

## An Investigation into the Relationship between Secondary School Students' Self-Learning Using Technology and Test Anxiety

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### ABSTRACT

This study aims to investigate the relationship between secondary school students' self-learning with technology and test anxiety. The study was conducted using a correlational survey model. The participants of this study are made up of 128 students of 7<sup>th</sup> and 8<sup>th</sup> grade, studying in three secondary schools in Adıyaman province of Turkey in the spring semester of the 2019-2020 academic year. "The Self-Directed Learning with Technology Scale for Young Students" adapted to Turkish by Demir and Yurdugül (2013) and "Test Anxiety Inventory" adapted to Turkish by Öner (1990) were used for collecting the data. Independent groups t-test and Pearson Correlation test were used to analyze the data. The analyses showed no significant difference between self-learning of secondary school students using technology regarding their gender and grade. However, there was a significant relationship between the students' grades and their test anxiety. The "test anxiety inventory" consisted of two subscales, "delusion" and "affectivity". There was a significant difference between students' delusion and affectivity subscales. In this consideration, the 8<sup>th</sup> graders had a higher test anxiety than the 7<sup>th</sup> grader'. The Pearson correlation indicated that there was a positive and significant correlation between self-learning using technology and test anxiety of the secondary school students ( $p < .01$ ).

**Key words:** Technology, Test Anxiety, Self-learning, Science Education

### INTRODUCTION

Test anxiety can be defined as a special condition of anxiety. The literature provides several definitions of anxiety. Spielberger (1972) defines anxiety as unpleasant emotional and observable reactions such as sadness and anxiety caused by situations leading to stress. Rachman (2013), however, defines it as tension and unrest on the emergence of a threatening or disturbing situation. Symptoms of anxiety are emotional, physiological, and behavioral responses accompanying anxiety regarding a potential failure (Sieber, 1980).

Furthermore, anxiety which is deemed an emotion is one of the basic emotions like being happy, sad, or angry (Freeman & Freeman, 2012). As an emotion, anxiety which has internal reactions rather than external is the reaction given to an uncertain, remote, and undefined dangerous situation (Bourne, 2015). Thus, anxiety affects the majority of a society. According to data from UK mental health organizations, one third of British adults experienced anxiety problems (Freeman & Freeman, 2012).

Spielberger (1966) discussed test anxiety within the framework of "State-Trait" model. The state anxiety is the state of anxiety, fear, or unhappiness which emerges when it turns to threaten an individual's personality or interests, but disappears when threat is eliminated (Öner, 1972;

Çavuşoğlu 1993). However, trait anxiety, being a personality dimension of the individual in all circumstances, refers to being more sensitive and anxious than other people (Öner, 1972; Çavuşoğlu, 1993). Öner and Le Compte (1998) elaborated these two anxiety types to potential and kinetic energy, which are two different types of energy in physics. State anxiety was likened to kinetic energy while trait anxiety was likened to potential energy. This is because kinetic energy is formed at a specific time. Similarly, state anxiety is a kind of anxiety that occurs at a specific time. However, potential energy is the tendency of a substance to show a certain reactivity. This potential which is thought to cause anxiety is compared to trait anxiety.

According to Spielberger (1995), test anxiety is an unpleasant emotional state experienced during a formal examination or evaluation, which has cognitive, affective, and behavioral characteristics that prevent the individual from revealing his/her real performance along with tension. Spielberger and Vagg (1995) have stated that test anxiety consists of two dimensions, which are delusion and affectivity. Delusion is the cognitive dimension of test anxiety. It comprises individuals' negative evaluations about themselves, negative internal speeches, and thoughts about their failure and inadequacy. The delusion dimension comprises a process that causes individuals to get distracted by negative

thoughts such as “what if I fail or I cannot do?” believing that they cannot do what should be done during the exam and cannot solve the problems they face. Affectivity is the sensorial dimension of test anxiety consisting of its sensory physiological aspect. Affectivity dimension is a process that comprises physical responses such as rapid heartbeats, sweating, flushes, and chill, roseola, nausea, nervousness, and tension.

The studies on self-learning emerged in the 1960s. The first studies on this field included adults. However, the studies conducted in the following years started to use the “self-learning” concept for children too (Merriam & Caffarella, cited in Nor & Saeednia, 2009). Self-learning can be defined as a learning approach in which students decide what, where, when, and how to learn. During the learning process, students determine and formulate their own learning needs within the framework of their priorities and procure the resources they need in learning (Knowles, 1975, cited in Alkan & Erdem, 2013). A student with an ability of self-learning follows the following learning steps in this process (Knowles, 1975):

- Completing learning needs,
- Expressing clearly the learning objectives,
- Determining learning materials,
- Choosing and applying the proper learning strategy,
- Evaluating learning outcomes (cited in Oladoko, 2006, p. 15).

There is a transition from the concept of self-learning to the concept of self-learning with technology, which should be added as another consideration (Demir & Yurdugül, 2013; Teo et al., 2010). This is because self-learning has become unrealizable without utilizing the facilities offered by the Internet like search engines, education information networks (EBA), educational sites such as Morpa Campus, online libraries, social networks, etc. In this regard, self-learning has left its place to self-learning with technology in the literature. The use of education technologies has many positive effects on students. For example, students can have equality in the opportunity to receive distance education independent of time and space and take on the responsibility of self-learning. Or, recording courses on videos allows them to receive those courses at any time or day. Therefore, education technologies have many contributions to the teaching process (Kaya, 2017). İşman (2011) mentioned the benefits of the use of education technology as follows;

1. Independence
2. Information from primary sources
3. Equality of opportunity
4. Diversity and quality
5. Individual teaching
6. Productive education and fast learning
7. Creativity
8. Life-long learning

The self-learning concept consists of “self-directed learning” and “self-regulated learning” (Ural Aışan, 2009). According to Zimmerman (2002) and Zimmerman (2001), self-directed learning is the self-management process in which students transform their mental skills into academic

skills. Pintrich (2000) defines self-directed learning as an active process that students form learning goals and try to follow and control their cognition. Self-directed learning is the ability to understand and control the environment (Schraw, Crippen, & Hartley, 2006; Williams, 2001). Pilling-Cormich (1996, p. 2) defines self-regulated learning as “it is a learning approach that individuals determine their priorities and choose from a variety of available sources”.

Based on the study of Teo et al. (2010), Demir et al. (2014) stated that technology and self-learning consist of two components that are intentional learning and self-management. In this sense, self-management is defined as the willingness and ability to manage one’s learning (Candy cited in Teo et al., 2010). Intentional learning, which is another component, can be defined as the willing and conscious use of technologies such as computers and the Internet for self-learning.

Another concept that this research deals with is “technology literacy”. Before introducing the concept of technology literacy, first of all, information about “literacy” will be given. “Literacy” can be defined as the ability to effectively use communicative symbols, which are interpreted by society, by individuals (Kellner, 2001; Kress, 2003). When the literature studies are examined, the main literacy concepts are as follows; e-literacy, moral literacy, environmental literacy, technology literacy, critical literacy, internet literacy, media literacy, information literacy, visual literacy, digital literacy, cultural literacy (Au, 2006; Bruce, 2003; Grisham and Wolsey, 2006; Holum and Gahala, 2006). Technology literacy is expressed as the ability to use technology, to understand and solve the problems that arise while using this technology, and to comprehend the importance of technology for the society in which the individual lives (Holland, 2004; Bölükbaşı, 2012).

Shackelford (2007) emphasizes that individuals living today should understand how technology affects the world and how they exist in and around technology. Therefore, technology literacy has now become an integral part of education. Increasing the technology literacy of individuals can only be achieved with a serious education policy. In this study, which is planned to be done, the focus is on students’ self-learning with technology. In this context, the research also includes technology literacy. Since students’ self-learning situations with technology will reflect their technology literacy in a way. In today’s world where everything changes and develops very rapidly, technology literacy has a very important place. It is thought that the research will make important contributions to the literature in this context.

Coronavirus outbreak in Wuhan city of Hubei country, China on December 27, 2019, and spread very rapidly throughout the world; thus became pandemic after it was classified as “a public health emergency of international concern” by the World Health Organization on 30<sup>th</sup> January. Precautions were taken in Turkey before confronting any case. However, the precautions were increased after the first case was detected on 11<sup>th</sup> March. As a result of these measures, distance education was initiated on March 23, after a 1-week compulsory holiday (Gülmez Güngörmez, 2020). The use of technology in education has become inevitable

with the development of technology in education and the COVID-19 pandemic around the world. The Ministry of National Education (MEB) reinforced the infrastructure of EBA to ensure live courses. Thus, teachers and students were allowed to participate in live courses on the online platform. During the COVID-19 pandemic, students tried to learn by themselves and reinforce what they learned by watching videos from educational platforms such as EBA, Morpa campus, Okulistik, and all courses that are sciences, mathematics, Turkish, English, social sciences, religious culture, doing screening tests and comprehending outcomes, and doing exercises. Thus, the study is of importance in terms of revealing how and in what way secondary school students' self-learning with technology affected their exam anxiety. The studies conducted have shown that secondary school students' test anxiety has been investigated in terms of different variables. Bacanlı and Sürücü (2006) examined the relationship between test anxiety and decision-making styles of the 8th-grade students; Kağıtçı (2014) determined the anxiety scores of middle school students from sciences in terms of achievement levels, gender and grade level; Duman (2008) investigated the relationship between test anxiety and parental attitudes of the secondary school students; Nnorom et al. (2020) determined the effect of examination anxiety on the academic performance of secondary school students; Kumari (2020) investigated the examination anxiety of secondary school students, personality type and test anxiety in terms of personality types; Caymaz and Aydın (2021) examined the secondary school students' anxiety and motivation levels for science lesson in terms of variables such as gender, grade level and education level of parents; Clipa et al. (2021) determined the relationship between test anxiety and student resilience in secondary school students according to gender and grade level variables; Akça (2017) examined the relationship between mental risk-taking behaviors of the secondary school students towards science and their science anxiety. The results of this study can provide information that will help secondary school students to determine methods and techniques that will help them to control their test anxiety before any examination such as high-school entrance exam (LGS) and scholarship exams they will take.

The most important feature that distinguishes this study from other studies on self-learning and test anxiety is that its participants are subject to distance education during the COVID-19 pandemic and self-learning with technology is compulsory. Another distinctive point of this study is that no other study has been found to investigate the relationship between self-learning with technology and test anxiety of secondary school students during the pandemic either Turkish or international literature. Therefore, this study can contribute to both Turkish and international literature, and the findings can guide researchers who are in the opinion to conduct a study on self-learning with technology and test anxiety in the future.

### Objectives and Research Questions

In this study, it is aimed to determine the relationship between self learning levels of secondary school 7<sup>th</sup> and

8<sup>th</sup> grade students by using technology and their test anxiety levels. For this purpose, the following research questions were posed.

1. Is there any significant difference between Secondary School students' self-learning mean scores by using technology according to their gender?
2. Is there any significant difference between secondary school students' self-learning mean scores by using technology according to their grade levels?
3. Is there any significant difference between the students' test anxiety mean scores according to their gender?
4. Is there any significant difference between the students' test anxiety mean scores according to their grade levels?
5. Is there any significant difference between the male and female students' delusion and affectivity sub-dimensions of test anxiety inventory?
6. Is there any significant difference between the 7<sup>th</sup> and 8<sup>th</sup> graders' delusion and affectivity sub-dimensions of test anxiety inventory?
7. Is there any significant correlation between the students' anxiety and technology use?

### METHOD

The study was conducted using a correlational survey model. A scanning method is an approach that aims to describe either past or present situation as it is or as it was (Karasar, 2012). However, the correlational scanning model is a model that aims to determine the presence and amount of change between at least two variables (Karasar, 2009).

### Data Collection Tools

To collect the data, the "Self-Directed Learning with Technology Scale for Young Students" was adapted to Turkish by Demir and Yurdagül (2013), and the "Test Anxiety Inventory" was adapted to Turkish by Öner (1990) were used. The "Self-Directed Learning with Technology Scale for Young Students" was developed by Teo et al. (2010) to determine young students' self-learning with technology. This scale, consisting of a single subscale and 6 items, is a five-point Likert-type scale with Strongly Disagree (1), Disagree (2), Indecisive (3), Agree (4), and Strongly Agree (5). Demir and Yurdagül (2013) conducted the reliability and validity study of the scale with primary and secondary school students. The Cronbach's alpha internal consistency coefficient was found to be 0.729. The "Test Anxiety Inventory" is a product of the studies by Spielberger and a group of doctoral students between 1974 and 1979. In the form consisting of a total of 20 inventory items, 8 consist of the delusion sub-test, and the remaining 12 consist of the affective sub-test. The inventory is a four item Likert type form with Seldom (1), Sometimes (2), Often (3) and Almost always (4). The original form of the Test Anxiety Inventory was developed for high-school and university students and its Turkish adaptation includes the 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup>-grade students (Öner, 1990).

### Population and Sample of the Study

The participants of this study consisted of 7<sup>th</sup> and 8<sup>th</sup> grade 128 students enrolled in three secondary schools in Adıyaman province of Turkey in the spring semester of the 2019-2020 academic year. By following per under the research ethics, the schools have been coded as A, B, and C. Of the 128 students, 42 studied in the secondary school of A, 36 in B, and 50 in C. The participants of this research have learnt to study by themselves during the period of COVID-19 by watching the Science videos on Morpa Campus, Tonguc Academy, Okulistik and Education and Information network (EIN) and by solving the exercises and the tests and planning their working schedule with the help of technology.

### Data Collection

Since the students continued their education via distance education during the COVID -19 epidemic, the data collection tools were converted into an online form by the researcher electronically by using the Google survey tool. In this process, WhatsApp groups were created in all schools in order to communicate with students in distance education. The link of online survive form was sent to the students by their teachers and they were asked to fill it out. At the entrance of online survive form, the students were informed that their answers would be used for scientific research purposes and their personal information would be kept confidential.

### Data Analysis

Secondary school 8<sup>th</sup>-grade students' levels of "Self-Directed Learning with Technology Scale for Young Students" and "Test Anxiety Inventory" were analyzed using independent groups t-test in terms of gender and grade. The Pearson correlation test was used to examine the relationship between students' self-learning with technology and their test anxiety levels.

## RESULTS

This section presents the results of analysis of the data. Each one of the tables in this section will subsequently summarize the results related to the seven research questions of the study. Firstly, independent groups t-test results are presented to compare male and female students' self-learning with technology mean scores that was addressed by the first research question.

Table 1 shows no significant difference between male and female students' self-learning with technology.

The next research question compared 7<sup>th</sup> and 8<sup>th</sup> graders' mean scores of self-learning with technology. The independent group's t-test was carried out to answer the second research question (Table 2).

Table 2 shows no significant difference ( $p>.05$ ) between the 7<sup>th</sup> and 8<sup>th</sup> graders' mean scores of self-learning with technology.

The third research question compared the test anxiety mean scores of male and female students. The independent groups t-test results are given in Table 3.

Table 3 indicates an insignificant difference ( $p>.05$ ) between test anxiety levels of boy and girl students.

The fourth research question compared 7<sup>th</sup> and 8<sup>th</sup> graders' test anxiety mean scores (Table 4).

Table 4 shows a significant difference ( $p<.05$ ) between test anxiety mean scores of the 7<sup>th</sup> and 8<sup>th</sup>-grade secondary school students. The test anxiety means score was found to be 2.08 for the 7<sup>th</sup> graders and 2.50 for the 8<sup>th</sup> graders. The 8<sup>th</sup> graders' significantly higher test anxiety scores could be attributed to the fact that they were going to take the LGS exam.

The "test anxiety inventory" that was used as a data collection tool in this study consisted of two subscales, 'delusion' and 'affectivity'. The independent groups t-test was run to determine the significance of difference between the delusion mean scores as well as affectivity mean scores of male and female students (research question 5).

As the results in Table 5 indicate, there is no significant difference ( $p>.05$ ) between delusion and affectivity means scores of boy and girl students.

Next, the delusion means scores and affectivity means scores were compared between the 7<sup>th</sup> and 8<sup>th</sup> graders using independent groups t-test (Research question 6).

Table 6 shows that the mean scores of the 8<sup>th</sup> graders in terms of both delusion and affectivity scores are significantly

**Table 1.** Self-learning with technology mean scores of the participants according to gender

Gender	N	M	SS	SD	T	p
Girl	73	3.10	1.27	126	-0.067	0.947
Boy	55	3.11	1.33			

$p>0.05$

**Table 2.** Self-learning with technology mean scores of the participants according to grade

Grade	N	M	SS	SD	t	p
7 <sup>th</sup> grade	59	3.03	1.28	126	-0.586	0.550
8 <sup>th</sup> grade	69	3.17	1.30			

$p>0.05$

**Table 3.** The general test anxiety mean scores of the participants according to gender

Gender	N	M	SS	SD	t	p
Girl	73	2.34	0.97	126	0.39	0.690
Boy	55	2.27	0.98			

$p>0.05$

**Table 4.** Test anxiety mean scores of the participants according to grade

Grade	N	M	SS	SD	t	p
7 <sup>th</sup> grade	59	2.08	0.87	126	-2.491	0.014
8 <sup>th</sup> grade	69	2.50	1.02			

$p>0.05$



**Table 5.** The test anxiety inventory mean scores of the participants according to gender

Test Anxiety Inventory Subscales	Gender	N	M	SS	SD	t	p
Delusion subscale	Girl	73	2.05	0.74	126	0.47	0.630
	Boy	55	1.98	0.77			
Affectivity subscale	Girl	73	2.24	0.67	126	1.15	0.25
	Boy	55	2.10	0.69			

**Table 6.** Comparison of 7<sup>th</sup> and 8<sup>th</sup> graders' delusion and affectivity scores

Test Anxiety Inventory Subscales	Gender	N	M	SS	SD	t	p
Delusion subscale	7 <sup>th</sup> grade	59	1.83	0.73	126	-2.634	0.009
	8 <sup>th</sup> grade	69	2.18	0.74			
Affectivity subscale	7 <sup>th</sup> grade	59	2.00	0.64	126	-2.73	0.007
	8 <sup>th</sup> grade	69	2.33	0.68			

*p*>0.05

higher (*p*<.01) compared with those of the 7<sup>th</sup> graders. The 8<sup>th</sup>-grade students scored higher in both delusion and affectivity subscales due to the LGS exam.

The final research question of this study was to determine the correlation between the secondary school students' self-learning with technology and their test anxiety mean scores. The results of the Pearson correlation test addressed this research question (Table 7).

The correlation matrix shows that there is a positive and significant correlation (*r*=0.24, *p*<.01) between the students' test anxiety scores and their self-learning with technology. Based on this finding, the participants' test anxiety increases as their self-learning with technology increases.

## DISCUSSION

This study aims to investigate the relationship between secondary school students' self-learning with technology and test anxiety. Therefore, the 7<sup>th</sup> and 8<sup>th</sup>-grade students were administered self-learning with technology scale and test anxiety inventory. The data obtained were analyzed to reach the results of the study. As a result of the analysis performed according to the gender and grade variables of the self-learning with technology scale, *p*>.05 was calculated (Gender Table 1, *p*=.940; Grade Table 2, *p*=.550). This finding indicates that there is no significant difference between secondary school students' self-learning with technology and both gender and grade.

The general mean score of the test anxiety inventory, which is the second data collection tool used in this study, and the mean scores of the subscales were discussed and analyzed one by one according to gender and grade variables. There was no significant difference between mean scores of the general test anxiety according to gender (Table 3, *p*=.690). As a result of the analysis performed according to grade, there was a significant difference as the value was *p*<.05 (Table 4, *p*=.014). There is a significant difference between the mean scores of 7<sup>th</sup> and 8<sup>th</sup>-grade students on test

**Table 7.** The results of Pearson correlation test

Self-learning scale	Test anxiety level
r	0.239**
p	0.007

\*\* . Correlation is significant at the 0.01 level (2-tailed).

anxiety due to the LGS exam. The test anxiety inventory consists of two subscales are “delusion” and “affectivity”. The delusion subscale includes a cognitive (intellectual) aspect of test anxiety, whereas the affectivity subscale deals with the physiological aspect (Öner, 1990). According to gender variable, the analysis found the value to be *p*>.05 aiming at determining whether there was a significant difference between the mean scores of the “delusion” and “affectivity” subscales (Table 5, Delusion *p*=.630, Affectivity *p*=.250). Based on this finding, there was no significant difference between mean scores of delusion and affectivity subscales according to gender. Another variable covered in this study is grade. According to the grade variable, the analysis found the value to be *p*<.05 between the mean scores of the “delusion” and “affectivity” subscales (Table 6, Delusion *p*=.009; Affectivity *p*=.007). We can say that there is a significant difference between subscales of the test anxiety inventory of the 7<sup>th</sup> and 8<sup>th</sup>-grade students. Test anxiety of the 8<sup>th</sup>-grade students was significantly higher compared to 7<sup>th</sup>-grade students. This is because there was a very high significant difference between the mean scores of the general test anxiety inventory and the mean scores of “delusion” and “affectivity” subscales (*p*<.01). These findings are supported by the study of Sirmacı (2007). However, they are not supported by some other studies. Kağıtçı (2014) found that there was no significant difference between anxiety scores of the students and their grades. In a similar vein, Akça (2017), Yenilmez and Özabacı (2003), Yenilmez and Midilli (2006) obtained the same results.

These results show that there is no significant difference between the mean scores of the secondary school students in terms of self-learning with technology and test anxiety inventory according to gender variable. These findings are supported by Kahyaoğlu et al. (2019), Avcı and Kırbaşlar (2017), Akça (2017) and Kağıtçı (2014). Akça (2017) investigated the correlation between gender and test anxiety by administering the “Science Anxiety Scale” to 600 secondary school students. The study found no significant difference between gender and test anxiety. On the other hand, some studies (Çakmak et al., 2017; Yılmaz et al., 2014; Arı et al., 2010, Bacanlı and Sürücü, 2006, Brown, 2002) found a significant difference between the test anxiety mean scores of boy and girl students.

## CONCLUSION

The main objective of this study was to detect the correlation between secondary school students' self-learning with technology and test anxiety inventory. The Pearson correlation analysis performed in this regard showed that there is a positive and highly significant correlation between them, finding  $r=0.239$  (Table 7,  $p<.01$ ). Based on this finding, the 7<sup>th</sup> and 8<sup>th</sup>-grade students' test anxiety increases as their self-learning with technology increases.

Another major finding from this study is that there is a significant difference between the test anxiety mean scores of the secondary school students according to grade variable. In this consideration, there is a significant difference between both the general anxiety levels and the "Affectivity" and "Delusion" sub-scales of test anxiety of the 7<sup>th</sup> and 8<sup>th</sup>-grade students. One of the most important reasons for this conclusion may be the High School Entrance Examination (LGS) for 8<sup>th</sup>-grade students.

Face-to-face education was quickly replaced by distance education in secondary schools due to the COVID-19 pandemic. In this process, the students faced self-learning through technology for the first time and had to design their learning. While the COVID-19 pandemic affected students' test anxiety necessarily, this affected 8<sup>th</sup>-grade students more. Below are some suggestions to perform the self-learning process more effectively using technology that affects students' exam anxiety levels:

1. The interested researchers can conduct further studies with a more comprehensible sample including the 5<sup>th</sup> and 6<sup>th</sup>-grade students.
2. Information, Technology, and Guidance teachers can be provided with training that will enable them to plan and carry out their learning using the technology, after being designed by school administration to increase the quality of learning for secondary school students.
3. Changes in the technology in the 21<sup>st</sup> century affect education life also. Education is not only limited to the school environment, but it is a lifelong period. To ensure secondary school students' lifelong learning, they should be provided with opportunities to learn by themselves using the technology.
4. The fact that secondary school students will take the LGS examination increases their level of anxiety. To control and minimize students' anxiety levels, the school's psychologists can early detect the students with high anxiety levels and provide them the necessary support.

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