Pedagogical Research
2023, 8(4), em0174
e-ISSN: 2468-4929
https://www.pedagogicalresearch.com

MODESTUM

Research Article **OPEN ACCESS**

Investigation of science teachers' self-efficacy for online measurement and evaluation

Ferhat Karakaya [1*], Eray Selcuk [2], Mehmet Yilmaz [3]

[1] Department of Mathematics and Science Education, Faculty of Education, Yozgat Bozok University, Yozgat, TÜRKİYE
[2] Ministry of Education, Ankara, TÜRKİYE
[3] Department of Mathematics and Science Education, Gazi Faculty of Education, Gazi University, Ankara, TÜRKİYE
***Corresponding Author:** ferhat.karakaya@bozok.edu.tr

Citation: Karakaya, F., Selcuk, E., & Yilmaz, M. (2023). Investigation of science teachers' self-efficacy for online measurement and evaluation. *Pedagogical Research, 8*(4), em0174. https://doi.org/10.29333/pr/13851

ARTICLE INFO

Received: 07 Jul. 2023

Accepted: 12 Oct. 2023

ABSTRACT

The spread of the COVID-19 pandemic across the world has caused countries to differentiate in their education systems. In order to minimize the effects of the epidemic and prevent its spread, online education has become widespread around the world. In this research, it was aimed to examine the self-efficacy of science teachers for online measurement and evaluation according to different variables. The research in which the survey model, which is one of the quantitative research methods, was used, was carried out with 149 science teachers. The data of the research were created by using the self-efficacy scale for online measurement and evaluation. It has been determined that there is a significant difference between the variables of education level, type of school and technological competencies of science teachers' self-efficacy for online assessment and evaluation. Despite that, it was determined that there was no significant difference in the self-efficacy scores of science teachers for online measurement and evaluation according to gender, in-service training, and professional experience.

Keywords: COVID-19, online measurement and evaluation, self-efficacy, distance education

INTRODUCTION

The epidemic disease, which first appeared in Wuhan, China in December 2019 and spread rapidly around the world, was initially defined as the new coronavirus (2019-nCoV) (Wang et al., 2020). However, in the course of time, it was named "COVID-19" by the World Health Organization (WHO, 2020). In order to stop the spread of epidemic diseases and their deadly effects, measures have been taken on a global scale. In this context, measures have been implemented in many areas, including education systems, in order to reduce the spread of the epidemic worldwide (Arik et al., 2021). For example, formal education has been suspended and countries have started online education processes. Distance education, which is realized through institutional and communication technologies (Moore & Kearsley, 2012), has an educational approach that enables the establishment of the bond between students, teachers and teaching materials thanks to the technological infrastructure (Ozgol et al., 2017).

As of March 10, 2020, the first case of COVID-19 was detected in Turkey and both individual/institutional measures were put into effect throughout the country. On March 16, 2020, face-to-face education was suspended in primary and secondary education institutions in Turkey. On March 23, 2020, it was decided to switch to distance education in order not to disrupt the education process and to prevent students from being victimized. The distance education process has been initiated through the education information network, which serves as the official digital education platform in Turkey (Ozer, 2020).

In distance education, the learning processes of students should not be evaluated with classical methods. It is necessary to adopt different approaches (method, measurement, evaluation, etc.) in order to increase the participation and interaction of individuals in educational processes (Hodges et al., 2020). Not giving the necessary importance to measurement and evaluation in online education and not measuring student success properly by giving random grades (Sari, 2020) are issues that need to be considered in terms of the future of education. It is very important to know the assessment and evaluation approaches related to education policies and to implement different practices (Koc et al., 2022). As a matter of fact, during the COVID-19 epidemic, the experiences and competencies of both teachers and instructors for online measurement and evaluation came to the fore.

Self-efficacy is a theoretical framework that emphasizes the importance of competencies in shaping people's career processes (Hatlevik, 2017; Sáinz & Eccles, 2012). People can be expressed as the perception of taking responsibility for a task and achieving success (Bandura, 1997; Sáinz & Eccles, 2012). Self-efficacy for online assessment and evaluation is explained as the thoughts that individuals have about measurement and evaluation practices that they have made using different applications within the framework of their technological competencies (Koc et al., 2022). In order for online measurement and evaluation activities to be

Table 1. Participants information

Demographic information		n	Percentage (%)
Gender	Male	66	44.3
	Female	83	55.7
Education level	Undergraduate	114	76.5
	Postgraduate	35	23.5
Professional experience	0-5 years	25	16.8
	6-10 years	33	22.1
	11-15 years	37	24.8
	16 year and above	54	36.2
Employed institution	Public	136	91.3
	Special	13	8.7
In-service training	Yes	62	41.6
	No	87	58.4
Technological competence	Little	8	5.4
	Middle	77	51.7
	Good	64	43.0

carried out effectively and efficiently, teachers' self-efficacy should be high. In the literature, national and international studies on online measurement and evaluation have been identified. These are scale development (Koc et al., 2022), opinion (Arik et al., 2021; Eygu & Eygu, 2022; Karadag & Ozgur, 2021; Kolcu et al., 2020; Ozalkan, 2021; Pekcan & Toraman, 2022), and experiences (Tekedere et al., 2022; Zimmerman & Kulikowich, 2016). For example, Pekcan and Toraman (2022) determined the opinions of individuals about measurement and evaluation methods in distance education processes. In their study, Koc et al. (2022) developed a scale that can be used to determine the self-efficacy of individuals in the position of instructors for online measurement and evaluation. In the study conducted by Kolcu et al. (2020), the opinions of medical school students on online measurement and evaluation practices were determined. In addition, studies examining the self-efficacy of both teachers and prospective teachers for measurement and evaluation have been identified in the literature (Baskonus, 2020; Karamustafaoglu et al., 2012; Kilic, 2020; Kocaturk Kapucu & Adnan, 2018; Oren et al., 2014; Yarali, 2017; Yenice et al., 2017).

It is seen that the measurement and evaluation approach is defined in the science curriculum in Turkey.

> "Measurement and evaluation practices in education are an integral part of education and are made throughout the education process. The measurement results are not handled alone, but together with the processes followed as a whole. Due to the fact of individual differences, it is not appropriate to talk about a uniform measurement and evaluation method that covers all students and is universal for all students. The academic progress of the student is not measured and evaluated with a single method or technique. Multi-focus assessment is essential. Measurement and evaluation practices are carried out with the active participation of teachers and students" (MoNE, 2018, p. 7).

This approach shows that it is expected that science teachers should have high self-efficacy in measurement and evaluation. Stanford and Reeves (2005) emphasized the necessity of assessment and evaluation activities in order to determine the efficiency of teaching strategies and for teachers to play an active role in the process. Hatlevik (2017) stated that there is a positive relationship between self-efficacy and learning strategies. However, it can be said that there are not enough studies in the literature to determine the factors affecting the self-efficacy of science teachers towards online assessment and evaluation.

In this research, it was aimed to examine the self-efficacy of science teachers for online measurement and evaluation according to different variables. The research focused on the variables of gender, education level, school, taking courses/seminars/training for online assessment and evaluation, duration of professional experience and proficiency in using technological materials.

METHOD

Research Model

In this research, scanning model was used. According to Karasar (2006), this model is a system of surveys made on the universe or a sample selected from the universe to evaluate the universe that contains many different variables in its structure.

Sample of Research

In determining the sample of the study, easily accessible sampling method was preferred. The easily accessible sampling method was defined by Balci (2021) as a sampling method that provides benefits to the researcher (time, cost, etc.) in transportation. The sample of the researchconsists of 149 science teachers with various demographic characteristics (**Table 1**).

Approximately 24% of the participants are postgraduate graduates, 83% have more than five years of professional experience, 90% of them work in the public sector, 42% attend in-service trainings, and 95% of them are medium and high in technological innovations. level of competency.

Table 2. Cronbach's alpha reliability coefficient values

Factors	Cronbach's alpha	
	Koc et al. (2022)	The present study
Competencies	.950	.966
Deficiencies	.925	.932
CEASES	.958	.957

Table 3. Kolmogorov-Smirnov normality test results

Independent variable	Sub-dimensions	Competencies			Deficiencies			CEASES		
		K-S	df	p	K-S	df	p	K-S	df	p
Gender	Male	.106	66	.063	.085	66	.200	.116	66	.200
	Female	.080	83	.200	.094	83	.068	.054	83	.200
Education level	Undergraduate	.068	114	.200	.076	114	.129	.075	114	.155
	Postgraduate	.128	35	.161	.085	35	.200	.100	35	.200
Professional experience	0-5 years	.118	25	.200	.091	25	.200	.101	25	.200
	6-10 years	.120	33	.200	.111	33	.200	.091	33	.200
	11-15 years	.099	37	.200	.081	37	.200	.113	37	.200
	16 year and above	.105	54	.200	.107	54	.187	.107	54	.184
Employed institution	Public school	.075	136	.058	.076	136	.051	.069	136	.200
	Private school	.163	13	.200	.121	13	.200	.159	13	.200
In-service training	Yes	.107	62	.072	.111	62	.057	.091	62	.200
	No	.073	87	.200	.076	87	.200	.063	87	.200
Technological competence	Little	.273	8	.082	.235	8	.200	.201	8	.200
	Middle	.125	77	.051	.098	77	.065	.077	77	.200
	Good	.096	64	.200	.089	64	.200	.090	64	.200

Note. *p<.05 & **p<.01

Table 4. Results of one-way independent t-test analysis in terms of gender

Scale factors	Gender	n	Mean	Sum of squares	sd	t	p-value
Competencies	Male	66	1,025.00	197.38	147	3.04	.003**
	Female	83	919.39	220.25			
Deficiencies	Male	66	810.45	223.29	147	0.25	.806
	Female	83	801.80	205.00			
CEASES	Male	66	1,835.45	371.55	147	1.84	.068
	Female	83	1,721.20	380.10			

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

Data Collection Tool

"Online assessment and evaluation self-efficacy scale" developed by Koc et al. (2022) was used as the data collection tool. The scale consists of two factors, "competencies" and "deficiencies", 25 items and 10 graded scoring. The internal consistency coefficient (Cronbach's alpha) for the reliability of the scale was calculated.

Table 2 shows Cronbach's alpha reliability values obtained from CEASES sub-factors consisting of 25 items and all of them. Accordingly, the values obtained by the researchers show similarities with the values in the development phase of the scale.

Analysis of Data

Statistics program was used in the analysis of the data of the research. In order to use parametric tests, the data must show a normal distribution. In this context, Kolmogorov-Smirnov normality test was conducted for the normal distribution of the data. Normality test results are given in **Table 3**. Findings in **Table 3** showed that the Kolmogorov-Smirnov normality test results were not significant in terms of the independent variables of the study and its sub-factors (p>.05). This results in the use of parametric tests for analyzes in all sub-problems of research. t-test for independent groups to find answers to the first, second, third and fourth questions of the research; one-way analysis of variance (ANOVA) was conducted to find answers to the 5th and 6th questions.

FINDINGS

In the research, *"does the self-efficacy of science teachers for online assessment and evaluation differ significantly in terms of gender?"* focused on the sub-problem.

It was determined that the scores of science teachers in the online assessment and evaluation self-efficacy scale (t_{147}=1.84; p>.05) and the deficiencies (t_{147}=0.25; p>.05) sub-dimension did not make a significant difference in terms of the gender variable. However, it was determined that there was a significant difference in favor of male teachers in the competencies (t_{147}=3.04; p<.01) sub-dimension of the scale (**Table 4**).

In the research, *"does the self-efficacy of science teachers for online assessment and evaluation differ significantly in terms of education level variable?"* focused on the sub-problem.

Table 5. One-way independent t-test analysis results in terms of education level variable

Scale factors	Education level	n	Mean	Sum of squares	sd	t	p-value
Competencies	Undergraduate	114	936.14	217.23	147	-3.15	.002**
	Postgraduate	35	1,064.00	183.91			
Deficiencies	Undergraduate	114	781.22	220.35	147	-2.57	.011*
	Postgraduate	35	885.14	163.94			
CEASES	Undergraduate	114	1,717.36	384.06	147	-3.26	.001**
	Postgraduate	35	1,949.14	306.48			

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

Table 6. One-way independent t-test analysis results in terms of school variable studied

Scale factors	Employed institution	n	Mean	Sum of squares	sd	t	p-value
Competencies	Public	136	961.83	224.04	26.50	-1.49	.146
	Special	13	1,011.53	97.71			
Deficiencies	Public	136	796.54	216.24	147	-1.69	.091
	Special	13	900.76	143.90			
CEASES	Public	136	1,758.38	392.45	36.10	-3.02	.005**
	Special	13	1,912.30	137.30			

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

Table 7. One-way independent t-test analysis results according to in-service training

Scale factors	In-service training	n	Mean	Sum of squares	sd	t	p-value
Competencies	Yes	62	1,001.45	211.66	147	1.38	.169
	No	87	941.03	217.15			
Deficiencies	Yes	62	821.12	200.27	147	1.69	.093
	No	87	794.59	221.45			
CEASES	Yes	62	1,822.58	356.80	147	0.75	.455
	No	87	1,735.63	392.68			

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

From the science teachers' self-efficacy scale for online assessment and evaluation (t_{147}=-3.26; p<.01), the competencies that make up the scale (t_{147}=-3.15; p<.01) and deficiencies (t_{147}=-2.57; p<.05) sub-dimensions were found to be significantly different in terms of education level variable. It was seen that this difference was significant in favor of those who had postgraduate education between education levels (**Table 5**).

In the research, *"does the self-efficacy of science teachers for online assessment and evaluation differ significantly in terms of the school variable they work in?"* focused on the sub-problem.

It was determined that the scores of science teachers from the online assessment and evaluation self-efficacy scale ($t_{36.10}$=-3.02; p<.01) differed significantly in terms of the school variable studied. This difference was found to be significant in favor of teachers working in private schools. However, no significant difference was found in the sub-dimension of competencies ($t_{26.50}$=-1.49; p>.05) and deficiencies (t_{147}=-1.69; p>.05) that make up the scale (**Table 6**).

In the research, *"does the self-efficacy of science teachers for online assessment and assessment differ significantly according to the status of taking courses/seminars/trainings for online assessment and assessment?"* focused on the sub-problem.

From the science teachers' self-efficacy scale for online assessment and evaluation (t_{147}=0.75; p>.05), the competencies that make up the scale (t_{147}=1.38; p>.05) and deficiencies (t_{147}=1.69; p>.05) sub-dimension, it was determined that there was no significant difference in terms of participation in in-service training (**Table 7**).

In the research, "*does the self-efficacy of science teachers for online assessment and evaluation differ significantly according to their professional experience?*" focused on the sub-problem.

It was determined that the scores obtained by the science teachers from the online measurement and evaluation self-efficacy scale (F[3, 145]=1.81; p>.05), competencies of the scale (F[3, 145]= 1.34; p>.05), and deficiencies (F[3,145]=2.11; p>.05) sub-dimensions, there was no significant difference in terms of professional experience (**Table 8** and **Table 9**).

In the research, "*do the self-efficacy of science teachers for online assessment and evaluation differ significantly according to their ability to use technological materials?"* focused on the sub-problem.

Science teachers' self-efficacy scale for online assessment and evaluation (F[2, 146]= 52.31; p<.01), competencies constituting the scale (F[2, 146]= 68.35; p<.01), and deficiencies (F[2, 146]= 18.12; p<.01) sub-dimensions, it was determined that there was a significant difference in terms of technological use proficiency variable. Accordingly, as the level of technological use proficiency increases, the scores obtained from the self-efficacy scale and its sub-dimensions for online assessment and evaluation increase significantly (**Table 10** and **Table 11**).

Table 8. Frequency, mean, & standard deviation values-1

Scale factors	Professional experience	n	Mean	Sum of squares
Competencies	0-5 years	25	1,026.40	147.78
	6-10 years	33	989.69	186.52
	11-15 years	37	959.45	264.70
	16 year and above	54	928.51	220.35
	Total	149	966.17	216.24
Deficiencies	0-5 years	25	895.60	147.11
	6-10 years	33	767.87	219.05
	11-15 years	37	812.43	232.56
	16 year and above	54	782.40	213.14
	Total	149	805.63	212.61
CEASES	0-5 years	25	1,922.00	233.38
	6-10 years	33	1,757.57	369.41
	11-15 years	37	1,771.89	465.62
	16 year and above	54	1,710.92	364.72
	Total	149	1,771.81	379.37

Table 9. ANOVA results according to professional experience period

Scale factors		Sum of squares	sd	Mean squares	F	p	Tukey
Competencies	Between groups	187,175.82	3	62,391.941	1.34	.263	-
	In-group	6,733,343.64	145	46,436.853			
	Total	6,920,519.46	148				
Deficiencies	Between groups	280,228.79	3	93,409.599	2.11	.101	-
	In-group	6,409,835.63	145	44,205.763			
	Total	6,690,064.43	148				
CEASES	Between groups	770,783.40	3	256,927.802	1.81	.147	-
	In-group	20,529,827.33	145	141,585.016			
	Total	21,300,610.73	148				

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

Table 10. Frequency, mean, & standard deviation values-2

Scale factors	Technological competence	n	Mean	Sum of squares
Competencies	Little (1)	8	563.75	168.94
	Middle (2)	77	881.03	168.80
	Good (3)	64	1,118.90	138.49
	Total	149	966.17	216.24
Deficiencies	Little (1)	8	537.50	205.33
	Middle (2)	77	755.58	182.19
	Good (3)	64	899.37	200.86
	Total	149	805.63	212.61
CEASES	Little (1)	8	1,101.25	255.42
	Middle (2)	77	1,636.62	287.42
	Good (3)	64	2,018.28	300.08
	Total	149	1,771.81	379.37

Table 11. ANOVA results according to technological competence

Scale factors		Sum of squares	sd	Mean squares	F	p	Tukey
Competencies	Between groups	3,346,591.64	2	1,673,295.82	68.35	.000**	3>2
	In-group	3,573,927.82	146	24,478.95			3>1
	Total	6,920,519.46	148				2>1
Deficiencies	Between groups	1,330,440.72	2	665,220.36	18.12	.000**	3>2
	In-group	5,359,623.70	146	36,709.75			3>1
	Total	6,690,064.43	148				2>1
CEASES	Between groups	8,892,290.22	2	4,446,145.11	52.31	.000**	3>2
	In-group	12,408,320.51	146	84,988.49			3>1
	Total	21,300,610.73	148				2>1

Note. *p<.05 & **p<.01 (assumption of homogeneity of variances is provided for each factor)

DISCUSSION & CONCLUSIONS

We aimed to examine the self-efficacy of science teachers for online assessment and evaluation in terms of different variables.

It was determined that science teachers' self-efficacy for online assessment and evaluation and the scores they got in the deficiencies sub-dimension did not differ significantly in terms of gender.

As a result, it can be said that gender is not effective in the sub-dimension of self-efficacy and deficiencies in online assessment and evaluation. In the literature, the gender variable is defined as the variable that does not make a significant difference in the self-efficacy of both prospective teachers (Oren et al., 2014; Yarali, 2017) and teachers (Baskonus, 2018; Kilic, 2020). However, it was observed that there was a significant difference in favor of male teachers in the sub-dimension of the competencies constituting self-efficacy. It can be said that the emergence of this result is due to the fact that male teachers have higher perceptions of competence and attitudes towards using communication technologies in education. Studies have shown that male teachers have higher perceptions of efficacy towards the use of technology in education (Ulas & Ozan, 2010; Sad & Nalcaci, 2015).

In the research, it was determined that there was a significant difference in favor of the scores of science teachers with postgraduate education in the self-efficacy scale and its sub-dimensions (competences and deficiencies) for online measurement and evaluation. As a result, it can be said that education level is a variable that affects science teachers' self-efficacy and sub-dimensions for online assessment and evaluation. It is thought that different experiences gained in postgraduate education are effective in the formation of this result. The studies carried out are similar to the results of this research (Bas & Beyhan, 2016; Haynie, 1992; Kilic, 2020; Zhang & Burry-Stock, 2003). For example, Haynie (1992) stated that the experiences gained in graduate education increase the success of teachers in different areas of measurement and evaluation (question preparation, validity, etc.). As a result of the research conducted by Bas and Beyhan (2016), it was determined that teachers' educational status and self-efficacy perceptions towards measurement and evaluation differed significantly in favor of postgraduate teachers. In addition, it is stated that the measurement and evaluation literacy of teachers who receive postgraduate education is high (Ergul, 2019). Postgraduate students have positive opinions about the advantages of online teaching (time management and course repetition opportunity) during the pandemic process (Genc et al., 2020; Arik et al., 2021).

In the research, a significant difference was determined in favor of private school in the scores of science teachers from the online measurement and evaluation self-efficacy scale. However, in the sub-dimension of competencies and deficiencies constituting the scale, no significant difference was found in terms of the institution studied. It can be said that the institution of study is a variable that affects the self-efficacy of science teachers towards online measurement and evaluation. It is thought that the technological infrastructure opportunities offered by private schools to their employees and the importance they give to in-service training are effective in the emergence of this situation. Studies have shown that teachers need to have different equipment (Avci & Guven, 2020) and experience (Koehler et al., 2013) in order to evaluate online processes.

In the research, it was determined that there was no significant difference between the self-efficacy scale for online measurement and evaluation and the scores they got in the sub-dimensions (competences and deficiencies) of the science teachers in terms of the variable of training for service (seminar, course, or training). It can be said that in-service training is not a variable that affects science teachers' self-efficacy for online measurement and evaluation. In addition, it is thought that in-service trainings or courses are not effective enough to increase self-efficacy for online measurement and evaluation. Dong et al. (2020) stated that the training content prepared is important for online training to be successful. When the literature is examined, it has been determined that there are studies supporting the results of the research (Karamustafaoglu et al., 2012; Yenice et al., 2017). For example, Yenice et al. (2017) stated as a result of their study that taking courses for measurement and evaluation in teacher candidates does not affect their self-efficacy.

In the research, it was determined that there was no significant difference in the scores of science teachers in the online measurement and evaluation self-efficacy scale and its sub-dimensions (competences and deficiencies) in terms of the variable of professional experience. It can be said that professional experience is not a variable that affects Science teachers' self-efficacy for online measurement and evaluation. Studies have shown that professional experience does not affect opinions and self-efficacy towards measurement and evaluation (Karamustafaoglu et al., 2012; Okur & Azar, 2011). However, there are also studies in the literature showing that there is a negative relationship between teacher experiences and self-efficacy (Guo et al., 2010). In addition, there are studies showing that professional seniority is a factor that affects teachers' self-efficacy regarding measurement and evaluation in education, their level of knowledge and self-efficacy (Bas & Beyhan, 2016; Baskonus, 2018; Kilic, 2020).

In the research, it was determined that there was a significant difference between the scores of science teachers on the online measurement and evaluation self-efficacy scale and its sub-dimensions (competences and deficiencies) in favor of those with good technology proficiency. It can be said that technological competencies are a variable that affects science teachers' self-efficacy for online measurement and evaluation. It is thought that teachers' technology use skills are effective in the emergence of the result of the research. When the literature is examined, it is seen that teachers prefer alternative measurement and evaluation methods as their technology usage skills increase (Dommeyer et al., 2004; Pekcan & Toraman, 2022; Steer et al., 2016). In addition, studies have shown that teachers' high proficiency in using digital tools and equipment positively affects the educational content they will prepare (García-Martínez et al., 2020) and the presentation of these contents to students (Ehlers, 2013).

Suggestions

Considering the findings of the research:

1. It can be shared with teachers and teacher candidates to increase their motivation for post-graduate education.
2. Studies can be conducted with teachers working in special education institutions to reveal the reasons for the difference with more concrete findings.
3. In the research, it was determined that there was no significant difference between the scores of science teachers who received in-service training from the self-efficacy scale and the scores of teachers who did not receive in-service training. In this context, research involving all stakeholders can be conducted on the reasons for the ineffectiveness of in-service training.

Author contributions: All authors have sufficiently contributed to the study and agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Ethical statement: The authors stated that the study was approved by the Ethics Committee of Yozgat Bozok University, Yozgat, Türkiye on 20 April 2022. Written informed consents were obtained from the participants.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

Arik, S., Karakaya, F., Cimen, O., & Yilmaz, M. (2021). Determination of secondary education students' views on distance education applied in the COVID-19 pandemic process. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi* [*Gazi University Gazi Faculty of Education Journal*], *41*(2), 631-659. https://doi.org/10.17152/gefad.926838

Avci, B., & Guven, M. (2021). Identifying training needs of in-service teachers for online education. *Dokuz Eylül Üniversitesi Buca Eğitim Fakültesi Dergisi* [*Journal of Dokuz Eylül University Buca Faculty of Education*], *51*, 345-367. https://doi.org/10.53444/deubefd.882866

Bas, G., & Beyhan, O. (2016). Examination of teachers' self-efficacy perceptions on educational measurement and evaluation in terms of some variables. *Journal of Measurement and Evaluation in Education and Psychology, 7*(1), 18-32. https://doi.org/10.21031/epod.34199

Baskonus, T. (2018). *Examination of attitudes and qualifications related to measurement and evaluation of physical education and sports teachers* [Unpublished doctoral thesis]. Sakarya University.

Dommeyer, C. J., Baum, P., Hanna, R. W., & Chapman, K. S. (2004). Gathering faculty teaching evaluations by in-class and online survey: Their effect on response rates and evaluations. *Measurement and evaluation in Higher Education, 29*(5), 611-623. https://doi.org/10.1080/02602930410001689171

Dong C., Lee, D. W. C., & Aw, C. W. (2020). Tips for medical educators on how to conduct effective online teaching in times of social distancing. *Proceedings of Singapore Healthcare, 30*(1), 59-63. https://doi.org/10.1177/2010105820943907

Donovan, J., Mader, C., & Shinsky, J. (2007). Online vs. traditional course evaluation formats: Student perception. *Journal of Interactive Online Learning, 6*(3) 158-180.

Ehlers, U. D. (2013). *Open learning cultures: A guide to quality, evaluation, and assessment for future learning*. Springer. https://doi.org/10.1007/978-3-642-38174-4

Ergul, A. O. (2019). *Examination of teachers' assessment literacy levels in terms of some variables* [Unpublished master's thesis]. Hacettepe University.

Eygu, H., & Eygu, S. (2022). Factors affecting perceived learning satisfaction in distance education in Turkey. *Cukurova University Faculty of Education Journal, 51*(3), 1769-1790. https://doi.org/10.14812/cufej.1177360

García-Martínez, J. A., Rosa-Napal, F. C., Romero-Tabeayo, I., López-Calvo, S., & FuentesAbeledo, E. J. (2020). Digital tools and personal learning environments: An analysis in higher education. *Sustainability, 12*(19), 8180. https://doi.org/10.3390/su12198180

Genc, S. Z., Engin, G., & Yardim, T. (2020). Postgraduate students' views related to application of distance education during the COVID-19 pandemic. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi* [*Ataturk University Kazim Karabekir Faculty of Education Journal*], *41*, 134-158. https://doi.org/10.33418/ataunikkefd.782142

Gungoren, O. C., Bektas, M., Ozturk, E., & Horzum, M. B. (2014). Acceptence of TPC scale–Validity and reliability study. *Education and Science, 39*(176), 69-79. https://doi.org/10.15390/EB.2014.3497

Guo, Y., Piasta, S. B., Justice, L. M., & Kaderavek, J. N. (2010). Relations among preschool teachers' self-efficacy, classroom quality, and children's language and literacy gains. *Teaching and Teacher Education, 26*(4), 1094-1103. https://doi.org/10.1016/j.tate.2009.11.005

Hatlevik, O. E. (2017). Examining the relationship between teachers' self-efficacy, their digital competence, strategies to evaluate information, and use of ICT at school. *Scandinavian Journal of Educational Research, 61*(5), 555-567. https://doi.org/10.1080/00313831.2016.1172501

Haynie, W. J. (1992). Post hoc analysis of test items written by technology education teachers. *Journal of Technology Education, 4*(1), 27-40. https://doi.org/10.21061/jte.v4i1.a.3

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*. https://er.educause.edu/articles/2020/3/thedifference-between-emergency-remote-teaching-and-online-learning

Karadag, N., & Ozgur, A. Z. (2021). Examination of learners' views on assessment practices in Anadolu University open education system. *Anadolu Üniversitesi Sosyal Bilimler Dergisi* [*Anadolu University Journal of Social Sciences*], *21*(2), 505-530. https://doi.org/10.18037/ausbd.959264

Karamustafaoglu, S., Caglak, A., & Meseci, B. (2012). Self-efficiency of primary school teachers related to the alternative testing and assessment tools. *Amasya Üniversitesi Eğitim Fakültesi Dergisi* [*Amasya University Faculty of Education Journal*], *1*(2), 167-179.

Karasar, N.(2006). *Bilimsel araştırma yöntemi* [*Scientific research method*]. Nobel Publishing.

Kilic, M. Y. (2020). Investigation of self-efficacy of teachers in high schools for measurement and evaluation. *Bayburt Eğitim Fakültesi Dergisi* [*Bayburt Faculty of Education Journal*]*, 15*(30), 307-328. https://doi.org/10.35675/befdergi.686853

Koc, A., Uzun, N. B., & Unaldi Coral, M. N. (2022). Development of the self-efficiency scale for online measurement and evaluation. *International Journal of Social Sciences and Education Research, 8*(1), 87-98. https://doi.org/10.24289/ijsser.1031155

Kocaturk Kapucu, N., & Adnan, M. (2018). Uzaktan öğretimde çevrimiçi eğitmen başarısının değerlendirilmesi [Evaluation of online instructor success in distance education]. *HAYEF: Journal of Education, 15*(1), 7-20.

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education, 193*(3), 13-19. https://doi.org/10.1177/002205741319300303

Kolcu, G., Demir, S., & Kolcu, M. I. B. (2020). Evaluation of online measurement and evaluation applications. *Süleyman Demirel Üniversitesi Sağlık Bilimleri Dergisi* [*Suleyman Demirel University Journal of Health Sciences*]*, 11*(3), 330-333.

Ministry of National Education [MoNE] (2018). *Fen bilimleri dersi öğretim programı (3., 4., 5., 6., 7. ve 8. sınıflar)* [Science course curriculum (Grades 3, 4, 5, 6, 7, and 8)]. https://mufredat.meb.gov.tr/Dosyalar/201812312311937-FEN%20BİLİMLERİ%20ÖĞRETİM%20PROGRAMI2018.pdf

Okur, M., & Azar, A. (2011). Primary teachers' opinions about alternative measurement and assessment techniques used in science and technology course. *Kastamonu Eğitim Dergisi* [*Kastamonu Education Magazine*]*, 19*(2), 387-400.

Oren, F. S., Ormanci, U., & Evrekli, E. (2014). The alternative assessment-evaluation approaches preferred by pre-service teachers and their self-efficacy towards these approaches. *Education and Science, 39*(173), 103-117.

Ozalkan, G. S. (2021). Measurement and evaluation in distance education: Rethinking social sciences education during the pandemic. *International Journal of Economics Administrative and Social Sciences, 4*, 18-26.

Pekcan, N., & Toraman, C. (2022). Investigation of online measurement and evaluation applications in COVID-19 pandemia according to teacher-student opinions. *Erzincan University Journal of Education Faculty, 24*(1), 120-129. https://doi.org/10.17556/erziefd.862654

Sad, S., & Nalcaci, O. (2015). Prospective teachers' perceived competencies about ıntegrating ınformation and communication technologies into education. *Mersin University Journal of the Faculty of Education, 11*(1),177-197.

Stanford, P., & Reeves, S. (2005). Assessment that drives instruction. *Teaching Exceptional Children, 37*(4), 18-22. https://doi.org/10.1177/004005990503700402

Steer, K., Gang, L., Layfield, C., & Borg, J. (2016). Assessment in e-learning for higher education. In *Proceedings of the International Conference on Computers and Management*.

Tekedere, H., Sahin, S., & Goker, H. (2022). An Investigation of student experiences about online distance education at higher education in the COVID-19 term. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi* [*Gazi University Gazi Faculty of Education Journal*]*, 42*(1), 123-166. https://doi.org/10.17152/gefad.871254

Ulas, H., & Ozan, C. (2010). The qualification level of primary school teachers' use of educational technology. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* [*Ataturk University Social Sciences Institute Journal*]*, 14*(1), 63-84.

Wang, Y., Wang, Y., Chen, Y., & Qin, Q. (2020). Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. *Journal of Medical Virology, 92*(6), 568-576. https://doi.org/10.1002/jmv.25748

WHO. (2020). WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020. *World Health Organization*. https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-themedia-briefing-on-2019-ncov-on-11-february-2020

Yaralİ, D. (2017). The analysis of teacher candidates'competency perceptions toward measurement and assessment (example of Kafkas Universty). *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi* [*Abant İzzet Baysal University Faculty of Education Journal*]*, 17*(1), 487-504. https://doi.org/10.17240/aibuefd.2017.17.28551-304650

Yenice, N., Ozden, B., & Alpak Tunc, G. (2017). Examination of the selfefficacy of pre-service teachers about the use of alternative assessment approaches. *Amasya Education Journal, 6*(2), 367-397.

Zhang, Z., & Burry-Stock, A. J. (2003). Classroom assessment practices and teachers' self-perceived assessment skills. *Applied Measurement in Education, 16*(4), 323-342. https://doi.org/10.1207/S15324818AME1604_4

Zimmerman, W. A., & Kulikowich, J. M. (2016). Online learning self-efficacy in students with and without online learning experience. *American Journal of Distance Education, 30*(3), 180-191. https://doi.org/10.1080/08923647.2016.1193801