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Research Article

The Relationship Between Gifted Students' Self-Efficacy Perceptions of Computational Thinking Skills and Information Technologies Self-Efficacy Perceptions

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Abstract – Today, due to the developing technologies and compulsory reasons such as pandemics, some educational activities are performed through distance education. For these activities, which are mostly carried out online through computers, tablets, and mobile phones, to be effective, they must address the needs and changing characteristics of the students. In this context, the aim of the research was to examine whether there is a relationship between the self-efficacy perceptions of gifted students regarding their computational thinking skills and information technology. The sample consisted of 130 secondary school students studying via distance education in Science and Art Centers in Balıkesir in the 2020-2021 academic year. As a result of the analyses, it was observed that the gifted students' computational thinking and information technology self-efficacy perceptions were above the average and there was a high positive correlation between them.

Keywords: Special talented students, computational thinking, information technology self-efficacy.

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Introduction and Theoretical Framework

The traditional learning-teaching methods have served society well for a very long time. The area of education has changed as a result of the evolving and expanding technologies, and student-centered methodologies are now commonplace. In the modern era, information sharing and access have both improved, and educational activities have been moved into technologically advanced settings. These modifications have eliminated the restrictions of time and place on education and made it widely available (Akgün, 2013). It is anticipated that education that is more widely available will produce more effective outcomes. Technological advancements will improve educational environments and should be designed based on the various needs of teachers and students.

The changing qualities of pupils should be considered to deliver the necessary learning in educational activities. In addition to their knowledge and experience, students' abilities and intelligence areas can vary. As one of these several groupings, gifted students are defined as individuals who are significantly superior to their peers in academic ability, who can learn to think creatively, and who are leaders, have high abilities in leadership and other areas, or have intelligence above normal developments (Worrell et al., 2019). “Gifted/talented students” is a term generally used to describe students who show higher potential than their peers in a particular field. These students may have in-depth knowledge and understanding, generally high academic achievement, and ability to solve complex problems (Gelgoot et al., 2020). Gifted students have certain needs different from their counterparts. To discover and grow their skills, they need help (Bilgiç et al., 2013). In light of their unique demands and abilities relative to their peers, gifted students require more robust educational activities outside of their formal education. (Bakioğlu & Levent, 2013). Additionally, these students should receive support based on their areas of intelligence.

Gardner (1993) described intelligence as having aptitude in one or more areas and coming up with original, workable answers to problems that arise in daily life. Giftedness refers to a person's ability to perform at a higher level than their counterparts in terms of intelligence potential. Instead of the terms “gifted” and “gifted talent”, which are found in the literature, “unique talent” has become more popular and is now used instead. It is seen that the concept of gifted is used instead of the concept of gifted in the “Special Talented Individuals Strategy and Implementation Plan 2013-2017” in the study of the Ministry of National Education (MoNE, 2020). Uncertainty will be prevented in this manner (Özsoy, 2015). The idea of extraordinary talent was favored in this study.

Gifted students receive education at the Science and Art Center on some days of the week after the formal education they continue with their peers. The Science and Art Centers provide five different programs for education. These programs are adaptation program, support program, Individual Talent Recognition program (ITR), Special Talent Development (STD) program, and project production program (MoNE, 2019). The ITR program aims to help students find their abilities through various activities (Özsoy, 2015). Two of these objectives are to develop computational thinking abilities and to raise self-efficacy perceptions of information technologies.

One of the important factors affecting the educational activities of individuals is computational thinking skills. One of the 21st-century talents is computational thinking, which is a type of thought process along with creative, critical, cooperative, problem-solving, and communication skill development (Wing, 2006). According to the International Society for Technology in Education (ISTE), computational thinking, a technical approach to problem-solving, is a skill that everyone should have, not just programmers who think with computer logic (ISTE, 2015). The goal of learning this skill is to increase problem-solving abilities by applying the logic of algorithms to every part of people's lives, not to be able to write programs (Alsancak Sırakaya, 2019). Cross et al. (2016) talked about the strong connection between mathematical thinking, scientific thinking and computational thinking, and stated that the gifted education experience, especially in the field of mathematics and science, offers students the opportunity to develop strong problem-solving skills and improve their cognitive abilities to better understand computational concepts.

Computational thinking skill, which can be acquired at any age from pre-school, facilitates understanding the problem and solving it by breaking it into small parts. Having this skill provides interdisciplinary knowledge transfer, producing creative solutions, lifelong learning, transforming what has been learned, and critical thinking (Gülbahar et al., 2019). Computational thinking, which is considered as the process of logical sequencing, analyzing data, and producing solutions using algorithms, is referred to as problem-solving skills in all fields, especially in science, mathematics, and social sciences. It also promotes interdisciplinary knowledge transfer and strengthens students' critical thinking abilities (Buitrago-Flórez, 2021). When used in both classroom and non-school settings, this skill gives students an advantage and can be helpful for resolving issues that arise in a variety of areas of our life.

It can be stated that self-efficacy belief, which is contributed by the past experiences and the problems encountered, is an important variable for the learning-teaching process, since it affects the individual's behaviors. The idea that a person can carry out a task successfully is another definition of self-efficacy. Self-efficacy belief, which was first expressed by Bandura (1977), was defined as an individual's performance in overcoming difficulties and has gained importance with student-centered teaching approaches (Tekerek et al., 2012).

Information technologies are becoming more and more significant, and for many people in the educational stage of life, using technology properly and efficiently has become mandatory. As a result, every year, instruction in information technology is introduced to pupils in the foundational phases of their education. The goal of providing this early education is to improve people's perceptions of their own information technology self-efficacy (Göçer & Türkoğlu, 2020).

When the studies are examined, it is stated that people with strong information technology self-efficacy beliefs are more willing to use computers and participate in computer-based activities. People who have a strong IT self-efficacy belief tend to use technology more easily and effectively. These individuals are more willing to participate in various activities using computers and are more open to acquiring new technology-related skills (Hatlevik et al., 2018). In addition, it was stated that thanks to these strong skills, they found easy, effective, and creative solutions to the problems they encountered. In other words, those who have strong self-efficacy beliefs in information technology tend to make better decisions and have better usage skills (Seferoğlu & Koçak, 2003). In addition, it can be claimed that those who have a high level of self-efficacy in a particular field are more likely to engage in activities related to that area and have better problem-solving skills. Therefore, it is possible to describe self-efficacy perception as a significant educational variable (Çubukçu & Girmen, 2007).

On the other hand, people with a weak sense of self-efficacy do not prefer difficult tasks and give up quickly in the face of the problems they encounter; it is seen that their anxiety is high and their performance is low. Because of this, it might be said that their success is lower than anticipated. In addition, individuals' misevaluation and low perception of self-efficacy prevent them from demonstrating their abilities (Erden-Kurtoğlu & Seferoğlu, 2020).

Purpose of the Research

The purpose of the study is to ascertain how gifted students perceive their own levels of self-efficacy and information technology self-efficacy in connection with computational thinking skills, and to discover whether there is any relationship between the two and, if so, to what extent. In addition, it is aimed to examine whether self-efficacy perceptions for computational thinking skills and information technology self-efficacy perceptions differ according to various variables (gender, age, class level, parental education level, etc.).

The research looks for solutions to the following sub-problems to accomplish these purposes:

1. What is the level of self-efficacy perceptions of gifted students regarding computational thinking skills?

2. Do gifted students' self-efficacy perceptions towards computational thinking skills differ according to various variables (gender, age, education level, duration of internet use, duration of computer use, educational status of parents)?

3. What is the level of information technology self-efficacy perceptions of gifted students?

4. Do gifted students' information technology self-efficacy perceptions differ according to various variables (gender, age, education level, duration of internet use, duration of computer use, educational status of parents)?

5. Is there a significant relationship between gifted students' self-efficacy perceptions for computational thinking skills and information technology self-efficacy perceptions?

Significance of the Research

When the studies in the literature on acquiring and increasing computational thinking skills are examined, many approaches have been encountered. While some researchers emphasize the importance of enriched activities to gain this skill, some researchers emphasize the importance of activity practices, and some emphasize the importance of group work (Yeni, 2017). When the research in the literature is assessed, it is clear that their main objective is to define the concept and scope of computational thinking abilities. In addition, studies examining the relationship between the individual's perception of information technology self-efficacy and computational thinking skills have not been found. It is also thought that systematic review studies involving gifted students, in which research is evaluated under different titles, current data are processed, and different variables will be included, will contribute to the literature.

Studies in the field of information technology self-efficacy belief generally make comparisons with the demographic information and competencies of the sample. There is no study investigating how computational thinking abilities and information technology self-efficacy beliefs relate to gifted secondary school students. It is thought that determining this relationship will contribute positively to increasing students' self-perceptions and developing their problem-solving skills. In addition, it can be a guide for teachers' approach to students. It is anticipated that the study would help fill the gap on this topic in the literature. On the other hand, the research was limited to gifted students studying in Balıkesir.

Method

This research is a descriptive study in the relational screening model to examine whether there is a relationship between gifted students' self-efficacy perceptions for computational thinking skills and their information technology self-efficacy perceptions. The relational survey model is a type of survey research that aims to determine the relationship between variables, their severity, and direction (Bertiz & Kocaman Karoğlu, 2018; Büyüköztürk et al., 2015).

Sample

In the 2020-2021 academic year, a total of 130 students enrolled in the Individual Talent Recognition (ITR) and Special Talent Development (STD) program, including secondary school students studying via distance education in Science and Art Centers (BİLSEM) in Balıkesir province, constitute the sample of the study. Appropriate sampling method was preferred among the non-random models due to the pandemic in the selection of the sample. Demographic characteristics of the sample are shown in Table 1.

Table 1 Demographics of the Working Group

	Girl			Boy			
Institution	ITR1	ITR2	STD	ITR1	ITR2	STD	Total
Bandırma Science and Art Center	5	3	0	3	2	0	13
Burhaniye Science and Art Center	39	23	4	15	15	8	104
Balıkesir Şehit Prof. Dr. İlhan Varank Science and Art Center	2	1	1	4	3	2	13
Total	46	27	5	22	20	10	130

Data Collection Tools

In order to collect data in the study, the personal information form prepared by the researchers and the scales described below were used. In the personal information form, consisting of 22 items, there are questions about the student's age, gender, family, having computer and internet, and duration of use.

The Self-Efficacy Perception for Computational Thinking Skills [CTSSP] scale developed by Gülbahar, Kert, and Kalelioğlu (2018) consists of 36 items under 5 factors. The factors are algorithm design competence (nine items), problem-solving competence (ten items), data processing competence (seven items), basic programming competence (five items), and self-confidence competence (five items). On a 3-point Likert scale, “No” corresponds to 1 point, “Partly” corresponds to 2 points, and “Yes” corresponds to 3 points. A minimum of 36 points and a maximum of 108 points can be obtained from the scale. The internal consistency (Cronbach's Alpha) value of the scale varies between 0.762 and 0.930 for the sub-factors. When interpreting the scale, high total scores from the sub-factors and the entire scale will provide information that the participants' level of “Self-Efficacy Perception towards Computational Thinking Skills” is high.

Information Technologies Self-Efficacy Perception Scale [ICTSEP], developed by Göçer and Türkoğlu (2018), has 30 items and a single-factor structure. To test the reliability of the scale, Cronbach's Alpha internal consistency coefficient was calculated and Cronbach's Alpha internal consistency coefficient was found to be .90. On a 5-point Likert scale, “Doesn't suit me at all” corresponds 1, “Doesn't suit me” corresponds 2, “I'm undecided” corresponds 3, “Suits me” corresponds 4, and “Completely suits me” corresponds 5 points. A minimum of 30 points and a maximum of 150 points can be obtained from the scale. In the interpretation of the scale, the total score between 30-54 is determined as “very low level”, between 54-78 as “low level”, between 78-102 as “medium level”, between 102-126 as “high level”, and between 126-150 as “very high level”.

Data Analysis Methods

The collected data were analyzed using SPSS version 26 to determine the relationship between gifted students' self-efficacy perceptions regarding computational thinking skills and information technologies self-efficacy perceptions. With the data obtained, descriptive and descriptive statistics such as frequency, arithmetic mean, percentage, and standard deviation were carried out based on the 95% confidence interval and .05 significance level. To compare the obtained data according to two independent variables, the independent samples t-test from parametric tests was used. In addition, Pearson Correlation analysis was conducted to determine the relationship and level between the two variables. To compare more than two variables, Analysis of Variance (ANOVA) and LSD (Least Significant Difference) tests were used for independent samples.

Findings

Findings of the first sub-problem

The self-efficacy perception and factors total scores for the computational thinking skill obtained in the research and the total score of the information technology self-efficacy perception were subjected to explanatory factor analysis. In addition, the lowest score, highest score, mean, and standard deviation values are calculated and given in Table 2.

Table 2 Number of Participants, Average, Minimum, Maximum, Standard Deviation Values of CTSSP and Factor Scores

Variables	N	$\bar{X}$	Min.	Max.	SS.
Self-efficacy perception scale for computational Thinking skill (Total)	130	90.28	53.00	108.00	13.34
Algorithm design competence	130	21.00	9.00	27.00	5.60
Problem solving competence	130	26.57	18.00	30.00	3.07
Data processing competence	130	17.94	7.00	21.00	3.16
Basic programming proficiency	130	11.58	5.00	15.00	2.84
Self confidence competence	130	13.16	8.00	15.00	1.87

p< .05

When Table 2 is examined, it can be stated that the SCBA levels of the gifted students are ($\bar{X}$ =90.28) and the result is above the average as seen in Figure 1.

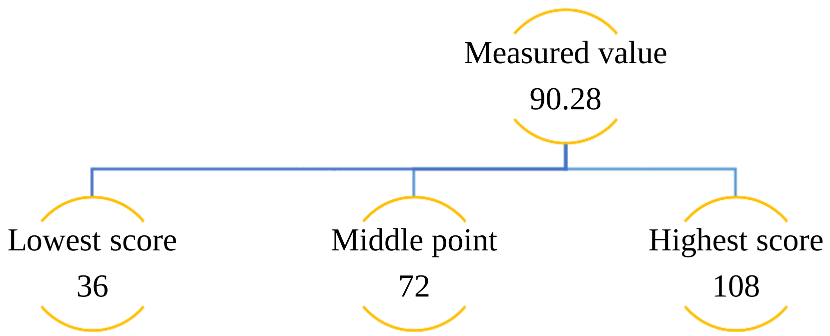

Figure 1 Displaying Participants CTSSP Levels

The Pearson correlation coefficients of the average scores of the CTSSP factors of proficiency in designing algorithms, proficiency in problem solving, proficiency in data processing, basic programming proficiency and self-confidence were calculated. Analysis results are presented in Table 3.

Table 3 CTSSP Factors Total Scores Pearson Correlation Coefficients

Variable	Algorithm design competence	Problem solving competence	Data processing competence	Basic programming proficiency	Self confidence competence
Algorithm design competence	1.00	.339	.538	.629	.533
Problem solving competence	.339	1.00	.602	.437	.577
Data processing competence	.538	.602	1.00	.686	.672
Basic programming proficiency	.629	.437	.686	1.00	.683
Self confidence competence	.533	.577	.672	.683	1.00

$p < .05$

When Table 3 is examined, between CTSSP factors, there is a weak level correlation on the positive side between Algorithm Design Proficiency and Problem-Solving Proficiency (r=.339; p< .05), and a moderate level on the positive side between Data Processing Proficiency (r=.538; p< .05), a moderate positive correlation between Basic Programming Competence (r=.629; p< .05) and a moderate positive correlation between Self-Confidence Competence (r=.533; p< .05). As for the relationship with Problem-Solving Competence, there was a positively moderate relationship between Problem-Solving Competence and Data Processing Competence (r=.602; p< .05), positively moderate relationship between Basic Programming Competence (r=.437; p< .05) and moderate relationship between Self-Confidence Competence (r=.577; p< .05). It was also found that there was a moderate positive correlation between Data Processing Competence and Basic Programming Competence (r=.686; p< .05), and a moderate positive correlation between Self-Confidence Competence (r=.672; p< .05). Finally, it was found that there was a moderate positive correlation between Basic Programming Competence and Self-Confidence efficacy (r=.683; p< .05).

Findings of the second sub-problem

Table 4 shows the numbers, mean, standard deviation, and t-test values of the scores that gifted students obtained from the CTSSP scale based on their school type, gender, having a room, and having a computer.

Table 4 Number of Participants, Mean, Standard Deviation and t-Test Values of Their Scores from the CTSSP scale

Variables		N	X̄	SS.	*t*
School type	State school	105	89.78	13.74	-.881
	Private school	25	92.40	11.55	
Gender	Female	78	91.25	13.23	1.017
	Male	52	88.82	13.51	
Do you have room	Yes	107	92.13	12.90	3.552
	No	23	81.69	12.17	
Do you have computer	Yes	100	92.37	12.66	3.382
	No	30	83.33	13.41	

p< .05

When Table 4 is examined, the self-efficacy perceptions of gifted students towards computational thinking skills are examined in terms of school type (t= -.881, p< .05), and public school was found to be (X̄=89.78, SD=13.74) and private school as (X̄=92.40, SD=11.55). Although it was higher in the direction of private schools, no significant difference was found. In terms of gender (t= 1.017, p< .05), there was no significant difference between female (X̄=91.25, SD=13.23) and male (X̄=88.82, SD=13.51) students, although CTSSP was higher in terms of female students. In terms of whether the students have their own room (t= 3.552, p< .05), there was a difference between the groups of having a room of their own (X̄=92.13, SS=12.90) and not having a room of their own (X̄=81.69, SD=12.17). It was found that CTSSP was higher in the direction of those who had their own room and there was a significant difference. In terms of whether students have a computer (t= 3.382, p< .05), a high and significant difference was observed between those who have a computer (X̄=92.37, SS=12.66) and those who do not have a computer (X̄=83.33, SS=13.41).

A one-way ANOVA was conducted to determine whether there was a statistically significant difference between the total scores of gifted students from the CTSSP scale and various variables. One-way ANOVA results are given in Table 5. One-way ANOVA test was preferred due to the distribution of the data, the number of groups and because it is an effective analysis method.

Table 5 ANOVA Results of Students' Scores from the CTSSP Scale by Various Variables

Variables	Source of variance	Sum of squares	sd	Mean Squares	F	p
Age	Between groups	322.987	4	80.747	.446	.775
	In-group	22653.482	125	181.228		
	Total	22976.469	129			
Grade	Between groups	199.177	3	66.392	.367	.777
	In-group	22777.292	126	180.772		
	Total	22976.469	129			
Mother's education status	Between groups	1459.995	5	291.999	1.683	.144
	In-group	21516.474	124	173.520		
	Total	22976.469	129			
Father's education status	Between groups	1254.510	6	209.085	1.184	.319
	In-group	21721.960	123	176.601		
	Total	22976.469	129	22976.469		

p< .05

In Table 5, the group variances of the self-efficacy perceptions of gifted students towards computational thinking skills are listed. Age F(4, 125) = .446, p< .05, grade level F(3, 126)= .367, p< .05, maternal education level F(5, 124) = 1.683, p< .05, father's education level, F(6, 123)= 1.184, p< .05 did not differ significantly in CTSSP.

Table 6 shows the data of the variables whose group variances do not show a homogeneous distribution. The results of the Kruskal-Wallis H test, which is one of the nonparametric tests used in the analysis of the variables whose group variances do not show homogeneous distribution, are listed. The Kruskal-Wallis H test was preferred because it is a powerful test for detecting differences between three or more independent groups.

Table 6 Kruskal-Wallis H Test Results According to Computer Usage Time of Students' Scores from CTSSP

	Computer usage time	n	Rank average	sd	χ^2	p
CTSSP total score	1 Year	22	54.32	5	11.456	.043
	2 Year	22	50.09			
	3 Year	17	64.94			
	4 Year	25	66.08			
	5 Year	20	82.75			
	6 Year or more	24	75.29			
	Total	130				

p< .05

When the data in Table 6 are examined, it is seen that gifted CTSSP scores differ according to the duration of computer use, χ 2 (df=5, n=130) = 11,456, p< .05. This finding shows that the duration of computer use has different effects on students' self-efficacy perceptions regarding computational thinking skills. When the mean rank of the groups is considered, the CTSSP score of the students who have been using computers for 5 years is the highest, followed by the groups of students who have been using computers for 6 years or more and for 4 years.

Table 7 shows the data of the variables whose group variances do not show a homogeneous distribution. The results of the Kruskal-Wallis H test, which is one of the nonparametric tests used in the analysis of the variables whose group variances do not show homogeneous distribution, are listed.

Table 7 Kruskal-Wallis H Test Results According to How Students Scores from the CTSSP Scale Define Computer Use Skills

	Computer skills	n	Rank average	sd	χ^2	p
CTSSP total score	A little bad	7	44.79	3	15.101	.002
	Some good	20	46.05			
	Good	69	64.47			
	Very good	34	83.29			
	Total	130				

p< .05

The data in Table 7 shows us that the CTSSP total scores of gifted students differ according to how they describe their computer use Skills, χ^2 (sd=3, n=130) = 15.101, p< .05. This result indicates that how students define their computer skills has different effects on CTSSP. When the mean rank of the groups is considered, it is seen that gifted students who define their computer use skills as very good have the highest self-efficacy perceptions towards computational thinking skills, followed by students who define themselves as good.

Findings of the third sub-problem

It was shown in Table 2 that gifted students had high ICTSEP levels ($\bar{X}$ =118.43). As seen in Figure 2, it can be stated that the ICTSEP scores are above the average.

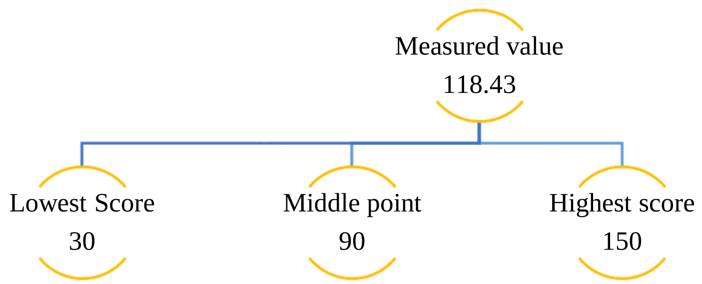

Figure 2 Demonstrating Participants' ICTSEP Levels

Findings of the fourth sub-problem

Table 8 shows the n-numbers, mean, standard deviation and t-test values of the scores that gifted students got from ICTSEP according to their school type, gender, having a room, and having a computer.

Table 8 Number of Participants, Mean, Standard Deviation and t-Test Values of the Scores Received from ICTSEP

Variables		N	X̄	SS.	*t*
School Type	State school	105	118.30	23.59	-.137
	Private school	25	119.00	19.08	
Gender	Female	78	115.74	22.25	-1.667
	Male	52	122.48	23.05	
Do you have room	Yes	107	120.31	21.57	2.058
	No	23	109.69	26.25	
Do you have computer	Yes	100	121.12	22.66	2.505
	No	30	109.50	20.91	

p< .05

As seen in Table 8, when the information technology self-efficacy perceptions of gifted students in terms of school type (t= -.137, p< .05) are analyzed, there was no significant difference between public schools (X̄=118.30, SD=23.59) and private schools (X̄=119.00, SS=19.08) groups. In terms of gender (t= -1.667, p< .05), no significant difference was found between female (X̄=115.74, SD=22.25) and male (X̄=122.48, SD=23.05) students, although the ICTSEP was higher for male students. In terms of whether the students have their own room (t= 2.058, p< .05), there was a difference between the groups of having a room of their own (X̄=120.31, SD=21.57) and not having a room of their own (X̄=109.69, SD=26.25). It was found that ICTSEP was higher in the direction of those with their own room and there was a significant difference. In terms of having a computer (t= 2.505, p< .05), there was a significantly high difference between those who have a computer (X̄=121.12, SS=22.66) and those who do not have a computer (X̄=109.50, SD=20.9).

A one-way ANOVA was conducted to determine whether there was a statistically significant difference between the total score of gifted students in ICTSEP with various variables. One-way ANOVA results are given in Table 9.

Table 9 ANOVA Results of Students' Scores from ICTSEP by Various Variables

Variables	Variance Source	Sum of Squares	sd	Mean Squares	F	p
Age	Between groups	1019.128	4	254.782	.485	.747
	In-group	65640.879	125	525.127		
	Total	66660.008	129			
Grade	Between groups	122.837	3	40.946	.078	.972
	In-group	66537.170	126	528.073		
	Total	66660.008	129			
Mother's education status	Between groups	1426.921	5	285.384	.542	.744
	In-group	65233.087	124	526.073		
	Total	66660.008	129			
BİLSEM Grup	Between groups	123.391	2	61.696	.118	.889
	In-group	66536.616	127	523.910		
	Total	66660.008	129			

p< .05

Table 9 lists the group variances of gifted students' information technology self-efficacy perceptions with homogeneous distribution. Age F(4, 125) = .747, p< .05, grade level F(3, 126)= .972, p< .05, maternal education level F(5, 124) = .744, p< .05, and BİLSEM group did not differ significantly F(2, 127)= .889, p< .05.

Table 10 shows the data of the variables whose group variances do not show homogeneous distribution. The results of the Kruskal-Wallis H test are given below.

Table 10 Kruskal-Wallis H Test Results According to Computer Usage Time of Students' ICTSEP Scores

	Computer using time	n	Rank average	sd	χ^2	p
ICTSEP total score	1 Year	22	49.70	5	19.488	.002
	2 Year	22	50.75			
	3 Year	17	51.41			
	4 Year	25	72.06			
	5 Year	20	84.90			
	6 Year or more	24	80.48			
	Total	130				

p< .05

When the data in Table 10 are examined, it is seen that the ICTSEP scores of the gifted students differ according to the time they use the computer χ^2 (sd=5, n=130) = 19.488, p<.05. This finding shows that the duration of computer use has different effects on students' information technology self-efficacy perceptions. When the mean rank of the groups is taken into account, the students who have been using computers for 5 years have the highest

ICTSEP, followed by the groups of students who have been using computers for 6 years or more and for 4 years.

Table 11 shows the data on how students define their computer use skills, among the variables whose group variances do not show a homogeneous distribution. The results of the Kruskal-Wallis H test are presented.

Table 11 Kruskal-Wallis H Test Results According to How Students' ICTSEP Scores Define Computer Use Skills

	Computer using skills	n	Rank average	sd	χ^2	p
ICTSEP total score	A little bad	7	35.21	3	32.883	.000
	Some good	20	43.58			
	Good	69	60.56			
	Very good	34	94.66			
	Total	130				

p< .05

The data in Table 11 shows us that gifted students' total scores on ICTSEP differ according to how they describe their computer use skills χ^2 (sd=3, n=130) = 32.883, p< .05. This result indicates that how students define their computer use skills has different effects on ICTSEP. When the mean rank of the groups is taken into account, it is seen that gifted students who define their computer use skills as very good have the highest self-efficacy perceptions towards computational thinking skills, followed by students who define themselves as good.

Findings of the fifth sub-problem

Pearson correlation coefficients of the scores were calculated to determine the relationship between the total scores and factors of the participants from the self-efficacy perception scale for computational thinking skills and the total score they got from the information technology self-efficacy perception scale. Analysis results are presented in Table 12.

Table 12 CTSSP, ICTSEP and Factors Total Scores Pearson Correlation Coefficients

Variables	CTSSP (Total)	ICTSEP (Total)
ICTSEP (Total)	.744	1
CTSSP (Total)	1	.744
F1. Algorithm design competence	.834	.577
F2. Problem solving competence	.690	.433
F3. Data processing competence	.842	.659
F4. Basic programming proficiency	.837	.743
F5. Self confidence competence	.802	.624

p< .05

When Table 12 is examined, in terms of total scores and factors; It was observed that there was a high level of positive correlation between ICTSEP total score and CTSSP total score (r=.744; p< .05). As for the relationship between ICTSEP and the factors, there was a positive correlation between ICTSEP total scores and Algorithm Design Competence (r=.577; p< .05), a positive correlation with Problem Solving Competence (r=.433; p< .05), a positive correlation with Data Processing Competence (r= .659; p< .05), a high level of positive correlation with Basic Programming Competence (r=.743; p< .05), and a high level of positive correlation with Self-Confidence Competence (r=.624; p< .05).

Conclusion, Discussion and Recommendations

In this study, the relationship between gifted students' self-efficacy perceptions for computational thinking skills and their information technology self-efficacy perceptions were examined. Accordingly, the results of the perception of self-efficacy towards computational thinking skills, the factors of this perception and its relationship with various variables, the perception of information technology self-efficacy, the relationship of this perception with various variables, and the connection between these two scales are presented.

In the study, it was determined that gifted students' self-efficacy perceptions towards computational thinking skills were above the average and high. In similar studies (Özel, 2019; Ramazanoğlu, 2021), it was stated that the self-efficacy perceptions of middle school students towards computational thinking skills are at a moderate level and that they can be increased with the training provided. The results obtained can be interpreted as the education and perception capacities of gifted students at BİLSEM increase these perceptions. In addition, it is seen that the sub-dimensions of perception of self-efficacy for computational thinking skills are above the average. The overall effect of the sub-dimensions on the total score is from large to small; problem solving competence, self-confidence competence, data processing competence, algorithm design competence, and basic programming competence. Wetzel et al. (2020) stated in their study that gifted students demonstrated advanced skills in algorithmic thinking, debugging and generalization, but remained at a basic level only in abstraction skills. In the literature, no ranking was encountered in terms of factors, but Kuleli (2019) stated that secondary school students taking the elective information technologies and software course in the seventh and eighth grades increased the scores of these factors. It can be said that individuals with high computational thinking skills can solve complex problems and use analytical thinking skills more effectively. For this reason, it has been stated that these individuals are generally more successful in finding creative and efficient solutions to complex problems (Alyahya & Alotaibi, 2019).

In the next stage of the study, the self-efficacy perceptions of gifted students towards computational thinking skills do not differ according to gender, age, class level, school type, education status of parents. On the other hand, there was a significant difference between the self-efficacy perceptions in terms of having a private room, owning a computer, computer usage time, and computer usage skills. Kuleli (2019) stated that this perception differs according to gender in her study with eighth-grade secondary school students, while Özel (2019) emphasized that gender does not have a decisive effect on this perception. It is thought that the change in the gender effect may be due to the place and class level of the students. Ma et al. (2021) examined the effect of a problem-solving-based teaching approach to improve computational thinking skills and self-efficacy perceptions among primary school students in China. It was determined that there was a significant difference in the computational thinking skills and self-efficacy perceptions of female students. While there is no research in the literature examining the effect of mother's education and father's education on this perception, there are studies that address the effects on students' computational thinking skills. In these studies, it is stated that the increase in the education level of parents increases the probability of encountering experiences and activities that increase their children's computational thinking skills (Sivrikaya, 2019; Yolcu, 2018). The self-efficacy perceptions of students for computational thinking skills, which change according to how many years they have been using computers, increase in direct proportion with the increase in time. This result is in parallel with the study by İbili and Günbatar (2019). Studies indicate that students' computer use for many years increases their computational thinking skills (Bilici & Güler, 2021; Totan, 2021). It can be said that increasing computational thinking skills will lead to an increase in the self-efficacy perception of the individual. In addition, the self-efficacy perception that increases according to how the person defines his/her computer skills is quite high in students who define themselves as very good computer users. This situation can be explained by the fact that the students know themselves and are aware of their abilities.

In the study, the information technology self-efficacy perception of gifted students was also analyzed, and it was observed that it was above the average. Similar results were obtained in studies conducted with different age groups in the literature. Taşdöndüren (2020) in her study with secondary school students states that students' past experiences and computer training increase their self-efficacy perceptions. In a similar study conducted with teachers and pre-service teachers, it is stated that the perception of information technologies self-efficacy increases depending on the individual's interest in and frequency of use of computers (Gurer et al., 2019; Sak & Demirer, 2014;). In their study with university students, Akçay and Çoklar (2018) stated that the level of information technology self-efficacy perception also affects the university department preferences of the students. However, it is thought that the perception of self-efficacy may depend not only on computer use but also on other factors such as the person's problem-solving skills, mathematical ability, and logical thinking ability. Therefore, it is emphasized that when evaluating a student's self-efficacy perception towards computational thinking skills, attention should be paid not only to the duration of computer use but also to the general skill level and experience (Labusch et al., 2019).

Within the scope of the study, it was observed that while the information technology self-efficacy perceptions of gifted students did not differ according to gender, age, class level, school type, or mother's education level, it increased according to whether they have a private room, computer usage, computer usage time, and computer usage skills. While it cannot be stated that there is a significant difference in the perception of information technology self-efficacy, which is higher in the direction of male students compared to gender, there are also studies in which the difference is at a significant level (Adsay et al., 2020; Dikmen & Çağlar, 2017). In the study examining the relationship between information technology self-efficacy and information technology acceptance, it is stated that basic computer knowledge and experience, social factors, using information systems and perceived usefulness have an effect on computational thinking (John, 2013). It is thought that this change may be due to variables such as the region where the application is made, the number of people, and age, and that the sample consists of gifted students. It has been concluded that the fact that the student has his/her own room and computer increases the information technology self-efficacy perception. In the literature, no results were found directly related to having one's own room and a computer. Eryılmaz et al. (2020) investigated the effect of family income on self-efficacy perception in their study with vocational high school students. They emphasized that having a computer that students can use whenever they want is important in increasing this perception. Le and Pinkwart (2019) reported that they spent a 10-week project experience with students in the Community of Gifted School Students in the Computer Science network they established and that the students demonstrated positive experience in the system analytics approach by implementing their own project ideas at the end of the semester. Another result that supports the aforementioned research is that the increase in the student's computer use time also increases the information technology self-efficacy perception. The study by Köroğlu and Demiriz (2015) reveals that the information technology self-efficacy perceptions of people change according to the age at which they first start using the computer and how many years they have been using the computer. In another study, it is stated that this perception decreases at young ages and in advancing ages (Korkmaz et al., 2019). In addition, the perception of self-efficacy, which changes according to how the person defines his/her computer skills, increases in students who define themselves as very good computer users. This self-evaluation of the student can be considered as an indicator of self-efficacy perception.

In this study, which examines the relationship between gifted students' self-efficacy perceptions for computational thinking skills and their information technology self-efficacy perceptions, there is a high level of self-efficacy for computational thinking skills between the information technology self-efficacy perceptions of the participants and their self-efficacy perceptions for computational thinking skills. It has also been concluded that there is a moderate relationship between the sub-dimensions of efficacy perceptions such as algorithm design competence, problem-solving competence, data processing competence, basic programming competence, and self-confidence competence. There is no study in the literature that directly examines this relationship. There are some studies addressing the relationship between information technology self-efficacy perception and factors. They stated that a high level of this perception positively affects students' proficiency in designing algorithms, increases their problem-solving skills and decreases problem avoidance behaviors, strengthens their skills to make sense of information and associate it with mental processes, increases their programming skills, and increases self-confidence (Alkan, 2019; Bakırcı, 2019; Bayırtepe & Tüzün, 2007; Hakkari et al., 2016; Mazman & Altun 2013; Uzun et al., 2010; Tuncer & Tanaş, 2011). These statements support the research results. It is stated that in evaluating students' computational thinking skills and self-efficacy perceptions towards information technologies, it may be useful for educators and researchers to understand students' attitudes towards computational thinking and the use of information technologies and to develop strategies that will make them feel more competent in these areas (Liao et al., 2022). However, the computational thinking process may differ in terms of students' readiness, motivation, teamwork, and peer communication (Tran, 2019).

Based on the results of this research, it has been shown that training and activities that will increase the information technologies and computational thinking skills of gifted students will increase their self-efficacy in these areas. These interrelated competencies can also create positive effects in interdisciplinary areas for students. In the research to be conducted in the future, the data collection tool used in such research of relational type, the amount of data collected and the evaluation method, the sample, and the variables may be differentiated, and their effects may be examined. The generalizability of the study can be increased by removing the dimension of gifted students, which is the focus of the study, and including all secondary school students. To support the quantitative aspect and reach more in-depth results, a qualitative dimension can be added to the research. By informing the stakeholders about the research results, its visibility and impact on the literature can be increased. It is recommended that researchers who will work in this field make applications, create good examples, and conduct studies that will increase students' information technologies and computational thinking self-efficacy.

Compliance with Ethical Standards

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Research involving Human Participants and/or Animals

The study involves human participants. Ethics committee permission was obtained from Balıkesir University, Science and Engineering Sciences Research Ethics Committee.

Özel Yetenekli Öğrencilerin Bilgi İşlemsel Düşünme Becerisine Yönelik Öz-Yeterlik Algıları ve Bilişim Teknolojileri Öz-Yeterlik Algıları İlişkisinin İncelenmesi

Özet

Günümüzde gelişen teknolojinin etkisi ve salgın hastalıklar gibi zorunlu sebepler nedeniyle eğitim ve öğretim faaliyetleri uzaktan eğitim yoluyla yapılabilmektedir. Çoğunlukla bilgisayar, tablet ve internet gibi teknolojik araçlarla gerçekleştirilen bu etkinliklerin etkili olabilmesi için öğrencilerin ihtiyaçlarına ve değişen özelliklerine hitap edebilmesi gerekmektedir. Bu bağlamda araştırmanın amacı üstün yetenekli öğrencilerin bilişimsel düşünme becerilerine ilişkin öz yeterlik algıları ile bilişim teknolojileri öz yeterlik algıları arasında bir ilişki olup olmadığını incelemektir. Örneklemi 2020-2021 eğitim-öğretim yılında Balıkesir ili Bilim ve Sanat Merkezlerinde uzaktan eğitim yoluyla öğrenim gören 130 ortaokul öğrencisinden oluşmaktadır. Yapılan analizler sonucunda üstün yetenekli öğrencilerin bilişimsel düşünme ve bilişim teknolojileri öz-yeterlik algılarının ortalamanın üzerinde olduğu ve aralarında yüksek düzeyde pozitif korelasyon olduğu görülmüştür.

Anahtar kelimeler: Özel yetenekli öğrenciler, bilişimsel düşünme, bilgi teknolojileri öz yeterliliği.

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