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Research Article

The Effect of Digital Activities on the Technology Awareness and Computational Thinking Skills of Gifted Students (eTwinning Project Example)

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Abstract:

The aim of this study was to examine the effect of interdisciplinary activities organised online within the scope of an eTwinning project carried out with gifted students on the students' technology awareness and computational thinking (CT). However the research was not' funded by eTwinning. The study was carried out through web-based tools for a period of 3 months in the year 2020. These Web 2.0 tools were: Canva, Zoom, Google Classroom, Jamboard, Tinkercad, Telegram, Facebook, Kahoot!, Instagram, StoryJumper, Padlet, etc. The research was designed with an explanatory design which is one of the mixed models. While in the quantitative aspect of the study, a quasi-experimental design with pretest posttest control group was carried out, a case study was carried out in the qualitative aspect of the study. The participants were 50 gifted students continuing their education at Science and Art Centres affiliated to the National Education Ministry in 6 different provinces of Turkey. Quantitative and qualitative methods were used together in the study. A technology awareness and computational thinking scale was chosen as the quantitative data collection tool, while mind maps were used as the qualitative data collection tool. As a result of the research, a significant increase in the participants' technology awareness and computational thinking was determined in favour of the posttest, while this increase was verified through the mind-mapping technique applied to the students. At the end of the study, the findings were discussed, and recommendations were made for future studies. In addition, a great limitation of this research was the effectiveness of activities that had to be carried out entirely remotely due to the COVID-19 pandemic. In the distance education, in which the teacher's control was weak, the skills intended to be fostered in students remained at a lower level.

Keywords: Gifted students, mixed method, technology awareness, computational thinking, eTwinning

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INTRODUCTION

In this section, the literature A gifted (talented) individual is defined as an individual with special academic ability, who displays high-level performance, who is ahead of his/her peers in terms of art, leadership and creativity, who can grasp abstract ideas, who likes to act independently, and who learns faster than his/her peers (Ministry of National Education [MoNE], 2019). Gifted students' characteristics can be listed as: in terms of their emotional characteristics, having the ability to take risks and empathise, being a perfectionist, having high creativity, a leadership spirit and interest in nature; while regarding their cognitive characteristics, possessing high observation skills, and having the ability to retain information in the memory for a long period, to work independently and individually, and to quickly learn complex and abstract concepts (Renzulli et al., 2002). The process of identifying gifted individuals is carried out with a procedure in which information about individual characteristics such as achievement, intelligence and creativity is gathered, and, in line with the information gathered, decisions are made about students' potential and mental capacity (Sak, 2016), together with the steps outlined by the Ministry of National Education (MoNE) in the directive for Science and Art Centres (BILSEM), published in the December 2019 Bulletin, for the process of identifying gifted students in Turkey:

- First of all, students studying in first, second and third grades of primary school are nominated by having an observation form filled in by their class advisor.
- Nominated students are taken for examination with a group screening test (tablet application) implemented via the host system by the MoNE.
- Students who display a performance meeting or above the criterion specified in the group screening application are taken for individual assessment.
- In line with the criteria specified by the Ministry's provincial identification commission, individual assessment is made in the general mental ability domain by the counselling and research centre using objective and standard measurement tools.
- Assessment of students nominated in the fields of music and visual arts is made by the provincial identification commission in line with the specified criteria.
- As a result of the assessments, students who are above the criteria specified by the Ministry are identified as gifted (MoNE, 2019).

In a globalising world, the importance of access to information is steadily increasing, both for gifted individuals and for others. It is an inescapable fact of our age that we can always access information independently of time and space. In this context, technology comes into play. Generally defined as equipment and materials, technology is defined as "the whole of the materials developed for controlling and changing humans' material environment, and knowledge related to these" (Turkish Language Institute, 2009). If we look at the nature of technology and the awareness processes in society, technology began after the Middle Ages, especially during the "Industrial Revolution". At the beginning of the 20th century, ideas expanded to encompass the transition to various vehicles and machines. When we reached the middle of the 20th century, however, technology then began to be defined as all the activities carried out through investigation by humans for transforming their environment. Technology awareness began with the rapidly developing technology of the present age, which is known as the age of science and technology. Of course, it cannot be considered that this awareness does not have an impact on today's education processes. It is stated that the development of technology has an effect on the structure of the education system and, moreover, on the educational activities carried out in education environments (Pala, 2006). Since students, who are the essential element of education, are individuals who learn in the age of science and technology, their awareness regarding the use of technology in lessons is of great importance. Combining technology with lessons has become indispensable for effective and permanent learning. Students with a traditional understanding of education take part in activities in class in a passive position, whereas, together with the use of technology in lessons, students assume more active roles by participating in the learning environment rather than merely listening (Demirci, 2008).

With the advancement of technology in every area in the 21st century, the skills expected from students are also steadily increasing. One of these skills is computational thinking (CT) skill. When the literature related to computational thinking skills is examined, it is seen that the term "computational thinking" was first used by Papert (1996). The concept is given various names in the Turkish literature, corresponding to such terms as "computational thinking", "data processing thinking", "calculative thinking", "algorithmic thinking" and "thinking like a computer scientist" in English. Computational thinking is defined as the thinking process required to convert problems encountered in daily life into a formula by a human or computer (Kirmit, Dönmez & Çataltaş, 2018), and according to Thomas, Odemwingie, Saunders and Watlerd (2015), "involves identifying and understanding a problem, articulating an algorithm or set of algorithms in the form of a solution to the problem, implementing that solution in such a way that it solves the problem, and evaluating the solution based on some set of criteria". The International Society for Technology in Education (ISTE) (2015) expresses computational thinking as a problem-solving approach supported by technology. The subskills of computational thinking are creative thinking, problem solving, algorithmic thinking, critical thinking, collaborative learning and communication skills (ISTE, 2015).

The stages of computational thinking stated by the International Society for Technology in Education (ISTE) are as follows:

1. Understanding problems by utilising the power of technological methods;
2. Formulating the problem by using models and algorithmic thinking;
3. Presenting datasets through data collection and digital tools;

4. Developing descriptive models to facilitate problem solving;
5. Using algorithmic thinking to generate and test solutions.

The stages expressed for computational thinking show similarity with the process for creating project products using Web 2.0 tools at the implementation stage of projects conducted by using digital platforms. As Peachey (2009) stated, the use of Web 2.0 tools encourages working jointly on a subject and participants' higher-order thinking skills such as creativity, problem solving, analytical thinking, and establishing cause-effect relationships.

Especially since the internet began to be used in education, it has become possible to conduct the instructional processes in education synchronously or asynchronously. Particularly the use of digital platforms like Web 2.0 tools continues to progress rapidly. Nowadays, numerous activities can be carried out via distance learning. One of the project activities that are widely used in all countries of the world are eTwinning projects.

eTwinning is defined as a web-based network created for schools in Europe. eTwinning consists of two words: "e" for "electronic" and "twinning" for "mutual partnership" (Başaran et al., 2020). It is a network which aims to establish communication between teachers and teachers and teachers and students, enable them to carry out projects in cooperation, increase personal and professional development, and increase the use of technology. This communication network plans to increase teachers' and students' knowledge and skills. The eTwinning European Online Platform was initiated in 2005 as an e-learning programme affiliated to the European Commission. It was integrated into the Lifelong Learning programme in 2007, and since 2014, it has been conducted within the framework of the Erasmus+ programme of the Education, Audiovisual and Culture Executive Agency (EACEA).

With the coordination of the Central Support Service affiliated to the European Schools Network created with the Education Ministries of 44 countries from Europe and beyond, 901,751 teachers have taken part in eTwinning activities, and 118,219 eTwinning projects have been conducted in 218,508 schools (eTwinning Turkey, 2021c; eTwinning Turkey, 2021d). The eTwinning Turkey National Support Service began its activities in 2009 within the scope of the General Directorate of Innovation and Education Technologies of the Ministry of National Education (eTwinning Turkey, 2021a). In Turkey, 270,863 teachers have been involved in eTwinning activities, and 47,389 eTwinning projects have been conducted in 55,315 schools (eTwinning Turkey, 2021b).

Through eTwinning, teachers in the 44 participating countries can share their experiences with teachers in different schools and countries, engage in an exchange of ideas by communicating online, and conduct projects suitable for their own curricula. In eTwinning activities, it is expected that technology will be used in the process by integration in education. By providing technological equipment (interactive boards, tablet computers, broadband internet infrastructure, etc.) through the Fatih project, and in collaboration with EBA (Educational Informatics Network), eTwinning is conducted as a positive activity.

If we express eTwinning activities in the form of beneficial items for teachers, these are

1. Acquiring ideas about educational practices carried out in different schools or European countries,
2. Improving their foreign language practice,
3. The possibility to use information technologies in their lessons effectively,
4. The possibility to make their lessons more enjoyable by enabling students to become more motivated,
5. The possibility to develop themselves professionally (eTwinning Turkey, 2021e).

As well as its benefits for teachers, eTwinning also offers students new learning opportunities. According to the views of teachers, the new learning that takes place in students who take part in eTwinning projects can be summed up as follows:

1. Being more motivated towards lessons,
2. Becoming acquainted with different cultures by communicating with their peers from other schools or countries,
3. The possibility to communicate in foreign languages,
4. Being aware that web technologies can also be used for educational purposes,
5. More active participation in lessons due to involvement in projects (eTwinning Turkey, 2021e).

It is possible to come across some studies in which gifted individuals are included in eTwinning projects in Turkey. For this, the eTwinning coordinator has also determined some criteria under the heading of inclusive education (eTwinning, 2017). Although there are projects organized by Science and Art Centres such as “Gifted People Volunteer”, “M.A.R.S.”, and “Art Fellowship in Special Education”, there are no studies in which the outputs of these projects are scientifically reported. There are limited studies in the literature reporting the CT skills of gifted students (Avcu & Er, 2020; Çakır & Bayraktar, 2019; Kirmit, Dönmez & Çataltaş, 2018). In addition, there are studies reporting on technology awareness in gifted people such as Cırık (2016), Çubukçu and Tosuntaş, (2018) Özmen and Kömürlü (2011) and Pereira Coutinho and Rocha (2007). However, no research has been encountered that examines the effects on these mentioned skills as a result of the digital activities they perform using remote Web 2.0 tools such as eTwinning. Hook (2004) states that it is important to implement collaborative projects and include rich online programs, which include various activities, created in cooperation with informatics teachers, observant teachers, school administrators, and other interested parties. In this context, it is considered that the research subject is important in the context of closing the gap in the relevant field and literature.

Aim of the Study

In scientific research studies made on the subject of eTwinning in the literature, it is seen that there are studies related to various levels and perspectives of integration of teaching programmes that include eTwinning projects, views of teachers about the effects and educational needs of eTwinning in teaching practices, professional implications for teachers and administrators in new and developing types of professional development using Web 2.0 tools, how national and local teachers' professional development plans form an interaction with eTwinning, effects on multiculturalism, and benefits with regard to communication and collaboration, as well as meta-analysis studies (Başaran, Kaya, Akbaş & Yalçın, 2020; Crisan, 2013; Gajek, 2018; Orava & Worrall, 2011; Vuorikari et al., 2011; Yılmaz & Yılmaz Altun, 2012). However, no research studies can be found in the literature on the subject of eTwinning studies conducted with gifted students. Therefore, it is seen that in the literature, the number of research studies made with regard to how eTwinning projects affect gifted students' technology awareness, and what kind of contributions are made to their computational thinking, is limited and insufficient. In this respect, it is expected that this study will fill this gap. In particular, the importance of computational thinking, which is regarded as one of the basic skills of our age, and of the technology awareness that today's individuals need to possess, has made conducting research into these subjects, and making up this deficiency in the literature, imperative. Accordingly, in this study, an attempt is made to seek answers to the following questions:

1. Do digital activities carried out remotely have an effect on gifted students' technology awareness?

1.1. Does gifted students' technology awareness differ significantly according to the variables of gender, school type and parental education levels?

2. Do digital activities carried out remotely have an effect on gifted students' computational thinking?

2.1. Does gifted students' computational thinking differ significantly according to the variables of gender, project experience and parental education levels?

3. Do digital activities carried out remotely have an effect on gifted students' perceptions of the concept of technology?

METHOD

Research Design

This study was constructed in a mixed model in which quantitative and qualitative data tools were used to identify the impact of the eTwinning project carried out with gifted students on the students' technology awareness and CT. Creswell (2012) describes the mixed model as collecting and analysing both quantitative and qualitative data. The research was carried out with an explanatory design from mixed models. In explanatory mixed method research, quantitative data are collected first and then qualitative data are collected to explain the quantitative data (Creswell & Plano Clark, 2014). This method makes it possible to eliminate the limit in terms of the results obtained from a single data collection tool, as well as providing strong evidence (Suhonen, 2009). The reason for preferring this design is that the data collected by the quantitative method should be examined by the qualitative method in accordance with the research purpose. In this regard, the research was carried out in two stages. The first stage is the quantitative dimension of the research. In the quantitative section of the research, in which a holistic single-case design was chosen, a single-group pretest-posttest model, one of the pre-experimental designs, was preferred. This model includes no randomness or matching. The symbolic representation of the model is shown below (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2014).

Group	Pretest	Process	Posttest
G	M_1	X	M_2

The second stage of the research was carried out in a qualitative dimension. Data collected by the qualitative method can further deepen and elaborate the quantitative results (Patton, 2014). In the qualitative stage, one of the non-random sampling methods, the confirming or disconfirming sampling method was used. In this context, in order to determine the pattern between the data collected in the quantitative stage and reveal the backgrounds on which the quantitative data were based, the confirming or disconfirming sampling method was used. The main feature of a qualitative case study is in-depth investigation of one or several cases (Yıldırım & Şimşek, 2016). The factors related to a case (environment, individuals, events, processes, etc.) are investigated with a holistic approach, and focus is placed on how they affect the relevant case and how they are affected by the relevant case. Within the scope of the holistic single-case design, a mind-mapping technique was used in the qualitative section.

Study Group

The participants of the study were determined with the convenience sampling approach, one of the non-probability sampling types. In convenience sampling, the researchers select the participants from volunteer individuals who are easily accessed and suitable for the research (Gravetter & Forzano, 2012). The following procedures were followed in the selection of the participants:

1. Being a volunteer and willing to do the research,

2. Never participating in an eTwinning project before,

3. Not using Web 2.0 tools too much or too little,

4. Being a BILSEM student and in the age range of 9-16 years,

5. Students allowed by their parents were included in the project.

6.Science and art centres that could find students under these conditions and obtain permission from the school administration were included in the project. Within this scope, volunteer students who responded to the announcement of an eTwinning project were included in the project. The participants who applied for the project consisted of 50 gifted students continuing their education at Science and Art Centres in 6 different provinces in Turkey during the 2020-2021 academic year. These students also comprised the participant group of the research. In this context, descriptive characteristics of the study group are given in Table 1.

Table 1

Information related to descriptive characteristics of participants

		Frequency	**Percentage (%)**
Gender	Female	34	68
	Male	16	32
Grade Level	4th grade	13	26
	5th grade	33	66
	6th grade	4	8
School Type	State	41	82
	Private	9	18
Possession of a Personal Computer	Yes	45	90
	No	5	5
Project Experience	Yes	20	40
	No	30	60
TOTAL		50	100

In the study group, 34 (68%) of the participants were female, while 16 (32%) were male. The participants consisted of 13 students (26%) from primary school level (4th grade) and 37 students (74%) from secondary school level (5th and 6th grade). The majority of participants attended state schools, and the percentage of them who owned a personal computer was very high (90%). 20 of the participants (40%) had previously taken part in a project, while 30 (60%) had not been involved in any projects before.

Data Collection Tools

During the data collection process, a parental or guardian permission form was requested from each participant in the project. A meeting was held on Zoom with the parents of the participants who had received permission and detailed information about the project was given. During the project process, it was explained that they would also take part in some activities in this project from time to time. Later, the parental or guardian permission forms were submitted to school administrations. At the end of all these processes, the project schedule was started and the data collection tools were applied with the approval of the ethics committee. Detailed information on the qualitative and quantitative research tools is given below.

Awareness Scale for Technology Use in Courses

Developed by Dağtekin and Artun (2016), the "Awareness Scale for Technology Use in Courses" was used after obtaining the necessary permission. The scale is of the five-point Likert type. Likert-type ratings are "Totally Agree," "Agree," "Unsure," "Disagree," and "Totally Disagree." The validity and reliability processes of the scale were repeated, and values close to those of the developed scale were determined. For validity, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed again. In this regard, the KMO value of .85 and Bartlett's sphericity value of .00 for the scale were found to be significant. The scale items explain 59% of the total variance. The higher the variance rates that are obtained as a result of factor analysis, the more powerful is the factor structure of the scale (Tavşancıl, 2002). Following the EFA, as in its original form, the scale consists of 2 factors and 22 items. These two factors that emerged are "Benefits of Using Technology" (17 items) and "Harms of Using Technology" (5 items). Goodness-of-fit indices of the scale revealed that the model was confirmed and that this structure was valid for measuring technology awareness ($\chi2$= 249.426, d=186, p < .01, GFI= 0.91, AGFI=0.90, SRMR= 0.057, NFI= 0.91, NNFI= 0.90, CFI=0.91, IFI=0.92, RMSEA= .03). The awareness scale for technology use was administered to the 50 participants in online form through Google Forms. The Cronbach alpha coefficient of the "Benefits of Using Technology" factor was .95, while the Cronbach alpha coefficient of the "Harms of Using Technology" factor was .85, and the Cronbach alpha coefficient for the overall scale was calculated as .83. In this form, the scale is valid and reliable.

Computational Thinking Levels Scale

This scale was developed for secondary school students by Korkmaz, Çakır and Özden (2015). The necessary permission was obtained for the scale, and validity and reliability studies were repeated for this research. The scale is of the five-point Likert type. For the validity studies, first of all, EFA was performed in SPSS 24.0, while CFA was carried out with AMOS 21.0. Before commencing the EFA, the KMO value of .80 and Bartlett's sphericity value of .00 were found to be significant, and the EFA was begun. The scale items explain 68% of the total variance. As in its original form, the scale consists of 22 items that can be grouped under 5 factors. These factors are "Creativity", "Algorithmic Thinking", "Collaboration", "Critical Thinking" and "Problem Solving". Goodness-of-fit indices of the scale revealed that the model was confirmed and that that this structure was valid for measuring computational thinking ($\chi2$= 353.310, d=186, p < .01, GFI= 0.90, AGFI=0.90, SRMR= 0.06, NFI= 0.91, NNFI= 0.90, CFI=0.90, IFI=0.90 ve RMSEA= .08). Fit values ranging between $\chi2/d<3$; $0<RMSEA<.05$; $0\leq S\text{-}RMR\leq.05$; $.97\leq NNFI\leq1$; $.97\leq CFI\leq1$; $.95\leq GFI\leq1$;

.95≤AGFI≤1 and .95≤IFI≤1 indicate excellent fit, while values ranging between χ2/d<5; .06≤RMSEA<.08; .06≤S-RMR≤.08; .90≤NNFI≤.96; .90≤CFI≤.96; .90≤GFI≤.96; .90≤AGFI≤.96 and .90≤IFI≤.96 indicate acceptable fit (Kline, 2005). The computational thinking levels scale was administered to the 50 participants in online form through Google Forms. A Cronbach alpha coefficient of .76 was calculated for the overall scale, while the Cronbach alpha values of the subscales were .77, .77, .80, .84 and .86, respectively. The scale in this form is valid and reliable.

Mind Maps

Mind maps were first developed by Buzan (1976), based on the idea of making notes as short and specific as possible and making them eye-catching by using visual items. Mind maps (mental maps, arrow graphs, conceptual maps, communication diagrams) offer a means of systematic visualisation of the thinking process (Bystrova & Larionova, 2015). A mind map is a sketch in which major/large categories radiate from a central image and lesser categories are displayed graphically as sub-branches of larger branches (Budd, 2004). As is known, in qualitative studies, the special language, meanings and concepts used by the persons investigated are emphasised, and by understanding them, an attempt is made to reveal what the investigated individuals express (Ekiz, 2013). Therefore, in the study, by means of mind maps, the pretest-posttest method was used to observe the extent to which the concept of "Technology" developed in the students and to confirm the results obtained from the quantitative data. Mind mapping, which is practicable for discovering individual perceptions and knowledge related to complex concepts (Beckett, 2010), can be evaluated as a valid tool for analysis of qualitative data (Tattersall, Watts & Vernon, 2007).

Process

The scope of the eTwinning project on which the research is grounded is described in Figure 1.

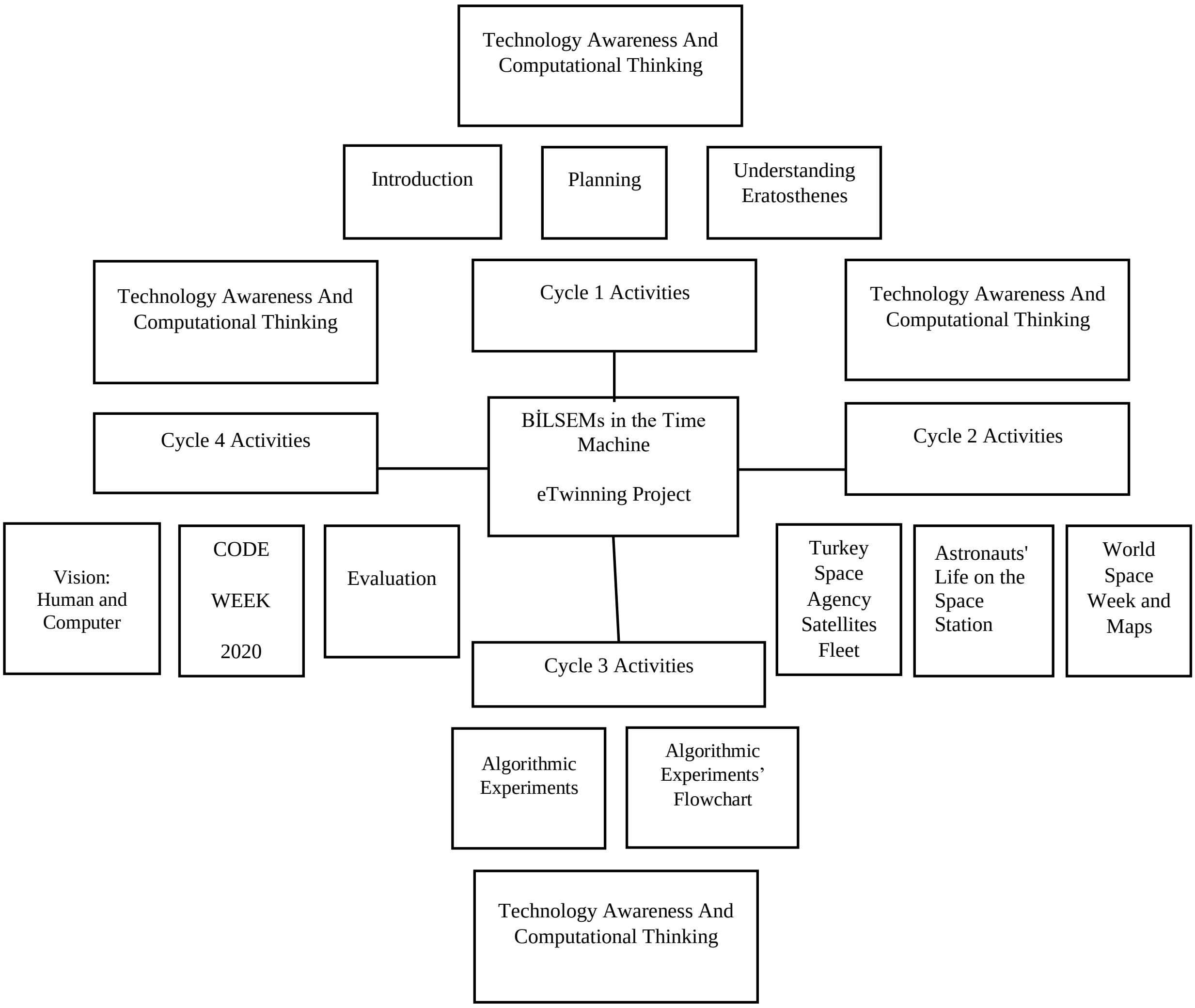

Figure 1.

"BILSEMs in the Time Machine" Project Cycle

Within the scope of the "BILSEMs in the Time Machine" eTwinning project carried out via interactive online activities as part of the Eratosthenes Experiment, Code Week 2020 and Space Week 2020, cycles lasting one week in three were planned. In these cycles, ballots for determining Web 2.0 tools, implementations with the selected Web 2.0 tools, virtual panels, and dissemination activities took place. A large part of the project activities were conducted with mixed teams made up of students attending different BILSEMs participating in the project. The activities in the project, which lasted about 3 months, were carried out in the form of 4 cycles. The contents of the cycles are shown in detail in Table 2.

Table 2

Activities conducted in the project which was the subject of the research

	Cycle 1 – Introduction - Understanding Eratosthenes	Cycle 2 - Satellites Improve Life	Cycle 3 - Algorithmic Experiments	Cycle 4-Vision: Human and Computer Evaluation
Month 1	Receiving parental permission forms	Creation of questionnaire reports	Making additions to Code Week map	Performing Vision: Human and Computer activity
	Student introductions webinar	Making additions to Space Week map	Additions to TwinSpace Cycle 3 activity pages	Additions to TwinSpace Cycle 4 activity pages
	Creation and implementation of questionnaires	Additions to TwinSpace Cycle 2 activity pages	Jamboard activities (Each BILSEM will perform its own trials)	Project dissemination activities (sharing on Haber, Facebook and blogs)
	Additions to TwinSpace introduction pages	15 October 2020-15.00: Ali Kuşçu Space House online activity	Preliminary preparations for algorithm and flow diagram	Revisions of TwinSpace space
	Poster and logo designs	Satellite design activities (Each BILSEM will perform its own trials with Tinkercad)	Use of chat room	Forum discussions
Month 2	Voting for and specifying poster and logo design	Preparations for joint satellite design activities (with Tinkercad)	Algorithmic Experiments: Preparation of joint activities and mixed country team activities (with Jamboard and Telegram)	Student, parent and teacher evaluation activities
	Student introductions webinar	Satellite design with mixed country team activities (with Tinkercad and Telegram)	Additions to TwinSpace Cycle 3 activity pages	Preparation of virtual project panel (with Linoit)
	Creation of mixed country teams	Additions to TwinSpace Cycle 2 activity pages	Project dissemination activities (sharing on Haber, Facebook and blogs)	Preparation of project publicity video

	Creation of mixed country communication groups-Telegram groups	Project dissemination activities (sharing on Haber, Facebook and blogs)	Revisions of TwinSpace space	Conducting and reporting end-of-project questionnaires
	Conducting Understanding Eratosthenes experiment	Revisions of TwinSpace space	Forum discussions	Making mind maps and conducting posttests
	Allocation of tasks for Understanding Eratosthenes ebook activity	Forum discussions	Use of chat room	Online activity with Gizem Arıkan
Month 3	Completion of Understanding Eratosthenes ebook joint activity	Completion of joint satellite design activities	Algorithmic Experiments: Completion of joint activities	Additions to TwinSpace Cycle 4 activity pages
	Additions to TwinSpace Cycle 1 activity pages	Additions to TwinSpace Cycle 2 activity pages	Additions to TwinSpace Cycle 3 activity pages	Project dissemination activities (sharing on Haber, Facebook and blogs)
	Project dissemination activities (sharing on Haber, Facebook and blogs)	Project dissemination activities (sharing on Haber, Facebook and blogs)	Project dissemination activities (sharing on Haber, Facebook and blogs)	Revisions of TwinSpace space
	Revisions of TwinSpace	Revisions of TwinSpace	Revisions of TwinSpace	Forum discussions
	Forum discussions	Forum discussions	Forum discussions	Use of chat room
	Use of chat room	Use of chat room	Use of chat room	Preparation of Cycle 4 diary
	Preparation of Cycle 1 diary	Preparation of Cycle 2 diary	Preparation of Cycle 3 diary	

Data Analysis

For the analysis of the quantitative data, first of all, the normality of the collected data was tested. The normality test was performed for the technology awareness and computational thinking overall scales and each of their subscales. In the normality test, skewness and kurtosis values were examined on the basis of the overall scales and all their subscales in the pretest-posttest context (Table 3).

Table 3

Results of normality test for technology awareness and computational thinking overall scales and subscales in pretest-posttest context

Scales	Subscales		Skewness		Kurtosis	
			Statistical Value	Standard Error	Statistical Value	Standard Error
Technology Awareness Scale	Benefits of Using Technology	Pretest	-.46	.34	-.11	.67
		Posttest	-.62	.33	.36	.66
	Harms of Using Technology	Pretest	-.18	.34	-.02	.67
		Posttest	-.21	.33	-.71	.66
	Overall Scale	Pretest	-.27	.34	-.12	.67
		Posttest	.02	.34	1.0	.66
Computational Thinking Scale	Creativity	Pretest	-.78	.34	.34	.67
		Posttest	-.10	.33	.93	.66
	Algorithmic Thinking	Pretest	-.71	.34	-.02	.67
		Posttest	-.77	.33	-.38	.66
	Collaboration	Pretest	-.24	.34	1.1	.67
		Posttest	-.10	.33	.57	.66
	Critical Thinking	Pretest	-.58	.34	.26	.67
		Posttest	-.10	.33	1.3	.66
	Problem Solving	Pretest	.26	.34	-.83	.67
		Posttest	.11	.33	1.3	.66
	Overall Scale	Pretest	-.25	.34	-.53	.67
		Posttest	.02	.33	1.2	.66

p>.05

As can be understood from the table, in the context of both the overall scales and their factors, the normality tests of the quantitative data collection tools ranged between +1.5 and -1.5 values. According to Tabachnick and Fidell (2013), it is stated that in cases where the sample group is greater than 50, when skewness and kurtosis values are between +1.5 and -1.5, it is accepted that the data are normally distributed. In this context, the distribution of the scales was accepted as normal and suitable for the use of parametric tests. Accordingly, arithmetic mean, standard deviation, t-test for dependent groups, one-way variance analysis (ANOVA) and effect value (eta-squared) analyses were made. For determining the degree of effect of the specified difference, the η2 (eta-squared) statistic was used. The η2 value expresses the proportion of variance of dependent variables that can be explained by independent variables. An η2 value between 0.01–0.05 is interpreted as a low effect size, between 0.06–0.13 as a medium effect size, and 0.14 and over as a strong effect size (Pallant, 2003). In both scales, the lowest score that can be obtained is 22, while the highest score is 110. For determining the arithmetic mean values, Table 4 was taken into consideration.

Table 4

Values used for interpreting the arithmetic means of the scales

Score Range	Mean Score (Score Range X Number of Items)	Rating	Interpretation of Awareness
1.00-1.78	22-39	Totally disagree	Very low
1.79-2.59	40-57	Disagree	Low
2.60-3.40	58-75	Unsure	Average
3.41-4.24	76-93	Agree	High
4.25-5.00	94-110	Totally agree	Very high

For the analysis of the qualitative data, the content analysis method was used. Content analysis is defined as a systematic, repeatable technique in which certain words of a text are summarised with smaller content categories with codings based on certain rules (Büyüköztürk, Çokluk & Köklü, 2010). Content analysis requires in-depth analysis by digitisation of the collected data. In content analysis, it is essential to gather similar data within the framework of certain concepts and themes and to organize them in a way that the reader can understand (Guba & Lincoln, 1994). In content analysis, the data obtained through interviews, observations or documents are analyzed in four stages: (1) coding the data, (2) finding codes, categories and themes, (3) organizing codes, categories and themes, (4) defining and interpreting the findings. (Eysenbach & Köhler, 2002; Miles & Huberman, 1994) The mind maps were implemented prior to the project and after the project. Students were informed before the mapping process. A meeting was held where they could find the answers to what a mind map is and how to design it. Some examples are shown, and detailed information about the procedure from scientific studies is given. All teachers working in the project also attended this meeting. The symbols drawn by the 50 students on their mind maps in the pretest and posttest were coded separately by three different domain experts (1 math and 2 science expert teachers in the project). The consistency between the symbols coded by the experts was examined. In the pretest, 32 different codes were found by the experts. Of these, 2 codes found by the first expert, 3 codes found by the second expert, and 3 codes found by the third expert were identified differently. The total number of common codes of the researchers was 24, while the total number of individual codes was 8. In this context, inter-rater reliability was calculated with the formula [(Number of Agreements / Number of Agreements + Number of Disagreements)*100] (Miles & Huberman. 1994). The inter-coder reliability for the pretest was found to be [(24/24+8)*100] = 75%. Next, the 8 differing codes were discussed and evaluated. It was then decided to also include these codes in the analysis. The codes were grouped according to themes and the data were presented in the form of frequencies and percentages. The same process was carried out for the posttest, and a total of 41 codes were found. Of these, 2 codes found by the first expert, 2 codes found by the second expert, and 3 codes found by the third expert were identified differently. The total number of common codes of the researchers was 34, while the total number of individual codes was 7. The inter-coder reliability for the posttest was found to be [(34/34+7)*100] = 82.9%.

For scientific research to be accepted, it must be valid and reliable at a certain level. In qualitative research, validity-reliability is considered differently from quantitative studies. There are a number of strategies that the qualitative researcher can use to increase the “credibility” of his findings. Guba and Lincoln (1994) pointed out that in qualitative research, there should be credibility rather than validity and reliability. Guba and Lincoln (1994) gathered the criteria for credibility under four main headings: credibility, reliability, approvability and transferability.

Credibility: There are many methods to increase credibility. These are prolonged involvement, member checking and peer debriefing (Holloway & Wheeler, 1996). The teachers working in the project responsible for collecting qualitative data within the scope of the research interacted with the students in the project for 3 months. Asking the participants whether the study findings reflect their own thoughts correctly is called participant confirmation (member checking). In line with this strategy, the participants were given information about mind maps, shown how they should be drawn, and given feedback related to their drawings . One of the precautions that can be taken in terms of credibility is the expert review (Creswell, 2012). In this context, feedback was received from an assessment and evaluation specialist, whose opinion was asked for about the mind maps collected. In terms of reliability, researcher triangulation was carried out. The opportunity was given for independent evaluations about the mind maps by means of different views by the inclusion of more than one researcher in the collection, analysis and interpretation of the data.

Verification: At this stage, drafts, procedures and questions referenced in the analysis process are written and reflected in full and carefully. The aim here is to show the thought process and evidence that lead to conclusions as much as possible (Houser, 2015; Streubert & Carpenter, 2011). Citations and stories are very important. For this, the findings should include the participants’ own statements instead of the researcher’s prejudices or opinions (Lincoln & Guba, 1985). In this context, direct quotations from mind maps are included.

Transferability: This stage is one of the main purposes of quantitative research and transferability, which is used as the equivalent of “generalization” in qualitative research, is used to judge the value of research. It is also called fittingness. Accordingly, the results of a study should be able to be transferred to situations in similar participants and environments (Houser, 2015; Streubert & Carpenter, 2011). In quantitative studies, generalization (external validity) is achieved by statistical results and showing that the data are collected from a sample representing the population (randomized, stratified, etc.) (Guba & Lincoln, 1982). In this context, in order to prove the transferability in qualitative research, the sample selection, the characteristics of the participants and the environment should be clearly stated (Sharts-Hopko, 2002). The participants of the study, how the process is run and how remote digital activities take place are given in detail in the method section.

Research Ethical Permissions

In this study, all rules stated to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were taken.

Ethical review board name: Karamanoğlu Mehmetbey University Ethical Review Board

Date of ethics review decision: 13.04.2020

Ethics assessment document issue number: 95728670-044-E.10146

A Parental or Guardian Permission Form for Research Participation was obtained from the parents of the underage students who wanted to participate in the project study. These forms were submitted to the school administration. In the context of the content of the project, parents from time to time participated in the project activities with their children and they were provided with a diary with one of the Web 2.0 tools, "Padlet".

RESULTS

The obtained findings are presented in line with the research questions.

1. The findings made based on the problem determined as "Do digital activities carried out remotely have an effect on gifted students' technology awareness?" are presented below.

Table 5

Results of dependent groups t-test for technology awareness pretest and posttest mean scores and significance of difference between mean scores

	N	X	ss	Mean Score	Interpretation of Awareness	t-Test		
						t	sd	p
Pretest	48	78.56	11.95	3.57	High			
Posttest	50	81.08	11.80	3.68	High	-.97	47	.33

**p<.05*

The participants' technology awareness before and after participating in the digital activities was high. Based on scores, an increase in mean scores for technology awareness occurred in favour of the posttest following the digital activities (78.56 < 81.08). This increase was not significant according to the results of the dependent t-test (t=-.97, p>.05). This situation was the same with regard to the subscales.

1.1. With respect to the digital activities carried out remotely within the scope of the research, the findings made in the context of the posttest with regard to the question

"Does gifted students' technology awareness differ significantly according to the variables of gender, school type and parental education levels?" are given below in Table 6, Table 7 and Table 8, respectively.

Table 6

T-test results for subscales and overall scale posttest according to gender variable

Subscales and overall scale	Gender	N	X	ss	t	p
1. Negative awareness	Female	34	19.94	5.69	-1.1	.27
	Male	16	21.75	4.52		
2. Positive awareness	Female	34	62.23	14.32	1.3	.19
	Male	16	57.00	10.09		
3. Overall scale	Female	34	82.17	11.89	.97	.33
	Male	16	78.75	10.90		

**p*<.05

Examination of Table 5 reveals that according to the gender variable, no significant difference was found between posttest mean scores of the overall technology awareness scale or its subscales ($t_{negative}$= -1.1, p> .05 $t_{positive}$= 1.3, p>.05, $t_{overall}$= .97, p>.05). The striking point here is that female participants' technology awareness was both higher and more positive than that of males.

Table 7

T-test results for subscales and overall scale posttest according to school type variable

Subscales and overall scale	School type	N	X	ss	t	p
1. Negative awareness	State	41	20.80	5.33	-.79	.42
	Private	9	19.22	5.65		
2. Positive awareness	State	41	60.80	12.46	.27	.78
	Private	9	59.44	17.12		
3. Overall scale	State	41	81.60	11.44	.68	.49
	Private	9	78.66	12.64		

**p*<.05

As can be seen in Table 6, a significant difference was not found between posttest mean scores of the overall technology awareness scale or its subscales according to the school type variable ($t_{negative}$= -.79, p> .05 $t_{positive}$= .27, p>.05, $t_{overall}$= .68, p>.05).

Table 8

One-way variance analysis (ANOVA) for subscales and overall scale posttest according to parents' (mother's) education level

Subscales and overall scale	Literacy	N	X	ss	sd	F	p	Scheffe Test	Levene's F Test	η2
1. Negative awareness	Primary school (1)	4	20.25	2.50	3	8.40	.00*	1-3, 1-4	P>05, $F_{negative}$=.89, sd=46 p=.44	.34
	High school (2)	11	25.36	4						
	Bachelor's (3)	25	20.40	4.77						
	Postgraduate (4)	10	15.60	4.55						
2. Positive awareness	Primary school (1)	4	62.25	8.09	46	.76	.51		P>.05, $F_{positive}$=.34, sd=46, p=.79	
	High school (2)	11	59.81	13.65						
	Bachelor's (3)	25	58.48	13.90						
	Postgraduate (4)	10	65.90	12.85						
Overall scale	Primary school (1)	4	82.50	10.37	49	.77	.51		p>.05, $F_{overall}$=1.14, sd=46 p=.34	
	High school (2)	11	85.18	14.68						
	Bachelor's (3)	25	78.80	10.71						
	Postgraduate (4)	10	81.50	10.69008						

*$p<.05$

No significant difference was determined in relation to the technology awareness scale posttest according to the education levels of gifted students' fathers. However, as seen in Table 8, a difference was found in the negative technology awareness subscale of the scale according to the gifted students' mothers' education levels. To determine whether this difference was significant, the ANOVA test was performed. To reveal the direction of the difference found as a result of the test, the post-hoc Scheffe test was performed. The Scheffe method was developed to compare all possible linear combinations between groups, and in general terms, this method is discussed as a conservative post-hoc type which can keep the α margin of error under control in cases of large numbers of flexible groups to be compared, and which does not consider the assumption that observation numbers in the groups are equal (Scheffe, 1959). As a result of the test, in the negative technology awareness dimension of the scale, a statistically significant difference was found between mothers who were primary school graduates and mothers with bachelor's degrees, and also between mothers who were primary school graduates and mothers with postgraduate degrees, in the direction of those who were primary school graduates [$F_{negative}$ =.89, sd=46, p=.00]. No significant difference was found with respect to the overall scale or the positive technology awareness subscale [($F_{positive}$ =.34, sd=46, p=.51) ve ($F_{overall}$ =1.14, sd=46, p=.51)]. As education level decreased, technology awareness moved in a negative direction. To calculate the value of the effect of parents' education levels on gifted students' technology awareness, the eta-squared value was calculated. Accordingly, the eta-squared value, which was calculated as .34, shows that parents' education level had a large effect on negative technology awareness ($\eta2>0.14$).

2. The findings made based on the problem determined as "Do digital activities carried out remotely have an effect on gifted students' computational thinking?" are shown below.

Table 9

Results of dependent groups t-test for computational thinking (CT) pretest and posttest mean scores and significance of difference between mean scores

	N	X	ss	Mean Score	Interpretation of CT	t-Test		
						t	sd	p
Pretest	48	78.39	8.72	3.56	High	-.32	47	.74
Posttest	50	79.00	9.24	3.59	High			

**p<.05*

The participants' computational thinking before and after participating in the digital activities was high. Based on scores, an increase in mean scores for computational thinking occurred in favour of the posttest following the digital activities (78.39 < 79). This increase was not significant according to the results of the dependent t-test (t=-.32, p>.05). This situation was the same with respect to the subscales.

2.1. With regard to the digital activities carried out remotely within the scope of the research, the findings made in the context of the posttest with regard to the question "Does gifted students' computational thinking differ significantly according to the variables of gender, project experience and parental education levels?" are given below in Table 10, Table 11 and Table 12, respectively.

Table 10

T-test results for subscales and overall scale posttest according to gender variable

Subscales and overall scale	Gender	N	X	ss	t	p
Creativity	Female	34	17.58	2.95	1.29	.20
	Male	16	16.50	2.30		
Algorithmic Thinking	Female	34	16.14	3.38	-.96	.33
	Male	16	17.06	2.46		
Collaboration	Female	34	18.11	2.64	.23	.81
	Male	16	17.93	2.40		
Critical Thinking	Female	34	15.97	3.77	.31	.97
	Male	16	15.93	2.79		
Problem Solving	Female	34	10.26	3.69	-2.4	00*
	Male	16	14.00	7.16		
Overall Scale	Female	34	78.08	8.63	-1.22	.22
	Male	16	81.43	9.91		

*$p<.05$

When Table 10 is examined, it is seen that according to the gender variable, there was a significant difference in mean scores of the CT overall scale and its subscales only in the "problem solving" subscale(t=--2.4, p<.05). This significance was in favour of males ($\underline{X}female = 10.26$, $\underline{\underline{X}}male = 14.00$).

Table 11

T-test results for subscales and overall scale posttest according to project experience variable

Subscales and overall scale	Project Experience	N	X	ss	t	p
Creativity	Yes	20	18.15	2.13	1.29	.04*
	No	30	16.63	3.03		
Algorithmic Thinking	Yes	20	17.45	2.70	-.96	.04*
	No	30	15.76	3.24		
Collaboration	Yes	20	18.55	2.43	.23	.27
	No	30	17.73	2.61		
Critical Thinking	Yes	20	16.90	2.61	.31	.11
	No	30	15.33	3.84		
Problem Solving	Yes	20	10.15	4.86	-2.4	.15
	No	30	12.33	5.46		
Overall Scale	Yes	20	81.20	6.31	-1.22	.19
	No	30	77.80	10.43		

*$p<.05$

As can be seen in Table 11, with regard to the mean scores of the overall scale and its subscales according to the project experience variable, a significant difference was found in the "creativity" and "algorithmic thinking" subscales. This significance was in favour of those with project experience in both the creativity ($t_{creativity}$= 1.29, p<.05, $\underline{X}yes = 18.15$,

$\underline{\underline{X}}no = 16.63$) and algorithmic thinking dimensions ($t_{algorithmic\ thinking}$ = -.96, p<.05, $\underline{X}yes = 17.45$, $\underline{\underline{X}}no = 15.76$).

Table 12

One-way variance analysis (ANOVA) for subscales and overall scale posttest according to parents' (mother's) education level

Subscales and overall scale	Literacy	N	X	ss	sd	F	p	Scheffe Test	Levene's F Test	η2
Creativity	Primary school (1)	4	16.25	2.87	46	.66	.58	-	P>.05, $F_{creativity}$=.53, sd=46, p=.66	
	High school (2)	11	18.18	2.12						
	Bachelor's (3)	25	17.16	2.62						
	Postgraduate (4)	10	16.80	3.79						
Algorithmic Thinking	Primary school (1)	4	16.50	3.00	46	1.97	.13	-	P>.05, $F_{algorithmic}$=.97, sd=46, p=.41	
	High school (2)	11	18.27	2.49						
	Bachelor's (3)	25	15.60	3.30						
	Postgraduate (4)	10	16.50	2.83						
Collaboration	Primary school (1)	4	18.50	1.25	47	31	.81	-	p>.05, $F_{collaboration}$=1.97, sd=46 p=.13	
	High school (2)	11	17.63	3.32						
	Bachelor's (3)	25	17.96	2.42						
	Postgraduate (4)	10	18.70	2.49						
Critical Thinking	Primary school (1)	4	14.50	3.69	47	1.51	.22	-	p>.05, $F_{critical}$=1.44, sd=46 p=.13	
	High school (2)	11	17.81	2.48						
	Bachelor's (3)	25	15.48	4.03						
	Postgraduate (4)	10	15.70	2.16						
Problem Solving	Primary school (1)	4	11.50	2.38	47	1.75	.16	-	p>.05, $F_{problem}$7.25, sd=46 p=.05	
	High school (2)	11	14.27	8.23						
	Bachelor's (3)	25	11.12	3.95						
	Postgraduate (4)	10	9.20	4.23						
Overall Scale	Primary school (1)	4	77.20	6.63	47	3.18	.03*	2-1	p>.05, $F_{overall}$=.55, sd=46 p=.64	.41
	High school (2)	11	86.18	10.51						
	Bachelor's (3)	25	78.32	8.57						
	Postgraduate (4)	10	78.90	6.31						

**p<.05*

No significant difference was determined in relation to the computational thinking scale posttest according to the education levels of gifted students' fathers. However, as seen in Table 12, a difference was found in the overall computational thinking scale posttest according to the educational levels of the gifted students' mothers. To determine whether this difference was significant, the ANOVA test was performed. To reveal the direction of the difference found as a result of the test, the post-hoc Scheffe test was performed. As a result of the Scheffe test, a statistically significant difference was found between mothers who graduated from primary school and mothers who graduated from high school in favour of those who graduated from high school [$F_{overall}$=.64, sd=46, p=.03]. As mothers' education level increased, the computational thinking of gifted students increased. To calculate the value of the effect of parents' education levels on gifted students' CT, the eta-squared value was calculated. Accordingly, the eta-squared value, which was calculated as .41, shows that parents' education level had a large effect on students' computational thinking ($\eta 2>0.14$).

3. Findings related to the question "Do digital activities carried out remotely have an effect on gifted students' perceptions of the concept of technology?" are as follows:

The mind-mapping activity carried out in the qualitative dimension of the study was conducted before and after the implementation of the project. In the mind-mapping, the intention was to measure the effect of the project in terms of perceptions of the "technology" concept. The 50 participants were asked to draw mind maps on A3 papers, and drawings considered to be relevant to the main concept in the pretest and posttest were classified by 3 different domain experts (1 in mathematics and 2 in science) by coding them under themes (Figures 2 and 3).

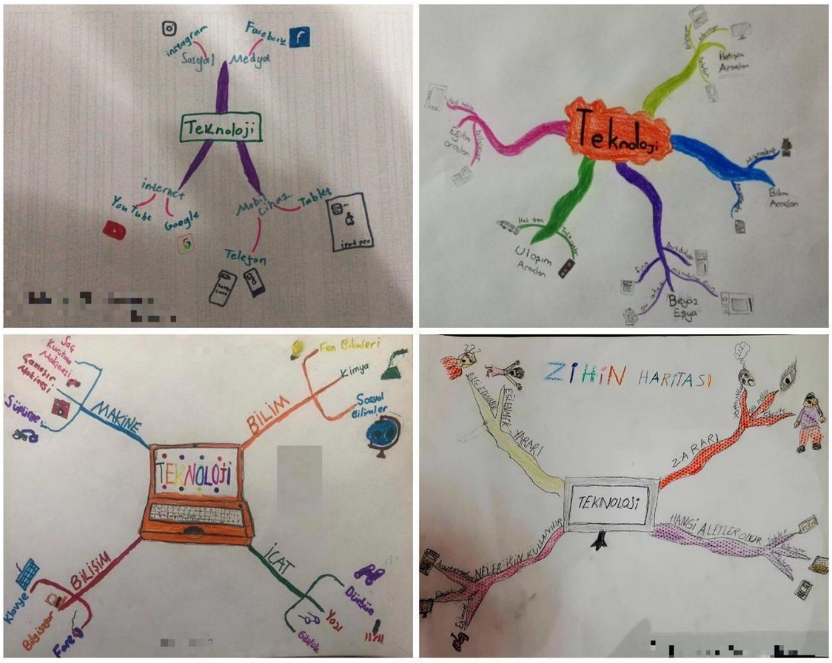

Figure 2

Examples of mind maps drawn during pretest

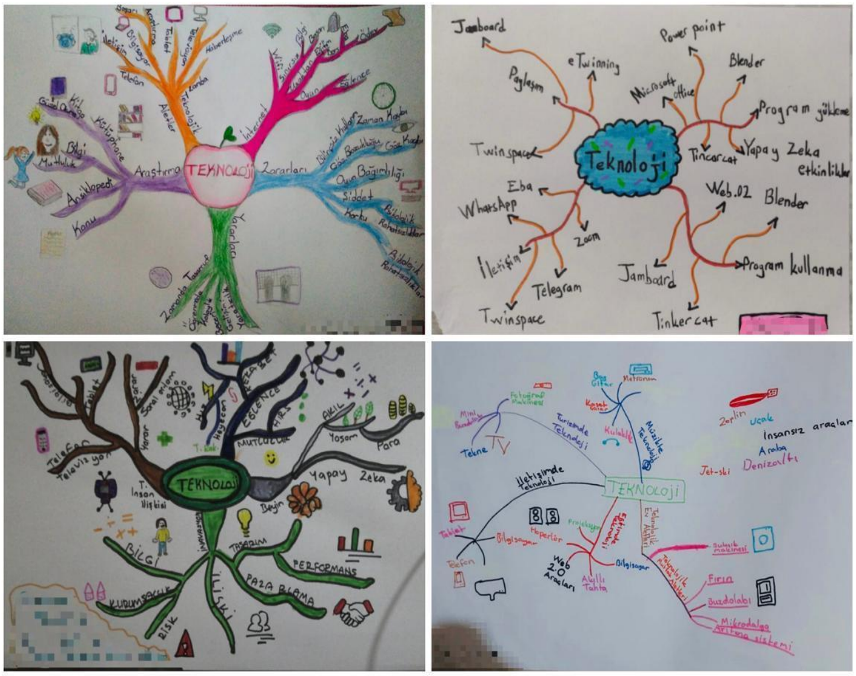

Figure 3

Examples of mind maps drawn during posttest

As can be understood from the examples of mind maps shown in Figure 2 and Figure 3, the use of branching and symbols for perception of the "technology" concept was much greater in the drawings in the posttest than in the pretest.

The codes and themes for the pretest and posttest are presented in Table 13.

Table 13.

The codes and themes for the pretest and posttest

Themes	Codes	Pretest		Posttest		Themes	Codes	Pretest		Posttest	
		f	%	f	%			f	%	f	%
Web 2.0 Tools	Canva	-	-	10	9.8	Health	MRI	9	23.68	10	23.81
	Zoom	4	11.43	17	16.67		X-ray	9	23.68	9	21.43
	Google	9	25.71	13	12.75		Stethoscope	7	18.42	7	16.67
	Tinkercad	-	-	9	8.82		Vaccination	5	13.16	4	9.52
	YouTube	8	22.85	5	4.90		Medicine	4	10.53	4	9.52
	Jamboard	-	-	5	4.90		Dialysis	2	5.26	2	4.76
	Artificial intelligence	3	8.57	5	4.90		Ultrasound	2	5.26	2	4.76
	Microsoft Office	-	-	5	4.90		ECG	-	-	1	2.38
	WhatsApp	2	5.71	4	3.92		Thermometer	-	-	1	2.38
	Telegram	1	2.86	4	3.92		ePulse	-	-	1	2.38
	eTrade	2	5.71	4	3.92		Stretcher	-	-	1	2.38
	eTwinning	2	5.71	4	3.92						
	Bitmoji	-	-	2	1.96	Communication	Telephone	39	26.35	34	26.36
	StoryJumper	-	-	2	1.96		Computer	38	25.68	38	29.46
	Instagram	-	-	2	1.96		Tablet	33	22.30	28	21.71
	Facebook	4	11.42	2	1.96		Television	22	14.86	17	13.18
	Skype	-	-	1	0.98		Radio	4	2.70	2	1.55
	Google Assistant	-	-	1	0.98		Satellite	1	0.68	3	2.33
	Kahoot!	-	-	1	0.98		Headphones	3	2.03	1	0.78
	eGovernment	-	-	1	0.98		Virtual glasses	1	0.68	1	0.78
	mBlock	-	-	1	0.98		iOS	1	0.68	1	0.78
	Scratch	-	-	1	0.98		Mouse	3	2.03	1	0.78
	Navigation	-	-	1	0.98		SIM card	2	1.35	2	1.55
	PosterMyWall	-	-	1	0.98		Android	1	0.68	1	0.78
	Yahoo	-	-	1	0.98						
	Smartboard	11	34.38	12	25.53		Bus	5	12.5	6	9.68

Education	Microscope	2	6.25	3	6.38	Transport	Car	12	30	15	24.19
	Eba	6	18.75	7	14.90		Express train	4	10	6	9.68
	Telescope	1	3.13	2	4.26		Motorcycle	1	2.5	2	3.23
	Smartwatch	3	9.38	7	14.90		Drone	-	-	2	3.23
	Printer	3	9.38	6	12.77		Combine harvester	-	-	1	1.61
	Projector	2	6.25	5	10.64		Metro	3	7.5	2	3.23
	Camera	1	3.13	1	2.13		Electric vehicles	1	2.5	2	3.23
	Photocopier	1	3.13	2	4.26		Hoverboard	-	-	1	1.61
	eSchool	2	6.25	2	4.26		Aeroplane	6	15	9	14.51
Home Tools	Dishwasher	6	15.38	13	20.63		Helicopter	4	10	3	4.84
	Washing machine	11	28.21	10	15.87		Traffic lights	2	5	2	3.23
	Refrigerator	4	10.26	8	12.7		Zeppelin	-	-	1	1.61
	Vacuum cleaner	5	12.82	5	7.94		Submarine	-	-	1	1.61
	Microwave oven	2	5.13	7	11.11		Space shuttle	-	-	3	4.84
	Kettle	1	2.56	3	4.76		Tractor	-	-	1	1.61
	Food mixer	1	2.56	3	4.76						
	Hairdryer	2	5.13	2	3.17	Harms of Technology	Visual impairment	13	35.14	13	25.49
	Iron	1	2.56	1	1.59		Curvature of spine	4	10.81	5	9.80
	Air conditioner	1	2.56	2	3.17		Obesity	4	10.81	6	11.76
	Light bulb	5	12.82	5	7.94		Addiction	9	24.32	6	11.76
	Power outlet	-	-	1	1.59		Radiation	1	2.7	2	3.92
	Electric toaster	-	-	3	4.76		Wasting time	2	5.41	2	3.92
							Violence	1	2.70	3	5,88
Benefits of Technology	Information research	1	1.47	2	2.94		Fear	2	5.41	3	5.88
	Creativity	-	-	-	2.94		Headache	-	-	2	33.92
	Time saving	-	-	1	1.47		Anger	-	-	1	1.96
	Comfortable life	-	-	2	2.94		Laziness	-	-	2	3.92
	Entertainment	-	-	1	1.47		Being scammed	-	-	1	1.96

	Shopping	-	-	1	1.47		Mental health problems	-	-	1	1.96
	Communication	-	-	14	20.59						
	Education	-	-	9	13.24						
	Innovation	-	-	1	1.47						
	Design	-	-	1	1.47						
	Robot	-	-	8	11.76						

In order to determine the increase in the perceptions of the participants regarding the concept of technology through mind mapping, a pretest-posttest implementation was carried out. In both the pretest and the posttest, 8 themes were created by 3 experts in agreement. While a total of 270 codes were determined in the pretest, a total of 310 codes were detected in the posttest. Looking at these codes, it is seen that the theme with the highest increase in the posttest according to the pretest is related to the Web 2.0 tools. While it was 32 in the pretest, it is seen that the total number of concepts increased to 102 in the posttest. After Web 2.0 tools, the second-highest increase in perception in mind maps drawn for the concept of technology was in the theme of the benefits of technology. While there was 1 acceptable code in the pretest, 40 codes were detected in the posttest. The third-highest increase was in home technology. 39 codes were determined in the pretest, and this number increased to 69 in the posttest. This situation reveals that there was a general increase in students' perception of the concept of technology after the project, and this coincides with the findings in the quantitative part of the research.

CONCLUSION AND DISCUSSION

The great majority of research studies aimed at the use of technology in the education process reveal the positive effects of technology on learning and achievement. eTwinning projects, in which technology is put to maximum use, are an important project approach for increasing students' academic success by developing their interest, attitudes and skills related to technology. By contributing to the use of digital technology for educational purposes, eTwinning is a platform which enables teachers and students in different schools to carry out projects with collaborative activities. In this context, in this study, the effect of digital activities conducted remotely within the scope of an eTwinning project, which is the focus of the research, on gifted students' technology awareness and computational thinking was investigated. As the first of the findings obtained in the light of the research questions, it was determined that this project, which was carried out digitally and remotely, made a positive contribution to students' technology awareness, but that the extent of this was not significant ($t=-.97$, $p>.05$). Considering the results of the pretest and posttest implementations, the students' technology awareness was high. This finding is in parallel with the mind mapping technique carried out in the qualitative section of the study. When the related literature is examined, in the joint eTwinning projects conducted in the study made by Pereira Coutinho and Rocha (2007), it was stated that students made progress in their computer skills and use of technology. This finding corresponds with the results obtained in this research. Çalışkan (2017) reported that gifted students were faster and more productive than their peers in the use of information technologies and approaches towards information technologies, that they were more predisposed to technology, that they used information technologies more expediently, and that they were open-minded and forward-looking. It is possible to find a number of studies that support this view (Bayraktar, 2001; Diffly, 2002; Usta; 2016). At this point, it is seen that the use and awareness of information technologies is important for bringing out and developing gifted-talented students' potential (Chen, Yun Dai, ve Zhou, 2013; Pyryt, 2009; Shavinina, 2009). The need which is frequently stressed in the literature for individualisable and adaptable education technologies that are independent of time and space, and the efforts made for this purpose, especially online learning applications, can ensure that these technologies are also made utilisable and applicable in gifted education. Studies made on this subject stress the benefits of using podcasts and blogs (Siegle, 2007), flipped classrooms (Siegle, 2013), QR codes (Siegle, 2015a), online games (Siegle, 2015b), and STEM (Dieker, Grillo & Ramlakhan, 2012; Ülger & Çepni, 2017), the preference for up-to-date technologies (Çubukçu & Tosuntaş, 2018), and practices such as distance learning (Cırık, 2016) in the education of gifted children.

In the study, it is seen that no significant relationship was found between the digital activities carried out with the scope of the eTwinning project and gifted students' mean scores for technology awareness with regard to the gender variable ($t_{negative}$= -1.1, p> .05 $t_{positive}$= 1.3, p>.05, $t_{overall}$= .97, p>.05). The striking point here is that female students' technology awareness was higher than that of male students. It was reported by Köroğlu (2015) that gifted children's motivation for the use of social media, which is one of the information technologies, did not differ significantly in terms of gender. However, Master, Cheryan and Meltzoff (2017) reported that following a short programming activity, gifted female students became very motivated and felt competent. It can be said that the fact that gifted students' technology awareness was found to be high was due to the fact that these students wished to communicate with many other gifted students and used technology to carry out their identity development (Cross, 2004), and also considered technological tools to be vehicles for developing themselves and sharing their experiences (Özcan & Biçen, 2016)

Another finding made in the study was that gifted students' technology awareness did not differ according to the type of school they attended($t_{negative}$= -.79, p> .05 $t_{positive}$= .27, p>.05, $t_{overall}$= .68, p>.05). In contrast to this, it was revealed that their technology awareness moved in a negative direction as their mothers' education level decreased [$F_{negative}$ =.89, sd=46, p=.00]. It is reported in the literature that parents of gifted children have difficulty in meeting their children's needs due to socio-cultural and socio-economic reasons, and that furthermore, they do not have the skills to cope with gifted children (Karakuş, 2011). According to Ersoy and Avcı (2000), gifted children ask questions very frequently and superficial answers given to these questions do not satisfy the students. These students' questions must be answered in depth and attention must be given to details. Adults must give these children the chance to present the products they have developed and motivation must be given for them to produce new products. In terms of enabling them to use their abilities, interests and capacities at the highest level, their parents should understand them very well (Dağlıoğlu & Alemdar, 2010). To achieve this, parents' education level must be high enough to overcome this problem. In the relationship between education level and parents' self-efficacy perception, it is reported that increasing the education level will have a positive effect on parents' self-efficacy perception (Söğüt & Çekiç, 2020). It should not be forgotten that parents with high self-efficacy will be able to give more support to their children regarding technology and other subjects.

Another finding made in the context of the second research question was that the digital activities carried out remotely made a positive contribution to gifted children's computational thinking (CT), but that the extent of this contribution was not significant($t=-.32$, $p>.05$). The students' CT was high in both the pretest and posttest. This result corresponds to those of some studies in the literature. Avcu and Er (2020) determined that as a result of a 74-hour programming instruction, gifted and talented students' digital thinking skills developed. Çakır and Bayraktar (2019) also achieved similar results. In their study, Kirmit, Dönmez and Çataltaş (2018) found that gifted secondary school students had high mean scores in the overall CT scale and its sub-dimensions, with the exception of the problem-solving sub-dimension. Galvin et al. (2007) reported that carrying out eTwinning projects in collaborative online learning environments and conducting education activities via distance learning enabled students to develop their digital skills. There are also studies which show that there is a significant relationship between students' CT and their computer programming skills (Avcu & Ayverdi, 2020; Çiftci, Çengel & Paf., 2018; Ünsal-Serim, 2019; Yıldız-Durak, Karaoğlan-Yılmaz & Yılmaz, 2019).

Gender is one of the variables that need to be discussed in the context of acquisition and development of computational thinking skills. Yıldız Durak and Saritepeci (2018) stated that gender may be important in the development of CT, which is used as a concept related to computer sciences. It is seen that in the digital activities carried out within the scope of the study, the students' mean scores in both the subdimensions of the CT scale and the overall scale were not significantly correlated with the gender variable, except that there was a significant relationship in the "problem solving" subscale($t=--2.4$, $p<.05$). This significance was in favour of male students. With regard to studies made with gifted and talented students, Kirmit, Dönmez and Çataltaş (2018) examined these students' computational thinking with respect to girls and boys, and found that there were significant differences in favour of boys in the creative thinking, algorithmic thinking and critical thinking subfactors. On the contrary, Dönmez, Kirmit, Gürbüz and Birsen (2018) found that gifted and talented students' digital thinking skills did not differ according to gender. While some research results emphasised that computational thinking skills based on different variables based on gender differed significantly according to the research (Atmatzidou & Demetriadis, 2016; Roman- González et al., 2017), others concluded that there was no significant difference based on gender (Alsancak Sırakaya, 2019; Korucu, Gencturk & Gundogdu, 2017; Yağcı, 2018). In the literature, it was reported that gifted students' problem solving, algorithmic thinking and programming self-efficacy in digital activities (e.g., Scratch) was correlated with students' readiness for the designed activities (Yıldız-Durak, 2018). In this context, regarding the significance in favour of males in the problem solving subdimension of CT, it can be said that males were more prepared for these activities. Female students should be given support for CT.

Project studies are important enrichment strategies for differentiated education and meeting the needs of gifted and talented students (Calvert, 2010; Tortop, 2014). In this respect, the relationship between students' project experiences and their computational thinking was tested. According to the findings made, with regard to the mean scores of the overall scale and its subscales regarding the project experience variable, a significant difference was found in the "creativity" and "algorithmic thinking" subscales ($t_{creativity}$= 1.29, p<.05, $\underline{X}yes = 18.15$, $\underline{\underline{X}}no = 16.63$, $\text{talgorithmic thinking} = -.96, \text{p} < .05$ $\underline{X}yes = 17.45$, $\underline{\underline{X}}no = 15.76$).This significance was in favour of those with project experience in both the creativity and the algorithmic thinking dimensions. Project activities are important enrichment strategies for meeting the needs of gifted and talented students (Calvert, 2010; Tortop, 2014). In the literature, it was stressed that these students were highly motivated for project activities and that they derived pleasure from projects that enabled them to be independent (Delcourt, 1993; Johnsen, 2008; Johnsen & Goree, 2009). Project studies and artistic activities enable children to think critically, creatively and from various perspectives (Kaplan & Hertzog, 2016). Hill-Anderson (2008) argued that the potential of gifted children can be realised through projects. Diffily and Sassman (2002) stated that since products are produced after a process, projects increased children's ability to transfer knowledge and create new knowledge, and developed their problem-solving skills. The result obtained in the study and the findings reported in the literature correspond with each other. It can be said that the creativity, critical thinking skills and problem-solving ability that the students had acquired with their previous project experience contributed positively to their CT skills in this context.

The change in gifted students' CT was significant in the overall scale according to the mothers' education levels ($F_{overall}$=.64, sd=46, p=.03). This significance was in favour of mothers who were high school graduates. Therefore, one can say that as mothers' education level increased, CT in gifted students also increased. This significance that emerged with regard to mothers who were high school graduates is a result that was obtained only by measuring mothers' education levels in an academic sense. Parents might have also done research or taken part in training other than academic education, and may have participated in activities with the aim of feeling more competent (Söğüt & Çekiç, 2020). Such a finding may have been made in this study for reasons such as these as well. It is seen that there are studies reporting a relationship between parents' education level and their children's levels of competence (Aksoy & Diken, 2009; Uysal & Akman, 2016). Parents' education level, the fact that they have developed themselves, is very important in terms of having high awareness in matters concerning their children and demonstrating competence to their children in all kinds of subjects. It is reported in the literature that parents of gifted children need more education than parents of children who show normal development (Davaslıgil, 2000). In this regard, educated parents are one of the most important factors in meeting the needs of gifted children concerning technology, since it is the parents who know what their children need and who can meet this need. Making up the deficiencies in areas like the internet, computer hardware and software, and use of social media platforms, and the correct guidance of children are only possible with the technology awareness of educated parents. The findings obtained by mind mapping, which is the qualitative part of the study, show an increase in the perceptions of the participants towards the concept of technology in favour of the posttest, supporting the quantitative results. Especially the formation of more concept perceptions in the Web 2.0 tools, benefits of technology and home tools themes is an indication of the contribution of remote digital activities carried out with the eTwinning project. This is because the technological tools and equipment used more especially in the activities have been covered by these themes.

LIMITATIONS

In this study, the effects of digital activities used in the scope of an eTwinning project on 50 gifted students who took part in the project were investigated with regard to different variables. The low number of participants in the study group led to study being conducted with a single group design. Besides this, experimental studies can be conducted for technological awareness and computational thinking. These skills can also be tested by carrying out different projects or different digital activities related to the case of gifted students. Another characteristic that limited this research was the effectiveness of activities that had to be carried out entirely remotely due to the COVID-19 pandemic. In the distance education, in which the teacher's control was weak, the skills intended to be fostered in students remained at a lower level. It is recommended that the activities be carried out again digitally, but face-to-face under the teacher's control in a classroom environment. The persons responsible for education must meticulously implement processes such as motivation, observation, monitoring and assessment of gifted students, and the achievement potential of these students must be increased by direct intervention for students in the case of difficulties that may be experienced. Finally, the mind maps that were used as the qualitative data tool in the research were required to be drawn by the students on paper, not by using digital programs. In other studies, the change in students' perceptions of the technology concept can be measured by using mind-mapping programs.

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