Effect Of Information Technologies (It) Pre-Service Teachers' Learning Approaches On Their Attitude Towards Programing

Mustafa YAĞCI
Ahi Evran University Faculty of Education
TURKEY
mustafayagci06@gmail.com

ABSTRACT
It has been widely debated issue in the literature that learning programming requires students to have advanced thinking skills to be successful in programming. Having a negative attitude towards programming is considered as one of the important reasons which cause students to fail in programming. The relationship among students' way of learning programming, their study approaches and their success in programming has not been explored in the literature in detail yet. In this regard, the purpose of the present study is to determine IT preservice teachers' learning styles and their attitude of towards computer programming; and to investigate their relationship. It was determined that whereas IT preservice teachers' year at the university exhibits significant difference with respect to their attitude towards programming; no significant relationship is found between their gender and types of their previous high school. However, it was observed that vocational high school graduates were more inclined toward programming compared to students graduated from other types of high schools. Additionally, it was found that most IT preservice teachers preferred deep studying approach the most effective way of comprehension of education materials since it uses the most effective learning strategy. Another positive correlation was determined between approaches of preservice teachers towards deep studying and their attitude towards programming.
Keywords: Computing, Programmed learning, Teacher training, Learning approaches.

INTRODUCTION

Learning programming requires students to possess high level of cognitive thinking skills (Lau & Yuen, 2009). Students usually develop a negative attitude towards programing (Askar & Davenport, 2009; Baser, 2013). This negative attitude is also effective on students' learning capability for programming. Majority of studies in the relevant literature revealed that students' attitude towards programming is effective on their programming learning capability. Baser (2013) and Korkmaz & Demir (2012) reported various factors effective on success in computer programming such as attitude, motivation and demographical characteristics. Moreover, in studies oriented on self-sufficiency perception of students towards "Introduction to Programming" Course studied in universities (Mazman & Altun, 2013), it was reported that students' attitude toward programming changes. Advanced technological tools are utilized in almost all of education areas frequently. Therefore, as it was reported by Lau and Yuen (2009), programming learning skills play significant role in development of information literacy in educational sciences.

Students taking programming languages course usually experience difficulty in displaying the performance expected from them in programming field. This could be associated with their low attitude level towards programming (Altun & Mazman, 2012). On the other hand, students' negative attitude towards programming could also affect their success in programming. Hence, Haslaman & Askar (2007) and Baser (2013a) suggest that self-sufficiency perceptions of students taking programming language course, have positive significant effect on their success level.

Experimental studies conducted on education of programming languages indicate that educational environments which allow to gain superior problem solving skills could have positive influence on students' success and programming perceptions (Uysal, 2014). Course contents carefully prepared by taking difficulty of programming language course into account motivate students to reach target acquisitions (Forte & Guzdial, 2005). Alternative programming education methods connected with structural programming techniques could foster students' success in programming as well (Robinson, 1995).

It is substantially important task to determine learning approaches of students to enhance quality and productivity of education (Abraham, Vinod, Kamath, Asha, and Ramnarayan, 2008). Although differences among students have taken prominent area of interest in recent reforms in education, no any practical suggestion has been made concerning how to assess these differences.

Identifying learning styles of students could be helpful for teachers to select more efficient education strategies (Lau & Yuen, 2009), allowing to determine origins of differences among students and transition from teacher-centered education to student-centered education more conveniently. In this regard, it is contemplated that the present study would contribute in developing learning performances of students with different learning styles. The relevant literature search exposes only limited number of studies on attitudes of students towards programming and their self-sufficiency perception towards programming. On the other side, it was found that there was no study investigating the relationship between learning approaches of IT preservice teachers who teach programming in Turkey and their attitude towards programming whereas there was only one study on this subject in the global literature (Lau & Yuen, 2009). Additionally, there are suggestions regarding necessity of investigation of factors influent on performance in programming in the literature (Cetin & Ozden, 2015; Mazman & Altun, 2013; Korkmaz & Altun, 2013; and Başer, 2013).

This study aims to determine attitude of IT preservice teachers towards computer programming, their learning styles and the relationship between them. Along this purpose, following research questions were tried to be answered:

a) How is the attitude of IT preservice teachers towards computer programming?
b) Do attitude of IT preservice teachers towards computer programming display significant difference according to their demographical characteristics (gender, grade, graduated high school)?
c) How is studying approach of IT preservice teacher?
d) Is there significant relationship between attitude of IT preservice teachers towards computer programming and their approach towards study?

METHOD

Study Group

The study group of this research is consisted of IT preservice teachers at the 1st, 2nd, 3rd and 4th grades from the Faculty of Educational Science at the Ahi Evran University. Research data was from 165 preservice teachers by means of a survey form developed in both internet and printed environments. Distributions of gender, grade, type of graduated high school and study approaches of study group were summarized in Table 1.

Table 1: Demographical Characteristics of IT Preservice Teachers

Variable	Characteristics	F	%
Gender	Male	81	49.1
	Female	84	50.9
Grade	1	41	24.8
	2	39	23.6
	3	51	30.9
	4	34	20.6
Type of Graduated High School	Vocational	101	61.2
	Regular	37	22.4
	Anadolu*	27	16.4
Deep Learning Approach		127	77
Superficial Learning Approach		38	23
Total		165	100

In terms of significant figures of Table 1, whereas 61% of participant IT preservice teachers were vocational high school graduates; 77% were the ones adoted deep learning approach.

Data Collection Tools

In identifying learning approaches of IT preservice teachers, “Studying Approach Scale” was developed while “Scale for Measuring Attitude toward Computer Programming” was developed to measure their attitude toward programming. Besides, personal information form was utilized collect demographical characteristics of participants.

Scale for Measuring Attitude toward Computer Programming

"Scale for Measuring Attitude toward Computer Programming" developed by Baser (2013) in five-point Likert scale was employed to determine attitude of participant preservice teachers toward computer programming based on the scale structured by Wiebe, Williams, Yang and Miller (2003), consisted of 38 items and four factors. As a result of factor analysis and reliability analysis, 9 items were removed from the original scale consisted of 47 items. In development process of the scale, data was collected totally from 220 students, of which 179 were from the Computer and Information Technologies Education (CITE) Department and 41 were from Computer Engineering Department. The scale developed for the purpose of this study was structured on following sub-scales: "Self-confidence in programming and motivation" (Items from 1 to 11 and from 33 to 38); "Benefits of Programming" (Items from 23 to 32); Attitude toward success in programming" (Items from 12 to 19); and Social perception toward success in programming (20, 21 and 22). Internal consistency coefficients of sub-dimensions of the scale range between .618 and .944. The Cronbach's Alpha coefficient for internal consistency of the whole scale was estimated at .947. Scale items include "1-Totally Agree", "2-Agree", "3-Not Sure", "4-Disagree" and "5-Totally Disagree" as answer options.

Scale for Studying Approach

Within the scope of the present research, the scale adapted into Turkish by Yılmaz & Orhan (2011) from the study of Biggs, Kember, & Leung (2001) on studying approaches of university students was employed in determination of learning approaches of preservice teachers. As the scale is comprised of totally 20 items, its two constituent factors were referred as deep and superficial approaches. Of which, 10 items (1, 2, 5, 6, 9, 10, 13, 14, 17 and 18) were designated to measure deep approach; the other 10 (3, 4, 7, 8, 11, 12, 15, 16, 19 and 20) were to measure superficial approach. As items in the scale were structured in five-point Likert Scale, they were offering following opions: "It does not or rarely consider me (1)", "It sometimes considers me (2)", "It considers me in half of occasions (3)", "It considers me frequently (4)" and "It considers me almost all the time (5)". Regarding internal consistency of the scale, Cronbach's Alpha coefficients were estimated for deep approach and superficial approaches at .79 and .73, respectively. Study results reported by Yılmaz and Orhan (2011) suggest that adapted scale was reliable and it was a valid measurement tool to investigate studying approaches of students in higher education in terms of language equivalency and quality.

Data Collection and Analysis

To identify the appropriate statistical method for analysis of collected data, Kolmogorov-Smirnov normality test was utilized. Skewness value was calculated as 4.015 by dividing skewness coefficient (.759) to the skewness standard error (.189). Since this value remains outside the range of -1.96 and 1.96 ($p<.05$), it was concluded that data was not normally distributed. According to Kalaycı (2009), skewness values ($p<.05$) greater than 1.96 or less than -1.96 are accepted. Thus, since test results of Kolmogorov-Smirnov normality analysis did not display normal distribution in all groups for dependent variables, non-parametric tests were applied. In terms of descriptive analysis of collected data, frequency (f), percentage (%), mean (X) and standard deviation (Sd) were employed; whereas Kruskal Wallis and Mann-Whitney U tests were conducted for exploratory statistical purposes. The minimum and maximum scores that can be gained by respondents from the scale were 38 and 190, respectively. In assessment of total score, as total gained score closes to 190, it could be implied that positive attitude toward computer programming increases; as it closes to 38, positive attitude decreases. In the evaluation scale utilized in assessment of findings obtained as a result of data analysis, (5-1) / 3 evaluation range is taken as basis; if the correlation level between average score limits and knowledge levels was in the range of 1 – 2.33, then, it could be considered as "Low Level"; it was in the range of 2.34 – 3.67, "Medium Level"; and it was in the range of 3.68 – 5.00, "Advanced Level".

Spearman serial correlation tests were employed to exmine the correlation between attitudes of preservice teacher toward computer programming and their studying approaches. Differences and significance of correlations were investigated according to $p<.05$ level.

FINDINGS AND CONCLUSIONS

a. How is attitude of IT preservice teachers towards computer programming?

Descriptive statistic results regarding attitudes of preservice teachers towards computer programming and mean scores according to their sub-dimensions were exhibited in Table 2.

Table 2: Descriptive Statistics Results of IT Preservice Teachers regarding Their Attitude Towards Computer Programming

Attitudes Towards Programming	N	Minimum	Maximum	X	Sd
Self-confidence and motivation in programming		1.76	4.76	2.9660	.41685
Benefits of programming		1.30	4.70	2.9370	.42358
Attitude toward success in programming	165	1.13	4.63	2.5220	.65854
Social perception of success in programming		1.00	5.00	3.8586	.86262
General		1.76	4.63	2.9353	.37149

It can be observed from Table 2 that mean scores regarding attitudes of preservice teachers towards computer programming differ for all sub-dimensions in the range of 2.52 and 3.86. For sub-dimension of "Social perception of success in programming", this was considered as "Advanced Level"; for sub-dimension of "Self-confidence and motivation in programming", "Benefits of programming" and "Attitude toward success in programming", its significance was considered as "Medium Level". Thus, it is possible to conclude that general attitude of IT preservice teachers towards programming was at medium level. This result corresponds to the results reported in the relevant literature. Korkmaz & Altun (2013) reported that students from computer engineering and CITE departments were inclined toward learning programming at medium level in general. However, researchers stated that students' attitude toward programming were observed at higher level especially with engineering students. Similarly, Başer (2013) reported that students from the CITE Department had negative attitude towards programming. According to Ozyurt & Ozyurt (2015), whereas attitudes of students from computer programming department towards programming were positive; their self-confidence levels towards programming were at medium level.

b. Whether attitudes of IT preservice teachers towards computer programming exhibit significant difference according to their demographical characteristics (gender, grade, and type of high school graduated)?

i. Do attitudes of IT preservice teachers toward computer programming exhibit significant difference according to gender?

In order to determine whether attitudes of preservice teacher towards computer programming exhibit statistically significant difference according to their genders, Mann-Whitney U-test results were taken into consideration and they were summarized in Table 3.

Table 3: Mann Whitney U Test Results regarding Attitudes of Preservice Teachers towards Computer Programming according to Their Genders

Gender	N	Mean Distribution				
		Factor 1	Factor 2	Factor 3	Factor 4	General
Male	81	76.40	82.21	79.18	81.23	76.29
Female	84	89.36	83.76	86.68	84.71	89.47
Mann Whitney U		2867.500	3338.000	3092.500	3258.500	2858.500
Z		-1.760	-.211	-1.022	-.483	-1.782
P		.078	.833	.307	.629	.075

*p<=.05

According to Table 3, it was observed that attitudes of IT preservice teachers towards computer programming did not significantly differentiate for none of sub-dimensions of the scale according to their gender variable. This finding corresponds to findings reported by Bakr (2011) and Lau & Yuen (2009). Robinson (1995), who investigated success of students in programming and their attitudes towards programming through an emprical study, concluded that methodical differences were not effective on gender. On the other hand, Whitley (1997), who investigated attitudes of genders towards computer programming through content analysis, concluded that gender was not effective on students' approach towards computer. Similarly, Yıldırım & Kaban (2010) reported in their study in which they investigated attitude of preservice teachers from the CITE department towards computer-aided education that gender variable caused significant difference. On the contrary to this finding, it was reported in literature that gender was significant factor with respect to attitude towards programming and to problem solving skills. Askar & Davenport (2009), Baser (2013), Brosnan (1998) and Kirkpatrick & Cuban (1998) stated that attitude of male students towards programming were higher in comparison with female students. This could have been result of the finding of Milic (2009) and Turkle (1984) that gender was significant variable in resolution of programming tasks. In studies of Ozyurt, (2015), Ozyurt & Ozyurt (2015), which investigated research attitudes of distant education students towards programming, a significant relationship was found between some sub-dimensions of scale and gender variable.

ii. Do attitudes of IT preservice teachers towards computer programming exhibit significant difference according to their years at the university?

In order to determine whether attitudes of preservice teachers toward computer programming exhibit significant difference according to their year at the university, results of the "Kruskall Wallis" test conducted for independent groups were summarized in Table 4 below.

Table 4: Kruskal Wallis Test Results of Preservice Teachers Regarding Their Attitudes Towards Computer Programming According to Their Years at the University

Year at the University	N	Mean Distribution				
		Factor 1	Factor 2	Factor 3	Factor 4	General
1	41	75.54	76.10	74.71	87.48	76.41
2	39	83.68	75.72	69.31	93.67	79.23
3	51	92.99	96.79	96.82	71.29	92.68
4	34	76.24	78.99	87.97	82.93	80.75
Kr. Wallis Chi-S (χ2)		4.001	6.423	9.313	5.729	3.228
Z		3	3	3	3	3
P		.261	.093	.025	.126	.358

*p<=.05

Based on Table 4, attitudes of preservice teachers towards computer programming according to their year at the university exhibited significant difference for preservice teachers at the 3rd year in terms of sub-dimension of "Attitude toward success in programming" (U=9.313, p=.025, Factor 3). In terms of the 1st, 2nd and 4th sub-dimensions, there was no significant difference according to their year at the university. In other words, attitudes of preservice teachers towards computer programming differed only with respect to "Attitude toward success in programming" sub-dimension according to their year at the university. Thus, it is possible to conclude that perceptions of IT preservice teachers towards programming were positively affected by the programming courses given at the 1st, 2nd and 3rd grades. It is possible find similar results in the literature. For example, Mazman & Altun (2013) and Altun & Mazman (2012) claimed that self-sufficiency perceptions of students towards programming increased significantly after they received programming course. Along the same line, Ozyurt & Ozyurt (2015) reported significant correlation between students' year at the university and their attitude towards programming. On the other hand, the difference among their attitude toward programming reduces afterwards of their first experience. There are various other results reported in the literature as well. For instance, Yıldırım and Kaban (2010) stated that there was no significant correlation between students' year at university and their attitude towards computer-aided education. Again, Bakr (2011) indicated that experiences of teachers were not influent on their attitude towards computer.

iii. Do attitudes of IT preservice teachers towards computer programming exhibit significant difference according to the type of their high schools?

In order to determine whether attitudes of preservice teachers toward computer programming exhibit significant difference according to the type of high school where they were graduated from, results of the "Kruskal Wallis" test conducted for independent groups were summarized in Table 5 below.

Table 5: Kruskal Wallis Test Results of Preservice Teachers Regarding Their Attitudes Towards Computer Programming According to the Types of Graduated High School

Type of Graduated High School	N	Mean Distribution				
		Factor 1	Factor 2	Factor 3	Factor 4	General
Vocational	101	87.91	84.69	86.11	79.13	86.08
Regular	37	78.69	77.81	75.22	89.64	80.91
Anadolu*	27	70.54	83.78	82.02	88.39	74.33
Kr. Wallis Chi-S (χ2)		3.272	.586	1.460	1.837	1.397
Z		2	2	2	2	2
P		.195	.746	.482	.399	.497

* (p<=.05)

According to Table 5, it can be observed that whereas the Vocational High School (86.08) exhibited the maximum mean score; the Anadolu High School (74.33) exhibited the minimum mean score. Additionally, according to the Kruskal Wallis test results, attitudes of preservice teachers towards computer programming did

not exhibit significant difference with all sub-dimensions according to the type of graduated high school. In other words, perceptions of IT preservice teachers towards computer programming did not exhibit significant difference according to the type of high school where they were graduated from.

c. Which studying approach do IT preservice teachers adopt?

In order to determine studying approach of preservice teacher, statistical results based on the mean scores obtained according to deep approach and superficial approach dimensions were exhibited in Table 6.

Table 6: Descriptive Statistic Results regarding Studying Approaches of IT Preservice Teachers

	N	Minimum	Maximum	X	Sd
Deep Approach	165	15	48	31.70	5.888
Superficial Approach		13	45	27.59	6.596

Table 6 implies that mean score ($\bar{X} = 31.70$) of IT preservice teachers who adopt deep studying approach necessitating comprehension of the course subject rather than only gaining high scores in exams and focusing on core of the subject without losing integrity of the course subject was higher than the mean score ($\bar{X} = 27{,}59$) of the IT preservice teachers who adopt superficial approach not necessitating concentration and prone to lose integrity of subject because it fragmentizes the subject for convenient memorizing and it passively accepts new subjects and knowledge given to them without questioning. In Table 1, which exhibits demographical characteristics of students, it can be observed that whereas 77% of students adopt "deep studying approach"; 23% adopt "superficial studying approach". Accordingly, it can be concluded based on two tables that IT preservice teachers were the individuals who were inclined to deep studying approach, the most effective way of comprehending education materials and using the most effective learning strategy. In the relevant literature, Olpak & Korucu (2014b), in their study including 245 bachelor degree students from various departments of faculty of educational sciences, reported that majority of students exhibited deep studying approach. On the contrary, Yilmaz & Orhan (2011) indicated in their study conducted on 400 students from different bachelor degree programs that students mostly exhibited superficial approach. Cuhadar, Gunduz and Tanyeri (2013) reported that deep approach and superficial approach mean scores of students from the CITE Department of the Faculty of Educational Sciences at Trakya University were close to each other.

d. Is There Significant Correlation between Attitudes of the IT Preservice Teachers Towards Computer Programming and Their Studying Approach?

As collected data was not normally distributed, the "Spearman Serial Correlation" analysis was conducted to investigate the relationship between two variables. The Spearman Serial Correlation coefficient is expected in the range of -1 and +1. As correlation coefficient approaches to +1, then, this suggests that there is positive perfect correlation; as it approaches to -1, then, this indicates negative perfect correlation. If coefficient is estimated at 0, then, this suggests that there is no linear correlation between variables (Kalaycı, 2009). Table 7 displays correlation coefficients and correlation levels below.

Table 7: Correlation Coefficients and Correlation Levels (Buyukozturk, 2009)

Absolute Value Range (r)	Level of Correlation
0.00 – 0.30	Low
0.31 – 0.70	Medium
0.71 – 1.00	High

Table 8 summarizes analysis results regarding the correlation between studying approaches of preservice teacher and their attitude towards computer programming.

Table 8: The Correlation between Studying Approaches of Preservice Teacher and Their Attitudes toward Computer Programming

Attitude towards Computer Programming		General Mean
Deep Studying Approach	r	.079
	p	.314
	N	165
Superficial Studying Approach	r	-.014
	p	.856
	N	165

According to Table 8, it can be observed that there was low level positive correlation between deep studying approach of IT preservice teacher and their attitudes towards computer programming (r=.079). Based on this

result, it was possible to conclude that as mean scores regarding deep studying approach of preservice teachers increased parallel to their positive attitude towards computer programming. On the other hand, low level negative correlation between superficial studying approaches of preservice teacher and their attitude towards computer programming was observed (r=-.014). Hence, it can be deducted at this point that increasing mean scores of preservice teachers regarding superficial studying approach negatively affected their attitude towards computer programming.

Mazman & Altun (2013) reported positive and high level of correlation between self-sufficiency perception of students toward programming and their academic success. Similarly, Ozyurt (2015) determined significant relationship between attitude of distant learning students towards programming and their self-sufficiency perception levels. There are also researches in the literature oriented on different variables effective on computer programming success. For instance, Ozdinc & Altun (2014) investigated factors effective on programming process of IT preservice teachers and reported that their program coding and program reading tasks were under influence of various variables.

RESULT AND SUGGESTIONS

Sampling group of this study employed screening model was consisted of 165 IT preservice teachers. Study results suggested that attitudes of IT preservice teachers towards computer programming were at medium level, which is parallel to the findings reported in the relevant literature. But, IT preservice teachers were expected to be more interested in programming learning. This result addressed the necessity of activities to enhance attitudes of students towards programming, one of the factors effective on students' success.

Additionally, no any difference was observed in attitudes of preservice teachers towards computer programming according to their gender. Thus, it was concluded that tendency of both male and female preservice teachers towards programming were similar. Another finding exposed by the present study was that years of preservice teachers at the university were effective on their attitude towards programming. This difference was on the advantage of students attending to the 3rd year at the university. This result can be interpreted as that new regulations on courses given in curriculums of the 1st and 2nd years in the IT teaching departments would be effective on attitudes of preservice teachers towards programming positively. In terms of types of graduated high school, there was no significant difference among attitudes of preservice teachers towards programming. However, students graduated from vocational high schools were found to be more inclined toward programming. Moreover, it was observed that whereas 127 of IT preservice teachers adopted deep studying approach; 38 adopted superficial studying approach. It was also observed that majority of IT preservice teachers prefered deep studying approach. They displayed minor tendency toward superficial studying approach.

Another result of the present study was that there was positive correlation between mean scores of preservice teachers according to their deep studying approach and their attitude towards computer programming. On the other hand, a negative relationship was determined between superficial studying approaches of preservice teachers and their attitude towards computer programming.

Following suggestions were drawn based on the research findings:

a. Content and gaining of programming course given to IT preservice teachers are required to be prepared by taking perceptions and readiness of students toward programming into consideration.
b. By considering students' studying approaches, student-centered learning environments must be provided in programming education; and education activities must be organized along this purpose. Thus, it must be ensured that students adopt deep studying approach combining the new information with former ones and focusing on the core subject.
c. Course contents must be designated by considering the fact that programming languages necessitate high level of problem solving skill during learning process; and they must be structured so as to enhance motivation of students to reach target skills and competencies (Forte & Guzdial, 2005).
d. Problem-based learning should be encouraged in order to support and improve high-level thinking and problem solving capabilities.

Acknowledgements

Statement on open data

Data of the study could be shared with other researchers via personal communication.

Statement on ethical guidelines

Anonymous data collection process was utilized during this study in order to protect privacy of participants and to avoid conflict of interest. There was no question on questionnaire that reveals the identity of participants. Furthermore, participants discussed the topics anonymously on the discussion forum.

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