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## The Perception of Technology in Secondary School Students' Drawings and Expressions

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With today's developing technology, students' ways of living, learning, and working have been changing rapidly, leading them to acquire new approaches related to technology. The main objective of this study is to identify the views of secondary school students regarding technology. The participants of the study, which was designed as a qualitative study, consisted of 5<sup>th</sup> grade students studying at a state secondary school in the district of Yalova, Turkey in the fall semester of the 2023-2024 academic year. The data of the study, which consisted of students' pictures and written expressions, were analyzed with the content analysis technique. As far as the emerging results are concerned, while the students emphasized the more useful and entertaining aspects of technology as its positive features, they expressed their opinions on the lack of social communication, energy insufficiency and environmental damage as technology's negative features. In the students' perceptions, it can be seen that technology makes their lives easier, but that the harms to personal health, social communication and the environment are taken into account. Since the study was carried out with 5<sup>th</sup> grade students, perception of technology at different age and grade levels is a matter of interest for future research. In this sense, it is possible to recommend identifying the direction of the trends with studies to be conducted with different age levels.

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## Introduction

The most distinctive feature of the era we live in is the diversification of the means of obtaining information in the globalizing world and the re-evolution of the social structure. We have been witnessing how the technological tools used from the agricultural revolution to the British Industrial Revolution, especially as a result of the advancement of knowledge over time, have transformed people into the post-industrial societies (Şenel & Gençoğlu, 2003). The rapidly developing technology has begun to integrate the societies in an extraordinary way but

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has isolated some societies in the course of time. The education systems, one of the areas impacted in this change and development process, have made a great breakthrough with technology (Çolak et al., 2023). In this day and age, the technology in question has become an important identifier of national and global as well as cultural borders (Tekinarslan et al., 2015). As far as the historical perspective of technology is concerned, it is possible to say that since the beginning of mankind, activities such as production as a whole, and developing and inventing tools and gadgets in order to dominate and govern nature have endured (Yörükoğulları, 2013). It can be said that science, which shortens distances and facilitates accessibility in every field, has the highest level of benefits for humanity in this period of tremendous developments in information and communication technologies, the development of technologies for children, gene mapping and space travel (Shaw & Marlow, 1999; Fler, 2023). Therefore, technological developments directly affect people's quality of life, learning speed, access to information, perceptions, and perspectives. (Levin & Barry, 1997; Seligmann, 2007). In this context, with the development of technology today, the perception of technology has an important place in all segments of society. Especially middle school students grow up under the influence of technology and actively use various technological tools in their daily lives. Therefore, this situation has an impact on their perceptions and attitudes (Sadikovna & Mukhtorjonova, 2023).

### ***Technology and education***

“The rapid advancements in science and technology, coupled with evolving societal and individual needs, along with innovations in learning and teaching methodologies, have significantly reshaped the roles expected of individuals. This transformation necessitates individuals who not only generate knowledge and information but also possess the ability to apply it effectively in real-life scenarios, solve problems, think critically, demonstrate entrepreneurship, exhibit determination, communicate effectively, empathize with others, and contribute meaningfully to society and culture” (Ministry of National Education [MoNE], 2023, p. 3). The technology as part of this change has been defined as all the means and information related to these developed by humans in order for them to audit and change their material environment (Turkish Language Institution, [TLI], 2023). As far as the etymological origin of the concept of technology is concerned, it is clear that it comes from the combination of the Greek words "*techne*" (meaning "art" or "skill") and "*logos*" (meaning "study" or "knowledge"). Within the semantic framework, it is the practical application of knowledge and information in order to execute something completely new (European Space Agency, [ESA], 2023; Cambridge, 2023; Funk, 1999). Even though there are different approaches to the contemporary definition of the concept of technology, its common meaning is the rational development of tools produced to organize and transform material, energy, and knowledge/information to fulfill certain purposes (Funk, 1999). Similarly, it is a procedure that takes place based on the interaction of human and machine organizations with the influence of management and ideas (Ihde, 2004).

In order to understand the technological developments and their effects in this day and age, it is essential, initially, to recognize and be familiar with the concept of technology. One of the optimum ways to know this concept is through the teachers, lessons and subjects in schools. The educational institutions affected by the developments in science and technology initiated to design their classrooms based on the educational technologies and students have been integrated with technology (Aktay & Aktay, 2015). Therefore, thanks to the internet and computer technologies, access to information has become easier and contributed to the development and dissemination of knowledge and information (Odabaşı et al., 2007).

During this process of development, the fact that children play games with their smart phones and utilize the computer technologies from an early age paves the way for the formation of technology-related thoughts in their mental world. Unequivocally, it is evident that children acquire examples of technology use as a result of their interactions with their schools and families, and their interest in some technological tools augments day by day in parallel with their lives (Şahin, 2014). Consequently, the elementary and secondary schooling period symbolizes a significant time period that crucially shapes individuals' approach to technology. During this period, students regularly use the technological tools such as the internet, smartphones and computers and go on to interact with the world through these tools. Therefore, secondary school students' attitudes, perceptions and usage habits towards technology emerge as a crucial issue.

It is possible to say that individuals have both positive and negative opinions and thoughts regarding the use of technology. Primarily, the positive aspects of technology can be identified as ease of communication, access to information, its use in education and efficiency. The negative aspects of technology, on the other hand, can be briefly defined as addiction, confidentiality of personal information, unemployment, and health problems. Nevertheless, the rationale of defining technology positively or negatively varies depending on the purpose of use of the technology. Therefore, it is apparent that some students can do their homework better thanks to technology, acquire new information thanks to informative lessons, and benefit from the use of technology in this respect (Murphy & Beggs, 2003). However, based on the views of some students, one of the downsides of technology was that they regarded it as a threat since it is possible to say that people's private personal information could be stolen and some malicious software could infect their personal data (Odabaşı et al., 2007; Mehrotra et al., 2007). Nevertheless, still, a world without technology in the 21<sup>st</sup> century is almost impossible to imagine.

A world without technology in the 21<sup>st</sup> century is almost unattainable. This is simply because technology is a field that supports people's knowledge and information, skills and abilities and offers them real-life experiences (Khunyakari et al., 2009). The education provided at school and in the family is of great importance for children, who are important actors of our age and the future, to understand the concept of technology appropriately. Principally, students can participate in active learning processes at school, develop their problem-solving skills with the help of technological tools, enhance their interest in technology, and develop their skills in understanding and using technology (Black, 1998).

### ***Technology and social studies course***

It is possible to say that the social studies course taught in schools has an important contribution to make in order for students to comprehend and use the concept of technology appropriately. Principally having access to information through technological tools and equipment, implementing research, making plans, thinking critically, solving problems, saving money, being able to communicate, improving intelligence, enabling mechanical learning, helping the individuals to assess opportunities, reveal and strengthen their potential, and also It is of great importance to gain scientific process skills are all crucially significant in terms of helping the students to acquire the scientific procedures (NCSS, 1994; Lind, 1998; Visvizi et al., 2018). With the "Technology and life" unit in the 5<sup>th</sup> grade social studies curriculum and the "Trade and technology" topics in the "Global interaction" unit, the contributions of technology to the individual and social life are evidently observed in students (MoNE, 2023, p. 1-18).



As far as the studies on technology in the relevant literature are concerned, it is obvious that these studies have mainly concentrated on the fields of science and technology, mathematics, and information technologies (Lowerison et al., 2006). The topics of these studies have generally been about the views of the participants about technology and curricula (Çolak et al., 2023), a phenomenological approach to technology experience (Cilesiz, 2011), secondary school students' self-efficacy perception towards technology (Çakmak, 2020), technologically supported teaching (Kozma, 2003; Ünal & Yeşilyurt, 2023), primary and secondary school teachers' perception of technology (Levin & Barry, 1997; Sarıkaya, 2019), students' perceptions, experience and attitudes towards technology (Carswell et al., 2000; Ardies et al., 2015; Başer et al., 2012; Baytak et al., 2011; Topal & Geçer, 2014; DiGironimo, 2011; Ersoy & Türkkan, 2009; Li, 2007; Hew & Brush, 2007), technology education in primary school (Aktay & Aktay, 2015), and students' opinions on technology in their drawings (Rennie & Jarvis, 1995). Nevertheless, even though there are technology-related topics in the social studies course (MoNE, 2023), it is noteworthy that there are an insufficient number of studies on how the concept of technology is perceived by secondary school students and on what they draw to express their views and feelings.

There are some specific reasons that are essential in the selection of this research topic, which was designed based on the studies present in the relevant literature. The most crucial of these is the differences that occur in the learning processes of students and the effect of their learning experiences. Specifically, in the 21<sup>st</sup> century, the rapid development of technology has affected social relations. In this sense, it is critical to first identify the positive and negative views of students in order for them to understand and use the concept of technology appropriately. The aim of this study is to identify how secondary school students perceive technology and their positive and negative views about it. Within the framework of this purpose, answers to the following questions were sought:

- (1) What kind of concepts do secondary school students use in their minds to represent technology?
- (2) How are the positive and negative opinions of secondary school students about technology?
- (3) What are the pictures that secondary school students draw about technology?

## **Method**

In the study, secondary school students' views and drawings on the concept of technology were determined from their own perspectives and interpretations. In this context, the study was designed through a basic qualitative research method. Basic qualitative research is concerned with how participants relate phenomena and events to their world (Merriam, 2018). In this way, the underlying structure of phenomena is examined and deeper meanings that go beyond discovery emerge (Merriam & Tisdell, 2015, p. 24). The current study was found to be in line with the nature of basic qualitative research in terms of presenting the reflections of technology on children and providing the opportunity to examine student experiences in detail.

## ***Participants and sample***

The participants in this study were 5<sup>th</sup> grade students studying in a secondary school in the district center of Yalova, Turkey in the fall semester of the 2023-2024 academic year. Participants were 14 students in total: 8 females and 6 males. The participants were selected by criterion sampling, which is one of the purposive sampling types. Therefore, it was emphasized

that the participants should meet some important criteria (Patton, 2002). The criteria were that the participants were students who studied at a school with an average socio-economic level, that they were in the 5<sup>th</sup> grade, and that they had a class with a suitable heterogeneous balance (male-female).

### ***Instruments and data collection tools***

The data of the research were obtained face-to-face with the pictures drawn by the students and their written expressions on these pictures in accordance with the qualitative research design. Students were asked to draw one or more objects related to technology that came to their minds and to write down their positive and negative opinions about these objects in a time limited to a total of one class period (40 minutes). In order to be in close contact with the students and to spend time with them in their natural environment, the researcher took part in the implementation and spent a class period with the students before the implementation and gave information about it (Merriam, 2018). For instance, in an attempt to ensure reliability in the study, the researcher seated the students individually in each row and prevented them from being affected by one another. Subsequently, the researcher handed out the semi-structured interview form containing the questions he had prepared about technology to the students. This interview form was designed entirely based on the research questions. It should be note here that the students voluntarily answered the questions in this data collection tool during the social studies class hour. The topics of “technology and life” in the 5<sup>th</sup> grade social studies curriculum and “trade and technology” in the “global interaction” unit were influential in the selection of the implementation course. In this process, in order to reduce data loss and prevent confusion, the pictures of the students were transferred by giving them codes as S1, S2, S3...

### ***Data analysis***

In this study, descriptive content analysis was utilized when evaluating the written illustrations of the students regarding the concept of technology, and interpretative content analysis was used in the analysis of the pictures they drew. Therefore, at the outset, the descriptive content analysis and the previous studies on certain subjects were addressed and their similar aspects and groupings were gathered under one category. The visual data were interpreted by bringing a holistic and interpretive perspective to the data by questioning and asking some strategic questions based on the researcher’s intuitions (Saldana, 2019). In the analysis process proceeding with an inductive process (Merriam, 2018), the written data were evaluated and tabulated by considering the frequency values. Meaningless and violence-related items in the students’ illustrations were excluded from the study.

### ***Credibility***

In the present study, the written and visual illustrations of the students were transferred as they naturally were, and an attempt was made to reveal the patterns within the data. The positive and negative comments they expressed for technology were separated by considering their semantic integrity. At this stage, the opinions of two faculty members who are experts in the field of qualitative study, apart from the researchers, were obtained with the peer debriefing technique suggested by Patton (2014). In line with the opinions, some technological devices gathered around the same concept were combined as frequencies. For instance, similar illustrations such as computer/brain-reading computer or robot/humanoid robot were collected under a single code.





**Results**

The results of this research are examined in two sections. First of all, students’ perceptions towards technology are discussed through their verbal expressions. At the next stage, students’ drawings are interpreted.

***Concepts that students create for the concept of technology***

In this study in which secondary school students’ views and their own pictures of technology were examined, initially, the technological tools existing in the minds of the students were examined. The frequency values of these tools, which were illustrated by the students with their written documents and pictures, are presented in Table 1.

**Table 1 Concepts and frequency values created by the students for the concept of technology**

Technological tools	f	Technological tools	f
Smart phone	9	Big drone	1
Smart board	4	Earthquake meter	1
Brain-reading computer/Computer	3	Solar-powered scooter	1
Humanoid robot/Robot	3	Solar panel	1
Walking/Flying house	3	Phone with solar panel	1
Television	2	Remote-controlled basketball	1
Cloned/Twin people	2	Rocket	1
Phone with long-lasting battery life	1	Hair dryer	1
Tablet computer	1	Flying ball	1
Technological robot	1	Satellite	1
Flying ship	1	Remote-controlled dog	1
Space rocket	1	Total	43

As is clear in Table 1, the students expressed technology predominantly with the concept of smart phone (9). Furthermore, smart board (3), computer (3), robot (3), and walking/flying house (3) were among the responses emphasized by the students. Television (2) and cloned/twin people (2) received multiple responses. When the relevant answers are examined, it is obvious that students were inspired not only by today’s technology but also by future technology and their imaginations. Solar panel phone, flying house, brain-reading computer, etc., were among the examples that supported this response.

***Positive features of technology for the secondary school students***

In this study, which examined what students thought about the positive features of technology as an additional question, some of the concepts stated by the students and their comments are presented in Table 2.

**Table 2 Positive features stated by the students for technology**

Technological devices	Positive features
Smart phone	<p>“Texting, setting an alarm, placing an order, taking notes, playing games, making an appointment, talking to someone, listening to music, buying a travel ticket...” (S12)</p> <p>“Video calling someone and talking to them as if they are nearby.” (S11)</p> <p>“It helps with our homework; we can play games.” (S9)</p> <p>“People can order food or groceries.” (S8)</p> <p>“It helps people to learn knowledge and information.” (S4).</p> <p>“We can call someone.” (S1)</p>
Walking house	<p>“Very portable.” (S5)</p>
Robot people	<p>“It carries what people cannot carry.” (S7)</p>

	<i>"It helps the disabled."</i> (S3)
Solar panel	<i>"It allows us to generate electricity and not to waste money."</i> (S8)
Satellite	<i>"Scientists will explore space and find out if things like meteors will hit the earth and warn people."</i> (P10)
Earthquake meter	<i>"It detects earthquakes and warns people living there to build shelters."</i> (P10)

When Table 2 is examined, it is clearly seen that the students emphasized the functional aspects of technology rather than its positive features. Consequently, the phone and the internet and applications available on the phone and the possible activities were highlighted. Similarly, the idea of offering economic benefits with solar panels or preventing meteors from hitting the earth with satellites were some of the examples stated by the students.

### ***Negative features of technology for the secondary school students***

As far as the responses received from the secondary school students are concerned, the negative statements of technology were examined, and irrelevant statements were removed and presented in Table 3.

**Table 3 Negative features stated by the students for technology**

Technological devices	Negative features
Smart phone	<i>"It damages our eyes."</i> (S2) <i>"Excessive game playing makes children and people visually impaired."</i> (S5) <i>"The smart phone may make us addicted to it."</i> (S9)
Computer	<i>"It harms our family relationship."</i> (S4)
Rocket	<i>"The rocket could explode."</i> (S3)
Robot	<i>"It may be deactivated."</i> (S3)
Tablet computer	<i>"It harms our communication within the family."</i> (S7)
Solar panel	<i>"If the cables are broken, it will damage the soil out in the fields."</i> (S8)
Earthquake meter	<i>"It cannot measure deep seismic waves and distant seismic waves."</i> (S9)
Satellite	<i>"A meteor could come and hit the earth and scientists can no longer control it."</i> (P10)
Computer	<i>"If we sit in front of the computer too much, we will have to start wearing glasses."</i> (S11)
Flying house	<i>"It won't fly without charging."</i> (P14)
Solar-powered scooter	<i>"It cannot be driven in the evenings."</i> (S3)

When Table 3 is examined, clearly students thought that technology could harm themselves and the environment more because of its negative features. For instance, "the phone is harmful to the eyes and generates addiction; and computers and tablets disrupt family relations" was among the harms inflicted. Similarly, the statement of the students that the failure of the solar panel would damage the soil and that a satellite would cause a meteor collision were related to the damage that technology could cause to the environment.

### ***Drawings of students about technology***

Secondary school students' views on technology were also examined visually and they were asked to draw as many objects as they wanted. Some of the pictures drawn by the students are presented in the form of visuals below.





scooters cannot be driven in the evenings.

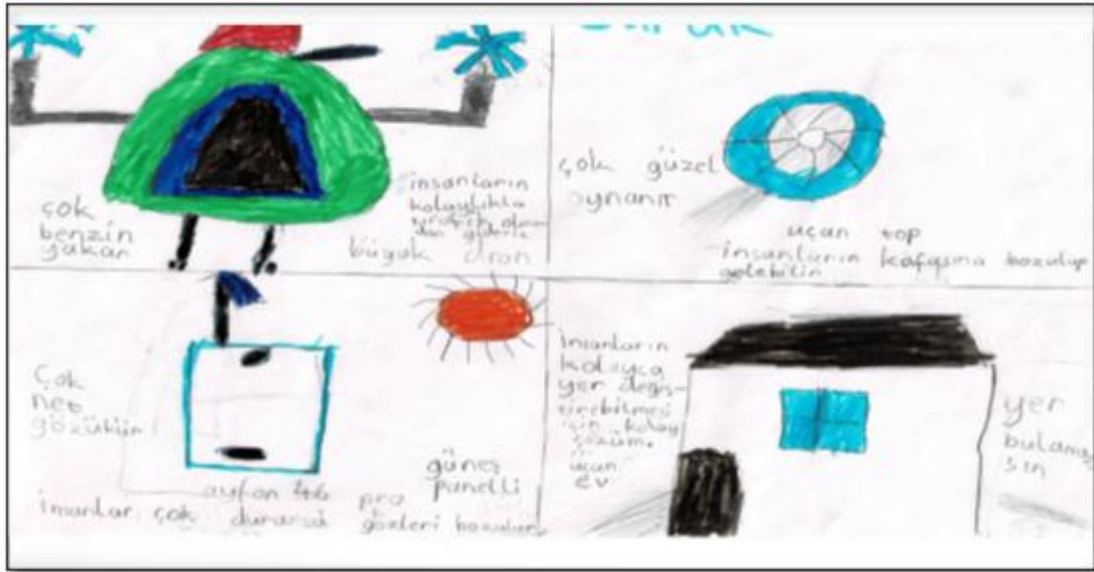


Figure 3. Drawing of S2

In Figure 3, the participant has mentioned large drones, solar-powered telephones, flying balls and flying house objects in their drawings of technological objects. Unlike the other participants, this student has made technological drawings that he has designed with his imagination. Regarding the features of technology, he has presented the views that people can travel easily in traffic with the big drone and flying house, the phone screens can be more easily visible, and the ball can be used for fun.

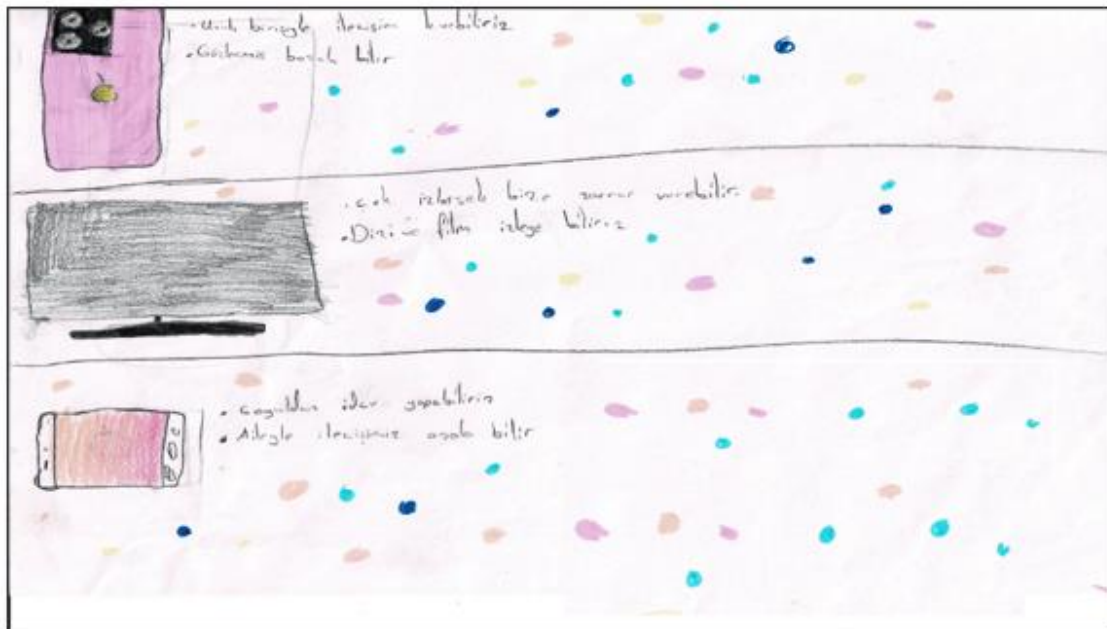


Figure 4. Drawing of S7

In Figure 4, the striking objects in the student's drawings are the devices that are used very frequently in daily life such as phones, televisions, and tablets. The student has mostly associated their representations of these objects with their features such as providing communication, being used for entertainment purposes, and doing homework.

## **Discussion and Conclusion**

As far as the results obtained in this study, which examined the technology perception of secondary school students, are concerned, the students mostly associated technology with the devices they came into contact within their daily lives such as smart phones, smart boards and computers. In the representations of some participants, creative statements representing their imaginations were also striking. In this sense, it is possible to say that there were participants who approached technology from a futuristic perspective. It is clear that the students who emphasized the entertainment and usefulness of technology had their awareness raised. Therefore, the studies in which secondary school students represented the physical accessibility of technology are conspicuous in the literature (Özek, 2019; Volk & Dugger, 2005; Hardem, 2014; Mehrota et al., 2007; Solomonidou & Tassios, 2007; Herdem et al., 2014). While DiGiromino (2011) reported in his study that students had a partial understanding of the nature of technology, while Ersoy & Türkkan (2009) found that students mostly used technology for doing research and playing games. In another study conducted on technology, it was stated that students were aware of the technological developments and innovations (Başer et al., 2012; Kozma, 2003). It also illustrated that the interest in technology increased with age in children (Becker & Maunsaiyat, 2002). Nevertheless, contrary to these results, Ardies et al. (2015), who sought to improve children's attitudes towards technology with multiple variables, concluded that students' interest in technology diminished from the first to the second grade of secondary education.

The results of this study demonstrated that predominance of students' optimistic opinions about technology and their views about technology in their pictures was strikingly noticeable. On the other hand, a trend was observed in the relevant literature on the studies that supported the multifaceted nature of technology with the curriculum, increased learning efficiency, and achieved positive meaningful results (Li, 2014; Avsec & Jamšek, 2018; Soykan, 2015; Başer et al., 2012). Chauhan (2017) investigated the relationship between technology and pedagogy with a meta-analysis and confirmed that it had a moderate effect on primary school students' learning activity. Students generally perceived technology as a human endeavor (Boser & Daugherty, 1998). Hilton (2006), who addressed the subject from a different perspective, drew attention to the fact that school-age children's achievement scores did not improve because they did not use computers for high-level cognitive activities at home. Therefore, it is possible to say that the technology-based teaching process may have impacted the positive and negative perceptions of students regarding technology (Potvin & Hasni, 2014).

Another result obtained in this study is related to the positive features of technology from the perspective of students. Students emphasized the useful and life-enhancing features of technology such as doing homework, ordering food, and earthquake detection. Furthermore, the students stated that technology was in the frame with its personal, social and environmental benefits (Baytak et al., 2011). Ersoy and Türkkan (2009) reported that thanks to the internet, reaching our homes with the development of technological infrastructure, children benefited from it for doing research, playing games and engaging in communication. Özek (2019), on the other hand, revealed that students mostly regarded doing homework, communicating, and having fun as benefits of technology use.

Solomonidou and Tassios (2007) reported that technology was now a very human need, emphasizing the main benefits of technological devices such as using less physical force, doing work faster and being dynamic (Mehrota et al., 2007). Furthermore, it is evident that when they made technology-related drawings readily, the students had a positive perception of this concept

(Gökçe et al., 2024).

Considering the negative features of technology in students' responses, the most common result was the damage it can cause to one's eye health. Moreover, there were responses stating that technology reduces family communication and that it can cause possible harm to the environment. This reveals that the students had environmental awareness. In the study by Küçükaydın et al. (2014), students stated that tablets and computers can harm eye health and that if they are used for game purposes, they will prevent their success in the science course. Unlike other results reported in the relevant literature, Karaçam and Aydın (2014) found that students' awareness of the harms of technology was low. In their study, Hardem et al. (2014) reported that when interpreting technology-related drawings, students principally expressed their thoughts within the framework of minimizing their habit of reading books, using it in weapon production, and lack of getting engaged in communication. Moreover, in the studies implemented by Amok et al. (2013) and Küçükaydın et al. (2014), teachers and students reported the premature dying of the tablet battery as a technological problem. Calvert and Wilson (2008) stated that there were problems such as dry eyes, musculoskeletal problems and problems with linguistic development in children related to the harms of digital technology usage habits, and that some children were faced with technology addiction as cited in (Karaman & Ayhan, 2021).

As far as the results regarding the students' drawings are concerned, it is possible to say that the most drawn object was the phone, and that students used colours in their drawings. In this sense, students thought that technology was fun, and they were curious about technology. The students considered technology not only in terms of personal, but also social, environmental, and scientific aspects and reported more opinions in terms of its positive contributions. In the study by Solomonidou and Tassios (2007), students highlighted technical tools by referring to human needs and activities with their drawings. In the study by Ersoy and Türkkkan (2009), students generally focused on a single feature of the internet such as "doing research", "playing games", and "communication" in the pictures they drew.

Mehrota et al. (2007), who studied Indian secondary school students on this subject, found that the students mostly associated technology with the objects that represented modern tools used to speed up work and make life easier. In a study conducted with children in England and Australia, individual depth was revealed in students' drawings (Rennie & Jarvis, 1995). In another study, Levin and Barry (1997) reported that primary school children tried to point out what a "technology expert" was in their drawings regarding their thoughts about computer technology. Moreover, in students' drawings, technology was predominantly defined with tools and equipment (Yeh et al., 2019).

The general results obtained from the study demonstrated that students had awareness regarding the use of technology by considering the opportunities and threats. Therefore, this study will help curriculum and technology designers and educators to consider these perceptions of students in their future education plans and policies. The meaning that children attached to technology was more about the factors that were motivational, practical and convenience-related. Eventually, the fact that students were involved in learning environments supported by technology and that the educational process was technologically supported impacted the formation of their perceptions about technology (Hsieh & Tsai, 2017). Consequently, as far as students' perceptions were concerned, technology made life easier. Nevertheless, it was clearly indicated that the negative effects of technology on personal health, social communication and the environment should be kept in mind as well.



## Recommendations

Some recommendations to be made in the light of the results obtained in the study are as follows:

- Initially, it was found that students' use of technology in the education-teaching process was not mentioned much in the study. In this sense, it is possible to recommend that parents and teachers guide students to efficient practices using technology that will increase students' success.
- Since the study was carried out with 5<sup>th</sup> grade students, perception of technology at different age and grade levels is a matter of interest for future research. In this sense, it is possible to recommend identifying the direction of the trends with studies to be conducted with different age levels.

## Acknowledgements

### *Data availability*

The datasets presented in this study are not publicly available for privacy reasons. This data is available from the corresponding author on reasonable request.

### *Ethical approval*

This research obtained a favorable opinion from the Research Ethics Committee of Van Yuzuncu Yıl University.

### *Conflicts of interest*

The authors declare that they have no conflict of interest.

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