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Analysis of Readiness for Change and Self-Efficacy Perceptions of IT Teachers and Pre-Service Teachers

Bilişim Teknolojileri Öğretmenlerinin ve Öğretmen Adaylarının Değişime Hazır Olma ve Öz Yeterlik Durumlarının İncelenmesi

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Abstract: In the present study, the readiness for change, programming self-efficacy and teaching self-efficacy of Information Technology (IT) teachers and pre-service teachers in Information Technologies and Software course were investigated based on various variables. The study was conducted with 209 females and 252 males, a total of 461 individuals. In the present study that was designed with the relational survey model, the Readiness for Change Scale developed by Kondakçı, Zayim and Çalışkan (2010), the Programming Self-Efficacy Perception Scale developed by Ramalingam and Wiedenbeck (1998) and adapted by Altun and Mazman (2012) and Teacher Self-Efficacy Scale developed by Tschannen-Moran and Woolfolk Hoy (2001) and adapted by Çapa, Çakıroğlu and Sarıkaya (2005) were utilized in conjunction to analyze the results based on gender, the type of the school of graduation, experience status, active employment status, and the school level of employment variables. Study findings suggested that although experience did not affect participants' perceptions of teachings self-efficacy, it was an effective factor on their readiness for change. furthermore, gender or school of graduation type were not effective on their readiness for change. Study results also suggested that gender had an impact on programming self-efficacy perception, and the difference between male and female participants in simple programming skills was lower, while the male participants had significantly higher level of self-efficacy in complex programming skills when compared to female participants.

Keywords: Programming, readiness for change, self-efficacy, software course, teacher

Öz: Bu araştırmada Bilişim Teknolojileri (BT) öğretmenlerinin ve öğretmen adaylarının, Bilişim Teknolojileri ve Yazılım dersine ilişkin değişime hazır olma durumları, programlama öz yeterlikleri ve öğretmenlik öz yeterlikleri bağlamında ele alınarak çeşitli değişkenler temelinde araştırılmıştır. Araştırma 209'u kadın 252'si erkek olmak üzere toplam 461 kişi ile gerçekleştirilmiştir. İlişkisel tarama modelinde desenlenen bu araştırmada, Kondakçı, Zayim ve Çalışkan (2010) tarafından geliştirilen Değişime Hazır Olma Ölçeği, Ramalingam ve Wiedenbeck (1998) tarafından geliştirilen, Altun ve Mazman (2012) tarafından uyarlanan Programlamaya İlişkin Öz Yeterlik Algısı Ölçeği ve Tschannen-Moran ve Woolfolk Hoy (2001) tarafından geliştirilen, Çapa, Çakıroğlu ve Sarıkaya (2005) tarafından uyarlanan Öğretmen Öz Yeterlik Ölçeği birlikte işe koşularak; cinsiyet, mezun olunan okul türü, deneyim durumu, aktif olarak görev yapıp yapmama durumu ve görev yapılan okul düzeyi değişkenlerine göre incelenmiştir. Araştırma sonucunda elde edilen bulgular arasında deneyimin, katılımcıların öğretmenlik özyeterlik algılarını etkilememesine karşın, değişime hazır olma durumları üzerinde etkili bir faktör olduğu, bunun yanında cinsiyetin ya da mezun olunan okul türünün değişime hazır olma durumları üzerinde etkili olmadığı sonuçları öne çıkmaktadır. Araştırmada ayrıca cinsiyetin programlamaya ilişkin öz yeterlik algısı üzerinde etkili olduğu, buna göre basit programlama becerilerinde kadın ve erkek katılımcılar arasındaki fark azalırken karmaşık programlama becerileri söz konusu olduğunda erkek katılımcıların kadın katılımcılardan anlamlı derecede yüksek öz yeterlik düzeyine sahip oldukları sonuçlarına ulaşılmıştır.

Anahtar Kelimeler: Programlama, değişime hazır olma, öz-yeterlik, yazılım dersi, öğretmen

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Introduction

Individuals need to acquire production skills from early ages in order for Turkey to develop and progress and to be able to carry out its production activities in a self-containing manner. With this awareness, Ministry of National Education (MNE) decided on the instruction of computer software knowledge in a course to ensure that in individuals could analyze problem situations, make decisions using comparisons, develop critical thinking and problem solving skills, and to create new products from the early ages. Based on this decision, the software course was added to the IT curriculum designed in 2012, and the curriculum was updated to include software skills and an Information Technologies and Software (ITS) course in 2015. If the in case that the competencies of graduates acquired from the application courses such as algorithms and programming languages that are instructed in CEIT departments are not updated and applied after graduation, the knowledge remains in theoretical level and become difficult to teach. Thus, the first graduates of the Department of Computer Education and Instructional Technologies Education in 2002, who have been working as IT Teachers for 13 years should spend more effort to adapt themselves to the new technologies to teach new ITS courses. Furthermore, it is considered that the teaching methods and techniques used by IT teachers such as instruction or applied presentation during class are effective in ensuring that the students acquire IT and programming skills. Thus, it is observed that the occupational knowledge of IT teachers and their self-efficacy perception towards teaching are significantly important factors. Therefore, teaching self-efficacy and self-efficacy towards programming knowledge are important factors for teachers to instruct this course effectively. It is also necessary for IT teachers, who have been working in the same educational process for many years, to be prepared to teach the new skills to include changing software and programming skills. However, experienced IT teachers, who did not improve themselves about the development of new technologies and their uses in the educational process, and are not open ideas for new ideas. Thus, it is considered that the readiness of IT teachers for instructing the updated ITS course should be investigated.

Programming Education and Self-Efficacy Belief

It is expected that students' can think analytically, synthesize, solve problems and have effective communication skills as a result of the technological advances and developments in education (Şentürk & Köklü, 2010). One of the fields that helps the students to achieve these skills is programming and software training. Using a programming language, specific commands are created for desired objectives. Solutions to different problem situations are found in the process that leads to the goal using special commands. Thus, it was supported strongly in the literature that analysis and problem solving skills of the students who experience programming and software processes develop (Dasso et al., 2005; Mulder, 2002; Sebetci & Aksu, 2014). Furthermore, scholars, who investigated the effects of programming on children, stated that their creative, guidance and higher cognitive skills developed (Clements & Fullo, 1984), they learn the rules better (Gorman & Bourne, 1983), and it helps the natural language patterns (Hromkovic, 2006). Programming logic is based on the algorithm. Using algorithms, the individual separates the problem into steps and constructs the process that leads to the solution. Thus, it is considered that the students who learn the logic of the algorithm could easily solve the problems they encounter in daily life with the help of algorithmic logic (Gür & Hangül, 2015; Toker, 2012). Furthermore, algorithms and programming skills provide individuals high-level thinking skills such as systematic thinking, finding the fastest solution, observing the relationships between events and creative thinking (Fesakis & Serafeim, 2009; Yükseltürk & Altıok, 2015). Considering all these benefits, it is considered that programming and software knowledge is an important training for children. Thus, it is necessary for the teachers who will provide programming and software training to determine whether they are satisfied with their programming skills. Furthermore, for algorithms and programming skills to be acquired by the students, there must exist qualified teachers who feel self-efficient in occupational knowledge in teaching. As a result, the significance of self-efficacy is imminent.

Self-efficacy is the belief of the individual on the capacity to achieve learning behavior (Bandura, 1988). Individuals' self-efficacy beliefs affect task selection, level of the effort spent, desire to cope with difficulties, and the achievement status (Bandura, 1977). When individuals with the same level of cognitive skills are considered, those with high self-efficacy beliefs can cope better with difficulties and spend more effort to succeed; it is considered that individuals with low self-efficacy beliefs experience more difficulty in solving problems and could complicate the situation and experience emotional depression (Davidsson, Larzon & Ljunggren, 2010). Thus, the belief of the individual in her or his own skills and achievements is considered as an important factor. Since programming is a course which is hard to comprehend and learn by university students, low self-efficacy beliefs in programming could be a strong obstacle in achieving success (Altun & Mazman, 2012). Therefore, the teachers who will instruct programming education to children should first have high self-efficacy beliefs in programming. However, it might not be sufficient for IT teachers with high programming knowledge and self-efficacy beliefs alone for their students to acquire the required skills if their occupational knowledge on teaching or teaching self-efficacy perception are low. Thus, programming self-efficacy belief is not considered to be sufficient alone in making the students to acquire the required skills. As a result, the self-efficacy perceptions of teachers' on occupational knowledge on teaching should also be examined.

According to Demirel (1999), pre-service teachers are prepared for their career by obtaining knowledge of general culture, subject area and pedagogic. For an effective instructional activity to be conducted, teachers should be proficient and with high self-efficacy beliefs in these three fields. Self-efficacy belief can affect an individual's ability to identify higher goals, be consistent in their decisions, organize their cognitive processes, and have a high motivation (Locke & Latham, 1990). Thus, the self-belief of the teacher to enable problem students with low achievement and motivation to perform desired behavior is called teacher self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). Teaching competencies are the tools that the teacher possesses and uses during the teaching process to enable the students to reach their educational goals (Şahin, 2004). Furthermore, teachers who perceive that they are competent in instructing a course tend to be spend more time in that class (Riggs & Enochs, 1990), more open to new ideas and more willing to try new methods-techniques (Cousins & Walker, 1995), while those that do not feel confident tend to avoid the classes (Riggs, 1995). Thus, the professional attitudes and beliefs of teachers are of great importance in educational activities to conduct effective teaching processes (Başokçu & Öğretmen, 2013).

For the students to fully acquire programming and software skills included in the updated ITS curriculum, the teachers' programming knowledge and teaching self-efficacy beliefs should be at a high level. But it is very important for IT teachers, who have been working on the same curriculum for years, to be ready for this new curriculum so that they can adapt to the curriculum and teach effectively. Thus, it is beneficial to investigate whether active teachers and pre-service teachers are ready for the changes in the new curriculum.

Readiness for Change

Change refers to a process that is positive if it goes from one state to another and progresses in to reach a goal planned or unplanned, while in the opposite case it results in a negative outcome (Helvacı, 2010). The only way to survive in changing conditions is to adapt to and manage the change. The main aim of change is to restructure the system, performance and efficiency that the previous conditions have destroyed. Individuals' thoughts about change are formed at the beginning of the period of change and promote or prevent change based on their perceptions of change (Canlı, Demirtaş & Özer, 2015). Thus, to achieve the objective of the change, the individuals in the environment must be able to adapt to changing conditions and manage the change (Tunçer, 2013).

The educational organization established to meet the educational needs of the community has been undergoing constant change and innovation especially in the last half century (Wallace, 2004). When considering the changing living conditions, conventional

concept of education becomes inadequate and it becomes a necessity to update the content of education, policies, purpose, structure, functions and programs and to initiate change based on technological developments (Arslan & Erarslan, 2003). Similar to other countries, efforts to change the learning environment and content based on technological advances and education system restructuring continue in Turkey. In recent years, depending on technological developments, awareness for the importance of programming and software skills was raised, restructuring of IT course curriculum was conducted to include software skills and a ITS course curriculum was developed. For the change in the curriculum to be effective, all affected individuals and the environment must be included in the change process. Thus, all individuals, especially the teachers and students, who are affected by the changing curriculum should be ready and open to change (Çalık & Er, 2014). It was also stated that self-efficacy beliefs are important factors for teachers on recognition of their professional problems and acceptance of the process of change to overcome these problems, and that past experiences, individual abilities and infrastructure support are important factors in the change of teachers (Day, 1999). As a result, it was considered that teachers' self-efficacy beliefs on programming field knowledge and their teaching self-efficacy beliefs on how to teach this knowledge could be effective in achieving the desired outcomes from the changed ITS curriculum based on the results of the studies conducted by Harris (2002) and Day (1999). Thus, it was considered that it is important and a requirement to conduct an analysis on IT teachers' programming and teaching self-efficacies and it is significant for the ITC curriculum to be effective.

Within the scope of the study, a literature review was conducted to identify which variables could be effective in determining the relationship between IT teachers' and pre-service teachers' programming and teaching self-efficacies and their readiness for change in the ITS course. It was observed that gender, school type and experience could be effective on determination of the correlation between IT teachers' and pre-service teachers' programming and teaching self-efficacies and their readiness for change in ITS course. Thus, gender, type of the school of graduation, and experience are accepted as variables in the present study and research questions were designed accordingly.

The Aim of the Study

The objective of the present study is to investigate the self-efficacy of information technologies teachers and pre-service teachers about software and programming that are planned to be instructed in information technologies and software course, their level of readiness and teaching self-efficacy based on various variables (gender, type of the school of graduation, experience, active duty status and the school of employment). Furthermore, the correlation between participants' self-efficacy about software and programming, readiness for change and teaching self-efficacy was scrutinized.

Based on the abovementioned objective, the following research questions were posed.

1. Do the readiness of change of IT teachers and IT pre-service teachers for the software course and their teaching and programming self-efficacies, depending on their active duty status, differ statistically significantly based on
 - a. gender,
 - b. the type of the school of graduation, and
 - c. experience?
2. Is there a correlation between the readiness of change of IT teachers and IT pre-service teachers for the software course and their programming self-efficacy?
3. Is there a correlation between the readiness of change of IT teachers and IT pre-service teachers for the software course and their teaching self-efficacy?
4. Is there a correlation between the teaching self-efficacy of IT teachers and IT pre-service teachers and their programming self-efficacy?

Method

Research design

The present study that aimed to investigate the self-efficacy of information technologies teachers and pre-service teachers about software and programming and their level of readiness and teaching self-efficacy was conducted with relational survey method. The general objective of scanning studies is to describe the topic of the study or an existing situation (Fraenkel & Wallen, 2011), while relational scanning method aims to discover the correlation between two or more variables (Büyüköztürk et al., 2013).

Measures

Readiness for Change Scale developed by Kondakçı, Zayim and Çalışkan (2010), Programming Self-Efficacy Perception Scale developed by Ramalingam and Wiedenbeck (1998) and adapted by Altun and Mazman (2012), and Teaching Self-Efficacy Scale developed by Tschannen-Moran and Woolfolk Hoy (2001) and adapted by Çapa, Çakıroğlu and Sarıkaya (2005) were used in the study after the receipt of approval of the relevant authors. Programming Self-Efficacy Perception Scale included 9 items in a 7-point Likert-type scale with "performing simple programming tasks" and "performing complex programming tasks" factors. It was determined that the Cronbach Alpha reliability coefficient of the scale was .928 and the McDonald's ω (omega) coefficient value, which provides more favorable results in congeneric measurements, was .956 (Altun & Mazman, 2012). Readiness for Change Scale, that was developed by Kondakçı, Zayim and Çalışkan (2010) and used in the present study, is a 5-point Likert type scale that measures readiness for change based on the factors of "intentional", "cognitive" and "emotional". It was observed that there are 5 items related to the intentional factor, 4 items related to the cognitive factor, 3 items related to the emotional factor and total number of items is 12. The authors who developed the scale calculated the Cronbach Alpha reliability for the scale as .87, .67 and .87 for the "intentional", "emotional" and "cognitive" subscales, respectively. The third data collection tool used in the present study was the Teaching Self-Efficacy Scale developed by Tschannen-Moran and Woolfolk Hoy (2001) and adapted by Çapa, Çakıroğlu and Sarıkaya. Teaching Self-Efficacy Scale is a 5-point Likert type scale that includes 24 items in 3 factors of "student engagement", "classroom management" and "instructional strategies". The internal consistency coefficient of the scale was calculated with Rasch analysis by the authors who adapted the scale and it is stated that they have found acceptable fitness values for the total items (Yenice, Saracaloğlu & Özden, 2013). Furthermore, the Cronbach Alpha internal consistency values for the scale were calculated by the authors who adapted the scale as .82 for "student engagement" factor, .84 for the factor of "classroom management" and .86 for the factor of "instructional strategies". In addition, the overall internal consistency value for the scale was calculated as .93, and it was determined that the ideal critical alpha value for the internal consistency levels was generally .70 and above, and thus, it was concluded that the scale could be used (Akbulut, 2010; Büyüköztürk, 2014).

Participants

The study data were collected between February and May, 2017. The study group included 461 participants, who were accessed through forums created by IT teachers and IT pre-service teachers and groups in online social networking platforms. Based on the data collected via the demographic questions, it was observed that 209 respondents were female and 252 were male. When the ages of the participants are examined, it was determined that 0,2% were under 18 years old, 41,9% were 19-25 years old, 33,6% were 26-30 years old, 20,4% were 31-35 years old and 3,9% were 36-40 years old. When the study group is examined based on the type of the high school that the participants graduated, it was identified that 59,8% of participants graduated from technical or vocational high schools, and 40,2% graduated from other types of high school. Furthermore, 28% of the study group were undergraduate students and thus have not yet started teaching, 18,6% were college graduates, but they have not worked as teachers yet

and 53,4% were active teachers. When the participants' experiences as a teacher are examined, it was observed that 28% had no teaching experience, 21.89% had less than 1 year teaching experience, 18% had 1-3 years teaching experience, 9.3% had 4-6 years teaching experience, 12,1% had 7-9 years teaching experience, 7.2% had 10-12 years teaching experience, 3.3% had 13-15 years teaching experience, and 0.2% had 16 years or longer teaching experience. When the schools of employment of the participants in the study group was examined, it was found that 40.35% never worked as teachers, 1.52% worked only in primary schools, 2.56% worked in primary and junior high schools, 35.82% worked only in junior high schools, 5.42% worked in junior high and high schools, and 14.32% worked only in high schools.

Data analysis procedures

The data obtained from the 461 IT teachers and pre-service teachers reached via the online measurement tool were analyzed using descriptive statistics. When the hypotheses of normal distribution for the data set are examined, it was concluded that neither the values calculated with Kolmogorov-Smirnov and Shapiro-Wilk tests, nor the skewness and kurtosis values, nor the interpretation of the related graphs reflected a normal distribution of the data. If normal distribution cannot be achieved, it is usually recommended to conduct common data transformation procedures on continuous variables such as squaring or extraction, or LOG10 conversion (Akbulut, 2010). Following the data transformation performed on the dataset, it was determined that the dataset does not provide the normal distribution assumptions in this case either. Therefore, to respond to the research questions determined in the study, nonparametric Kruskal-Wallis H test and Mann-Whitney U test were used on the original dataset in addition to the descriptive statistics.

Findings

Findings on teaching self-efficacy perceptions of it teachers and pre-service teachers

The Mann-Whitney U Test statistically significant results that was conducted to determine whether there was a significant difference between Teaching Self-Efficacy Perceptions of IT teachers and pre-service teachers based on gender with respect to whether they were on active duty or not are summarized in Table 1.

Table 1.
Analysis Results for Teaching Self-Efficacy Perceptions of IT teachers and pre-service teachers based on gender variable

Active Duty Status	Teacher Self-Efficacy Scale's Subtests and Totals	Gender	n	Mean Rank	Sum of Rank	U	Z	p
IT Teachers	Classroom Management	Female	111	113,18	12562,50	6346,50	-2,068	.039*
		Male	135	131,99	17818,50			
		Total	246					

* (p<.05)

The results demonstrate that there is no statistically significant difference between the total scores obtained by IT teachers and pre-service teachers Teaching Self-Efficacy Perceptions Scale based on the gender variable ($p>.05$). Examination of the sub-dimensions of the scale were examined, it was determined that active teachers' self-efficacy perception scores did not demonstrate a statistically significant difference in the dimensions of "student engagement" and "instructional strategies," while there was a statistically significant difference only in the "classroom management" subscale ($U=6346.50$, $p <.05$). Based on the mean ranks, it was determined that the corresponding variance was in favor of the male participants.

The results of the Mann-Whitney U statistically significant test that was conducted to examine whether IT teachers' and pre-service IT teachers' Teaching Self-Efficacy Perceptions differed statistically based on the variable of the type of high school graduated (ToVHS - other) with respect to the active duty status are summarized in Table 2.

Table 2.

Analysis Results for IT teachers' and pre-service IT teachers' Teaching Self-Efficacy Perceptions Based on the Variable of the Type of High School Graduated (Technical or Vocational High School (ToVHS) - Other)

Active Duty Status	Teacher Self-Efficacy Scale's Subtests and Totals	Type of High School Graduated	n	Mean Rank	Sum of Rank	U	Z	p
IT Teachers who did not actively teach	Student Engagement	ToVHS	59	47,25	2788,00	575,00	-2,073	.038*
		Other	27	35,30	953,00			
		Total	86					

* (p<.05)

The sub-dimension and total scores that IT teachers and pre-service teachers received on Teaching Self - Efficacy Perceptions Scale did not demonstrate any statistically significant difference based on the type of the high school of graduation variable (p>.05). It was determined that a total of 460 participants answered the question on the type of the high school of graduation among 461 participants, and 1 participant did not respond to this item. When the scale sub-dimensions were evaluated, it was observed that the teaching self-efficacy of the participants who did not actively teach although they were graduated did not demonstrate a statistically significant difference for the sub-dimensions of "instructional strategies" and "classroom management" based on type of the high school of graduation variable (U=575.00, p <.05), while there was a statistically significant difference for the "student engagement" sub-dimension. Based on the mean ranks, it seems that the related difference was in favor of technical or vocational high school graduates.

Table 3 summarizes the Kruskal-Wallis H analysis results that was conducted to examine whether there was a statistically significant difference between the Teaching Self-Efficacy Perceptions of the IT teachers and pre-service teachers based on experience variable in the context of active duty status.

Table 3.

Analysis Results for IT teachers' and pre-service IT teachers' Teaching Self-Efficacy Perceptions Based on the Experience Variable

Active Duty Status	Teacher Self-Efficacy Scale's Subtests and Totals	Experience	n	Mean Rank	df	χ^2	p	Significance
IT Teachers who did not actively teach	Instructional Strategies	I have no experience	29	44,47	3	7.933	.047*	Less than 1 year – 1-3 years
		Less than 1 year	42	37,93				
		1-3 years	13	59,92				
		4-6 years	2	39,75				
		Total	86					

* (p<.05)

There was no statistically significant difference between the scores of IT teachers in "student engagement", ($\chi^2_{(5)}=4.466$; $p=.614$), "instructional strategies" ($\chi^2_{(5)}=5.855$; $p=.440$) and "classroom management" ($\chi^2_{(5)}=5.287$; $p=.508$) sub-dimensions and the sub-dimensions of the experience variable. There was no statistically significant difference between the total scores of IT teachers in teaching self-efficacy perceptions scale ($\chi^2_{(5)}=4.285$; $p=.638$) and the sub-dimensions of the experience variable. There was no statistically significant difference between the scores of undergraduate pre-service IT teachers in teaching self-efficacy perceptions scale "student engagement" ($\chi^2_{(1)}=6.503$; $p=.165$), "instructional strategies" ($\chi^2_{(1)}=8.772$; $p=.067$), and "classroom management" ($\chi^2_{(1)}=5.786$; $p=.216$) sub-dimensions and the sub-dimensions of the experience variable. There was no statistically significant difference between the total scores of undergraduate pre-service IT teachers in teaching self-efficacy perceptions scale ($\chi^2_{(1)}=7.091$; $p=.131$) and the sub-dimensions of the experience variable. Similarly, there was no statistically significant difference between the scores of graduated but non-active IT teachers in teaching self-efficacy perceptions scale "student engagement" ($\chi^2_{(3)}=4.750$; $p=.191$), "classroom management" ($\chi^2_{(3)}=6.757$; $p=.080$) sub-dimensions, and total teaching self-efficacy perception scores ($\chi^2_{(3)}=6.593$; $p=.086$) and the sub-dimensions of the experience variable.

In general, it was determined that there was no statistically significant difference in multiple comparisons conducted between sub-dimension and total scores of teachers' and teacher candidates' perceptions on teaching self-efficacy perceptions scale and sub-levels of the experience variable ($p>.05$). However, it was determined that the teaching experiences of participants who were not active and graduated teachers demonstrated a statistically significant difference in multiple comparisons conducted for the "instructional strategies" sub-dimension of the scale ($\chi^2_{(3)}=7.933$; $p<.05$). In the case of Kruskal-Wallis H analysis, if differences are found between the groups in multiple comparisons, it is possible to determine between which groups the difference exists by using the Bonferroni adaptation or Miller Technique (Baştürk, 2010). A decision could be made about the source of the difference by using 6 Mann-Whitney U Tests, which is equal to the number of paired comparisons between the 4 sub-levels of the experience variable. In this case, however, Bonferroni Adaptation must be implemented to avoid a Type I error. For each of the 6 Mann-Whitney U tests performed to determine the difference, the calculated significance value was $p=.05 / 6$ ($p=.00833$) using the Bonferroni Adaptation. Although it was stated in the literature that the tendency of avoiding the type I error is higher than the tendency of avoiding the type II error (Huck, 2008), since the Bonferroni adaptation is over-conservative, it should not be forgotten that it could increase the type II error and thus reduce the statistical power value. To avoid such a problem, nonparametric multiple comparison techniques available in SPSS 18 and above versions were utilized to determine which sub-levels of the experience variable was involved in the related difference. The results obtained in nonparametric multiple comparison tests are summarized in Table 4.

Table 4.
Nonparametric Multiple Comparison Test Results for Experience Variable Sub-Dimensions

Sample1	– Test	Std. Error	Std. Test Statistic	Sig.	Adjusted Sig.
Sample2	Statistic				
Less than 1 year	-21,995	7,860	-2,798	.005	.031*
– 1-3 years					

* Adjusted significance level (adj. Sig.), $p<.05$. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

The descriptive visual for the multiple comparison results displayed in Table 4 is given in Figure 1. As can be observed in Figure 1, it was found that there was a statistically significant difference only between the participants who had less than 1 year of experience and those who had active teaching experience of 1-3 years in 4 sub-levels of experience variable ($p<.05$).

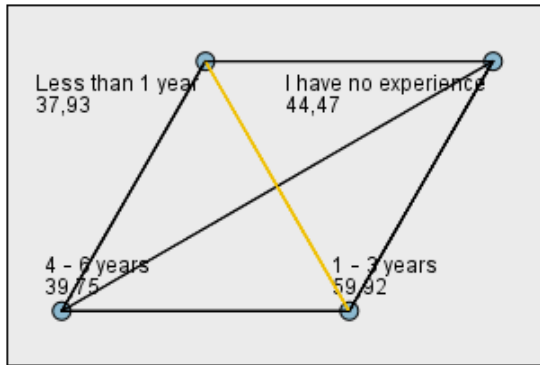


Figure 1. Results of the Multiple Comparison Conducted Between the Sub-Dimensions of the Experience Variable

Findings on readiness for change of it teachers and pre-service teachers in software course

The statistically significant results of Mann-Whitney U test conducted to determine whether the readiness for change of IT teachers and pre-service teachers statistically differed based on gender with respect to active duty status are summarized in Table 5.

Table 5.

Analysis results for the readiness for change of IT teachers and pre-service teachers based on gender variable

		Gender Variables							
Active Duty Status	Readiness for Change Scale's Subtests and Totals	Gender	n	Mean Rank	Sum of Rank	U	Z	p	
IT Teachers who did not actively teach	Emotional	Female	38	38,01	1444,50	703,50	-1,975	.048*	
		Male	48	47,84	2296,50				
		Total	86						

* ($p < .05$)

There was no statistically significant difference between the total scores of IT teachers and pre-service teachers in the readiness of change scale based on gender variable in the context of their active duty status ($p > .05$). When the subscales of the Readiness for Change Scale were examined, it was found that the scores of unemployed graduate participants in the "cognitive" and "intentional" sub-dimensions demonstrated a statistically significant difference but not in the "emotional" sub-dimension ($U=703.50$, $p < .05$). It was determined that the observed difference was in favor of male participants.

The results of the Mann-Whitney U test conducted to examine whether the readiness for change of IT teachers and pre-service teachers statistically differed based on the type of the high school of graduation (ToVHS – other) with respect to active duty status are summarized. There was no statistically significant difference between the scores of IT teachers and pre-service teachers in readiness for change sub-dimensions and total scale based on the type of the high school of graduation variable ($p > .05$). Table 6 summarizes the results of the Kruskal-Wallis H analysis that was conducted to investigate whether the readiness for change of IT teachers and pre-service teachers were statistically different based on the variable of experience, in the context of their active duty status.

Table 6.

Analysis Results for Readiness for Change of IT Teachers and Pre-Service Teachers Based on Experience Variable

Experience Variable		Readiness for Change Scale's Subtests							
Active Duty Status	Change Scale's Subtests	Experience	n	Mean Rank	df	χ^2	p	Significance	
IT Teachers	Intentional	Less than 1 year	33	150,94	5	14.647	.012*	-	
		1-3 years	69	134,35					
		4-6 years	40	109,16					
		7-9 years	56	125,27					
		10-12 years	33	102,14					
		13-15 years	15	91,87					
		Total	246						

* ($p < .05$)

There was no statistical difference between the scores of undergraduate pre-service IT teachers in "cognitive" ($\chi^2_{(1)}=2.311$; $p=.679$), "emotional" ($\chi^2_{(1)}=3.886$; $p=.422$) and "intentional" ($\chi^2_{(1)}=4.046$; $p=.400$) sub-dimensions of the readiness for change scale and the sub-dimensions of the experience variable. It was determined that there was no statistically significant difference between total scores ($\chi^2_{(1)}=1.640$; $p=.802$) of undergraduate pre-service IT teachers and the sub-dimensions of the experience variable. There was no statistical difference between the scores of graduated but not active IT teachers in "cognitive" ($\chi^2_{(3)}=0.768$; $p=.857$), "emotional" ($\chi^2_{(3)}=0.402$; $p=.940$) and "intentional" ($\chi^2_{(3)}=3.720$; $p=.293$) sub-dimensions of the readiness for change scale and the sub-dimensions of the experience variable. Furthermore, it was determined that there was no statistically significant difference between total scores ($\chi^2_{(3)}=1.652$; $p=.648$) of graduated but not active IT teachers and the sub-dimensions of the experience variable. There was no statistically significant difference between the total scores of the IT teachers in the readiness for change scale ($\chi^2_{(5)}=8.368$; $p=.137$) and the sub-dimensions of the experience variable. In addition, there was no statistically significant difference between the score of the IT teachers in the readiness for change scale "cognitive" sub-dimension ($\chi^2_{(5)}=8.973$; $p=.110$) and "emotional" sub-dimension ($\chi^2_{(5)}=9.826$; $p=.080$) with the experience variable.

In general, it was determined that the overall scores of IT teachers and pre-service teachers in the Readiness for Change scale did not demonstrate a statistically significant difference based on the experience variable ($p > .05$). However, it was determined that in the conducted multiple comparisons, it was determined that there was a statistically significant difference between the scores of the active teachers in the "intentional" sub-dimension of the readiness for change scale and the experience variable ($\chi^2_{(5)}=14.647$; $p < .05$). Nonparametric multiple comparison tests were used to determine between which sub-dimensions of the experience variable the difference existed. As can be observed in Figure 2, it was determined that there was not statistically significant difference between the participants based on the 6 sub-levels of experience variable ($p > .05$).

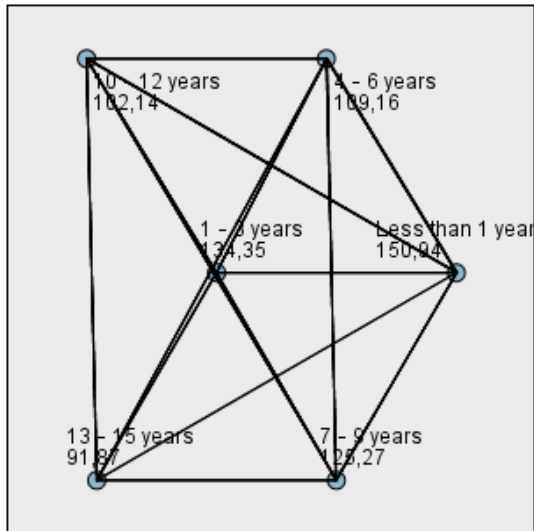


Figure 2. The Results of Multiple Comparison Conducted Between the Sub-Dimensions of the Experience Variable

Findings on programming self-efficacy perceptions of it teachers and pre-service teachers in software class

The results of the Mann-Whitney U Test conducted to determine whether the programming self-efficacy perceptions of the IT teachers and pre-service teachers were significantly different based on the gender variable with respect to their active duty status are summarized in Table 7.

Table 7.

Analysis Results on Programming Self-Efficacy Perceptions of IT Teachers and Pre-Service Teachers Based on the Gender Variable

Active Duty Status	Computer Programming Self-Efficacy Scale's Subtests and Totals	Gender	n	Mean Rank	Sum of Rank	U	Z	p
IT Teachers who did not actively teach	Simple Programming Tasks	Female	38	37,00	1406,00	665,00	-2,902	.004*
		Male	48	48,65	2335,00			
		Total	86					
	Complex Programming Tasks	Female	38	37,26	1416,00	675,00	-2,082	.037*
		Male	48	48,44	2325,00			
		Total	86					
	Total	Female	38	36,63	1392,00	651,00	-2,290	.022*
		Male	48	48,94	2349,00			
		Total	86					
IT Teachers	Simple Programming Tasks	Female	111	117,36	13026,50	6810,50	-1,507	.132
		Male	135	128,55	17354,50			
		Total	246					
	Complex Programming Tasks	Female	111	113,62	12612,00	6396,00	-1,982	.048*
		Male	135	131,62	17769,00			
		Total	246					
	Total	Female	111	113,36	12583,50	6367,50	-2,032	.042*
		Male	135	131,83	17797,50			
		Total	246					

* (p<.05)

There was no statistically significant difference between the total programming self-efficacy perception scores of IT teachers and pre-service teachers based on the gender variable with respect to the undergraduate participants ($p > .05$). On the contrary, it was found that there was a statistically significant difference between the scores of the inactive and active participants in the Programming Self-Efficacy Perceptions Scale based on the gender variable ($p < .05$). When the cases of differences identified were examined based on the mean ranks, it was observed that all related differences were in favor of the male participants.

The results of the Mann-Whitney U test that was conducted to examine whether there was a statistically significant difference between the programming self-efficacy perceptions of IT teachers and pre-service teachers based on the type of the high school of graduation (ToVHS - Other) variable with respect to their active duty status are presented in Table 8.

Table 8.

Analysis Results for Programming Self-Efficacy Perceptions of IT Teachers and Pre-Service Teachers Based on the Type of the High School of Graduation (Technical or Vocational High School (ToVHS) - Other) Variable

Active Duty Status	Computer Programming Self-Efficacy Scale's Subtests and Totals	Type of High School Graduated	n	Mean Rank	Sum of Rank	U	Z	p
Pre-service IT Teachers	Simple Programming Tasks	ToVHS	104	69,04	7180,50	775,50	-3,264	.001*
		Other	24	44,81	1075,50			
		Total	128					
	Complex Programming Tasks	ToVHS	104	68,91	7167,00	789,00	-2,804	.005*
		Other	24	45,38	1089,00			
		Total	128					
	Total	ToVHS	104	69,49	7226,50	729,50	-3,168	.002*
		Other	24	42,90	1029,50			
		Total	128					
IT Teachers	Simple Programming Tasks	ToVHS	112	135,24	14147,00	6189,00	-2,904	.004*
		Other	134	113,69	15234,00			
		Total	246					
	Complex Programming Tasks	ToVHS	112	142,12	15917,50	5418,50	-3,766	.000*
		Other	134	107,94	14463,50			
		Total	246					
	Total	ToVHS	112	142,82	15995,50	5340,50	-3,905	.000*
		Other	134	107,35	14385,50			
		Total	246					

* ($p < .05$)

It was determined that 460 participants responded out of the 461 participants and 1 participant did not respond to the item related to the type of the high school of graduation variable in the study. The results demonstrate that the programming self-efficacy perceptions of graduated but inactive participants did not statistically significantly differ based on the type of the high school of graduation variable ($p > .05$). It was determined that there was a statistically significant difference between both overall scores and sub-dimension scores of IT pre-service teachers and active IT teachers in Programming Self-Efficacy Perceptions based on the type of the high school of graduation variable ($p < .05$).

The results of the Kruskal-Wallis H analysis conducted to investigate whether the Programming Self-Efficacy Perceptions of IT teachers and pre-service teachers were statistically different based the experience variable, with respect to their active duty status.

There was no statistically significant difference between the scores of ungraduated pre-service participants in programming self-efficacy perception scale sub-dimensions of "performing simple programming tasks" ($\chi^2_{(1)}=2.681$; $p=.612$), "performing complex programming tasks" ($\chi^2_{(1)}=3.431$; $p=.489$) and overall scale scores ($\chi^2_{(1)}=3.877$; $p=.423$) based on the experience variable. It was determined that there was no statistically significant difference between the scores of graduated but inactive participants in programming self-efficacy perception scale sub-dimensions of "performing simple programming tasks" ($\chi^2_{(3)}=1.023$; $p=.796$), "performing complex programming tasks" ($\chi^2_{(3)}=2.970$; $p=.396$) and overall scale scores ($\chi^2_{(3)}=2.933$; $p=.402$) based on the sub-dimensions of the experience variable. It was determined that there was no statistically significant difference between the scores of IT teachers in programming self-efficacy perception scale sub-dimensions of "performing simple programming tasks" ($\chi^2_{(5)}=2.824$; $p=.727$), "performing complex programming tasks" ($\chi^2_{(5)}=5.725$; $p=.334$) and overall scale scores ($\chi^2_{(5)}=6.248$; $p=.283$) based on the sub-dimensions of the experience variable. In summary, it was determined that there was no statistically significant difference between the total scores and sub-dimension scores of IT teachers and pre-service teacher in Programming Self-Efficacy Perception Scale based on the experience variable with respect to their active duty status ($p>.05$).

Correlation analysis was used to test whether there was a correlation between readiness for change total scores of IT teachers and pre-service teachers and their total programming self-efficacy perception scores with respect to their active duty status and the results are presented in Table 9.

Table 9.

Results of the Correlation Analysis Between Total Readiness for Change Scores and Programming Self-Efficacy Total Scores of IT Teachers and Pre-Service Teachers

Active Duty Status	Computer Programming Self-Efficacy Scale's Subtests and Totals	Readiness for Change Scale's Totals		
		n	Spearman Correlation Coefficient $r(\rho)$	p
Pre-service IT Teachers	Simple Programming Tasks	129	.109	.221
	Complex Programming Tasks	129	.289	.001*
	Total	129	.268	.002*
IT Teachers who did not actively teach	Simple Programming Tasks	86	.252	.019*
	Complex Programming Tasks	86	.300	.005*
	Total	86	.278	.010*
IT Teachers	Simple Programming Tasks	246	.338	.000*
	Complex Programming Tasks	246	.373	.000*
	Total	246	.379	.000*

* ($p<.05$)

Table 9 demonstrated that there was a low level positive correlation between readiness for change and programming self-efficacy perceptions of non-active IT teachers and pre-service teachers based on their active duty status. It was interesting to note that there was a moderate level positive correlation between readiness for change and programming self-efficacy perceptions of active IT teachers ($r=0.379$, $p<.05$). There was no correlation between readiness for change and programming self-efficacy perception scale "performing simple programming skills" sub-dimension scores of IT pre-service teachers ($r=0.109$, $p>.05$). On the other hand, it was observed that there was a low level and positive statistically significant correlation between the readiness for change and the "performing complex programming tasks" sub-dimension of the programming self-efficacy perception scale scores of the same participants ($r=0.289$, $p<.05$).

Correlation analysis was used to test whether there was a correlation between the total readiness for change and teaching self-efficacy perception scores of the IT teachers and pre-service teachers with respect to their active duty status. The results are presented in Table 10.

Table 10.

Correlation Analysis Results Between the Total Readiness for Change and Teaching Self-Efficacy Scores of IT Teachers and Pre-Service Teachers

Active Duty Status	Teacher Self-Efficacy Scale's Subtests and Totals	Readiness for Change Scale's Totals		
		n	Spearman Correlation Coefficient r(rho)	p
Pre-service IT Teachers	Student Engagement	129	.292	.001*
	Instructional Strategies	129	.332	.000*
	Classroom Management	129	.344	.000*
	Total	129	.345	.000*
IT Teachers who did not actively teach	Student Engagement	86	.368	.000*
	Instructional Strategies	86	.403	.000*
	Classroom Management	86	.365	.001*
	Total	86	.399	.000*
IT Teachers	Student Engagement	246	.378	.000*
	Instructional Strategies	246	.395	.000*
	Classroom Management	246	.301	.000*
	Total	246	.382	.000*

* (p<.05)

Table 10 demonstrated that there was a moderate positive correlation between total readiness for change scores and total teaching self-efficacy scale and teaching self-efficacy scale sub-dimension scores of IT teachers and pre-service teachers with respect to their active duty status. It was determined that there was a low level positive correlation between readiness for change scores and teaching self-efficacy perception scale “student engagement” sub-dimension scores of IT pre-service teachers only ($r=0.292$, $p<.05$).

The correlation between the total programming self-efficacy scores and total teaching self-efficacy perception scores of IT teachers and pre-service teachers was tested with correlation analysis with respect to their active duty status and the results are presented in Table 11.

Table 11.

The Results of Correlation Analysis Between Total Programming Self-Efficacy Scores and Total Teaching Self-Efficacy Perception Scores of IT Teachers and Pre-Service Teachers

Active Duty Status	Teacher Self-Efficacy Scale's Subtests and Totals	Computer Programming Self-Efficacy Scale's Totals		
		n	Spearman Correlation Coefficient r (rho)	p
Pre-service IT Teachers	Student Engagement	129	.038	.668
	Instructional Strategies	129	.187	.034*
	Classroom Management	129	.051	.568
	Total	129	.094	.290
IT Teachers who did not actively teach	Student Engagement	86	.521	.000*
	Instructional Strategies	86	.546	.000*
	Classroom Management	86	.467	.000*
	Total	86	.542	.000*
IT Teachers	Student Engagement	246	.455	.000*
	Instructional Strategies	246	.506	.000*
	Classroom Management	246	.424	.000*
	Total	246	.494	.000*

* (p<.05)

Table 11 demonstrates that there was no statistically significant correlation between the total teaching self-efficacy perception scale and the total programming self-efficacy scale scores of IT pre-service teachers ($r=0.094$, $p>.05$). On the other hand, there was a moderate positive correlation between the total teaching self-efficacy perception scale and the total programming self-efficacy scale scores of active IT teachers ($r=0.494$, $p<.05$). Furthermore, there was a high level positive correlation between the total teaching self-efficacy perception scale and the total programming self-efficacy scale scores of non-active IT teachers ($r=0.542$, $p<.05$).

Result and Discussion

In the present study, software and programming skills self-efficacy, teaching self-efficacy and readiness for change of IT teachers and pre-service teachers that were planned to be instructed in information technologies and software courses were investigated based on the variables of gender, type of the school of graduation, experience, active duty status and the level of the school of employment. Study results demonstrated that, among active teachers, the teaching self-efficacy of the male participants was significantly higher when compared to that of the female participants in the context of classroom management. It was determined that self-efficacy of inactive technical or vocational high school graduate participants in student engagement was higher when compared to participants who graduated from other types of high schools. Furthermore, it was determined in the study that teaching self-efficacy perceptions did not differ based on the experiences of IT teachers and pre-service teachers. Based on the study findings, it was determined that university graduate participants with 1-3 years of teaching experience had self-efficacy instructional strategies. It was a remarkable finding that participants considered themselves as sufficient in instructional strategies, even after a short period of experience. It was considered to be due to the fact that the self-esteem of individuals improved as a result of in-service training and considered themselves proficient.

It was observed that there was no difference between the readiness for change of the participants based on the gender and type of the high school of graduation variables. This result supported the findings of a study by Levent (2016). The finding in the literature that teachers who graduated from technical or vocational high schools were more predisposed to readiness for change when compared to the graduates of other types of high schools is interesting (Mazman & Altun, 2013). Even though the software and programming skills are prominent in the IT curriculum, it is an important finding that there was no difference between the readiness for change of the participants based on the type of the high school of graduation. No statistically significant difference in multiple comparisons conducted between sub-dimension and total scores was found when the participants' readiness for change were analyzed based on experience. However, based on this finding, it could be argued that the professional experiences of the teachers made a significant contribution to their development in terms of readiness for possible changes. In the studies found in the literature that were conducted within the scope of the FATİH project that aims to integrate technologies into educational environments, it was observed that the acceptance and ease of use of technologies by the experienced teachers increased (Gürol, Donmuş & Arslan, 2012; Görhan & Öncü, 2015) and therefore they would be ready for change, and teachers with lower computer experience resisted against change (Görhan & Öncü, 2015). Furthermore, there are studies which established that there were differences between the perceptions of teachers on their readiness for change based on gender, and young and inexperienced teachers were more ready for change when compared to the experienced teachers (Er, 2013; Giliç, 2015; Levent, 2016). When these findings are considered, it could be concluded that experience is an important factor in the readiness of the teachers for changes such as curricula updates.

In the study, programming self-efficacy perceptions of IT teachers and pre-service teachers were examined based on Gender, the type of the high school of graduation, and experience. Thus, it was observed that male participants who graduated from the university and were not active teachers achieved higher results in all programming self-efficacy dimensions compared to female participants. It was observed that male participants who were active

teachers performed higher in programming complex tasks and general programming self-efficacy dimensions when compared to female participants. Thus, female participants who do not yet work as teachers felt less competent in programming when compared to male participants. This finding supports the results of previous studies which indicated the teaching self-efficacy perceptions differed in favor of the male students based on gender variable (Morgil, Seçken & Yücel, 2004; Şeker et al., 2005). No significant difference was observed between the self-efficacy perceptions of the teachers. It was noteworthy that when self-efficacy perceptions are considered in the context of gender variable, self-efficacy perceptions demonstrated a significant difference based on experience. These results also support the studies which demonstrated that the perception of teaching self-efficacy does not change based on seniority, in other words, the experience (Gotch & Frech, 2013; Gömleksiz & Serhatlıoğlu, 2013; Keskin, 2006).

It was noteworthy that active female teachers closed the gap with male participants in performing simple programming tasks. However, it was observed that active male teachers had higher self-efficacy perception when compared to active female teachers. Literature review demonstrated that this finding was parallel to that of the studies that stressed programming self-efficacy of the males was higher (Özyurt & Özyurt, 2015; Stoilescu & Egodawatte, 2010), and differed with the results of the studies which showed that there was no difference between programming self-efficacies based on gender (Altun & Mazman, 2012; Ramalingam & Wiedenbeck, 1998; Yağcı, 2016).

When the programming self-efficacy of the participants was examined based on the type of the high school of graduation, it was determined that the self-efficacy of pre-service IT teachers who were technical or vocational high school graduates and were yet to graduate from the university and active IT teachers had higher scores in all dimensions of programming self-efficacy scale when compared to the participants who graduated from other types of high school. Thus, technical and vocational high schools were more active than other high school types in ensuring that their students had higher programming self-efficacy. There are studies in the literature that support this finding (Mazman & Altun, 2013; Ramalingam, LaBelle & Wiedenbeck, 2004), as well as studies that are in conflict (Yağcı, 2016).

The relationship between readiness to change, programming self-efficacy and teaching self-efficacy of IT teachers and pre-service teachers was examined. Based on the study findings, it was determined that there was a significant positive correlation between participants' programming self-efficacy and their readiness for change. The adequate programming self-efficacy of the participants demonstrated that they were ready for change, especially for the planned changes in IT curriculum software skills. Furthermore, there was a positive correlation between all dimensions of the teaching self-efficacy of IT teachers and pre-service teachers and their readiness for change. Thus, the self-efficacy of IT teachers and pre-service teachers in teaching skills is a significant variable for their readiness for the changing IT curriculum. Therefore, initiatives to support teaching self-efficacy perceptions, which are highly effective in the context of adaptation to change, should be stressed during undergraduate programs and practices to achieve this goal should be prioritized.

It was determined that there was a generally positive correlation between programming and teaching self-efficacy of the participants in the study. Bandura (1995) emphasized that self-efficacy perception is shaped by social influences according to the social cognitive theory. Thus, it could be argued that teacher education supported by field knowledge, pedagogical competencies and general cultural interaction would be effective on the self-efficacy perceptions of individuals. The presence of a positive correlation between teaching self-efficacy and programming self-efficacy supports the contextual consistency of the IT curriculum. Given that expectations from the education and personal expectations, especially from teachers, are increasing every day, it has become inevitable for educators to be in the quest for various reforms to welcome these demands and to take innovative initiatives (Kurt, 2016). The adaptation to the change in the IT curriculum and the provision of the best possible instruction in the planned framework require the development of the teaching and programming self-

efficacy levels of IT teachers and pre-service teachers. It is very important for IT teachers and pre-service teachers with low self-efficacy perceptions to achieve improvements in both self-efficacy fields. In particular, the continuous development of the IT field also triggers changes in this field. Rapid adaptation to these changes is closely related to the self-efficacy perceptions both in the field and for the teaching profession in general. In development of these perceptions, pre-service and in-service training would provide significant contributions.

Contributor(s)

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Uzun Öz

Giriş

Bilişim Teknolojileri (BT) ve programlama ders becerilerinin öğrencilere kazandırılmasında BT öğretmenlerinin dersi anlatma veya uygulayarak gösterme gibi hangi öğretim yöntem ve tekniklerini kullandıklarının etkili olduğu düşünülmektedir. Buradan BT öğretmenlerinin öğretmenlik meslek bilgilerinin ve bu bilgilere karşı hissettikleri öğretmenlik öz yeterlikleri önemli olduğu görülmektedir. Bu nedenle öğretmenlerin bu dersi etkili bir şekilde verebilmeleri için öğretmenlik öz yeterliği ve programlama bilgisine karşı öz yeterliği önemli birer faktör olmaktadır. Ayrıca yıllardır aynı eğitim-öğretim sürecini işe koşan BT öğretmenlerinin yazılım ve programlama becerilerini içerecek şekilde değişen yeni kazanımların öğretimine hazır bulunmaları gerekmektedir. Fakat uzun süredir BT öğretmenliği yapan, yeni teknolojilerin gelişmesini ve bunların eğitim süreçlerinde nasıl kullanılabileceği yönünde kendini geliştirmeyen ve yeni gelişmelere açık fikirlerle yaklaşmayan öğretmenler olabilmektedir. Bu nedenle BT öğretmenlerinin güncellenen yeni BT dersini gerçekleştirmeye olan hazır bulunuşluklarının araştırılması gerektiği düşünülmektedir.

Bu araştırmanın amacı; Bilişim Teknolojileri Öğretmenlerinin ve Öğretmen Adaylarının Bilişim Teknolojileri ve Yazılım derslerinde öğretilmesi hedeflenen yazılım ve programlamaya yönelik öz yeterliklerinin, değişime hazır olma durumlarının ve öğretmenlik öz yeterliklerinin çeşitli değişkenler (cinsiyet, mezun olunan okul türüne, deneyime, aktif olarak görev yapıp yapmama durumlarına ve görev yapılan okul düzeyine) açısından incelenmesidir. Ayrıca katılımcıların yazılım ve programlamaya yönelik öz yeterlikleri, değişime hazır olma durumları ve öğretmenlik öz yeterlikleri arasındaki ilişkilerinin irdelenmesi de araştırma amaçları arasında yer almaktadır.

Yöntem

BT Öğretmenlerinin ve öğretmen adaylarının, yazılım ve programlamaya yönelik öz yeterlikleri, değişime hazır olma durumları ve öğretmenlik öz yeterliklerini incelemeye yönelik olarak gerçekleştirilen bu araştırma ilişkisel tarama modelinde desenlenmiştir. Araştırmada Kondakçı, Zayim ve Çalışkan (2010) tarafından geliştirilen Değişime Hazır Olma Ölçeği, Ramalingam ve Wiedenbeck (1998) tarafından geliştirilen Altun ve Mazman (2012) tarafından uyarlanan Programlamaya İlişkin Öz Yeterlik Algısı Ölçeği ve Tschannen-Moran ve Woolfolk Hoy (2001) tarafından geliştirilen Çapa, Çakıroğlu ve Sarıkaya (2005) tarafından uyarlanan Öğretmen Öz Yeterlik Ölçeği ilgili yazarlardan izin alınarak kullanılmıştır. Araştırma verileri Mart-Mayıs 2017 tarihleri arasında toplanmıştır. Araştırmanın çalışma grubu, BT Öğretmenlerinin ve BT Öğretmen Adaylarının katılımı ile oluşturulan forumlar ve çevrimiçi sosyal ağ platformlarına ait gruplar aracılığıyla ulaşılan 461 katılımcıdan oluşmaktadır. Ölçme aracı çevrimiçi yapıda olacak şekilde, ulaşılan 461 BT Öğretmenleri ve Öğretmen Adaylarından elde edilen veriler betimsel istatistikler kullanılarak analiz edilmiştir. Araştırma sorularına yanıt alabilmek üzere orijinal veri seti üzerinde; betimsel istatistiklere ek olarak parametrik olmayan Kruskal-Wallis H testi, Mann-Whitney U testlerinden faydalanılmıştır. Ayrıca, BT Öğretmenlerinin ve Öğretmen Adaylarının, yazılım ve programlamaya yönelik öz yeterlikleri, değişime hazır olma durumları ve öğretmenlik öz yeterlikleri arasındaki ilişkinin belirlenmesi amacıyla Spearman korelasyon katsayıları hesaplanmıştır.

Bulgular

Aktif olarak görev yapıp yapmama durumları bağlamında BT Öğretmenlerinin ve Öğretmen Adaylarının Öğretmenlik Öz Yeterlik Algılarına ait toplam puanlarının, cinsiyet değişkenine göre istatistiksel olarak anlamlı bir farklılık göstermediği görülmektedir ($p>.05$). Ölçeğe ait alt boyutlar irdelendiğinde, aktif olarak öğretmenlik görevi yapan katılımcıların öğretmenlik öz yeterlik algı puanlarının cinsiyet değişkenine göre “öğrenci katılımını sağlama” ve “öğretimsel stratejiler” boyutlarında istatistiksel olarak anlamlı bir farklılık göstermezken, yalnızca “sınıf yönetimi” alt boyutunda istatistiksel olarak anlamlı bir farklılık gösterdiği belirlenmiştir.

($U=6346.50$; $p<.05$). Sıra ortalamaları göz önüne alındığında ilgili farklılığın erkek katılımcılar lehine gerçekleştiği tespit edilmiştir. BT Öğretmenlerinin ve Öğretmen Adaylarının öğretmenlik öz yeterlik algılarına ait alt boyut ve toplam puanları ile deneyim değişkeninin alt düzeyleri arasında gerçekleştirilen çoklu karşılaştırmalarda istatistiksel olarak anlamlı bir farklılık bulunmadığı belirlenmiştir ($p>.05$). Ancak, mezun olduğu halde aktif olarak öğretmenlik görevi yapmayan katılımcıların öğretmenlik deneyimlerinin, ölçeğe ait alt boyutlardan “öğretimsel stratejiler” için gerçekleştirilen çoklu karşılaştırmalarda istatistiksel olarak anlamlı bir farklılık gösterdiği anlaşılmaktadır ($\chi^2_{(3)}=7.933$; $p<.05$).

BT Öğretmenlerinin ve Öğretmen Adaylarının, değişime hazır olma durumlarına ait toplam puanlarının, cinsiyet değişkenine göre istatistiksel olarak anlamlı bir farklılık göstermediği görülmektedir ($p>.05$). Değişime Hazır Olma Ölçeği 'ne ait alt boyutlar incelendiğinde, mezun durumda olduğu halde aktif olarak görev yapmayan katılımcıların “bilişsel” ve “kararlılık” alt boyutlarında istatistiksel olarak anlamlı bir farklılık sergilemedikleri, buna karşın “duygusal” alt boyutu için istatistiksel olarak anlamlı bir farklılık sergiledikleri tespit edilmiştir ($U=703.50$; $p<.05$). Tespit edilen farklılığın erkek katılımcılar lehine gerçekleştiği anlaşılmaktadır. BT Öğretmenlerinin ve Öğretmen Adaylarının değişime hazır olma ölçeğine ait alt boyut ve ölçek genel toplam puanlarının mezun olunan lise türü değişkenine göre istatistiksel olarak anlamlı bir farklılık göstermediği belirlenmiştir ($p>.05$). Genel olarak, BT Öğretmenlerinin ve Öğretmen Adaylarının Değişime Hazır Olma Ölçeğine ait genel toplam puanlarının, deneyim değişkeni bağlamında istatistiksel olarak anlamlı bir farklılık göstermediği tespit edilmiştir ($p>.05$). Ancak, aktif olarak öğretmenlik görevi yapan katılımcıların değişime hazır olma ölçeğinin “kararlılık” alt boyutundan elde ettikleri toplam puan ile deneyim değişkeni istatistiksel olarak anlamlı bir farklılık göstermektedir ($\chi^2_{(5)}=14.647$; $p<.05$).

BT Öğretmenlerinin ve Öğretmen Adaylarının Programlamaya İlişkin Öz Yeterlik Algılarına ait toplam puanlarının, cinsiyet değişkenine göre; mezun durumda bulunmayan katılımcılar ile istatistiksel olarak anlamlı bir farklılık göstermediği tespit edilmiştir ($p>.05$). Buna karşın, mezun olduğu halde öğretmen olarak görev yapmayan katılımcılar ve hâlihazırda öğretmenlik yapan katılımcılardan elde edilen puanların cinsiyet değişkenine göre Programlamaya İlişkin Öz Yeterlik Algılarında istatistiksel olarak anlamlı bir farklılık gösterdiği tespit edilmiştir ($p<.05$).

Aktif olarak öğretmenlik görevi yapmayan BT Öğretmenlerinin ve Öğretmen Adaylarının; değişime hazır olma durumları ile programlamaya ilişkin öz yeterlik algıları arasında düşük düzeyde, pozitif yönlü bir ilişki olduğu sonuçlarına ulaşılmaktadır. Aktif olarak öğretmenlik görevi yapan BT öğretmenlerinin ise değişime hazır olma durumları ile programlamaya ilişkin öz yeterlik algıları arasında orta düzeyde, pozitif bir ilişkinin varlığı dikkat çekmektedir ($r=0.379$, $p<.05$). BT Öğretmenlerinin ve Öğretmen Adaylarının; değişime hazır olma toplam puanları ile öğretmenlik öz yeterlik ölçeği ve ölçek alt boyutlarına ait toplam puanları arasında orta düzeyde, pozitif yönlü bir ilişki olduğu sonuçlarına ulaşılmıştır. BT öğretmen adaylarından mezun durumda bulunmayan katılımcıların; öğretmenlik öz yeterlik algısı ölçeğine ait toplam puanları ile programlamaya yönelik öz yeterlik ölçeğinden elde ettikleri toplam puanlar arasında istatistiksel olarak anlamlı bir ilişki bulunmamaktadır ($r=0.094$, $p>.05$).

Tartışma ve Sonuç

Araştırmada BT öğretmenlerinin ve öğretmen adaylarının programlamaya yönelik öz yeterlik algıları cinsiyete, mezun oluna lise türüne ve deneyime göre incelenmiştir. Buna göre üniversiteden mezun olup öğretmenlik mesleğini yapmayan erkek katılımcıların programlamaya ilişkin tüm öz yeterlik boyutlarında kadın katılımcılara göre anlamlı derecede yüksek sonuçlar elde ettiği görülmüştür. Öğretmen olarak görev yapan katılımcıların ise karmaşık programlama görevlerini gerçekleştirme ve genel programlama öz yeterliği boyutlarında erkek katılımcılar lehine yüksek farklılıklar sergiledikleri gözlenmiştir. Buna göre henüz öğretmen olarak çalışmayan kadın katılımcılar programlama öz yeterliğinde erkek katılımcılara göre kendilerini

daha az yeterli hissetmektedir. Bu durum ise öğretmenlik öz yeterlik algılarının cinsiyet değişkenine göre erkek katılımcılar lehine farklılık gösterdiğini ortaya koyan çalışmaları destekler niteliktedir (Morgil, Seçken ve Yücel, 2004; Şeker ve diğerleri, 2005). Öğretmenlerin öz yeterlik algılarında deneyim durumları göz önüne alındığında anlamlı bir farklılık gözlenmemiştir. Cinsiyet değişkeni bağlamında öz yeterlik algıları göz önüne alındığında ise öz yeterlik algılarının deneyim ile bağlantılı olarak, anlamlı bir farklılık sergilediği dikkat çekmektedir. Bu sonuçlar öğretmenlik öz yeterlik algılarının hizmet sürelerine yani deneyime göre değişmediğini ortaya koyan çalışmaları da destekler niteliktedir (Gotch ve Frech, 2013; Gömleksiz ve Serhatlıoğlu, 2013; Keskin, 2006).

Araştırma sonuçlarına göre katılımcıların programlamaya yönelik öz yeterlikleri ile değişime hazır olmaları arasında pozitif yönde anlamlı bir ilişki olduğu gözlenmiştir. Katılımcıların programlamaya yönelik olarak kendilerini yeterli düzeyde hissetmeleri, özellikle, yazılım becerilerine yönelik BT öğretim programında planlanan değişime hazır olduklarını da göstermektedir. Ayrıca BT öğretmenleri ve öğretmen adaylarının öğretmenlik öz yeterlikleri ile değişime hazır olmaları arasında tüm boyutlar çerçevesinde pozitif yönlü anlamlı bir ilişki bulunmuştur. Buna göre BT öğretmenleri ve öğretmen adaylarının değişen BT öğretim programına hazır olmalarında kendilerini öğretmenlik becerileri anlamında yeterli hissetmeleri önemli bir değişken olarak karşımıza çıkmaktadır. Dolayısıyla değişime adapte olma bağlamında oldukça etkili olan öğretmenlik öz yeterlik algılarının lisans eğitimi sürecinde desteklenmesine yönelik girişimler ön planda tutulmalı ve bunu sağlamaya yönelik uygulamalara öncelik verilmelidir.