Journal of Computer and Education Research
October 2023 Volume 11 Issue 22 (ISSN:2148-2896)
http://dergipark.org.tr/jcer

Research Article

Secondary School Teachers' Self-Efficacy Beliefs Regarding Information Technology

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Article Info

Received: *28 October 2022*
Accepted: *07 January 2023*

Keywords: Distance education, self-efficacy, information technology, Covid-19, teachers

10.18009/jcer.1344348

Publication Language: English

Abstract

Due to the rapid growth of technology, technological devices have begun to influence every aspect of our lives. In addition, technology is used extensively in education. Technology in education has several benefits, including allowing students to actively participate in lessons, creating a multi-learning environment, and making learning permanent. Therefore, teachers are expected to integrate technology into their lessons. Teachers' usage of technology tools has increased daily since the entrance of COVID-19 into our lives and the continuance of education as distance education. This research aims to determine teachers' self-efficacy in using information technologies. The survey research model was a quantitative research technique employed in this investigation. Two hundred eleven instructors employed in Balıkesir secondary schools for the academic year 2021–2022 make up the study group in this study. Teachers' self-efficacy is high due to the research; In terms of gender, age, branch, type of institution or education level, there was no noticeable difference. The conclusion reached was that there was a substantial difference based on undergraduate computer education.

To cite this article: Öztuzcu, Ö. & Mısırlı, Z.A. (2023). Secondary school teachers' self-efficacy beliefs regarding information technology. *Journal of Computer and Education Research*, *11* (22), 952-965. https://doi.org/10.18009/jcer.1344348

Introduction

People have struggled with various diseases from the past to the present. The COVID-19 pandemic is one of the illnesses that is currently being battled. People in various communities have been negatively impacted by the COVID-19 epidemic (Çakın & Külekçi Akyavuz, 2020). One of the areas affected by the pandemic is education (Türker & Dündar, 2020). Countries affected by the pandemic have taken various measures to prevent the spread of Covid-19, such as curfews, closure of schools, and restriction of travel. The emergency distance education [DE] process was started to ensure the continuity of education. DE is an education system that allows students and teachers to meet online through technological tools, regardless of place and time, in a completely virtual environment, where lessons can be taught synchronously (simultaneously) or

asynchronously (asynchronously). There are some differences between DE and emergency DE (Bozkurt, 2020). Among these differences (Bozkurt, 2020), While the DE is an option, the emergency DE is a necessity; as the DE creates long-term strategies for lifelong learning, the urgent DE develops temporary solutions for the need, while the emergency DE aims to continue training in a planned way for a purpose. It aims to ensure the continuity of education in times of crisis. In the DE process, which passed with the detection of the Covid-19 case in Turkey, teachers assigned the hours and days of their lessons through platforms such as EBA Live Lesson, Zoom, Google Meets and Microsoft Teams. They met with their students on the relevant platform on the specified days and hours. In this process, where technological tools are used intensively, the importance of using technology in education has been better understood.

The concept of self-efficacy is based on the principle of mutual determination, one of the basic principles of social-cognitive theory developed by Albert Bandura. According to the mutual determinism principle of the social-cognitive theory, the behaviour of individuals is affected by the environment they live in, the behaviours that the individual has previously exhibited and personal factors. It is known that some concepts are effective in the formation of individuals' self-efficacy beliefs, and according to Bandura, the concepts affecting individuals' self-efficacy beliefs are the individual's own experiences, the individual's indirect experiences, verbal persuasion, and physiological-psychological state (Arseven, 2016; Köroğlu, 2018; Tepe, 2011). While individuals' own experiences can enable individuals to form solid self-efficacy beliefs, the psychological state of individuals while performing an action also affects their self-efficacy beliefs (Tepe, 2011). Individuals with a low level of psychological stress and anxiety have a higher self-efficacy belief in completing a job successfully (Arseven, 2016). At the same time, according to Bandura, individuals tend to imitate the behaviours of those they take as models, and therefore, successful, or unsuccessful experiences of the individuals they model affect the self-efficacy belief of individuals (Arseven, 2016; Tepe, 2011). The concept of verbal persuasion refers to encouraging individuals to achieve success. Giving positive advice can increase the individual's self-efficacy belief, while giving negative advice can reduce the individual's self-efficacy belief (Tepe, 2011).

There is research in the literature that examines the self-efficacy of instructors. Seferolu and Akbıyık (2005) examined the computer self-efficacy of instructors The study's

findings demonstrated that teachers' computer self-efficacy was moderate and did not change by gender or school type. Govender and Govender's (2009) study aimed to investigate teachers' self-efficacy concerning information and communication technologies and their technology integration in education. As a consequence of the research, it was shown that instructors have a modest level of self-efficacy. Şahin and Göçer (2013) intended to examine the computer self-efficacy of instructors.

The research concluded that teachers' levels of self-efficacy were modest and that instructors' self-efficacy varied according to gender and branch characteristics but not seniority. Çetin and Güngor (2014) investigated the association between instructors' computer self-efficacy and their views on computer-assisted instruction. The research concluded that their self-efficacy was adequate and that the self-efficacy of male teachers was higher. Yalçınkaya and Özkan's (2014) study aimed to measure teachers' self-efficacy in using interactive whiteboards. The investigation revealed that male teachers had higher levels of self-efficacy. Köroğlu and Demiriz (2015) aimed to examine teachers' information technology [IT] self-efficacy, attitudes towards using technological equipment and their innovativeness levels, and as a result of the research, teachers' ICT self-efficacy perceptions were found to be high according to gender, age, seniority, and ICT education variables. It was concluded that there was no difference. Doğru, Şeren & Koçulu (2017) aimed to examine teachers' technology use self-efficacy. As a result of the research, Teachers' self-efficacy was determined to be consistent throughout gender and being a computer laboratory. Still, it differed according to the variables of age and seniority.

In the literature, studies examine teachers' self-efficacy in using computers and IT. Addressing the teachers' self-efficacy in using IT in the DE process during the COVID-19 epidemic is believed to contribute to the field. This study is important because it can provide insights into the challenges and opportunities that teachers face in using IT in the DE process, and how their self-efficacy can affect their performance and satisfaction. From this point of view, this research aims to determine the teachers' self-efficacy in using IT in the DE process. The following questions had to be addressed to accomplish this goal:

- What is the level of teachers' self-efficacy regarding their use of IT in the DE process?
- Do teachers' self-efficacy for using IT in the DE process differ according to demographic variables (gender, age, type of institution, branch, education level, computer education in undergraduate education)?

Method

One of the quantitative research methodologies used in this study was the survey research model. Survey studies According to Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel (2016), the participants' interests, attitudes, etc., related to a subject or a situation. It is defined as studies in which the research characteristics are determined and carried out with larger samples than other research models.

Sample

The research sample consists of 211 secondary school teachers in the province of Balıkesir for the academic year 2021-2022. The study sample was picked using a convenient sampling technique. According to Büyükoztürk et al. (2016), the convenient sampling approach is the collection of data from a readily accessible sample. The distribution of the participants' demographic features is displayed in Table 1.

Table 1. The distribution of participants regarding their demographic characteristics

		Gender			
		Female	Male	Total	
		F	f	f	%
Age	22 - 30	15	2	17	8
	31 - 40	54	24	78	37
	41 - 50	49	37	86	41
	50 and above	16	14	30	14
Branch	Science	24	10	34	16,11
	Mathematics	17	11	28	13,27
	Turkish	16	11	27	12,80
	Foreign Language	19	6	25	11,85
	Social Studies	8	11	19	9,00
	Religion culture and ethics	11	8	19	9,00
	Technology and design	12	2	14	6,64
	Physical education	6	7	13	6,16
	Information technologies	6	6	12	5,69
	Psychological counselling and guidance	8	2	10	4,74
	Music	4	2	6	2,84
	Visual arts	3	1	4	1,90
Institution Type	Government	124	77	201	95,30
	Private	10	0	10	4,70
Educational Status	Graduate	123	71	194	91,90
	Master's Degree	11	6	17	8,10
Computer education literacy	Yes	69	40	109	51,66
	No	65	37	102	48,34
Total				211	100

When the data in Table 1 are examined, female teachers make up 63,5% (N=134) of the participants in the study, 41% (N=86) are between the ages of 41-50, and 16.11% (N) =34) were science teachers, 95.30% (N=201) worked in public schools, 91.90% (N=194) had undergraduate education, and 51.66% (N) of teachers =109) received computer training in undergraduate education.

Data Collection Tool

"Teachers' Self-Efficacy on the Use of Information Technologies in the Distance Education Process" (TSEITDEP) scale, created by Öztuzcu and Mısırlı (2023), was employed in the study. The process of developing an item pool has commenced for constructing a measurement instrument to assess teachers' self-efficacy in utilising information technology. During this procedure, a collection of 110 items was created to form an item pool. The experts involved by the Department of Computer Education and Instructional Technologies were consulted to assess the generated item pool's content and face validity. Based on the feedback provided by the experts, essential modifications were implemented to the items, reducing the item pool from 110 to 60 items. A pilot study was conducted using the developed measurement tool, and exploratory factor analysis (EFA) was conducted using the obtained data. The Kaiser-Meyer-Olkin (KMO) value obtained from the exploratory factor analysis (EFA) was found to be 0.71, indicating an acceptable level of sampling adequacy.

Furthermore, the variance explained by the scale, which consisted of 5 components and 12 items, was 80.966%. The measurement tool for gathering the research data is divided into two components. The researchers constructed a personal information form to collect the teachers' demographic data for the first section. To assess teachers' self-efficacy in utilising ICT, the researchers created the TSEITDEP scale in the second section.

TSEITDEP is a five-point Likert-type scale consisting of 12 items in total, consisting of 5 factors: "Live Lesson Proficiency", "WEB 2.0 Applications", "Smart Board Usage", "E-School Usage", and "Technological Tool Usage". The scale includes five options: strongly disagree (1), disagree (2), undecided (3), agree (4), and strongly agree (5). The participant's scores on the scale range from 12 to 60. When TSEITDEP scores are evaluated out of 5, it is extremely low to have a score between 1.00 and 1.80; between 1.81 and 2.60 is low; between 2.61 and 3.40 is moderate; between 3.41 and 4.20 is high; A score between 4.21 and 5.00 indicates that they have remarkably high self-efficacy. The scale's Cronbach's alpha reliability coefficient was determined to be 0.843.

Data Analysis

The research data from the TSEITDEP scale were evaluated using a statistical analysis software application (IBM SPSS Statistics 24). The participants' TSEITDEP scale scores were evaluated for skewness and kurtosis values to determine whether non-parametric or parametric tests would be used to analyse the data. The study found that the TSEITDEP scale had skewness and kurtosis values of -190 and -424, respectively. The skewness and kurtosis values between -1.0 and +1.0 show the normal distribution of the data (Hair et al., 2013). A normal distribution is indicated by skewness and kurtosis values between -1.5 and +1.5, according to Tabachnick and Fidell (2013) and Aminu and Shariff (2014).

t-test was used for unrelated samples to determine that teachers' TSEITDEP scores did not differ according to gender, type of institution, educational background and having computer education in undergraduate education since the study's data displayed a normal distribution. According to Büyüköztürk (2020), the t-test is used to evaluate whether there is a relationship between two unrelated samples. ANOVA, or one-way analysis of variance, was employed for unrelated samples to determine that the teachers' TSEITDEP scores did not differ according to age and branch variables. According to Büyüköztürk (2020), ANOVA is used to determine the difference between the means between two or more samples.

Findings

What are the teachers' self-efficacy levels about using IT in the DE process? is the first sub-problem of the study. "Descriptive statistics regarding the teachers' TSEITDEP scores were calculated to answer the question. Descriptive statistics related to TSEITDEP scores are given in Table 2.

Table 2. Descriptive statistics on TSEITDEP scores

TSEITDEP	N	Minimum	Maximum	Average	SD
	211	33	60	46,02	5,041

When Table 2 is examined, it can be seen that the mean score of TSEITDEP is 46.02, which corresponds to an average of 3.83 points out of five. According to the scaling in the method section, this value corresponds to the "I agree" option. Therefore, it is seen that teachers' ICT use self-efficacy is at a high level. The research's second underlying issue, "Do teachers' self-efficacy for their use of IT in the NI process differ according to demographic variables (gender, age, type of institution, branch, education level, computer education in

undergraduate education)?" To find the answer to the question, To see if the self-efficacy scores of instructors vary depending on the gender characteristics, type of institution, education level, and having computer education in undergraduate education, a T-test was run on unrelated samples. T-test results for unrelated samples are presented in Table 3.

Table 3. Results of the t-test of TSEITDEP scores according to variables

Variable		N	$\bar{X}$	S	sd	t	p
Gender	Female	134	46,26	5,001	209	0,902	0,368
	Male	77	45,61	5,117			
Education Level	Graduate	194	47,29	5,72	209	1,084	0,280
	Master's degree	17	45,91	4,97			
Institution Type	Government	201	45,93	4,99	209	1,207	0,229
	Private	10	47,90	5,93			
Computer education literacy	Yes	109	47,08	4,80	209	3,224	**0,001**
	No	102	44,89	5,06			

When Table 3 is examined, teachers' self-efficacy is determined by gender (t(209)=.902, p>0.05), education level (t(209)=1.08, p>0.05) and type of institution (t(209) =1,20, p>0.05), it does not differ according to the variable of having computer education (t(209)=3,22, p<0.05). T-test results according to the sub-factors computer education variable are given in Table 4.

Table 4. t-test results based on sub-factors computer education variable.

Factor	Computer Education Literacy	N	$\bar{X}$	S	sd	t	p
Online Teaching Proficiency	Yes	109	13,75	1,75	209	1,05	0,29
	No	102	13,51	1,56			
WEB 2.0 Applications	Yes	109	11,98	2,89	209	5,22	**0,00**
	No	102	9,75	3,32			
Smartboard Usage	Yes	109	3,23	1,73	209	2,56	**0,01**
	No	102	3,88	1,96			
E-School Usage	Yes	109	8,85	1,71	209	,70	0,47
	No	102	8,68	1,90			
Usage of Technological Devices	Yes	109	9,27	,97	209	1,35	0,17
	No	102	9,08	1,04			

Examining Table 4, licences for instructors in the subfactors "Web 2.0 Applications" (t(209)=5.22, p0.05) and "Smart Board Usage" (t(209)=2.56, p<0.05) are statistically significant. It is observed that computer education differs significantly according to the variable of having computer education. Table 5 provides the descriptive data for the TSEITDEP scores of teachers according to age and branch characteristics.

Table 5. Descriptive statistics of TSEITDEP scores

	Variable		N	$\bar{X}$	SS
TSEITDEP	Age	22-30	17	45,59	6,33
		31-40	78	46,03	5,10
		41-50	86	46,72	4,87
		50 and above	30	44,27	4,28
		Total	211	46,02	5,04
	Branch	Turkish	27	45,44	5,57
		Science	34	45,85	4,83
		Mathematics	28	45,64	5,97
		Social Studies	19	44,32	3,72
		Religion culture, and ethics knowledge	19	44,74	4,44
		Foreign Language	25	47,92	4,53
		Information Technologies	12	50,33	2,90
		Technology and design	14	46,57	3,79
		Music	6	44,17	7,33
		Visual arts	4	44,25	4,03
		Physical education	13	46,23	4,43
		Psychological counselling and guidance	10	45,80	6,74
		Total	211	46,02	5,04

When Table 5 is examined, differences were observed in the TSEITDEP scores according to age and branch variables. ANOVA was performed for unrelated samples to test the significance of the observed differences. ANOVA results according to age and branch variables are given in Table 6.

Table 6. ANOVA results of TSEITDEP scores according to variables

Variable	Source of Variance	Sum of Squares	sd	Mean Squares	F	p	Significant Difference
Age	Between Groups	137,646	3	45,882	1,827	0,143	-
	Within Groups	5199,235	207	25,117			
	Total	5336,882	210				
Branch	Between Groups	452,306	11	41,119	1,675	0,081	-
	Within Groups	4884,576	199	24,546			
	Total	5336,882	210				

When examining Table 6, it is observed that the self-efficacy of instructors does not differ significantly by age ($F_{(3,207)} = 1.82$, $p>0.05$) and branch ($F_{(11,199)} = 1.67$, $p>0.05$) variables. The study investigated how undergraduate education teachers who did not receive computer training improved themselves. The answers from 100 teachers out of 102 who did not receive computer training in undergraduate education are in Figure 1.

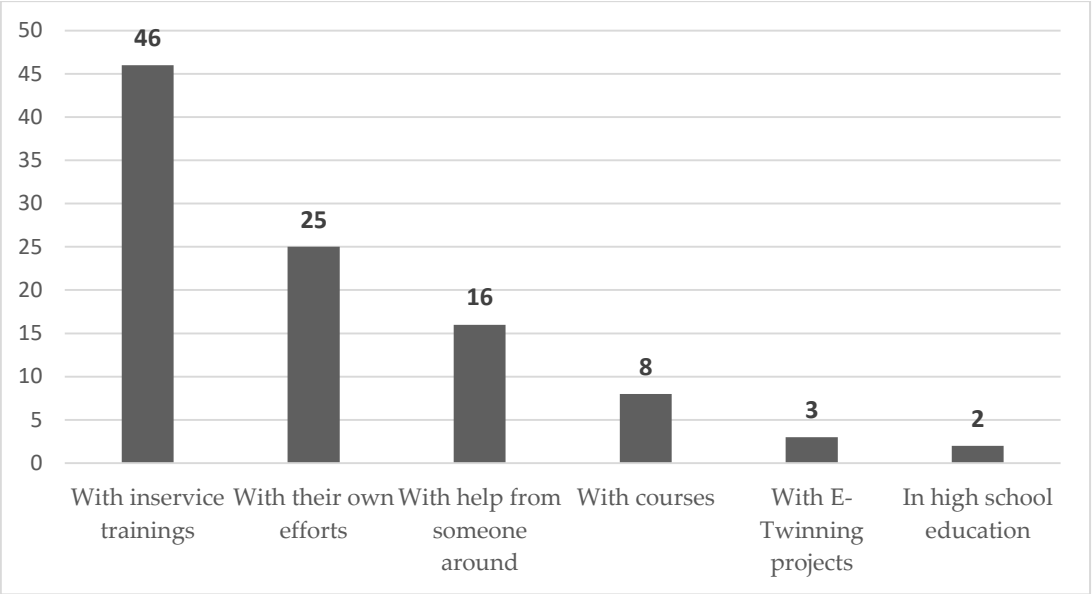

Figure 1. Self-development methods of teachers who do not have computer training.

When examining Figure 1, it can be noticed that 46 of 100 teachers have computer training. at the undergraduate education level improved themselves thanks to in-service training.

Discussion and Conclusion

In the first quarter of the twenty-first century, we are, and various decisions have been taken to prevent the spread of the virus by introducing the COVID-19 pandemic into our lives. One of these decisions was to suspend education. To ensure the continuity of education in the following process, the DE process was started, and in this process, teachers came together with their students on DE platforms on certain days and hours and ensured the continuity of their lessons. The technology teachers and students use has increased in the DE process. This research intends to determine the ICT self-efficacy of instructors involved in the IT process.

The teachers' self-efficacy in using ICT in the DE process was highly assessed. Teachers' intense use of technological tools in this process affects their self-efficacy. This result parallels investigations undertaken by Köroğlu and Demiriz (2016) and Kartal et al. (2018). The studies conducted by Govender and Govender (2009) and Şahin and Göçer (2013) concluded that the self-efficacy of instructors is moderate.

According to the study's findings, there were no significant gender disparities in the ICT self-efficacy of educators. This conclusion is like that of Seferoğlu and Akbıyık (2005), Köroğlu and Demiriz (2015), Doğru et al. (2017), Güney (2021), and Dikmen et al. (2021). In

the study conducted by Çetin and Güngör (2014), it was found that female instructors had a higher degree of self-efficacy; however, in the studies conducted by Şahin and Göçer (2013) and Kartal et al. (2018), male instructors were shown to have a higher level of self-efficacy.

The study reveals that teachers' self-efficacy in utilising ICT does not differ significantly by age variable. This result is comparable to that of Seferoğlu and Akbıyık (2005), Çetin and Güngör (2014), and Köroğlu and Demiriz (2007). In the study conducted by Yalçınkaya and Özkan (2014), it was concluded that the self-efficacy of teachers in the age range of 20-30 was higher, while in the study conducted by Doğru et al. (2017), the self-efficacy of teachers in the age range of 41-50 was higher, Dikmen et al. (2021), on the other hand, it was concluded that the self-efficacy of teachers aged 30-39 was higher, and Güney (2021) concluded that teachers aged 43 and over had lower self-efficacy.

According to the study, no statistically significant difference exists between the branch variable and instructors' self-efficacy in utilising ICT. Still, the self-efficacy of information technology and software teachers is higher than that of other branch teachers. The usage of self-efficacy in IT is believed to be an expected outcome higher in line with the education of information technologies and software teachers. The study conducted by Seferoğlu and Akbıyık (2005) concluded that teachers' self-efficacy did not differ according to the branch variable, and software teachers have higher self-efficacy.

The study revealed no significant difference between teachers' self-efficacy in using ICT based on their education level. Still, the self-efficacy of teachers with a graduate level of education was higher. The increase in computer use by teachers with a graduate education level, especially in the thesis period, is thought to affect their self-efficacy levels. The study conducted by Dikmen et al. (2021) concluded that teachers' self-efficacy differs according to the education level variable, and the self-efficacy of teachers with postgraduate education levels is higher. It can be stated that different studies should be conducted on whether teachers' ICT use self-efficacy differs according to the education level variable.

The study revealed that there was no significant difference between institution type and teachers' self-efficacy in using ICT. Still, the self-efficacy levels of teachers with special institution types were higher. In the studies conducted by Yalçınkaya and Özkan (2014) and Köroğlu and Demiriz (2015), It was determined that instructors' levels of self-efficacy are not affected by the institution type. Different studies should be undertaken to see if teachers' self-efficacy in utilising ICT vary based on the kind of institution variable.

The study concluded that teachers' self-efficacy in using ICT showed a significant difference compared to the variable of computer education in undergraduate education and that the self-efficacy of teachers who received computer education was higher. It is thought that the fact that teachers who have not received training before and who have little experience in computer use have an undergraduate education level can increase their use of technology, thus affecting their self-efficacy in using IT. Contrary to this finding obtained in the study, it was concluded in the studies conducted by Çetin and Güngör (2014) and Köroğlu and Demiriz (2015) that teachers' self-efficacy did not differ according to the computer education variable. For this reason, it can be stated that different studies should be conducted on whether teachers' ICT use self-efficacy differs according to the variable of having computer education.

The study sample is comprised of Balıkesir secondary school educators. The research can be repeated with teachers from various provinces or education levels. Within the scope of this study, it is thought that addressing the teachers' self-efficacy in the ICT process contributes to the field. Expanding the research by examining the relationships of teachers' self-efficacy with different variables can be suggested.

Acknowledgement

This research was produced from the master's thesis of the first author, supervised by the second author.

Ethical Committee Permission Information

Name of the board that carries out ethical assessment: Balıkesir University Social and Humanities Scientific Research Ethics Board

The date and number of the ethical assessment decision: 02.02.2021-52899066/302.08.01/7484

Author Contribution Statement

Özge ÖZTUZCU: *Conceptualization, literature review, methodology, implementation, data analysis, translation, and writing.*

Zeynel Abidin MISIRLI: *Conceptualization, literature review, methodology, data analysis, translation, and writing.*

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Appendix. Teachers' self-efficacy on the use of information technologies in the distance education process" scale

Factor Name	Item Number	Item
Ability to Teach	M1	I can provide voice control to my students in live lessons.
	M2	I can control the video of my students in live lessons.
	M3	I can process my live lesson with different applications (Zoom/ Google Meet etc.).
WEB 2.0 Applications	M4	I can prepare various materials with Web 2.0 tools (such as Kahoot, Canva).
	M5	I can design posters for my students.
	M6	I can prepare fun question-and-answer activities for my students with the help of various applications (Kahoot etc.).
The Use of Smartboards	M7*	I may have difficulty transferring the files on my USB stick to the smart board.
	M8*	I may have difficulty installing a program on the smart board on my USB stick.
E-School Use	M9	I can record student absences in the E-School system.
	M10	I can save student information to the E-School system.
The Use of Technological Devices	M11	I can use technological tools in my lessons.
	M12	Using different materials with technological tools can make the lesson more active.

* Negative Items