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COMPUTER PROGRAMMING STUDENTS' LEARNING MOTIVATION IN PROGRAMMING COURSES

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ABSTRACT

This study aimed to explore vocational school computer programming students' motivations to learn programming. The study used a survey research design and surveyed 165 first-year and second-year students studying computer programming. The data were collected using the "Learning Motivation in Computer Programming Courses Scale" consisting of nineteen items. The data were analysed using the frequency, mean, and standard deviation values. The independent-samples t-test was used to determine the difference between groups. The analysis results showed that computer programming students had a good level of learning motivation in computer programming courses.

Keywords: Learning motivation; programming education; programming courses; computer programming.

BİLGİSAYAR PROGRAMCILIĞI ÖĞRENCİLERİNİN PROGRAMLAMA DERSLERİNDEKİ ÖĞRENME MOTİVASYONLARI

ÖZET

Bu çalışmada meslek yüksekokulu bilgisayar programcılığı öğrencilerinin programlamayı öğrenmeye yönelik motivasyonlarının belirlenmesi amaçlanmıştır. Çalışmada, tarama modeli kullanılmıştır. Çalışmaya bilgisayar programcılığı programı 1. ve 2. sınıf toplam 165 öğrenci katılmıştır. Veriler, 19 maddeden oluşan "Bilgisayar Programlama Derslerinde Öğrenme Motivasyonu Ölçeği" aracılığı ile toplanmıştır. Verilerin analizinde frekans, ortalama ve standart sapma değerleri hesaplanmıştır. Gruplar arasındaki farklılığı tespit etmek için Bağımsız Gruplar T Testi kullanılmıştır. Çalışma sonunda elde edilen bulgulara göre bilgisayar programcılığı öğrencilerinin bilgisayar programlama derslerinde öğrenme motivasyonu düzeylerinin iyi düzeyde olduğu belirlenmiştir.

Anahtar Kelimeler: Öğrenme motivasyonu; programlama eğitimi; programlara dersleri; bilgisayar programcılığı.

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INTRODUCTION

With the rapid development and change of technology, information technologies have now become more important and more needed. As a result of this need, information technologies are used in every field including industry, military, health, transportation, agriculture, and economy. They have also been used intensively in the field of education. As information technologies become more important in human life, the need for writing and developing new software in every field has grown (Keskinsoy, 2010). Thus, programming education should be given to respond to this need and equip individuals with the skills required by the century, (Çatlak et al., 2015). Programming education has grown in importance with the changing conditions and understanding of education. In the ever-developing software industry, there has been an increasing need for talented individuals who can program. With the increasing need, there has been an increase in programming education to meet this need. In fact, countries have established relevant education policies to raise individuals who can both program and have the skills required by the century.

Programming means solving a given problem using a language that computers can understand (Blackwell, 2002; Van Roy & Haridi, 2004). From this point of view, programming is a complicated process to learn as it mostly requires complex and high-level skills (Gültekin, 2006; Kert & Uğraş, 2009; Tan et al., 2009; Helminen & Malmi, 2010; Monroy-Hernandez & Resnick, 2008; Shin et al., 2013; Akpınar & Altun, 2014). There are various problems in programming education both in our country and in the world (Kaleci & Özhan, 2017). Previous studies have shown that achieving the learning outcomes of computer programming courses at different levels of education depends not only on students' academic achievement but also on several factors that affect learning programming such as attitudes, self-efficacy, motivation, and demographics (gender, school type, year of study, GPA, etc.) (Jenkins, 2002; Akpınar & Altun, 2014; Başer, 2013a; Korkmaz & Demir 2012; Reardon & Tangney, 2014). These factors may cause students to easily lose interest in programming learning. Low motivation has been shown to be a crucial factor in programming learning (Gomes & Mendes, 2007; Tella, 2007; Heersink & Moskal, 2010; Saygıner & Tüzün, 2017).

Therefore, factors that affect learning should be taken into account in programming education to train programmers who have the desired skills and competencies. Motivation is one of the key factors that affect learning. To motivate individuals to learn, topics should be presented in such a way to encourage individuals and make them willing to learn (Bacanlı, 2005). Thus, it is of utmost importance to pay attention to students' learning motivation as well as individual differences in learning computer programming (Jenkins, 2001).

Learning motivation refers to the degree to which students are willing to continue learning. Learning and motivation are overly complex aspects of human behaviour (Law et al., 2010; Wang et al., 2020). Motivation is a key factor that encourages students to learn (Ling et al. 2020). Studies have demonstrated that learning motivation affects teaching outcomes (Lynch, 2006; Lin & Jou, 2013; Law et al., 2019; Rocha et al., 2019; Sanaie et al., 2019; Gan, 2020).

From this point of view, the necessity of improving programming education today requires paying special attention to students' learning motivation. Additionally, there is a limited number of studies on the effect of motivation on vocational school students in terms of programming education. Against this background, the purpose of this study was to explore trainee computer programmers' levels of learning motivation for programming according to different variables such as gender, the year of study, and the type of high school that they graduated from. To this end, answers were sought to the following questions:

1) What is the level of computer programming students' learning motivation for programming?

2) Does computer programming students' learning motivation for programming differ according to gender, the year of study, and the type of high school that students graduated from?

METHODS

Research Design

The study used a descriptive survey research design. This study aimed to determine trainee computer programmers' levels of learning motivation for programming according to different variables such as gender, the year of study, and the type of high school that they graduated from. Survey research aims to reveal a past and present situation as it is and to explain, compare, and describe attitudes and behaviour (Karasar, 2002).

Participants

The participants consisted of first- and second-year students studying computer programming in the vocational school of a university. 165 trainee computer programmers participated in the study. Table 1 shows information about the participants.

Table 1. Information About the Participants

Characteristics	N	%
Gender		
Female	34	20.6
Male	131	79.4
Year of Study		
1st year	73	44.2
2nd year	92	55.8
Type of high school that students graduated		
Regular	90	54.5
Vocational	75	45.5

Data Collection Tools

The "Learning Motivation in Computer Programming Courses Scale" (LMCPC Scale) was developed by Law, Lee, and Yu (2010) to investigate motivational factors that affect learning among computer science and engineering students taking computer programming courses. The scale was adapted to Turkish by Avcı and Ersoy (2018). The scale consists of nineteen items subsumed under six factors. It is rated on a 6-point Likert type scale as follows: 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, and 6 = strongly agree. The reliability coefficient was found to be .90 for the total scale. In this study, the internal consistency was recalculated for the total scale and Cronbach's alpha was found to be .85. The lowest possible score is 19 and the highest possible score is 114.

Data Analysis

The data were analysed using the frequency, mean, and standard deviation values. The normality of data was tested to decide which statistical analysis to use to explore the difference between the groups. To this end, the Kolmogorov-Smirnov test was used to check whether the data are normally distributed. The Kolmogorov-Smirnov test results showed that the data were normally distributed for the entire scale ($p = .098$, $p > .05$). Because the data were normally distributed, the independent-samples t-test was used to determine the difference between the groups. Table 2 presents the analysis results on the normality of the data obtained from the scale.

Table 2. Normality Test

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total	.064	165	.098*	.966	165	.000

FINDINGS

Table 3 shows the descriptive statistics for trainee computer programmers' total scores on the "LMCPC Scale" regardless of gender, the year of study, and the type of high school that they graduated from.

Table 3. Descriptive Statistics

	N	Min	Max	Mean	SD
Learning Motivation for Programming	165	19.00	108.00	79.9394	13.54563

Table 3 displays the minimum, maximum, arithmetic mean, and standard deviation values of students' learning motivation for programming. As can be seen from the data in Table 3, the participants had a good level of learning motivation for programming (X= 79.9394). Table 4 displays students' levels of learning motivation for programming according to gender.

Table 4. Descriptive Statistics according to Gender

	N	Min	Max	Mean	SD
Female	34	19	107.00	69.0882	15.79675
Male	131	53	108.00	82.7557	11.37277

Table 4 displays the minimum, maximum, arithmetic mean, and standard deviation values of students' total scores on the LMCPC Scale in relation to gender. In terms of gender, it is seen that male students had a higher mean score than female students. The difference could not be examined in terms of gender because the number of female and male students was not equal. Table 5 shows the descriptive statistics for students' learning motivation in terms of the year of study. Table 6 shows the t-test results.

Table 5. Descriptive Statistics according to the Year of Study

	N	Min	Max	Mean	SD
1st year	73	59	108	82.8219	12.15678
2nd year	92	19	103	77.6522	14.20527

Table 5 displays the minimum, maximum, arithmetic mean, and standard deviation values of students' total scores on the LMCPC Scale in relation to the year of study. First-year students had a higher mean score than second-year students.

Table 6. T-Test Results according to the Year of Study

Groups	N	Mean	SD	t	df	p
1st year	73	82.8219	12.15678	2.473	163	.014
2nd year	92	77.6522	14.20527			

As seen in Table 6, the t-test results showed that the difference between first-year students and second-year students in their mean learning motivation scores was statistically significant ($t = 2.473$; $p = .014$; $p < .05$). Table 7 shows the descriptive statistics for students' learning motivation in terms of the type of high school that they graduated from. Table 8 shows the t-test results.

Table 7. Descriptive Statistics according to the Type of High School

	N	Min	Max	Mean	SD
Regular	90	19	103.00	77.4333	13.43821
Vocational	75	53	108.00	82.9467	13.13947

Table 7 displays the minimum, maximum, arithmetic mean, and standard deviation values of students' total scores on the LMCPC Scale in relation to the type of high school that they graduated from. In terms of the type of high school, it is seen that students who graduated from a vocational high

school had a higher mean score than those who graduated from a regular high school. Table 8 displays the independent samples t-test results in terms of the type of high school that they graduated from.

Table 8. T-Test Results according to the Type of High School

Groups	N	Mean	SD	t	df	p
Regular	90	77.4333	13.43821	-2.651	163	.009
Vocational	75	82.9467	13.13947			

As seen in Table 8, the t-test results showed that the difference between students' mean learning motivation scores in terms of the type of high school that they graduated from was statistically significant ($t = -2.651$; $p = .009$; $p < .05$).

DISCUSSION AND CONCLUSION

The study explored trainee computer programmers' levels of LMCPC in relation to gender, the year of study, and the type of high school that they graduated from. It was found that trainee computer programmers' levels of LMCPC differed according to the year of study and the type of high school that they graduated from.

The analysis results showed that trainee computer programmers had a good level of LMCPC. It can thus be said that they are willing to learn computer programming and they consciously preferred to study computer programming. Reardon and Tangney (2015) reported that various methods and approaches that they used in programming courses increased students' learning motivation. In a similar vein, several approaches such as project-based, game-based, and cooperative learning are suggested to increase LMCPC (Başer, 2013b).

The present study found that the levels of LMCPC were higher among male trainee computer programmers compared to females. This result might indicate that male participants are more interested in programming. However, previous studies have reported that the effect of gender is not definite (Lau & Yuen, 2009; Pillay & Jugoo, 2005). Because the number of male and female participants was not equal in the present study, it was not possible to examine whether trainee computer programmers' levels of LMCPC differ according to the gender variable.

The analysis results showed that first-year students had a higher mean score than second-year students. Accordingly, trainee computer programmers' LMCPC differed according to the year of study and the difference was in favour of the first-year students.

Another finding of the study is that trainee computer programmers who graduated from a vocational high school had a higher level of LMCPC compared to those who graduated from a regular high school. As it is known, students from all kinds of high schools come to vocational schools. However, students attending vocational high schools take programming courses. This situation may have caused the difference in LMCPC. Accordingly, trainee computer programmers' LMCPC differed according to the type of high school that they graduated from, and the difference was in favour of those

who graduated from vocational high schools. Yağcı (2016) found a similar result in favour of vocational high schools.

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