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Examining the Relationship Between Gifted Students' Self-Efficacy Perceptions of Information Technology and Their Motivation Towards E-Learning Environments

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ABSTRACT

The purpose of this research was to examine the relationship between gifted students' information technology self-efficacy perceptions and their motivations for e-learning environments and to determine the variables (i.e., gender, age, class level, parental education level) are affected by these perceptions and motivations. A total of 104 gifted students, 51 female and 53 male, studying at the Science and Art Center (SAC) constituted the sample of the research. Information Technology Self-Efficacy Perception Scale (ICTSEP) and Motivation Questionnaire for e-Learning Environments (CBM) were used to collect data. It was determined that there was a moderately significant positive correlation between the total ICTSEP and MSDE scores obtained from the scales. It was determined that the motivation of the students towards e-learning environments was negatively affected by the quota and speed problem they encounter on their internet connections and differs according to the class level, SAC group and how they define their computer use skills. In addition, it was observed that the information technology self-efficacy perceptions of the SAC group differed according to how the computer usage time and computer usage skills were defined. As a result, it has been understood that the changing and developing educational needs of gifted students should be met, they should have a quality education and new learning opportunities, and environments where they can reveal their potential by developing their creative thinking skills. It is recommended to plan workshops and practices that will increase students' problem-solving skills, offer the opportunity to progress according to their own level and learning speed, and appeal to their age groups and interests.

Keywords: E-Learning, Gifted Students, Information Technology, Self-Efficacy.

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I. Introduction

Today, the ease of accessing information resources over the internet differentiates our learning styles. Technology, which is a necessity of daily life, has also become a necessity of education life. Individuals need to be better equipped to keep up with changing and developing conditions. The change and development of individuals shape the dynamics of society. The aim of education should be to meet these changing individual and social needs. In order to meet these needs, the education system should be supported by technology. Educational technologies, with their dynamic structures, provide equal opportunities and increase the quality of education. Developing information and technology has brought about change in education. This change has made it easier to access information and can meet the needs of everyone from anywhere at any time (Gülbahar, 2017). Some services and tools that have been transferred to electronic environments with the Internet have led to the introduction of concepts such as e-commerce and e-learning. These concepts, which make human life easier, have almost jumped in size by taking the first letter of the word electronic (e) in front of their names (Gökdaş & Kayri, 2005).

The concept of electronic learning (e-learning), which removes barriers and boundaries in teaching activities, provides a flexible and interactive learning environment as well as giving individuals the opportunity to learn from anywhere, anytime (Ulukan, 2009). In other words, it is the implementation of teaching activities in electronic environments. It has a structure that is primarily based on the interests of the learner, facilitates access to information and offers flexible learning opportunities (Soysal & Aldal, 2020). It also offers the opportunity to learn quickly and efficiently. It places the learner in the center and gives the responsibility and control of learning. In order for students to benefit from these e-learning environments efficiently, their technology

competencies should also be high (Akyüz & Numanoğlu, 2020). Based on the literature, it has been stated that creating activities by taking into account the differences and learning characteristics of individuals in e-learning increases the quality of learning. In addition, it has been suggested that it is important to investigate the widespread e-learning activities in terms of individuals studying in these environments, instructional activities to be done, and their effects on learner performance (Ünlü, 2019; Veznedaroğlu, 2005).

The motivation of the learner is also an important factor for effective learning to take place. The concept of motivation can be defined as a tendency or desire that moves a person (Öner & Öğretmen, 2018). Motivation, which is a force that affects the formation of behavior and fulfillment of responsibility, is one of the important factors that increase success. It is stated that students with high motivation have more interest and desire towards the lesson, as a result, they learn more easily and their success increases (Özbaşı *et al.*, 2018). Teaching-learning approaches shaped based on innovative technologies increase the quality of teaching and turn into student-centered methods that enable students to learn more effectively and permanently. In teaching activities, the channel through which information is transferred shifts to digital environments, which creates learning environments independent of time and space (Akgün, 2013). With the expression of digital environments in teaching activities, information technology (IT) tools are expressed. Today, education and training activities are mostly carried out with IT tools. Effective and efficient execution of instructional activities requires increasing knowledge and skills in the field of information technologies. Due to such reasons, information technology trainings are started to be given to students at secondary school and even primary school level, and it is aimed that students can use these tools effectively.

It can be said that with the effective and efficient use of IT tools, affective qualities such as self-efficacy in the individual come to the fore. Self-efficacy belief is described as a factor affecting the individual's readiness to learn (Kaçar & Beycioğlu, 2017). Self-efficacy belief, which was first introduced by Albert Bandura (1977), can be expressed as a person's performance in overcoming difficulties or coping with events for the first time. It is thought that the self-efficacy belief developed by past experiences and the difficulties experienced also affects the behavior of the student in the learning environment (Tekerek *et al.,* 2012). Information technology self-efficacy belief can also be expressed as the individual's self-confidence in using IT tools, in particular, computers. The literature shows that people with high self-efficacy belief in information technology are more willing to take part in activities using computers and IT tools. It is generally stated that these individuals with higher expectations are more successful in solving the problems they encounter. In short, the individual's high self-efficacy perception of information technology positively affects their attitudes towards IT tools and their ability to use these tools (Usluel & Seferoğlu, 2003). On the other hand, it has been observed that students with low self-efficacy in information technologies avoid difficult tasks and give up quickly in the face of difficulties (Erden & Seferoğlu, 2020).

When the student's interests, abilities, and learning styles are taken into account in the creation of learning environments, desired behavioral changes can be achieved more easily. The differences in student expectations and levels, and giving each student the opportunity to progress at their own learning pace, revealed the necessity of taking into account the changing characteristics of students. Gifted students also need enriched teaching and learning practices in terms of their differing needs from their peers (Bakioğlu & Levet, 2013). Students who differ significantly from their peers in terms of their characteristics and needs and who need educational activities to develop their potential are considered gifted students (Akbüker *et al.*, 2019). In the "Gifted Individuals Strategy and Implementation Plan 2013-2017", it is seen that the term gifted is used instead of the term special (MEB, 2020). The expressions "gifted intelligence", "gifted talent" and "special talent" have been used interchangeably by the Ministry of National Education. In this study, it has been tried to prevent semantic confusion by using the expression "gifted students".

As of February 2022, gifted students can receive education in 279 Science and Art Centers (SAC) across the country (MEB, 2022). It is ensured that students both continue their formal education and participate in gifted education programs at SACs together. There are 5 programs at SAC schools that are implemented progressively according to the student's grade level: i) the Adaptation Program, ii) the Support Program, iii) the Recognition of Own Talents Program (ROT), iv) the Development of Special Talent Program (DST), and v) the Project Production Program (Akbüker *et al.*, 2019). ROT and DST programs consist of students studying at secondary school (K5-8), who constitute the sample group of this study.

In this study, it is aimed to examine the information technology self-efficacy perceptions of gifted students and their motivation toward e-learning environments, and the level of the relationship between them. It is aimed to examine whether information technologies self-efficacy perceptions and motivations for e-learning environments differ according to such variables as gender, age, class level, and parental education level.

In this context, answers to the following research questions are sought:

- Is there a significant relationship between gifted students' information technology self-efficacy perceptions and their motivation towards e-learning environments?
- 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)?
- Does the motivation of gifted students towards e-learning environments differ according to various variables (gender, age, education level, duration of internet use, duration of computer use)?

II. METHOD

This research study was designed based on a correlational research model to examine whether there is a relationship between gifted students' information technology self-efficacy

perceptions and students' motivation towards e-learning environments. This model is a type of research that aims to find out whether there is a relationship between two or more variables, and if there is a relationship, to determine the degree of the relationship.

A. Participants

The sample of the study consisted of gifted students of K5-8 studying at a Science and Art Center, which is a public school under the Ministry of National Education in Balikesir, Turkey, aiming to discover, support and evaluate the special and superior aspects of students. Considering the epidemic conditions in the determination of the sample, the "Convenience Sampling" option from the "Non-random sampling" methods was preferred. During the Covid-19 epidemic period when distance education activities were actively being applied, faster and easier data collection affected the sample selection. Within this context, the sample of 104 students enrolled in the Recognition of Own Talents (ROT) and Development of Special Talent (DST) programs offered via distance education at the Science and Art Center (SAC) in the year of 2021. Demographic characteristics of the sample are shown in Table I below.

TABLE I: DEMOGRAPHIC CHARACTERISTICS OF THE STUDY GROUP

SAC	Female		Male		Total	
Group	f	%	f	%	f	%
ROT 1	20	19.25	20	19.25	40	38.50
ROT 2	27	25.95	22	21.15	49	47.10
DST	4	3.85	11	10.55	15	14.40
Total	51	49.05	53	50.95	104	100

B. Data Collection Tools

Three different data collection tools were used to collect data in this study.

ICT Self-Efficacy Perception Scale (ICTSEP) for Secondary School Students developed by Göçer & Türkoğlu (2018) was conducted. The 5-point Likert-type scale having neither sub-factors nor reverse items consists of 30 items. The highest score that can be obtained from the scale is 150, and the lowest score is 30. In the interpretation of the total scores, 30-54 points are considered to be “very low”, 54-78 points as “low level”, 78-102 points as “medium level”, 102-126 points as “high level”, and 126-150 points are defined as “very high” (Göçer & Türkoğlu, 2018).

Motivation In Self-Directed E-Learnıng (MSDE) was developed by Kim (2005) and adapted to the Turkish language by Yıldırım (2018). The 5-point likert type scale with 33 items including reverse items consists of four sub-factors such as internal, external, personal and appropriate. The highest score that can be obtained from the scale is 165, and the lowest score is 33. A high total score from the scale and a high score from the sub-factors are expressed as high motivation in the relevant field (Yıldırım, 2012).

Demographic questions consisting of 23 items were also asked to collect data about the student's age, gender, family, computer and Internet possession and duration of computer and Internet use.

C. Data Analysis

The collected data were analyzed through SPSS 25.0 program to determine the relationship between gifted students' information technology self-efficacy perception and their motivation toward e-learning environments. Descriptive statistics such as frequency, mean, percentage, and standard deviation were carried out based on the obtained data at a 95% confidence interval and .05 significance level. Asterisk (*) character will be added as superscript in numeric data to indicate the level of significance. Independent samples t-test was conducted to compare two independent variables; Pearson Correlation coefficient was conducted to determine the relationship and level between two variables, and Analysis of Variance (ANOVA) for independent samples and LSD (Least Significant Difference) test were conducted to compare according to more than two variables.

III. FINDINGS

In this section, the findings obtained from the analyzes made to test the hypotheses of the study are presented. In the study, first of all, the level of correlation between MSDE and ICTSEP scores was determined. Afterwards, the areas where the participants' MSDE and ICTSEP scores differed significantly in terms of various variables were examined.

The average, minimum, maximum scores and standard deviation values of gifted students' MSDE and ICTSEP scores are given in Table II. It was determined that the information technology self-efficacy levels of the gifted students were high ($\bar{X}$ =114.41).

Pearson Correlation Coefficients were calculated in order to determine the relationship between gifted students' scores in the MSDE and ICTSEP and to determine their level. As can be seen from Table III, it was found that there was a positive, moderately significant relationship between the students' total self-efficacy score and their motivation total score ($r = 0.463$; $p < 0.01$).

Table IV shows the mean, standard deviation and t-test values of the scores that gifted students got from the MSDE according to various variables. The motivation of gifted students towards e-learning environment was found that there was no significant difference according to the gender ($t = 1.073$, $p < 0.05$), school type ($t = 0.726$, $p < 0.05$), having a study room ($t = 1.192$, $p < 0.05$) and computer ownership ($t = 0.072$, $p < 0.05$). In terms of Internet quota and speed problems, a significant difference was found ($t = 2.796$, $p < 0.05$). Accordingly, the motivation of the gifted students who do not have quota and speed problems in their Internet connections is higher than the other students.

TABLE II: MEAN, MINIMUM, MAXIMUM SCORES AND STANDARD DEVIATION VALUES OF THE MSDE AND ICTSEP SCORES

Variables	N	$\bar{X}$	Min.	Max.	SD.
Motivation in Self-Directed E-Learnıng (Total)	104	125.50	85.00	156.00	14.99
ICT Self-Efficacy Perception Scale (Total)	104	114.41	66.00	147.00	17.16

TABLE III: PEARSON’S CORRELATION COEFFICIENTS FOR THE MSDE AND ICTSEP TOTAL SCORES

Variables	MSDE (Total)	ICTSEP (Total)
MSDE (Total)	1	0.463**
ICTSEP (Total)	0.463**	1

** *p< 0.01*

TABLE IV: MEAN, STANDARD DEVIATION, AND T-TEST VALUES OF THE MSDE SCORES

Variables		N	$\bar{X}$	SD	P	*t*
Gender	Female	51	123.90	15.21	0.286	-1.073
	Male	53	127.05	14.76		
School Type	Public school	88	125.96	14.94	0.470	0.726
	Private school	16	123.00	15.51		
Do you have a room?	Yes	86	124.70	14.63	0.236	-1.192
	No	18	129.33	16.50		
Do you have a computer?	Yes	64	125.59	1.82	0.943	0.072
	No	40	125.37	2.49		
Internet Quota/Speed Problem	Yes	43	120.76	15.45	0.006	-2.796
	No	61	128.85	13.83		

$p < 0.05$

TABLE V: MEAN, STANDARD DEVIATION, AND T-TEST VALUES OF ICTSEP SCORES

Variables		N	$\bar{X}$	SS.	P	*t*
Gender	Female	51	108.50	16.60	0.000	-3.639
	Male	53	120.09	15.86		
School Type	Public school	88	114.35	17.85	0.933	-0.085
	Private school	16	114.75	13.19		
Do you have a room?	Yes	86	114.44	17.55	0.971	0.037
	No	18	114.27	15.63		
Do you have a computer?	Yes	64	116.12	16.66	0.200	1.290
	No	40	111.67	17.80		
Internet Quota/Speed Problem	Yes	43	110.86	15.59	0.076	-1.791
	No	61	116.91	17.89		

$p < 0.05$

TABLE VI: ANALYSIS RESULTS OF INFORMATION TECHNOLOGY SELF-EFFICACY PERCEPTIONS IN TERMS OF VARIOUS VARIABLES

Variables	Variance Source	Sum of Squares	sd	Mean Squares	F	p
BILSEM Group	Between Groups	2706.137	2	1353.069	4.942	0.009*
	In-group	27651.084	101	273.773		
	Total	30357.221	103			
Computer Usage Time (Years)	Between Groups	8518.005	5	1703.601	7.645	0.000*
	In-group	21839.217	98	222.849		
	Total	30357.221	103			
Computer Skills	Between Groups	8871.759	3	2957.253	13.764	0.000*
	In-group	21485.463	100	214.855		
	Total	30357.221	103			

$p < 0.05$

TABLE VI: ANALYSIS RESULTS OF MOTIVATIONS TOWARDS E-LEARNING ENVIRONMENTS IN TERMS OF VARIOUS VARIABLES

Variables	Variance Source	Sum of Squares	sd	Mean Squares	F	p
Grade Level	Between Groups	1790.692	3	596.897	2.792	0.044*
	In-group	21375.298	100	213.753		
	Total	23165.990	103			
BILSEM Group	Between Groups	2329.350	2	1164.675	5.645	0.005*
	In-group	20836.640	101	206.303		
	Total	23165.990	103			
Computer Skills	Between Groups	2252.815	3	750.938	3.591	0.016*
	In-group	20913.175	100	209.132		
	Total	23165.990	103			

$p < 0.05$

Table V shows the mean, standard deviation, and t-test values of the scores that gifted students got from ICTSEP. According to Table V, CTSA of gifted students was determined by gender ($t = 3.639$, $p < 0.05$), school type ($t = 0.085$, $p < 0.05$), having a study room ($t = 0.037$, $p < 0.05$), having a computer ($t = 1.290$, $p < 0.05$) and quota and speed problems for Internet connection did not differ significantly ($t = 1.791$, $p < 0.05$).

A one-way ANOVA was conducted to determine whether the total scores of gifted students in ICTSEP showed a statistically significant difference in terms of various variables. The findings obtained as a result of the one-way ANOVA analysis are given in Table VI. Information technology self-efficacy perceptions of gifted students differs significantly based on SAC group ($F(2, 101) = 4.942$, $p < 0.05$), how many years students have been using computers ($F(5, 98) = 7.645$, $p<.05$) and how they describe skills about their computer use ($F(3, 100) = 13,764$, $p < 0.05$).

The LSD test was conducted to determine between which groups these differences in the information technology self-efficacy perceptions of gifted students were. In terms of the SAC groups, a significant difference was found between Developing Special Abilities 1 (DSA1) ($\bar{X}$=107.97) and (DSA2) ($\bar{X}$=118.67). In terms of computer usage time a significant difference was found between those who used a computer for one year ($\bar{X}$=94.57) and those who used it for

four years ($\bar{X}$=18.55), and between those who used it for five years ($\bar{X}$=121.23) and those who used it for six years or more ($\bar{X}$=12.2.82). According to how students define their ability to use computers, a significant difference was found between the defined skill "slightly bad" ($\bar{X}$=95.50) and "very well" ($\bar{X}$=126.80). In summary, it was found that the information technology self-efficacy perceptions of the gifted students in the DSA2 group were higher than those the students in the DSA1 group; and students who have been using computers for four-five-six years have higher perceptions than those who have been using computers for one year; and that students who describe their computer skills very well have higher perceptions than those who describe their computer skills as slightly bad.

A one-way ANOVA analysis was conducted to determine whether the total scores of gifted students from the scale of motivation towards e-learning environments showed a statistically significant difference in terms of various variables. The results in Table VII show that the motivation of gifted students towards e-learning environments; according to class levels $F(3, 100) = 2.792$, $p<.05$; BILSEM group $F(2, 101) = 5.645$, $p<.05$, and how they define computer skills $F(3, 100) = 3.591$, $p<.05$ shows a significant difference.

As a result of the LSD test, a significant difference was found between those attending the sixth grade ($\bar{X}$=128.17) and those attending the eighth grade ($\bar{X}$=111.00). In terms of SAC group, it was observed that it occurred between Recognizing İndividual Abilities 2 (RIA2) ($\bar{X}$=129.87) and DSA2 ($\bar{X}$=116.40). According to how students define their ability to use computers, it was determined that a significant difference was found between a slightly bad ($\bar{X}$=110.50) and very well ($\bar{X}$=131.84). In terms of the motivations of gifted students towards e-learning environments, it was found that those who attended the sixth grade had higher motivation than that of those who attended the eighth grade; those in the RIA group had higher motivation than that of those in the DSA2 group, and those who described their computer skills very well had higher motivation than that those who described their computer skills as slightly bad.

IV. Conclusion

This study, which examines the relationship between gifted students' perception of information technology self-efficacy and their motivation towards e-learning environments, points out that there is a correlation between their information technology self-efficacy perceptions and their motivation towards e-learning environments. In other words, it can be stated that the increase in the perception of information technology self-efficacy will increase the motivation towards e-learning environments. This finding in the study points to results consistent with similar research findings (Ergün & Kurnaz, 2019; Yıldız & Seferoğlu, 2020). This result shows that doing activities and practices that will increase the information technology self-efficacy perceptions of gifted students will also positively affect their interest and motivation towards online learning environments.

It has been observed that the motivation of gifted students towards the e-learning environment does not differ according to gender, school type, having a study room and having a computer, but differs in terms of the quota and speed problem they encounter via Internet connections. From this point of view, it can be concluded that the increase in quota and speed problems encountered by students reduces their motivation towards the e-learning environment. It is stated that difficulties in accessing information reduce student motivation (Şükrü *et al.*, 2021). Therefore, it can be said that Internet connection speed and quota problems should be minimized in order to increase the motivation of gifted students towards the e-learning environment. In addition, Tunga and İnceoğlu (2016) have stated that the motivation for the e-learning environment does not differ according to the gender of the student.

From the perspective of Information technology self-efficacy perceptions of gifted students, it has been observed that there was no difference according to gender, school type, having a study room, having a computer, and Internet quota and speed problems. This finding shows us that the situation (e.g., opportunities and possibilities) of the students does not affect their information technology self-efficacy. Moreover, the perception of information technology self-efficacy as a reflection of the experience and knowledge gained in the past life of the person can be acquired and developed later (Eryılmaz *et al.*, 2020).

In the study, it was revealed that the information technology self-efficacy perception in the SAC group was higher for the students at the ROT2 level than that of the students at the ROT1 level. This finding can be interpreted as students' self-efficacy perceptions increase in the process of learning especially in which they use information technology tools more frequently. It is stated that the fact that information technology tools are used more frequently in educational activities increases students' and teachers' information technology self-efficacy perceptions (Kartal *et al.*, 2018). Another finding that supports this finding is the information technology self-efficacy perception of gifted students, which differs in terms of computer usage time. It is observed that the perception of self-efficacy increases among students who have been using computers for one year to those who have been using computers for four, five, or six years or more. This result can be interpreted as the information technology self-efficacy perception of the student increases as the duration of computer use increases. From this point of view, it can be concluded that introducing information technology tools to students at an early age will pave the way for them to use these tools effectively for their purposes in the future. In support of this result, it can be stated that the increase in age and education level increases the technology self-efficacy perceptions of the individual. It is generally considered that individuals who are introduced to information technology tools at a young age have high self-efficacy perceptions and actively use technology innovatively. It is seen that students who define computer use skill as very well have a higher self-efficacy perception than students who define it as slightly bad. This shows that students' self-efficacy perceptions are not only related to the duration of experience, but also directly related to the increase in their skill levels. In another study with the translator candidates, it is stated that it is not enough to introduce these technologies to students at an early age in order to increase their information technology skills and a good technology education should be given (Aslan, 2020).

When the motivation for e-learning environments is examined in terms of the class level of the gifted students, it was found to be higher in the eighth-grade students than in the sixth-grade students. When similar studies in the literature are examined, the increasing use of technology with grade level increases the motivation of students towards e-learning environments (Konak, 2021; Demir & Eren, 2021).

To meet the changing and developing educational needs of gifted students and to provide environments where they can reveal their potential, emergent information technology and relevant instructional tasks should be considered and designed accordingly. In particular, in order to increase the perceptions of information technology self-efficacy, information technology tools training can be given at an early age through workshops or practices with content related to students' interests. Moreover, in order to increase students' motivation towards e-learning environments, activities that appeal to the student age group and increase their computer skills can be offered. Finally, IT workshops can be designed and offered in BILSEM's, which most likely increase students' problem-solving skills and offer the opportunity to progress according to their learning speed.

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