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## INVESTIGATION OF UNIVERSITY STUDENTS' ATTITUDES TOWARDS THE EFFECT OF TECHNOLOGY-MEDIATED LEARNING ON THE LEARNING PROCESS

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## PROFESSIONAL EDUCATION AND TRAINING | RESEARCH ARTICLE

### Investigation of university students' attitudes towards the effect of technology-mediated learning on the learning process

Nuri Babacan\* & Çetin Güler

**Abstract:** The use of technology has become inevitable in the education field and its importance has been felt in higher education as well. This study aims to investigate university students' attitudes toward the effect of Technology-Mediated Learning (TML) on the learning process. This study was carried out with 227 students studying in various undergraduate departments of five different state universities in Turkey. Three of these universities are located in the eastern part of Turkey while the other two universities are in central Anatolia. As a result of the research to investigate university students' attitudes towards the effect of TML on the learning process, there was no significant difference for the gender variable. However, a significant difference was found in favor of the students who owned a computer, a significant difference was found in favor of students with an advanced level of experience with computers, and a significant difference was seen in favor of the students studying at Konya Selçuk University and Van Yüzüncü Yıl University for the variables of the universities where the students were studying.

**Keywords:** Technology, higher education, learning, technology-mediated learning, TML

Humanity is witnessing surprising developments in technology-based teaching and learning. With these developments, the importance of information technologies is increasing. Especially in the last decade, the use of information technologies in the education field has had a noteworthy impact (Günüç & Babacan, 2018). Universities and many educational institutions are working to develop more effective and creative educational models with instructional technologies (Pacheco, Lips, & Yoong, 2018). On the other hand, students' tendency toward technology and their demands for the use of instructional technologies in the classes make the necessity of using the technology in the classroom inevitable (Çağiltay et al., 2007).

The use of information technologies for learning purposes is becoming widespread and can be a simple computer application or a combination of multiple computer applications (Bostrom, 2009). In a meta-analysis study on the effects of computer use in education, it was concluded that the use of technology improves learning outcomes in the majority of research (Kovalchick & Dawson, 2004; Raja & Nagasubramani, 2018). In support of this statement, Günüç & Babacan (2017), stated that the use of information and communication technologies such as interactive boards, tablet PCs, smartphones, the internet, and computers in education, increased class participation and made the lessons more efficient and fun. In addition, the use of technology in education not only increases students' learning speed but also addresses different learning styles by reducing the cost of education.

Technology-Mediated Learning, which is one of the studies on the use of technology in education, is an environment in which the interaction of learners with their learning materials, peers, and/or teachers is realized through information

technologies (Owusu-Agyeman & Larbi-Siaw, 2018). Technology-Mediated Learning has become popular in higher education. Many researchers (Bernacki, Greene, & Crompton, 2020; Cloete, 2017; Raja & Nagasubramani, 2018; Scherer, Siddiq, & Tondeur, 2019; Wells, 2019) have studied the use of information and communication technologies in education and individuals' attitudes towards it (Kozikoğlu & Babacan, 2019; Njiku, Maniraho, & Mutarutinya, 2019; Özdemir, 2017; Yurdagül & Öz, 2018). Çağıltay et al. (2007) stated that the use of instructional technologies among the students is widespread and as a result of a study he did with university students, it was found that the students expect the instructors to use the new technologies in the courses. In addition to all these findings, private and public institutions make technological investments to make education processes more effective and efficient. All these findings and investments have led to the need to investigate how to evaluate the effects of TML (Wang, Zhang, Du, & Wang, 2018).

In the related literature review, it was observed that the studies on TML were handled from various perspectives. In some studies, (Hu & Hui, 2012; Piccoli, Ahmad, & Ives, 2001; Workman, 2004) the learning outcomes provided by learning through technology, in some studies (H.-J. Chen, 2012; Klobas & McGill, 2010; Lin & Wang, 2012; McGill & Hobbs, 2008; McGill & Klobas, 2009; Muis, Ranellucci, Trevors, & Duffy, 2015) the perspectives of learners about learning through technology, in some studies the learner's commitment to learning through technology are discussed (Cocea & Weibelzahl, 2011; Henrie, Halverson, & Graham, 2015; Hu & Hui, 2012). Wang et al. (2018) developed a scale to investigate the effects of technology-mediated learning on the learning process. However, by looking at the literature review, it can be said that there are not many investigations on the attitudes of students toward TML, especially in Turkey. This study attributes to the literature by investigating the attitudes of students studying in Turkey towards TML as well as including different universities in the study at the same time.

### **1. Aim and importance of the study**

TML has become necessary in today's university education, therefore, understanding the effects of TML and evaluating its effects has been the subject of research and studies (Wang et al., 2018). In the literature review, no study on TML involving student attitudes in university education and more than one university at the same time was found. In this context, this study was carried out to reveal the attitudes of university students in Turkey towards the effects of technology-mediated learning on the learning process according to some variables. In addition, the Scale of the Effects of TML on Learning Process developed by Wang et al. (2018) is adapted to Turkish and contributed to the Turkish literature. This study aims to examine the effects of technology and teaching, which has become widespread in universities, on students' learning process. For this purpose, the following questions were sought with the participation of university students studying in different branches.

1-What is the attitude of university students toward the effect of Technology-Mediated Learning on the learning process?

2-Do the students' attitudes towards the effect of Technology-Mediated Learning on the learning process vary according to:

- a.gender?
- b.computer ownership?
- c.level of experience with computers?
- d.university that the participants attending?

## **2. Method**

### **2.1 Research model**

In this research, a descriptive survey model was used.

## 2.2 Study group

The participants of the study consisted of 227 students from five different state universities during the fall term 2019-2020 education year. For this study, the researcher tried to access as many universities and students as possible to achieve realistic statistical data. The personal characteristics of the participants are presented in Table 1.

Table 1. Some descriptive statistics of the university students

| Personal Characteristics          | Category              | Number (N) | Percent (%) |
|-----------------------------------|-----------------------|------------|-------------|
| Gender                            | Male                  | 100        | 44.1        |
|                                   | Female                | 127        | 55.9        |
| University                        | Ağrı İbrahim Çeçen U. | 40         | 17.6        |
|                                   | Ankara Hacettepe U    | 40         | 17.6        |
|                                   | Konya Selçuk U.       | 49         | 21.6        |
|                                   | Van Yüzüncü Yıl U.    | 48         | 21.1        |
|                                   | Erzurum Atatürk U.    | 50         | 22          |
| Computer Ownership                | Yes                   | 123        | 54.2        |
|                                   | No                    | 104        | 45.8        |
| Level of experience with Computer | Beginner              | 47         | 20.7        |
|                                   | Intermediate          | 139        | 61.2        |
|                                   | Advanced              | 41         | 18.1        |

According to Table 1, 100 (44.1%) of the students participating in the study were male and 127 (55.9%) were female. 40 (17.6%) of the students who participated in the research were from Ağrı İbrahim Çeçen University, 40 (17.6%) of them were from Ankara Hacettepe University, 49 (21.6%) of them from Konya Selçuk University, 48 (21%) of them from Van Yüzüncü Yıl University and 50 (22%) of them from Erzurum Atatürk University. In addition, 123 (54.2%) of the participants had a computer while 104 (45.8%) did not have a computer. On the other hand, 47 (20.7%) of the students who participated in the research were beginners, 139 (61.2%) of them were intermediate level and 41 (18.1%) of them had an advanced level of experience with a computer.

## 2.3 Data collection tools and data collection process

In this research, personal information form, and "The Effects of Technology-Mediated Learning on Learning Process" scale developed by Wang et al. (2018) were used to collect data. The personal information form was used to collect information about the university, age, gender, computer ownership, and level of experience with the computer of the

participants. In the literature review conducted to examine the effects of TML on students' learning process, a Turkish scale that serves this purpose was not found. Accordingly, it was decided to use the scale 'The effects of TML on learning Process' developed by Wang et al. (2018). The Scale consists of a total of 30 items and 8 sub-dimensions; Gaining Attention 4 items, Informing Learners of the Objective 4 items, Presenting Stimulus Materials 4 items, Recalling Prior Knowledge 3 items, Providing Learning Guidance 4 items, Eliciting Performance 3 items, Getting Feedback from Others 4 items, Getting Self-Feedback 4 items. The scale was composed of a 7-point Likert type. The process of adapting the scale to Turkish is presented below.

**Adaptation Studies** The procedures performed within the scope of adaptation of “The Scale of the Effects of TML on Learning Process” to Turkish were as follows; translation, semantic explanations, expert panel, back translation, pilot application, obtaining the latest version, data collection, validity and reliability studies of the collected data and documentation.

Since the scale was not in Turkish, it was first translated into Turkish by two English teachers whose mother tongues were Turkish. As a result of the first translation study, translation was evaluated by a total of 3 people, an academician who is an expert in the field and two English teachers who have a master's degree in the Department of Computer and Instructional Technologies. This translation was agreed upon and then translated back to English by 2 other experts. As a result of this process, the translation was found to be compatible with the source language and minor changes were made in a way that did not affect the meaning in order to adapt the scale in a semantic sense. The translated version of the scale was examined with a group of 20 students and a pilot study was conducted to determine whether each item had the same meaning for each student.

As a result of the experience obtained from the pilot implementation of the scale and the previous studies of the researchers, it was decided that it would be more beneficial to have a 5-point Likert type instead of a 7-point Likert type. Thus, the scale was obtained as a 5-Likert type and 30 items.

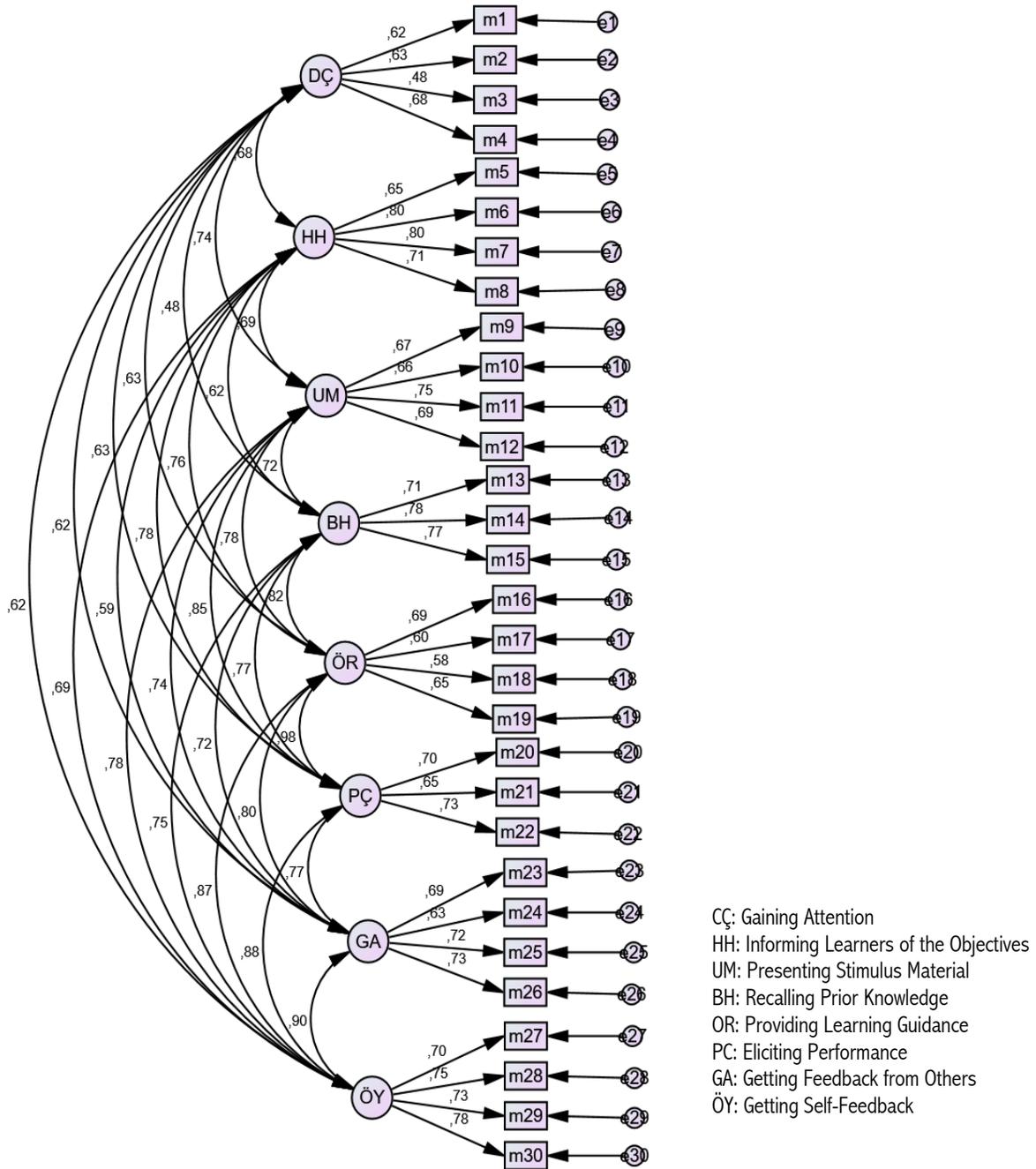


Figure 1. Confirmatory factor analysis diagram

As a result of the analysis of the item analyses, it was seen that the items of the scale were sufficiently adapted. Validity Study of the Scale. In the validity study of the scale, confirmatory factor analysis was performed using AMOS software. The values of the confirmatory factor analysis are given in Table 2 and the diagram of the model is given in Figure 1.

Table 2. Confirmatory factor analysis compliance indexes

| Compliance Indexes | Values  |
|--------------------|---------|
| $\chi^2$           | 583,697 |
| df                 | 377     |
| $\chi^2/sd$        | 1,548   |
| GFI                | ,857    |
| IFI                | ,934    |
| CFI                | ,932    |
| RMSEA              | ,049    |

As it is seen on table 2,  $\chi^2/sd = 1,548 < 5$ ,  $0,85 < GFI = 0,857$ ,  $0,90 \leq IFI = 0,934$ ,  $0,90 \leq CFI = 0,932$ ,  $RMSEA = 0,049 < 0,08$  according to the values, the model shows a high level of fit to the data.

### 2.3.1 Reliability of the scale

The Cronbach's Alpha reliability coefficient was reported as .80 (Wang et al, 2018), a Cronbach's Alpha reliability analysis was also conducted for the current study after CFA and the coefficient was found to be .93.

## 3. Findings

### 3.1 Findings of the first sub-problem

Some descriptive statistics of the first sub-problem of the study, which are calculated from the answers given by the university students to the "What is the attitude of university students towards the effect of TML on learning process" question, are given in Table 3:

Table 3. Mean and standard deviation values calculated according to university students' responses to the scale

| Scale                               | $\bar{X}$ | S    |
|-------------------------------------|-----------|------|
| Gaining attention                   | 3,32      | 0,86 |
| Informing learners of the objective | 3,47      | 0,91 |
| Presenting stimulus materials       | 3,68      | 0,81 |
| Recalling prior knowledge           | 3,72      | 0,88 |
| Providing learning guidance         | 3,54      | 0,79 |
| Eliciting performance               | 3,59      | 0,83 |
| Getting feedback from others        | 3,55      | 0,85 |
| Getting self-feedback               | 3,62      | 0,84 |
| Total                               | 3,56      | 0,66 |

When Table 3 is examined, it is seen that the attitudes of university students towards the effect of TML on the learning process are positive in gaining attention ( $\bar{X}=3.32$ ), informing learners of the objective ( $\bar{X}=3.47$ ), presenting stimulus material ( $\bar{X}=3.68$ ), recalling prior knowledge ( $\bar{X}=3.72$ ), providing learning guidance ( $\bar{X}=3.54$ ), eliciting performance ( $\bar{X}=3.59$ ), getting feedback from others ( $\bar{X}=3.55$ ) and getting self-feedback ( $\bar{X}=3.62$ ). When the total average of the scale is considered, it is understood that students' attitudes towards the effect of TML on the learning process are positive.

### 3.2 Findings of the second sub-problem

Independent sample T-test was applied to find the answer to the second sub-problem of the research "Do the attitudes of university students towards the effect of Technology-Mediated Learning on the learning process change according to gender?". The results of the test are given in Table 4.

Table 4. Independent sample T-test results according to the gender of attitudes of university students towards the effects of TML on the learning process

|        |        | Number | $\bar{X}$ | SD   | df  | t    | P    |
|--------|--------|--------|-----------|------|-----|------|------|
| Gender | Male   | 100    | 3.54      | 0.70 | 225 | -,32 | .225 |
|        | Female | 127    | 3.57      | 0.64 |     |      |      |

According to Table 4, attitude scores of university students towards the effect of TML on learning process do not differ significantly by gender ( $t(225) = -.32, p > .05$ ).

### 3.3 Findings of the third sub-problem

Independent sample T-test was applied to find answers to the third sub-problem of the research "Do the attitudes of university students towards the effect of Technology-Mediated Learning on the learning process change according to their computer ownership?". The data obtained from the test are given in Table 5.

Table 5. Independent sample T-test results of university students' attitudes towards TML according to their computer ownership

| Variable           |     | Number | $\bar{X}$ | SD   | df  | t      | P    |
|--------------------|-----|--------|-----------|------|-----|--------|------|
| Computer ownership | Yes | 123    | 3.52      | 0.62 | 225 | - 1,16 | .047 |
|                    | No  | 104    | 3.61      | 0.71 |     |        |      |

According to Table 5, the attitude scores of university students towards the effect of TML on the learning process show a significant difference in favor of students who are computer owners ( $t(225) = -1.16, p < .05$ ).

### 3.4 Findings of the fourth sub-problem

ANOVA test was applied to find answers to "Do university students' attitudes towards the effect of Technology-Mediated Learning on learning process change according to their level of experience with computers?" which is the fourth sub-problem of the study. The data obtained from the test are given in Table 6.

Table 6. ANOVA test results of university students' attitudes towards the effects of TML on the learning process according to the level of experience with computer

| Descriptive Statistics            |     |           |      | ANOVA Results   |         |     |       |       |      |            |
|-----------------------------------|-----|-----------|------|-----------------|---------|-----|-------|-------|------|------------|
| Level of experience with computer | No  | $\bar{X}$ | SD   | Variance Source | K.T     | df  | K.O   | F     | p    | Difference |
| Beginner                          | 47  | 3.54      | 0.68 | Between Groups  | 5.065   | 2   | 1.532 | 3.495 | .032 | Adv>Int    |
| Intermediate                      | 139 | 3.49      | 0.63 | Within Groups   | 98.202  | 224 | .438  |       |      |            |
| Advanced                          | 41  | 3.80      | 0.71 | Total           | 101.267 | 226 |       |       |      |            |

According to Table 6, a significant difference was found in the attitudes of university students towards the effect of TML on the learning process according to their experience in using computers ( $F_{(2, 224)} = 3,495, p < .05$ ). In order to determine the source of the significant difference, multiple comparison tests were conducted between the students with an advanced level of experience ( $\bar{X} = 3,80$ ) and the students with an intermediate level of experience ( $\bar{X} = 3,49$ ), a significant difference was found in favor of the students with an advanced level of experience. This finding reveals that the attitudes of students with advanced experience to the effect of TML on the learning process are higher than those with intermediate experience. The effect size value indicating the ratio of the variance explained by the dependent and independent variables was found to be  $\eta^2 = .030$ . This result showed that computer experience had a low effect on students' attitudes towards the effect of TML on the learning process.

### 3.5 Findings of the fifth sub-problem

ANOVA test was applied to find answers to the fifth sub-problem "Do the attitudes of university students towards the effect of Technology-Mediated Learning on the learning process change according to the universities they study?". The data obtained from the test are given in Table 7.

Table 7. ANOVA test results of university students' attitudes towards the effects of TML on the learning process according to the universities they study

| Descriptive Statistics |    |           |    | ANOVA Results      |     |    |     |   |   |            |
|------------------------|----|-----------|----|--------------------|-----|----|-----|---|---|------------|
| University             | No | $\bar{X}$ | SD | Variences Resource | K.T | df | K.O | F | p | Difference |

|     |    |      |      |         |         |     |       |       |      |         |
|-----|----|------|------|---------|---------|-----|-------|-------|------|---------|
| ICU | 40 | 3.85 | 0.74 | Between | 5.304   | 4   | 1.326 | 3.068 | .017 | SU>ICU  |
| HU  | 40 | 3.52 | 0.64 | groups  | 95.962  | 222 | .432  |       |      | YYU>ICU |
| SU  | 49 | 3.42 | 0.58 | Within  | 101.267 | 226 |       |       |      |         |
| YYU | 48 | 3.43 | 0.73 | groups  |         |     |       |       |      |         |
| AU  | 50 | 3.61 | 0.57 | Total   |         |     |       |       |      |         |

ICU: Ağrı İbrahim Çeçen University

HU: Ankara Hacettepe University

SU: Konya Selçuk University

YYU: Van Yüzüncü Yıl University

AU: Erzurum Atatürk University

According to Table 7, a significant difference was found in the attitudes of university students towards the effect of TML on the learning process according to the universities they studied ( $F_{(2, 222)} = 3,068, p < .05$ ). As a result of multiple comparison tests to determine the source of significant difference; There was a significant difference between Konya Selçuk University ( $\bar{X} = 3,42$ ) and Ağrı İbrahim Çeçen University ( $\bar{X} = 3,85$ ) in favor of Konya Selçuk University, and between Van Yüzüncü Yıl University ( $\bar{X} = 3,43$ ) and Ağrı İbrahim Çeçen University ( $\bar{X} = 3,85$ ) in favour of Van Yüzüncü Yıl University. This result reveals that the attitudes of Van Yüzüncü Yıl University and Konya Selçuk University students toward the effect of TML on the learning process are higher than that of Ağrı İbrahim Çeçen University students. The effect size value indicating the ratio of the variance explained by the dependent and independent variables was found to be  $\eta^2 = .052$ . This result showed that the university variable had a moderate effect on students' attitudes towards the effect of TML on the learning process.

#### 4. Discussion, conclusion, and suggestions

In this study, it has been investigated whether the attitudes of university students towards the effects of TML on the learning process vary according to various variables. In the light of the findings, no significant difference was found in the attitudes of university students towards the effect of TML on the learning process according to the gender of the students. On the other hand, it was found that there was a significant difference in students' attitudes according to their computer ownership, level of experience with computers, and universities.

Various results have been obtained in studies investigating gender variables. In the literature, there are studies indicating that the gender variable does not cause a significant difference (Cavas, Cavas, Karaoglan, & Kislal, 2009; Peterson, 2006). Cavas et al. (2009) and Peterson (2006) suggested that the reason for this would be that males and females have the same ICT perception. There are also studies with a significant difference in favor of males (Y.-F. Chen & Peng, 2008; Jackson et al., 2008; Jang & Tsai, 2013). Jang and Tsai (2013) states that the reason for the difference between male and female is that males spend more time with computers outside the school. These results indicate that different results have been obtained in terms of gender variables. For the current study, it can be said that the differences may be due to the reasons of sample or participants' characteristics, the number of participants and/or gender distribution.

The significant difference found in the computer ownership variable is in favor of the students who own a computer. In support of this paper's result, Roussos (2007) stated that having a computer had a significant effect on students' attitudes towards technology. In the literature, there are studies indicating that computer ownership does not affect

the attitude towards technology (Oz, Demirezen, & Pourfeiz, 2015). It can be said that the differences in the research results in the literature may be due to the efficiency of the technologies used by the participants and/or the purposes of using the technology.

The difference according to the students' level of experience with computers was in favor of the students with an advanced level of experience with a computer. Similar results have been obtained from a study by Oz et al. (2015). In addition, Varank (2006) stated in his study that as the level of experience with computers increased, attitude towards technology progressed positively. Based on these results, it can be said that students with an advanced level of experience with a computer have an attitude that technology makes positive contributions to learning processes.

Based on the results of this research, it was seen that the attitudes of university students towards the effect of TML on the learning process differed from the universities they studied. The difference was in favor of the students of Van Yüzüncü Yıl University and Konya Selçuk University. This difference may be because technology is used more in the courses in these universities. Or it may be caused by the differences in the fields of students studying in these universities, and accordingly, the methods of teaching vary depending on their fields.

In this research, 227 students studying at undergraduate departments of 5 different universities were studied. The limitations of this study are that only 5 universities have been studied. In addition, two of these universities are located in the Central Anatolia Region and three of them are located in the Eastern Anatolia Region. Considering the fact that these universities are located in similar geographical - cultural regions, it may be suggested to include different regions in future studies. On the other hand, the relationship between students' attitudes towards the effect of TML on the learning process and the fields they study can be studied. In addition, students' attitudes can be compared with their study time on the computer. Besides, the relationship between students' attitudes towards the effect of TML on the learning process and students' attitudes towards technology can be examined.

## 5. Disclosure of Conflict

The authors declare that they have no conflicts of interest.

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