition, the opinions about the flipped teaching practice were collected from the experimental group students. For this purpose, an interview form (prepared based on expert opinions) was applied to the 30 students from the experimental group.

Data collection tools and analysis

Achievement test was applied to both experimental and control groups as a data collection tool. In addition, the opinions about flipped teaching were collected with the interview forms from the experimental group students. Achievement test was developed as a multiple-choice test with 40 questions. The test was applied to different students (totally 122 students reached) who had already taken the course of educational psychology before. Based on the validity and reliability calculations after the pre-test, a 33-question test was selected. The reliability coefficient KR 20 for the 33-question test was 0.78. The student interview form used in the study consists of open-ended interview questions. Interview questions were prepared based on expert opinions, subjected to a preliminary trial and finalized by making necessary arrangements. Interview questions were formed by considering the features of flipped teaching practice. Independent t test, mean and standard deviation calculations were used for the analysis of data. Qualitative data were analysed descriptively.

Empirical procedure

This section explains the procedures applied to the experimental and control groups. In the control group, the students experienced with a traditional and frequently preferred teaching approach. In each lecture, the names of the subjects to be addressed in the following week were given to the students and they were asked to get prepared for the subject before the class. When the lecture started, course delivery proceeded mainly under the control of the lecturer. While the experimental group watched videos before the class, the control group did it during the class. With the control group, there was no activity in the classroom related to application, but all assignments were arranged to include case examinations. In other words, students listen to class lecture and then based on what they have learned, they conducted a case study as a part of their home assignment. Assignments were given at the end of the class every week and students were asked to submit their assignments at the following week. These homework assignments were done individually.

Coming to class as prepared by students in the experimental group was ensured through a web portal called Edmodo. The lecturer uploaded videos, course notes and reading materials to the portal for students to come to class as prepared. After their preparation, students were asked to respond to quizzes that were shared one day before the class. When the students came in the class, instead of giving elaborate explanations about the subject, a summary is given and students were asked if there were parts that they could not understand. Then, case studies were conducted through groups that were formed earlier. Responses given to case questions were shared and discussed by all groups. In the selection of the case studies, a book (Özcan & Sarıcı Bulut, 2013) containing case examples in the field of Educational Psychology was used. Students were given no assignment at the end of class; instead, they were told it would be helpful if they recap. Both experimental and control groups examined the same cases.

In the class where the traditional teaching took place, students’ class preparedness was not checked. They were only informed about the subjects to be addressed in the following class to make them come prepared and told that coming to class as prepared would be useful. In the class where flipped teaching is applied, students’ state of preparedness was checked by applying quizzes on the portal. Further, assignments of students from the control group were collected at the end of classes whereas students from the experimental group were only told that recap what was addressed in class would be useful.
FINDINGS

1. Class preparedness and homework performance

Students were asked whether they came to class each week as prepared before and to give their responses in writing without putting their names on. The state of being prepared for class is given below in percentages and by weeks. Additionally, it is examined whether students were engaged in recap after class. Since the methods applied to these two groups are different, class preparation and homework processes are also expected to be affected. Relevant data can be found in the table below.

1. a. Class preparedness and homework performance of students in the control group

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<td>Prepared before class</td>
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<td>4</td>
<td>13%</td>
<td>2</td>
<td>6%</td>
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<tr>
<td>No preparation before class</td>
<td>34</td>
<td>92%</td>
<td>28</td>
<td>87%</td>
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<td>Total</td>
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As can be seen in the table, a very large percentage of the control group students (87% and over for almost all weeks) came to class without any preparation. Very few students said they came as prepared. On the other hand, there is a high level of participation to homework (79% and over). Coming to class as unprepared while doing their homework can be associated with the fact that preparedness for class is questioned, whereas the homework is collected and checked.

1. b. Class preparation and after class recap among students in experimental group

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<tr>
<td>After class recap</td>
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<td>19%</td>
<td>5</td>
<td>15%</td>
<td>4</td>
<td>11%</td>
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<tr>
<td>No after class recap</td>
<td>30</td>
<td>81%</td>
<td>28</td>
<td>75%</td>
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<td>89%</td>
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</tbody>
</table>
As can be seen in table above, a large percentage (90% and over for every week) of students in the experimental group responds to the questionnaire that they came to the class as prepared. A very small percentage stated the opposite. The experimental group did not take any homework after the class. They were told recapping after class would help them better keep in their mind what had been learned and no material was disseminated. Looking at the practice of recap after class we see a table different from the pre-class preparedness. The majority of the students (75% and over) stated that they did not recap after the class every week. It is considered that the reason why students do not pay enough attention to recapping after class, while making their pre-class assignments, may be related to the compulsory attendance to the applications and the quizzes.

The idea in the first sub-problem of the study was to expose the state of student preparedness and whether they did their assignments or not. Results listed in Table 1 indicate that both assignments and preparedness are frequently ignored when there was no examination on whether it is fulfilled or not. Indeed, as mentioned earlier, preparedness for class is taken seriously in the experimental group while after-class assignments were collected in the control group. As such, it is observed that assignments that were supervised were taken more seriously.

2. Impact of flipped teaching practice on student performance

2.a. Pre and Post-test Scores of Experimental and Control Groups

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>X</th>
<th>S</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>39</td>
<td>3.97</td>
<td>2.05</td>
<td>0.390</td>
<td>0.972</td>
</tr>
<tr>
<td>Experimental</td>
<td>36</td>
<td>3.78</td>
<td>2.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
<td>-4.243</td>
<td>0.000</td>
</tr>
<tr>
<td>Control</td>
<td>37</td>
<td>14.34</td>
<td>4.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>35</td>
<td>18.86</td>
<td>4.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.a compares the pre and post-test score averages of experimental and control groups. Independent t-test was used to compare the scores of these groups. The pre-test averages indicate that there is no significant difference (p<.05) between the levels of performance of these two groups. Thus, those groups stand equal with respect to the pre-experiment level of performance. The post-test average score of the control group is 14.34 while that of the experimental group is 18.86. The t value calculated over the scores of these two groups is 0.000. According to this result, there is significant difference between the levels of achievements of these two groups (p>0.05). Even if there is an increase in the level of achievement of students, going ahead and collecting students’ opinions about flipped teaching was considered as important in obtaining deeper information about its application. The following section analyzes the student opinions on the flipped teaching practice.

3. Student opinions on the practice of flipped teaching

In relation to the flipped teaching practice, students were first asked to give a short response to the question

Question 1: “Which one would you prefer: Class in school and assignment at home after class or preparation before class and assignment in school?”

Responses given by students to the question above are as follows:

2.a. Responses to Question 1

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>% of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for class at home, homework in school (Flipped Teaching)</td>
<td>14</td>
<td>46.66</td>
</tr>
<tr>
<td>Class in school, homework at home</td>
<td>11</td>
<td>36.66</td>
</tr>
<tr>
<td>Undecided</td>
<td>5</td>
<td>16.66</td>
</tr>
</tbody>
</table>
In Table 2.a, whereas positive student opinions on flipped teaching are remarkable, the number of students with negative opinions or remain undecided is not negligible. Following this single question questionnaire, there were interviews with students on voluntary basis. Information obtained from opinions of students was made subject to a content analysis. When the written opinions were examined, it is noted that almost all students spoke about both positive and negative sides of the model. Hence, opinions were grouped under two main categories which were then examined in the context of sub-categories given in tables 2.b and 2.c.

2.b. Positive Opinions of the Students

<table>
<thead>
<tr>
<th>Positive opinions</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes you come to class as prepared</td>
<td>19</td>
</tr>
<tr>
<td>Spending more time to class activity is an effective way to follow</td>
<td>11</td>
</tr>
<tr>
<td>Videos are entertaining and catchy</td>
<td>7</td>
</tr>
<tr>
<td>Ensures active participation in class</td>
<td>5</td>
</tr>
<tr>
<td>Makes it possible to recap since we can reach class notes again</td>
<td>2</td>
</tr>
<tr>
<td>Contributes to studying in a regular manner</td>
<td>1</td>
</tr>
<tr>
<td>It motivates us when our comments on the video is appreciated</td>
<td>1</td>
</tr>
<tr>
<td>We are more interested since it is different</td>
<td>1</td>
</tr>
</tbody>
</table>

In Table 2.b, the most frequently repeated positive features of flipped teaching is coming to class as prepared, and then spending more time to class activity. Additionally, students find the videos entertaining and catchy; they think that they were encouraged to more active participation to the class. Other aspects that were found positive include the availability of course notes, the motivation generated by the teacher comments to videos.

2.c. Negative Opinions of the Students

<table>
<thead>
<tr>
<th>Negative opinions</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional model is better, it is difficult to adapt to the new practice</td>
<td>8</td>
</tr>
<tr>
<td>Reading materials shared are boring and hard to understand</td>
<td>8</td>
</tr>
<tr>
<td>You cannot reach internet all the time and its speed may be a problem</td>
<td>5</td>
</tr>
<tr>
<td>Quizzes and preparation create tension</td>
<td>5</td>
</tr>
<tr>
<td>Course narration in the class is short and insufficient</td>
<td>4</td>
</tr>
<tr>
<td>Online learning practice is hard to understand and there can be disruptions</td>
<td>4</td>
</tr>
<tr>
<td>It is difficult to read something on internet</td>
<td>3</td>
</tr>
<tr>
<td>Things turn to be bad when you come to class unprepared</td>
<td>1</td>
</tr>
<tr>
<td>One can be detracted to other site on internet</td>
<td>1</td>
</tr>
</tbody>
</table>

According to Table 2.c, negative opinions are: Not having accustomed to the new method and thinking that the traditional method is more helpful in learning; written materials were seen as boring; problems related to internet access and speed; and the tension created by the necessity of preparation for the class and by the quizzes. Additionally, students stated that they find the class lecture short and inadequate; they do not feel comfortable with the online learning; had trouble when trying to read online, and they want more entertaining materials like videos. Furthermore, some students stated that this method remains ineffective if the students come to class unprepared. There might also be some distractions to other web sites while surfing on the internet. Some of the actual opinions of the students are listed below.

**Student 1:** Although the system is actually practical I had troubles in my first try and it turned to be ineffective. So, I think the traditional way is better. The other could have been better if we could managed to use it. Personally I get tired of virtual environments. I mean the traditional method turned out to be more efficient due to our familiarity with it; I am not psychologically ready for the other.
Student 2: It seemed somewhat awkward since we have accustomed to the class lecture at school and homework at home. I think our failure derives from this. But meanwhile we observe discussions and different opinions in the class. I think this way is more efficient and potentially successful.

Student 3: I could not adapt to this practice much. I don't think it is effective in my own learning. It is important to study in advance and then come to class, but I think class lecturing is more effective. Some reading materials are too long and it may be boring. I believe a summarized narrative will be more effective. Maybe it appeared awkward to us since we have accustomed to the traditional way.

Student 4: This practice made us to be prepared in advance for the topic. We get less bored in class. The practice also helped us in consolidating what we have learned through class assignments. We can keep it in mind for longer period of time. But it may be difficult time to time to spend time to this practice. It is also problematic to be in the internet environment for long periods of time.

Student 5. I felt more at ease in the class as coming in prepared. Information I gathered about the topic allowed me to develop ideas and make comments. On the other hand, continuous presence of homework created some stress. It was the fear of giving wrong answers to homework questions. So I did homework partly for it being necessary.

Student 6. To tell the truth, I would not be regularly studying this course every week if this practice was not applied. I came to the class as prepared thanks to this practice. Also, videos posted by the teacher and the course notes were quite good. I am certain that it is useful for the students. The only negative aspect that I can talk about is the stress I experienced for timing I have to keep in homework and not being as good as I want in quizzes.

CONCLUSION, DISCUSSION AND SUGGESTIONS

During this research, it was observed that the students in the experimental group came to the class as prepared and others from the control group did not. However, it was also identified that while most students from the experimental group did not do the recap after class, other students in the control group did their after-class assignments. The results can be interpreted in terms of the teacher control. There are studies finding that students assign more importance to their homework when their teachers control these assignments (Aladağ and Doğu, 2009).

Achievement tests applied to both groups after practice resulted in higher scores on the experimental group than the control group. This outcome is consistent with the outcomes of many other studies in the literature (Sever, 2014; Turan and Göktaş, 2015; Göğebakan Yıldız et. al., 2016; Karaca, 2016). When students were asked for which method they prefer, the proportion of undecided and those preferring the traditional method was almost the same as the others preferring the flipped teaching. The most frequently repeated positive feature of flipped teaching is coming to class as prepared and then the effective and lasting learning by spending time to the class activity. Apart from these, students find videos entertaining and catchy and think they encourage more active participation to class. Other aspects that were stated as positive include the availability of course notes, motivation generated by teacher comments to videos, and different ways of addressing the subject.

Considering the negative opinions, frequently repeated ones include not having accustomed to the new method and thinking that the traditional method is more helpful in learning, and getting bored in reading the shared materials. Other negative opinions are related to the internet access, the speed, and the tension created by the necessity of preparation for the class and by the quizzes. Besides, students also stated that they find the class lecture short and inadequate; not comfortable with the online learning; had troubles while trying to read online, and they want more entertaining materials like videos. Furthermore, some students stated that this method will remains ineffective if the students come to class as unprepared. There might also be some distractions to other web sites while surfing on
the internet. The study by Turan and Göktaş (2015) indicates that students dislike long videos and prefer more entertaining materials such as games. Similarly the study by Kocabatmaz (2016) stated that students mainly evaluated the flipped teaching practice as positive; however, they had difficulties in accessing the internet and they thought that watching videos before class was time consuming. Similarly, in this study, the negative opinions of students include “Shared reading materials are boring and difficult to understand” while students stated that they need more entertaining, easy to focus on, and less time-consuming materials for preparation.

Based on the outcomes of this study, the flipped teaching method affects the student performance in a positive manner. Students were more engaged in class preparation with self-learning materials and the class environment offered opportunities for a deeper learning. This class preparation process can be defined as a pre-class assignment. Students stick to their assignments when there is a teacher control. In this sense, assignments given before class for preparing students left both the teacher and students more time for practices geared to a deeper learning. In order to accomplish better outcomes, new measures may be utilized to ensure that students use their pre-class preparation materials more effectively. It is expected that the concerns and the problems in this regard will decrease as students take part in online learning environments. Finally, there is still a need for long-breathed studies to confirm this expectation.

REFERENCES


