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The Perception of Educational Software Development Self-Efficacy among Undergraduate CEIT Teacher Candidates

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The objective of this study was to analyze self-efficacy perceptions for education software development of teacher candidates studying at Department of Computer Education and Instructional Technologies, with respect to a range of variables. The Educational Software Development Self-Efficacy Perception Scale was used as data collection tool. Sixty teacher candidates participated in the study. Independent sample t-test and canonical correlation were used as the data analysis techniques in the study. At the end of the study, it was determined that there is a weak correlation between teacher candidates' general academic performance and their self-efficacy perception for educational software development, and self-efficacy perception does not vary with gender. A significant difference in favor of 4th year undergraduates was established with respect to year of study. Also, a positive correlation was found between teacher candidates' self-efficacy perceptions in sub-dimensions of the scale and their achievement in the relevant courses.

Keywords: self-efficacy, self-efficacy perception, educational software development, computer and instructional technologies, teacher candidates

Today, computers are becoming tools commonly used in many educational institutions and courses. However, it has been discussed since the date computers have entered into the education sector that some teachers are more willing to use computers whereas some avoid using them (Bitner & Bitner, 2002). Indeed, since use of computers as a teaching tool in educational institutions is a feature that is expected from teachers, teacher competencies specified by Higher Education Council (HEC, 1999) in Turkey include benefiting from information technologies. Computer I, Computer II and Instructional Technologies and Material Development courses are included in teacher education programs so that teachers gain this competence, aiming to ensure that teacher candidates effectively use information technologies during teaching process, when they become teachers. Although this situation is applicable for all teacher candidates in different departments studying at faculties of education, teacher candidates studying at Department of Computer Education and Instructional Technologies (CEIT) are expected to perform much better in use of information technologies.

CEIT Departments were opened for the first time in Turkey in 1998 pursuant to "Restructuring Faculties of Education" and teacher competencies of the department have been defined or updated by the Ministry of National Education (MNE) since then (MNE, 2002, 2006). Accordingly, job definition of teachers graduated from this department has changed over time. Because ensuring that the students acquire knowledge and skills related to development of educational software is one the fundamental objectives of the department, graduates of the department can work as "Computer Teacher" in both primary and secondary education as well as in institutions

or organizations where they can work on the development of teaching materials (Aşkar & Dönmez, 2004).

Multi-faceted expertise is required by educational software development so course schedule of CEIT Departments include more than one course on educational software development. Examples of such courses can be instructional design, authoring language in PC environment, instructional technology and material development, programming languages I and II, using materials in education, authoring language in the internet environment, and design and evaluation of educational software. Advances in the field of education as well as changes in the Internet and distance education have led to an exponential increase in the need to develop educational software (Roschelle et al., 1999) and recently a famous project called "Movement for Increasing Opportunities and Improving Technology" was brought to the agenda by the Ministry of National Education in Turkey. With this project, 42,000 schools and 570,000 classes will be turned into computerized education classes equipped with latest information technologies. This project has 5 components; providing equipment and software infrastructure, providing educational e-content and management of e-content, effective usage of the ICT in teaching programmes, in-service training of teachers, conscious, reliable, manageable and measurable ICT usage. With respect to this project, the quality of CEIT teachers is expected to increase in Turkey.

Educational software development concept includes any software that is developed for use in teaching activities and runs on computers or computer-based systems. According to Johnson and Schleyer (2003), effective software development training requires a systematic process conducted by a team of experts. Steps of this process are analysis, design, development, implementation, maintenance and evaluation and the team may include teaching designers, web specialists, multimedia producers and programmers. Students may face some difficulties while developing educational software. For example, all students may not have sufficient knowledge and skills to use pieces of software such as Captivate, Visual Studio required to develop educational software or to develop database applications. Naturally, they may need to develop strategies to overcome the difficulties. Individuals' perceptions for whether they will efficiently use the strategies they have developed to overcome the difficulties or whether they'll be successful are associated with self-efficacy (Pajares & Schunk, 2001). Self-efficacy theory is an important component of Bandura's social cognitive theory. Self-efficacy means an individual's own judgment about his capacity to organize and successfully perform activities necessary to demonstrate a certain performance (Senemoğlu, 2000). Self-efficacy covers much more than knowledge and skills, and also incorporates the individual's own ability to efficiently use his/her own capacity (Bandura, 1977). Self-efficacy refers to self-perceptions or beliefs of capability in order to perform a task at a specified level (Bandura, 1986). However, the individual can not have the same perception of efficacy with regard to each case because self-efficacy is not a general pattern and may vary depending on the circumstances of the individual, the subject and the work (Bandura, 2001). Therefore, it is observed that in recent years, there's been an effort to determine self-efficacy for a specified area and performance such as "computer self-efficacy." Compeau and Higgins (1995) define computer self-efficacy as the individual's judgment on his ability to use a computer. It was reported that any attitudes towards computer technologies are related to the concept of computer self-efficacy, which is an important variable in understanding frequency of computer use by individuals and their performance in using computers (Compeau & Higgins, 1995; Delcourt & Kinzie, 1993; Kinzie, Delcourt, & Powers, 1994).

As seen in the studies on self-efficacy in computer field in the literature, it is apparent that most of the studies have focused on computer usage skills. In one of these studies carried out within the scope of effectiveness of information literacy program by Kurbanoğlu and Akkoyunlu (2002), at the end of a teaching process, a moderate relationship was found between teacher candidates' computer self-efficacy perceptions and their information literacy skills, and it was concluded that teacher candidates need more information in the areas of information literacy. A supporting study by Köseoğlu, Yılmaz, Gerçek and Soran (2007) for the purpose of investigating the effect of a computer course on achievement, attitude and self-efficacy beliefs on computers concluded that the course has a significant effect on developing computer self-efficacy of students.

Orhan (2005), however, found a high positive relationship between computer usage self-efficacy perceptions of CEIT teacher candidates and their computer teaching self-efficacy perceptions as a result of a study conducted on a total of 296 students from 8 different universities. Usluel and Seferoğlu (2004) investigated the relationship between computer usage levels of 186 academics working in faculties of education and their self-efficacy perceptions regarding computer use and established that most of the participants use information technology and have in general a sufficient level of self-efficacy perceptions regarding computer use. In addition to this, it was emphasized in this study that the problems experienced by the participants in the use of information technology arise from reasons such as hardware, physical conditions and lack of education.

In a study by Akkoyunlu and Orhan (2003) investigating the correlation between computer use self efficacy belief of CEIT students and their demographic characteristics, it was concluded that self-efficacy does

not make a significant difference by gender, a meaningful difference appeared in favor of General High School graduates in terms of alma mater, and self-efficacy increased over time within teaching activities. Despite high number of similar studies in the literature (Ekici & Uzun, 2007; Kutluca, 2009; Kutluca & Ekici, 2010; Seferoğlu & Akbıyık, 2005), there is rather limited number of studies on self-efficacy perception regarding educational software development. In one of these studies, Ateş (2010) examined the change in self-efficacy perception for educational software development of 46 CEIT students after they took the course, Design Development and Evaluation of Educational Software, which was found to have provided a significant improvement in students' self-efficacy perception for educational software development, and the study also determined that while there was a significant difference in favor of male participants and the participants who have prior knowledge of programming before the course, such difference disappeared at the end of the course.

In another study, Demirer, Özdinç and Şahin (2009) analyzed CEIT teacher candidates' self-efficacy perceptions for educational software development using variables of gender, alma mater, and year of study and concluded that self-efficacy perceptions for educational software development do not vary with gender and a significant difference arose in favor of graduates from Vocational High Schools and students at higher year of study. İmer and Özkılıç (2009) studied sub-dimensions of self-efficacy perception for educational software development in 296 CEIT teacher candidates with respect to gender variable, and reached to the conclusion that no significant difference was caused by gender in sub-dimensions of project management and instructional design, graphic design and programming, and a significant difference in favor of male participants was observed in sub-dimension of animation audio-video design.

Given the studies on this subject, a significant correlation is observed in general between self-efficacy perception of an individual and his/her performance in that area. Moreover, it is possible to say that there is a positive relationship between self-efficacy perception and experiences. Limited number of studies conducted on self-efficacy perception for educational software development show that this perception has been generally investigated using variables, including gender, type of alma mater and experience. However, among these studies, there is no study that investigates the relationship between courses taken by teacher candidates for educational software development within their curriculum and sub-dimensions of self-efficacy perception for relevant educational software development. By virtue of this unique aspect, this study is expected to contribute to the literature related to teacher training. In addition, considering that one of the main targets of CEIT departments is to ensure that teacher candidates gain educational software development skills, it is reasonable to state that the studies to be conducted on the candidates' self-efficacy perceptions for educational software development are important in terms of quality of teacher training. Based on these considerations the aim of this study was to investigate the correlation between CEIT teacher candidates' Self-Efficacy Perception for Educational Software Development and their performance in the courses, namely Instructional Design, Authoring Languages in PC Environment, Graphic Design and Programming Languages. Accordingly, research questions were structured as follows:

1. Is there a significant relationship between undergraduate teacher candidates' general academic performance and their total scores in Educational Software Development Self-Efficacy Perception (ESDSEP) Scale?
2. Does undergraduate teacher candidates' self-efficacy perception for educational software development vary with gender?
3. Does undergraduate teacher candidates' self-efficacy perception for educational software development vary with year of undergraduate study?
4. What is the correlation between undergraduate teacher candidates' scores for sub-dimensions of ESDSEP Scale such as project management and instructional design, graphic design, animation audio - video and programming and their achievement scores for Instructional Design, Authoring Language in PC Environment, Instructional Technology and Material Development and Programming courses which are thought to be related with the sub-dimensions?

Method

This study is a survey model type research. In the following sections, study group, data collection tools, data analysis techniques and procedure will be explained.

Study Group

We sent e-mails to a total of 90 teacher candidates who were 3rd and 4th year undergraduates from Uludağ University, Department of CEIT to invite them to participate in the study. The teacher candidates (27 females and 33 males) replied to the invitation and constituted the study group. Twenty nine participants were 3rd year and thirty one participants were 4th year students.

Data Collection Instruments

The participants' gender, year of undergraduate study, general grade point average and final exam scores in the courses of Instructional Design, Authoring Languages in PC Environment, Instructional Technology and Material Development and Programming Languages were collected as demographical data. In addition to these, ESDSEP Scale (Aşkar & Dönmez, 2004) was

applied to the participants. During the course of developing ESDSEP, researchers first examined software development process in institutions developing educational software and sought opinions from specialists. They determined sub dimensions of educational software development process in accordance with these opinions and wrote expressions related to these dimensions, indicating self efficacy perception. The scale was developed by participation of a total of 283 teacher candidates studying at CEIT departments of 4 different universities in Turkey. The results of principal components analysis showed that 22 items grouped under 4 factors with an equity value larger than 1. These factors were called as project management and instructional design (10 items), animation audio - video design (6 items), graphic design (3 items) and programming (3 items). According to the data obtained, these four factors explain 68.3% of test scores.

Participants give points to each item in the scale according to the scale of 100 ("0", I never rely on, "100" I always rely on). As a result of the points given by the participants, a total score reflecting self-efficacy perception for the process of educational software development as well as scores reflecting the perception regarding the sub-dimensions can be calculated.

Aşkar and Dönmez (2004) calculated reliability coefficient as .92 according to the total score of the scale. The reliability coefficients of project management and instructional design, animation audio - video design, graphic design and programming sub-dimensions were calculated as .91, .90, .80, .85 respectively (Aşkar & Dönmez, 2004). We found the reliability coefficient of the total scale as .89, and for project management and instructional design, animation audio - video design, graphic design and programming sub-dimensions as .83, .81, .79, .80 respectively in the pilot study conducted on 126 students studying in the department of CEIT, for the purpose of using the scale in this study.

The scale has been used by various researchers in Turkey since its development (İmer & Özkılıç 2009; Demirer et al., 2009; Akyüz & Kurt, 2010). This scale was used in this study because it was particularly developed to measure self-efficacy perception of teacher candidates from a CEIT department for developing educational software, and was also used for the same purpose in the literature.

Data Analysis

During the investigation, data comprising participants' self-efficacy perception, gender, year of undergraduate study, general grade point average and their final exam scores in the courses of Instructional Design, Authoring Languages in PC Environment, Graphic Design and Programming Languages were collected. Independent sample t-test was used for demographic variables such as gender and year of study. The correlation coefficient between total score of ESDSEP Scale and general grade point average was calculated. The correlation between sub-dimensions of the scale and student's performance in the courses regarding these sub-dimensions were analyzed by canonical correlation analysis.

Canonical correlation analysis is one of the multivariable analysis methods used to study the correlation between two variable sets. It is a statistical technique developed by Hotelling (1936). It is used as a statistical method investigating the mutual correlation between many independent and dependent variables (Pugh & Hu, 1991). Although it is not a necessity in this method, one of the variable sets is considered as dependent and the other is considered as independent set of variables. The method aims to obtain new canonical variables from the linear components of variables available in each set. This analysis method is a complex method investigating a large number of variables in two sets of variables in terms of the correlations among themselves as well as with the variables in the other set.

In canonical correlation analysis, canonical weight is the basic linear correlation between the original variable and its own canonical variable. This allows determination of the extent of contribution of such variable to its own canonical variable, thus to the canonical correlation coefficient. Factor loading represents basic linear correlations between original variables available in variable set 1 (e.g., on the left) and canonical variables on the right or basic linear correlations between original variables available in variable set 2 (e.g., on the right) and canonical variables on the left (Lorcu & Bolat, 2009).

Procedures

In the study, we transferred information form prepared to collect demographical data of the participants and ESDSEP Scale to the Internet by Google Documents. Google Documents is a web-based service which is provided free of charge by Google and helps to store online data, create files such as electronic tables, presentations, etc. as well as electronic forms. This service was recently renamed as Google Drive. We sent teacher candidates invitation e-mails including the web address link of data collection tool drawn up as an electronic form in online medium. Sixty teacher candidates who volunteered to participate in the study completed the transferred data online by the link in their invitation e-mails. We drew up this data by transferring them to Excel spreadsheets through Google Documents interface. We analyzed the data by Excel and SPSS programs.

Results

The findings of the survey are presented in this part of the study. Firstly, we examined the distribution of the responses given by participants to ESDSEP Scale, by Kolmogorov-Smirnov test for single sample in order to decide on statistical data analysis techniques to be conducted on the responses. As known, single sample

Table 1
Kolmogorov-Smirnov Test Results of ESDSEP Scale

N	$\bar{X}$	s	z	P
60	66.12	17.57	1.004	.266

Table 2
ESDSEP Scale t-test Results of by Gender

Groups	N	$\bar{X}$	s	t	p
Female	27	63.67	17.802	-.977	.333
Male	33	68.12	17.392		

Table 3
ESDSEP Scale t-test Results by Year of Study

Groups	N	$\bar{X}$	s	t	P
3rd year	29	56.59	17.352	-4.748	.000
4th year	31	75.03	12.497		

Kolmogorov-Smirnov test is used to determine whether the data distribution is normal or not. Test results are given in Table 1.

When the data in Table 1 were examined, it was seen that the distribution of responses given by the students to ESDSEP Scale was normal ($p>.05$). Therefore, it was decided that parametric tests are suitable for analyzing this data.

First research question was "Is there a significant relationship between teacher candidates' general grade point average and their total scores in ESDSEP Scale?" In order to find an answer to this question, Pearson correlation coefficient calculated between these variables was found as .174. Therefore, it can be concluded that there is a very weak correlation between these two variables.

In order to find an answer to the second research question "Does teacher candidates' self-efficacy perception for educational software development vary with gender?", we used independent sample t-test to determine if there is any significant difference between self-efficacy scores of female and male students.

According to the data in Table 2, p value (.333) is larger than .05. Hence, it is not possible to reject H0 hypothesis. In other words, there is no significant difference between female and male students' total scores of ESDSEP Scale.

Third research question was represented as "Does undergraduate teacher candidates' self-efficacy perception for educational software development varies with year of study?" In order to answer this question, we used independent sample t-test to determine if there is any significant difference between self-efficacy scores of undergraduate teacher candidates in 3rd and 4th year.

According to the data given in Table 3, a significant difference was found between 3th and 4th year undergraduate teacher candidates ($p<.05$). In other words, teacher candidates studying at 4th year feel more confident than teacher candidates studying at 3rd year on educational software development self-efficacy.

Fourth research question of the study is on the correlation between 4 sub-dimensions of ESDSEP Scale and the students' achievement scores in 4 courses related to these sub-dimensions. We performed canonical

Table 4
Eigen values of Canonical Correlation Results for Left and Right Side and Their Variances

		Root 1	Root 2	Root 3	Root 4
Eigen values		.314	.188	.030	.000
Explained variance	Left	.687	.123	.105	.083
	Right	.222	.302	.216	.260

Table 5
Wilk's Lamda Test Results of Canonical Roots

	Canonical R	Canonical R^2	X^2	Sd	p	Wilk's Lambda
Root 1	**.561**	**.314**	**33.655**	**16**	**.006**	**.539**
Root 2	.434	.188	13.091	9	.159	.786
Root 3	.175	.030	1.727	4	.786	.969
Root 4	.028	.001	.042	1	.838	.999

correlation analysis in order to find an answer to this research question. In this analysis, left side represents 4 sub-dimensions of ESDSEP Scale, namely project management and instructional design (PMID), graphic design (GD), animation audio-video design (AAVD) and programming (P), and the right side represents 4 courses associated with these dimensions, namely Instructional Design (ID), Authoring Languages in PC Environment (ALPE), Instructional Technology and Material Development (ITMD) and Programming Languages (PL), which are included in course schedule of Department of CEIT. Table 4 shows eigenvalues (roots) obtained from this analysis and their variances.

Considering Table 4, it is apparent that the number of Eigen values obtained from this study is four. Explained variances of the left side dramatically decreases as from Root 1. However, there is no such thing for the right side. Moreover, it is obvious that explained variance of the Left Side for Root 1 is much higher than the explained variance of the Right Side. Wilk's Lamda test results used to test statistical significance of canonical roots in Table 4 are given in Table 5.

Data in Table 5 demonstrate that only Root 1 is statistically significant ($p<.05$). In other words, only one statistically significant canonical root was found to describe the correlation between two sets of variables. Therefore, since the other roots were not found statistically significant, they won't hereinafter be taken into account in the analyses. Canonical weights for the right and left sides are given in Table 6 and Table 7, respectively.

From the canonical weights in Table 6, it is apparent that PL has the highest positive correlation, followed by ITMD. Similar results were obtained for factor loading. In other words, it is revealed that correlations of PL and ITMD original variables on the right side with their own canonical variable as well as their canonical component on the left are high.

Table 6
Table of Canonical Weights for the Right Side

	Right side	
	Canonical weights	Factor Loading
ID	-0,426803	0,029994
ALPE	-0,331923	-0,255403
ITMD	**0,605869**	**0,490103**
PL	**0,827792**	**0,762377**

Table 7
Table of Canonical Weights for the Left Side

	Left Side	
	Canonical weights	Factor Loading
PMID	**0,390363**	**0,911462**
GD	**0,803604**	**0,968928**
AAVD	-0,083522	**0,753134**
P	-0,111394	**0,642158**

From the canonical weights in Table 7, it is apparent that GD has the highest positive correlation. In other words, GD original variable has the highest correlation along with its own canonical variable. Correlations of the other three variables (left side) with their own variables were found to be pretty low. However, according to Table 7, it is clear that all original variables on the left correlate rather high with canonical variables on the right.

According to these results, there is clear evidence that ITMD and PL variables on the right correlate well with their own canonical variables as well as the canonical component of the left side. On the contrary, it is evident that the variables on the left do not correlate with their own canonical variable (except for GD), however, that they correlate well with the canonical variable on the right side.

Discussion

Promoting the use of technological products such as smart boards, tablet computers in educational institutions during teaching-learning activities lead to a growing need for educational software. This change will lead CEIT teacher candidates to the duty of encouraging the students in educational institutions they'll work in the future to develop their computer literacy skills, use computer-assisted teaching as well as to the field of educational software development. When CEIT teacher candidates' self-efficacy perceptions for educational software development are high, they'll make more effort to accomplish their work, and work more in a patient and persistent manner to solve the difficulties they face.

According to the findings obtained from this research, it is apparent that there is a weak correlation between teacher candidates' general academic achievement and their total scores in ESDSEP Scale. Given the studies investigating the correlation between self-efficacy and academic achievement, it is evident that a positive strong correlation exists between these two variables. For example, in a study by Doğan, Beyaztaş and Koçak (2012), it was stated that self-efficacy scores

of the students is a strong indicator for predicting their achievement in the Social Sciences course. In the investigation by Yıldırım (2011), it was concluded that self-efficacy has a positive influence on performance in mathematics. According to these results, it is remarkable that self-efficacy for a course correlates well with academic achievement in that course. However, our study cannot fulfill the expectation that there must be a stronger correlation between self-efficacy perception for educational software development and general academic achievement.

According to another result obtained from the research, it was apparent that there is no significant difference between self-efficacy perception for educational software development of female students and male students. This result is supported by the findings obtained from the studies by Akkoyunlu and Orhan (2003), Demirer et al., (2009) and Ateş (2010). It is possible to encounter studies in the literature which concluded that gender variable causes a significant difference (İmer & Özkılıç, 2009). Therefore, our findings on this matter are in line with some of the studies in the literature, however, contradict with others. Therefore, much different studies should be performed on this subject.

As known, self-efficacy perception shows an increase within teaching activities over time (Akkoyunlu & Orhan, 2003). Indeed, a significant difference was observed between self-efficacy perception for educational software development of teacher candidates studying at 3rd and 4th year. The difference was in favor of 4th year undergraduate teacher candidates. These findings show similarity with many studies in the literature (Akkoyunlu & Orhan, 2003; Ateş, 2010; Demirer et al., 2009; Köseoğlu et al., 2007). In other words, 4th year undergraduate teacher candidates are more likely to have higher self-efficacy feelings since they studied educational software development topic longer than 3rd year undergraduate teacher candidates did.

Canonical correlation analysis was applied to determine the relationship between sub-dimensions of ESDSEP Scale (left side) and final exam scores of the courses thought to be in relation with such dimensions (right side). The results of the analysis obtained for the right side showed that two of the canonical weights were high and positive (ITMD and PL), while the remaining two were low and negative (ID and ALPE). This suggests that the scores obtained from the scale can be used to explain achievement scores in ITMD and PL courses. It appears that grades obtained from ID and ALPE courses could not be explained by scale scores.

In other words, there is a positive correlation between the students' performance status in these courses (ITMD and PL) and their self-efficacy perception for educational software development. However, it should also be noted that all these statements are limited by a variance of .222 in Table 4.

The results of the analysis obtained for the left side showed that two of the canonical weights were high and positive (PMID and GD), while the remaining two were low and negative (AAVD and P). This demonstrates that GD and PMID subdimensions of the scale have high canonical weight than other dimensions in explaining course performances. It is evident that neither AAVD nor P can be used to explain course performances. When compared with analysis results of right side, it is apparent that the variance (.687) explained for the left side is significantly high (Table 4). Therefore, the variables on the left side have a greater effect in explaining canonical structure compared to the variables on the right.

In this respect it was concluded that the training program and teaching activities in the department should be reviewed once more. In existing curriculum, teacher candidates take 46 courses with a total of 150 credits. Total hours of practice in these courses are 53. Only 8 of these courses are aimed at teacher candidates' abilities to develop educational software. These courses have 26 credits and 12 hours of practice in total. As can be seen, number of courses and hours of practice for developing a significant skill for CEIT teacher candidates are very limited. In particular, increasing number of courses, their credits and hours of practice would significantly contribute to teacher candidates' self-efficacy perceptions for developing educational software. The findings of this research point to a need for reviewing contents of the courses, including ID and ALPE, teaching methods, and their assessment methods. For example, instructional designs that allow for group works while these courses are being taught, use of project-based teaching and preparation of higher number of educational software projects should be created. Designing learning environments of the courses in the department by placing the students in the center of learning activities, encouraging them for cooperative learning activities and providing them real-life experiences in their projects may contribute to achieving this target.

As known, it is not possible to match one-to-one the contents, goals and learning gains of the courses selected in the study with relevant sub-dimensions of the scale, however, a match was made based on the course titles. In addition to this, measuring and evaluation activities applied during the courses were also not planned according to the scale used. Moreover, CEIT training program, which was in practice during the period of the study, does not contain courses that are fully compatible with all sub-dimensions of the scale. All these factors can explain the lack of any strong correlation between all sub-dimensions of the scale and the courses thought to be related with these sub-dimensions. It appears that relevant courses in the program and the scale should be

reorganized, their content analyses should be done and new investigations are required. In consideration of the major project called as "Movement for Increasing Opportunities and Improving Technology", the self-efficacy perception for educational software development will be much more important for future CEIT teacher candidates. Because, "providing educational e-content and management of e-content", one of the components of the project, is directly related to the ability of developing educational software.

Even though the measurement tool meets the necessary criteria in terms of reliability and validity, it should be considered as one of the limitations of the study that it measures a complex structure like self-efficacy. Moreover, participants of the study are limited to 60 teacher candidates studying for a bachelor's degree in Uludag University, Faculty of Education, Department of CEIT. Considering the number of all teacher candidates studying in Departments of CEIT in Faculties of Education throughout Turkey, this number is rather low to make a generalization. For these two reasons mentioned above, it is evident that new research studies in which measurement tool is used on larger samples are needed to be able to generalize the findings of the research.

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