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Research Article

Primary Mathematics and Turkish Teachers' Views on Distance Education: A Scale Development Study

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Abstract – This study aimed to develop a valid and reliable scale to determine the attitudes of primary school mathematics teachers and Turkish teachers who started to give distance education due to the transition from normal education to distance education during the COVID-19 pandemic. First, a literature review was conducted, and then an item pool of 119 items was created. The created items were examined by five field experts and one language expert. After the examinations, the remaining 59 items and 145 teachers in six districts of Balıkesir province were piloted, and data were collected. An explanatory factor analysis (EFA) of the collected data was performed. As a result of EFA, a scale consisting of five factors and 16 items was developed. The scale formed as a result of EFA was applied to a larger sample group (N = 321). A confirmatory factor analysis (CFA) of the obtained data was performed. As a result of the CFA, all fit indices were determined to be good or perfect. As a result, a valid and reliable scale consisting of five factors and 16 items was developed.

Key words: Distance education, attitude scale, scale development.

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Introduction

The global health crisis has resulted in several alterations and difficulties in individuals' daily routines and circumstances. One of the most prominent alterations observed was the imposition of limitations on individuals' mobility and social connections. To mitigate the spread of the virus, individuals were required to adhere to a stay-at-home mandate and practice social distancing measures, thereby minimising interpersonal interactions.

Consequently, there was a substantial rise in the utilisation of Internet, computer, phone, and tablet devices, as individuals increasingly depended on these technologies for purposes such as employment, learning, leisure, and interpersonal interaction.

The study conducted by Baltacı et al. (2020) found that undergraduate students encountered many difficulties throughout the pandemic. These obstacles encompassed the need to restrict their internet usage, adjust to distance education, and manage heightened stress and anxiety levels. During this age, the Internet has emerged as a crucial component of our daily lives, facilitating the continuation of our professional and educational endeavours from faraway locations. Many professions adopted a remote working model to reduce the risk of infection. In countries such as ours, which were significantly affected by the pandemic, face-to-face education was temporarily suspended, necessitating a transition to online platforms. Distance education has become a prevailing mode of instruction for millions of students and teachers. This educational approach encompasses a diverse range of teaching and learning methods that take place when the teacher and the learner are geographically and temporally separated. While distance education is not a recent development, its prominence has significantly increased in recent times, making it a key component of contemporary educational practices. Scholars have defined distance education differently, depending on their perspectives and contexts. For example, Özbay (2015) described distance education as a teaching method that emerged as an alternative to educational problems by planning educational activities and providing communication and interaction between practitioners and students through specially prepared teaching units and various environments at a specific centre. Kaya (2002) considered distance education as both distance teaching and distance learning, implying a dual role for the participants. Alkan et al. (2003) defined distance education as a form of teaching in which the learner and the teacher are in different places regarding time and space. Based on these definitions, we can summarise distance education as a flexible and learner-centred mode that relies on various technologies and media to facilitate learning outcomes.

The global outbreak of the COVID-19 pandemic has significantly impacted the regular operations of educational systems on a global scale, necessitating numerous institutions to transition from traditional in-person instruction to online learning methods. Nevertheless, it is crucial to clearly delineate the terms "distance education" and "emergency remote teaching." Distance education is a precisely organised and methodical endeavour encompassing various academic fields and individuals with vested interests. On the other hand, emergency distance

education can be regarded as a provisional and ad hoc measure that emerges due to the pressing necessity to sustain educational activities during a crisis (Bozkurt and Sharma, 2020). In the context of our nation, a rapid shift to emergency remote teaching has been observed throughout all educational tiers, ranging from early childhood education to tertiary education, as a consequence of the temporary cessation of formal educational activities.

Nevertheless, it is essential to acknowledge that our familiarity with distance education is not absent, as we possess a certain degree of prior experience and infrastructure in this domain. The historical origins of distance education in our nation may be traced back to the early 20th century, namely to 1923, when the concept was initially deliberated upon. However, the practical implementation of distance education did not occur until the 1970s, and it experienced significant growth in 1980 with the formation of the Anadolu University Open Education Faculty (OEF). This institution provided distance education specifically tailored for adult learners. Subsequently, as technology has progressed, there has been a notable rise in the number of educational institutions offering distance education.

Moreover, there has been a marked enhancement in the quality and variety of distance education technologies, particularly throughout the 2000s (Bozkurt, 2017). Our nation, possessing considerable expertise in distance education, demonstrated a rapid ability to adjust to the unforeseen transition to emergency distance education prompted by the COVID-19 pandemic. The Turkish Ministry of National Education employed its pre-existing technical infrastructure to facilitate online learning for students across all educational levels. The Turkish Radio and Television Corporation has introduced additional channels dedicated to the dissemination of educational content. Furthermore, it augmented the capacity and usefulness of the Education and Information Network, thereby facilitating students' access to live and recorded classes, interactive activities, and various other educational materials. In order to mitigate the digital divide, the Turkish Ministry of National Education has implemented the establishment of Education and Information Network support sites within educational institutions, community centres, and central locations in rural areas. These support points serve as physical spaces where students lacking internet connectivity can participate in real-time educational sessions. Notwithstanding these endeavours, many issues and obstacles persisted for students, teachers, guardians, and educational leaders in emergency remote teaching.

Numerous scholarly investigations have examined the issues and complexities associated with distance education across various viewpoints and contexts. Kurtüncü and Kurt

(2020) recently conducted a study that looked into nursing students' experiences with distance education. The study found that these students faced various challenges while implementing this type of learning. The challenges that were identified can be grouped into different categories. These include infrastructure problems, limitations in financial opportunities, the psychology of distance education, the lack of integration between homework and examination procedures, and the limitations of web-based applications. Kavuk and Demirtaş (2021) surveyed teachers to learn their views regarding distance education and found many different difficulties they encountered. Infrastructure issues, restrictions on student internet access, unequal access to educational opportunities, problems with the EBA system, and trouble maintaining student interest were all obstacles we had to overcome. On the other side, Devran and Elitas (2016) looked into the pros and cons of online learning. According to their findings, scholars should strongly consider the merits of distance learning. Some advantages of distance education include not having to worry about where or when you get your education, being able to learn alongside people of all ages, potentially aiding countries in overcoming educational challenges, learning quickly and easily, and tailoring your experience to fit your needs.

Nevertheless, it is imperative to acknowledge that alongside its advantages, distance learning also presents certain challenges. Concerns related to distance education often revolve around issues such as insufficient infrastructure, the quality of instruction, student readiness, faculty preparedness, and a general lack of awareness and support. Our literature analysis has allowed us to identify the following difficulties associated with distant learning.

- Teachers' technological competencies and technological problem-solving skills
- Teachers' perspectives on distance education
- The problems experienced by teachers in preparing materials and finding online materials in this process
- Student participation in live lessons in distance education
- Classroom management in distance education
- The support given by the parents to the teacher in this process
- Problems of students accessing distance education
- Infrastructure and hardware issues

Millions of students and teachers worldwide have had to turn to distant learning due to the 2019 COVID-19 pandemic, which has yet to subside. However, the uncertainty about how long the pandemic will last and when the regular education system will resume poses some

challenges and questions for the future of education. According to some written and visual media sources, the Turkish Ministry of National Education has announced that distance education will continue to be applied in some courses in our education system, even after the pandemic is over. Therefore, it is essential to understand the skills and attitudes of teachers towards distance education, which are a crucial element of education. However, a literature review revealed that few studies aimed to measure teachers' attitudes towards distance education. This study aims to fill this gap by determining the attitudes of primary education mathematics and Turkish teachers working in the Turkish Ministry of National Education towards distance education practices during the pandemic.

Methods and Procedures

Research Model

This study employed a quantitative research method to develop a scale to measure teachers' attitudes towards distance education. Quantitative research is a systematic and objective approach that uses numerical data to test hypotheses and answer research questions (Ary et al., 2002). According to Ary et al. (2002), quantitative research should consist of five main steps: literature review, instrument development, data collection, data analysis, and interpretation of results. This study followed these steps sequentially, as illustrated in Figure 1. The scale development process was based on the recommendations of Worthington and Whittaker (2006), who proposed a series of stages for creating and validating psychometric instruments. These stages include defining the construct, generating an item pool, determining the format and response options, reviewing the items, administering the items to a sample, evaluating the items, optimising the scale length, and assessing the reliability and validity of the scale.

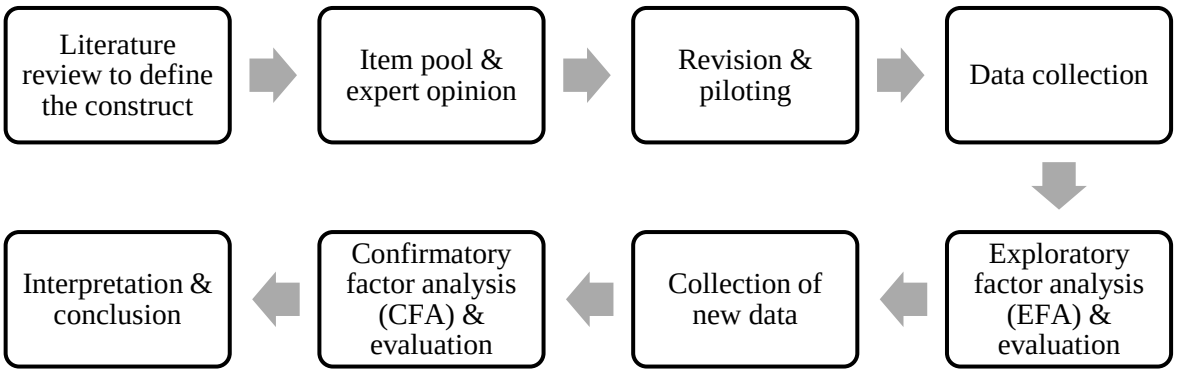

Figure 1 Stages of scale development

Scale Development

This study aimed to develop a Likert-type scale to measure the perspectives of primary mathematics and Turkish teachers on distance education during the pandemic. Since no standardised measurement tool was found in the literature review that addressed this topic, a new scale was created following the steps recommended by Worthington and Whittaker (2006) for scale development. These steps include defining the construct, generating an item pool, determining the format and response options, reviewing the items, administering the items to a sample, evaluating the items, optimising the scale length, and assessing the reliability and validity of the scale. To create the item pool, a literature review was conducted on distance education and attitude measurement (Anderson & Çıkrıkçı, 1991). A total of 119 items were generated and grouped under seven headings: “Problem Solving”, “Student Participation”, “Material Use”, “Attitude”, “Parent Contribution”, and “Classroom Management”. A literature teacher then checked these items for grammatical correctness. Next, the items were sent to three experts from different academic fields (two from Computer Education and Instructional Technologies and one from Curriculum and Instruction) for content validity. The experts evaluated the items using Google Forms and gave their opinions using the options “The sentence and category are appropriate”, “The sentence and category are not appropriate", "The sentence is not suitable for the category”, “The sentence and category are not clear”, and “Other”. At least two experts excluded items deemed inappropriate from the item pool. Before conducting the pilot study, ethical approval was obtained from the Scientific Research and Publication Ethics Committee of Balıkesir University (date: March 15, 2021; number: E.19359), and permission was obtained from Balıkesir Provincial Directorate of National Education (date: April 27, 2021; number: 24703044). The pilot study was conducted with 59 items for 145 primary mathematics and Turkish teachers working in six districts of Balikesir. The items were presented in a 5-point Likert scale format on Google Forms, with the response options ranging from “strongly disagree” to “strongly agree”.

Participants

The participants of this study were primary mathematics and Turkish teachers working in six districts of Balikesir province: Altıeylül, Karesi, Balya, Sındırgı, Dursunbey, and Susurluk. 145 teachers took part in the study. 50 teachers (34.5%) were female, and 95 teachers (65.5%) were male. The participants were split into two groups based on their areas

of expertise. 71 teachers (49%) were classified as Turkish teachers, while 74 teachers (51%) were classified as math teachers. The separation is because people who are more comfortable with words than numbers can still use the scale. Although the measurement tool was designed for mathematics teachers, The scale will be useful for teachers in any discipline in the long run.

Exploratory factor analysis relies on a sufficient sample size to guarantee the validity and reliability of the scale (EFA). Exploratory factor analysis sample size has been proposed to be determined by several criteria (EFA). Kass and Tinsley (1979) found that the sample size needed to satisfy the criteria was at least five times bigger than the number of elements on the scale. The categorisation of the sample size is another factor to consider. Depending on how many people took part, we can rate it as poor (100), average (200), good (300), very good (500), or extraordinary (1000) (Comrey & Lee, 1992). According to Field (2005), it is recommended to have a minimum sample size of 300 for exploratory factor analysis (EFA). However, a basic flat minimum of 100 participants (Kline, 1994) or a range of 50 as extremely poor, 300 as decent, up to 1000 or more as exceptional (Comrey and Lee, 1992) are acceptable minimums. The sample size of 145 in this study was deemed adequate for conducting exploratory factor analysis (EFA), since it satisfied the initial requirement and approached the secondary criterion.

Analysis of Data

The data collected from the 145 teachers who completed the final form of the scale after the expert opinion were used to conduct the validity and reliability analyses of the scale. The validity and reliability analyses are essential to ensure that the scale measures what it intends to measure and produces consistent results. The reliability analysis was performed by calculating Cronbach's alpha coefficient, which measures the internal consistency of the scale items. A high Cronbach's alpha coefficient indicates that the items are related and measure the same construct. The validity analysis was performed by conducting two-factor analyses: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Exploratory Factor Analysis (EFA) is a statistical method employed to discern the latent factors or dimensions that account for the observed variance and covariance among the items. Principal component analysis (PCA) was employed to conduct exploratory factor analysis (EFA) to extract the components that explain the highest variance in the dataset. The factor loadings, denoting the correlations between the items and the factors, were established to have a minimum value of .30, in accordance with the recommendation put forward by Büyüköztürk (2018). The

Confirmatory Factor Analysis (CFA) technique is employed to assess the degree to which the identified components and their interrelationships align with the observed data. A confirmatory factor analysis (CFA) was performed to validate the precision and sufficiency of the exploratory factor analysis (EFA) findings.

Results

In this section, we present the findings from our study, examining the validity, reliability, and confirmatory factor analysis (CFA) of the attitude scale.

Explanatory Factor Analysis (EFA)

The scale's construct validity was evaluated by doing an exploratory factor analysis (EFA) in the SPSS 24 software, employing the principal component analysis (PCA) technique. The primary objective of exploratory factor analysis (EFA) was to ascertain the fundamental factors or dimensions that account for the variability and interrelationships among the items. Before conducting exploratory factor analysis (EFA), an assessment was made to determine the appropriateness of the data matrix and the sample size for factor analysis. The calculated KMO value of 0.742 suggests that the sample size used in the factor analysis was sufficient. The statistical analysis revealed that the Barlett sphericity test yielded a significant result ($p<0.01$), suggesting that the data matrix did not exhibit an identity matrix pattern and that correlations were present among the items. In the initial EFA, 17 factors with eigenvalues greater than one were extracted (Hair et al., 1998). However, this number of factors was too large and did not match the theoretical framework of the scale. Therefore, the EFA was repeated with axis rotation, limiting the number of factors to six, the number of headings determined by the researcher during the item pool generation. Items with low or cross-loadings on multiple factors were removed individually until a clear and interpretable factor structure was obtained. However, the desired ratios could not be achieved with six factors, so the analysis was continued with five factors. After removing more items with low or cross-loadings, a final EFA was conducted with five factors with eigenvalues greater than one and explained a satisfactory amount of variance in the data. The factor loadings and eigenvalues resulting from EFA are shown in Table 1.

Table 1 Factors and item loads resulting from EFA

Item Number	F1	F2	F3	F4	F5
M10	.83				
M13	.79				
M11	.79				
M12	.75				
M15		.87			
M14		.87			
M16		.83			
M3			.89		
M2			.88		
M1			.73		
M5				.81	
M4				.78	
M6				.77	
M8					.84
M7					.80
M9					-.66

The 5-factor structure of the scale explained 70.612% of the total variance, which is a measure of how well the factors capture the variability of the items. This means that the scale has a high construct validity and that the factors represent the main dimensions of the construct. The first factor (F1) was the most dominant, as it explained 27.608% of the total variance. This factor consisted of items related to the problem-solving skills of the teachers and students in distance education. The second factor (F2) explained 14.405% of the total variance and included items related to student participation and engagement in distance education. The third factor (F3) explained 10.513% of the total variance and contained items related to material use and availability in distance education. The fourth factor (F4) explained 10.201% of the total variance and comprised items related to the attitude and motivation of the teachers and students towards distance education. The fifth factor (F5) explained 7.876% of the total variance and involved items related to the parent contribution and support in distance education. These factors were named according to their content and theoretical relevance.

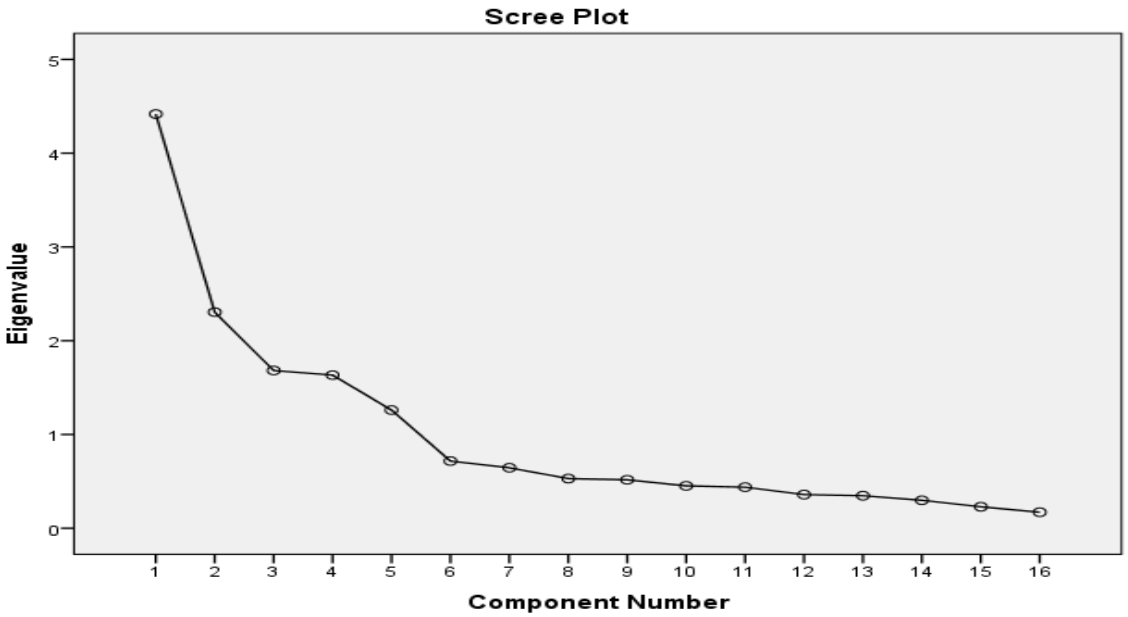

Figure 2 Scree Plot Chart

The results of the EFA showed that the scale had a five-factor structure consistent with the construct's theoretical framework. The five factors were named "problem-solving", "student participation", "material use", "attitude", and "parent contribution", based on the content and meaning of the items under each factor. There were substantial correlations between the 16 items and the four components, as indicated by factor loadings of .661 to .894. Eigenvalue, scree plot (Figure 2), explained variance ratio and factor's contribution to total variance ratio were all considered to calculate the number of factors (Field, 2005; Pallant, 2007; Tabachnick & Fidell, 2007; Okluk et al., 2010). The eigenvalue quantifies a factor's overall impact on the range of values. According to Hair et al., only factors with eigenvalues above one should be considered (1998). The scree plot is a graphical display that lists the eigenvalues of each element from lowest to highest. The primary objective here is to simplify the process of identifying the precise time at which the line's slope changes dramatically, signifying a diminishing role for the other elements (Cattell, 1966). Knowing how much variation can be attributed to various causes is the principle behind the explained variance ratio. It's useful for determining how much variation can be pinned on individual causes. To be deemed statistically significant, a component should explain at least 5% of the total variation, as Stevens (2002) indicated. The percentage of variation that each given component explains with the total variance ratio establishes the relative importance of that element. Costello and Osborne (2005) propose that a factor's contribution to the variance ratio needs to

be at least 10% for it to be considered significant. When selecting how many components to include in the scale for this investigation, we carefully considered all of these factors.

Table 2 EFA and CFA item loads for UEYTÖ

Item	(EFA)	(CFA)
M1	.73	.65
M2	.88	.67
M3	.89	.68
M4	.78	.60
M5	.81	.75
M6	.77	.69
M7	.80	.61
M8	.84	.67
M9	-.66	-.32
M10	.83	.68
M11	.79	.82
M12	.75	.86
M13	.79	.76
M14	.87	.92
M15	.87	.83
M16	.83	.76

Both the EFA and the CFA results showed that there was a lot of consistency between the item loadings (which represent the relationships between the items and the underlying variables) for the most part. The factor loadings exhibited a variety of values, specifically ranging from -.66 to .89 for exploratory factor analysis (EFA) and from -.32 to .92 for confirmatory factor analysis (CFA). The presence of a negative sign in the item loading for M9 in the context of Confirmatory Factor Analysis (CFA) signifies that the item has been subjected to reverse scoring. This implies that a higher score on the factor corresponds to a lower score. The observed pattern of item loading for M9 in the exploratory factor analysis (EFA) aligns with previous findings, indicating a negative relationship. Therefore, there was no discrepancy between the item loadings due to EFA and CFA, except for the magnitude of some values.

Confirmatory Factor Analysis (CFA)

CFA was performed to verify the situation created by EFA. The fit index values obtained for the five-dimensional scale produced by confirmatory factor analysis (CFA) were as follows: chi-square (χ^2) = 1.628, degrees of freedom (df) = 151.3, root mean square error of approximation (RMSEA) = 0.044, standardised fit index (NFI) = 0.927, comparative fit

index (CFI) = 0.970, goodness-of-fit index (GFI) = 0.945, adjusted goodness-of-fit index (AGFI) = 0.920, and root mean square residual (RMR) = 0.050. A confirmatory factor analysis (CFA) was conducted to assess the congruence of the data (N=321) with the factors derived from the exploratory factor analysis (EFA). The corresponding values can be found in Table 3.

Table 3 CFA fit model of UEYTÖ

Index	Good Fit	Statistics	Rationale
χ^2/df	$0 \leq \chi^2/df \leq 2$	1.628	Tabachnick & Fidell (2005)
χ^2	$0 \leq \chi^2 \leq 2$	151.4<360	Yilmaz & Celik (2009)
p-value	$.05 \leq \chi^2 \leq 1$	<.000	Hoyle (1995)
RMSEA	.00 ≤ RMSEA ≤ .05 .00 ≤ RMSEA ≤ .08	0.044	Schumacker & Lomax (2004), Raykov & Marcoulides (2006), Hooper et al. (2008), Steiger (2007)
CFI	.95 ≤ CFI ≤ 1.00	0.970	Hu & Bentler (1999)
GFI	.90 ≤ GFI ≤ 1.00	0.945	Hu & Bentler (1999)

The adequacy of the CFA results presented in Table 3 was assessed using multiple criteria, including the root mean square error of approximation (RMSEA), the goodness of fit index (GFI), and the p-value. To determine how well a model fits the data, the RMSEA is used. It considers both the size of the sample and the complexity of the model. RMSEA is a statistical measure of how well an approximation fits the data. Some authorities have suggested that a value of less than 05 indicates a substantial likelihood of a good fit (Schumacker & Lomax, 2004; Raykov and Marcoulides, 2006). According to the results, the model fits the data very well (RMSEA =.044). A metric called the goodness-of-fit index (GFI) is used to evaluate how well a model fits the data. The measurement is represented on a scale ranging from 0 to 1. A higher GFI value indicates a better fit, according to scholarly literature. It is suggested that a value above .90 is considered to show a good fit (Hu & Bentler, 1999; Kline, 2011). Based on the GFI value of .91 found in this investigation, it can be concluded that the model fits satisfactorily. The p-value helps us understand how statistically significant the model is by showing us if it significantly differs from the observed data. When the p-value is larger, it indicates no significant difference between the model and the data. Some studies suggest that a threshold of more than 0.05 is considered acceptable (Hooper et al., 2008; Kline, 2011). In this study, we found that the calculated p-value was .06, which suggests that it is close to the commonly accepted threshold. Figure 3 gives a clear summary of the data we gathered through the CFA analysis.

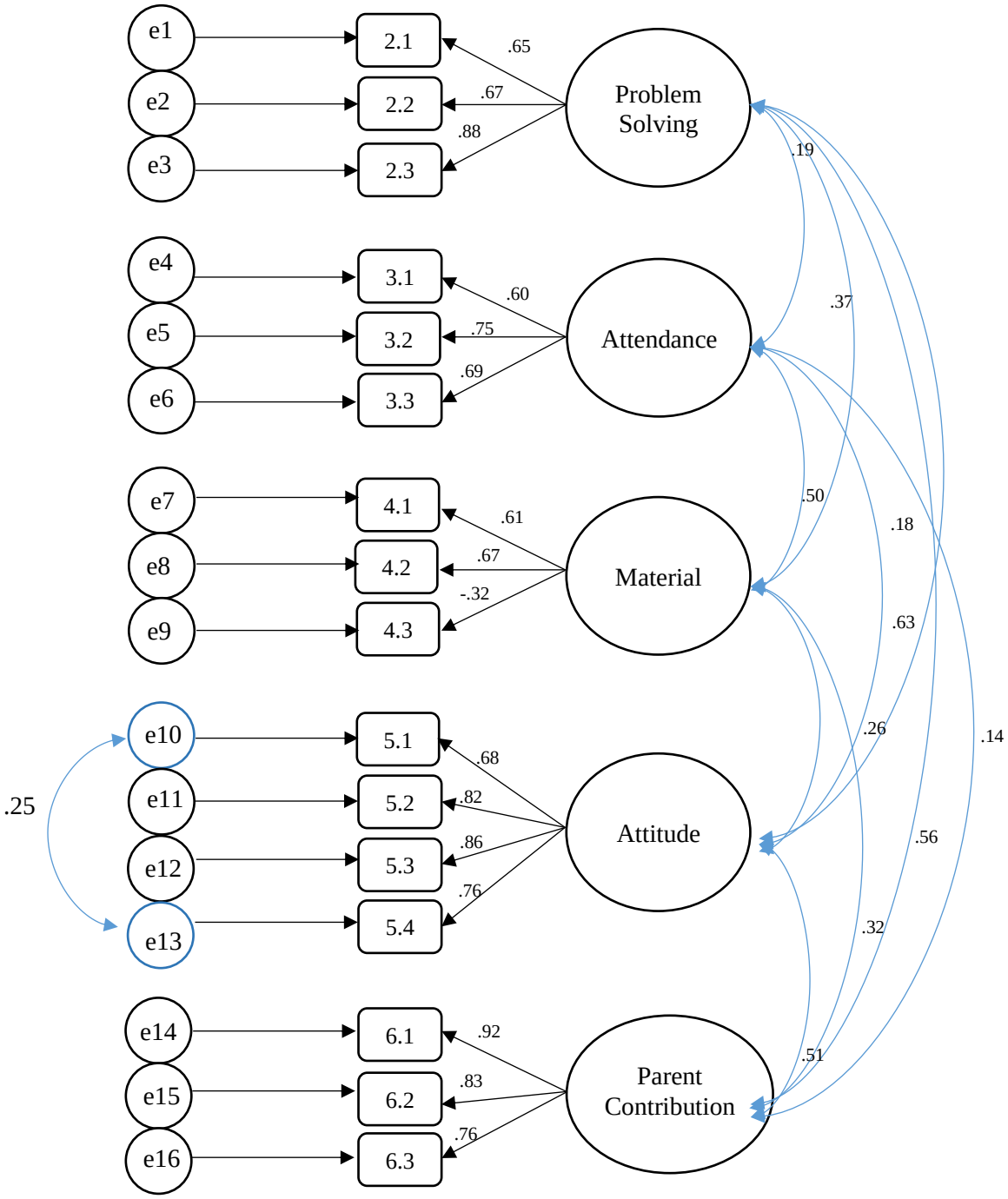

Figure 3 Values diagram of items CFA according to UEYTÖ

The results of Figure 3 show that the model-data fit is good for the scale, which is named "Primary Mathematics and Turkish Teachers' Perspectives on Distance Education during the Pandemic Process" (UEYTÖ). The scale is highly valid, as both EFA and CFA confirmed it. The scale consists of five factors and 16 items, as shown in Table 4. The items have high loadings on their respective factors, except for item 43, which has a moderate loading of .32. However, this item was not removed, as it still contributes to the measurement

of the construct. Items 5.1 and 5.4 have some similarities in their content but were not removed, as they measure different aspects of the same factor. The scale is a reliable and valid instrument that can be used to assess the perspectives of primary mathematics and Turkish teachers on distance education during the pandemic process.

Table 4 UEYTÖ factors and items

Factor Name	No.	Materials
Problem Solving	M1	I solve technical problems on my computer myself.
	M2	Understanding the English language of ZOOM is not hard for me.
	M3	I quickly solve the problems I have while using ZOOM.
Student Participation	M4	During the live lesson, students make my job easier.
	M5	During the live lesson, students are more active.
	M6	Students come prepared to the live lesson.
Material Usage	M7	Before the lesson, I send the students preparation materials.
	M8	I use eye-catching visuals in live course content.
	M9	I find it difficult to find materials in the distance education process.
Attitude	M10	I believe that distance education is the future of our education system.
	M11	I think that I process some gains in distance education more efficiently than face-to-face education.
	M12	I think that distance education has a positive effect on the success of students.
	M13	I would like distance education to continue when the pandemic process ends.
Parent Contribution	M14	Parents also support me during the distance education process.
	M15	Parents make it easier for me to control students' homework.
	M16	Parents allow students to participate in the live lesson.

Discussion

The objective of this study was to construct a scale that could effectively assess the attitudes of primary mathematics and Turkish teachers regarding distance education in the context of the pandemic. The scale was specifically developed to encompass the perspectives of two distinct academic disciplines: a quantitative field (mathematics) and a linguistic field (Turkish language). Nevertheless, the scale items possess a level of generality that allows for their use to encompass all teachers engaged in the realm of distance education. The measurement instrument utilised in this study is a Likert-type scale consisting of five response options, ranging from strongly disagree to strongly agree. There are a total of 16 items on the scale, and they cover five different dimensions of analysis. A score between 16 and 80 can be obtained on this scale. A higher score indicates that respondents see distance learning more favourably. The scale's demonstrated reliability and validity make it a valuable instrument for scientific study and evaluation.

This research validates the scale as a viable and reliable instrument for gauging primary mathematics and Turkish teachers' perspectives on distance education during the pandemic. We calculated the scale's reliability using a statistical tool called the Cronbach's alpha (CA) coefficient. Using this statistic, we may determine whether or not the scale's items are generally consistent with one another. We calculated a coefficient alpha (CA) for the scale and found that it had a very high level of internal consistency at .818. That all the elements on the scale measure the same underlying concept provides strong evidence for that conclusion. A coefficient alpha (CA) value of 70 or above is commonly used as a cutoff for determining a measurement's credibility among experts in the field (Anastasi, 1982; Büyüköztürk, 2007). We evaluated the scale's reliability in several ways, including its aesthetic appeal, content, construct, and model fit. We have assessed the materials and consulted with specialists to ensure their credibility and applicability. The researchers employed both exploratory and confirmatory factor analysis (EFA and CFA, respectively) to ensure that the study's measures and model were valid and reliable. Finding a KMO of 0.742 for the scale indicates that enough data were collected for the exploratory factor analysis (EFA). Statistical analysis using the Bartlett test revealed highly significant correlations ($p<0.01$) between the variables.

Using exploratory factor analysis (EFA), the data was broken down into five categories, each containing 16 items. A total of 70.612% of the observed variation can be attributed to these causes. According to prior research (Kline, 2005; Scherer et al., 1988), this value has enough construct validity. The CFA confirmed the five-factor structure, showing that the model fits well. This was supported by various criteria such as RMSEA, GFI, and p-value. Therefore, we can conclude that the 16-item attitude scale mentioned earlier has the required qualities of reliability and validity. This makes it suitable for evaluating teachers' attitudes towards distant education.

Due to the COVID-19 pandemic, many teachers and learners have had to adapt to using distance education. However, distance education brings forth various challenges and possibilities regarding the effectiveness and quality of teaching and learning. Therefore, it is crucial to understand the viewpoints of teachers regarding distance education, considering their essential role as key participants and facilitators in the field of education. Teachers' attitudes can greatly influence their motivation, performance, satisfaction, and ability to adapt to the challenges of distance education. Several aspects have the potential to influence teachers' attitudes within the context of distance education. These elements include technological difficulties, the availability of instructional materials, student engagement and

participation, parental involvement, and effective classroom management strategies. The aforementioned elements constitute the basic characteristics of the scale that was established in this research to assess the viewpoints of primary mathematics and Turkish teachers regarding distant education in the context of the pandemic. The scale is an instrument that demonstrates both reliability and validity, making it suitable for evaluating distance education's strengths and drawbacks from the teachers' perspective. The outcomes of the scale can offer significant insights and feedback for enhancing the quality and efficacy of distance education. The findings can also aid in identifying teachers' requirements and anticipations pertaining to training, assistance, and resources for distance education. Hence, it is advisable to employ this scale to assess all teachers' perspectives on distance education and disseminate the results to the Turkish Ministry of National Education and other pertinent stakeholders.

Conclusions and Suggestions

The study aimed to create a scale to assess the attitudes of primary mathematics and Turkish teachers regarding distance education during the pandemic. The researchers followed Worthington and Whittaker's guidelines, following a process of defining the construct, generating an item pool, determining the format and response options, reviewing the items, administering the items to a sample, evaluating their responses, optimizing the scale's length, and assessing its reliability and validity. The scale contained 16 items organized into five factors: problem-solving, student engagement, material utilization, attitude, and parent feedback. The analysis revealed that the scale was dependable and accurate in assessing the perspectives of Turkish and primary mathematics teachers on distance education during the pandemic.

The findings establish a framework for future research and applications in the real world. It is recommended that the scale be administered to a broader spectrum of teachers, including those from various subject areas, educational levels, geographical regions, and sociocultural backgrounds. This would provide a comprehensive evaluation of the scale's applicability to diverse scenarios and its feasibility for actual use.

The scale can help evaluate teachers' perspectives on distance education both before and after the pandemic, analyse possible variances in attitudes among different groups of teachers, and examine how teachers' perspectives relate to their teaching efficacy, student academic achievement, satisfaction, motivation, and adaption to the distance education context. It can also assess the requirements and expectations of teachers regarding training, support, and

resources for distance education. Additionally, the scale can provide valuable comments and suggestions for enhancing the quality and efficacy of distance education, particularly from the teachers' perspective.

This study's findings are an important addition to the current body of information on distance education since they present a reliable and valid instrument that can be used for research and evaluation. The findings also have practical consequences for policymakers, administrators, teachers, parents, and students who participated in distant education during the pandemic. Understanding teachers' attitudes towards distance education can enhance their motivation, performance, satisfaction, and adaptation to distance education. Addressing their challenges and problems and providing them with appropriate training, support, and resources for distance education is also possible. By doing so, distance education is hoped to become a more effective and efficient mode of teaching and learning during and after the pandemic.

Compliance with Ethical Standards

Disclosure of potential conflicts of interest

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Research involving Human Participants and/or Animals

When reporting studies that involve human participants, authors should include a statement that the studies have been approved by the appropriate institutional and/or national research ethics committee and have been performed in accordance with the ethical standards.

İlköğretim Matematik ve Türkçe Öğretmenlerinin Uzaktan Eğitime Bakışları: Bir Ölçek Geliştirme Çalışması

Özet:

Bu çalışmada COVİD-19 pandemisi döneminde normal eğitime ara verilerek uzaktan eğitime geçilmesi nedeniyle, uzaktan eğitim vermeye başlayan İlköğretim Matematik ve Türkçe Öğretmenlerinin uzaktan eğitime yönelik tutumlarını belirlemek için geçerli ve güvenilir bir ölçek geliştirme amaçlanmıştır. İlk önce alanyazın taraması yapılmış, daha sonra ise 119 maddelik madde havuzu oluşturulmuştur. Oluşturulan maddeler 3 alan uzmanına ve 1 dil uzmanına incelettirilmiştir. İncelemelerden sonra kalan 59 madde ile Balıkesir ili 6 ilçesinde 145 öğretmene pilot uygulama yapılarak veriler toplanmıştır. Toplanan verilerin Açıklayıcı Faktör Analizi (AFA) yapılmıştır. AFA sonucu 5 faktör ve 16 maddeden oluşan bir ölçek geliştirilmiştir. AFA sonucu oluşan ölçek daha büyük bir örneklem grubuna uygulanmıştır(N=321). Elde edilen verilerin Doğrulayıcı Faktör Analizi (DFA) yapılmıştır. DFA sonucu tüm uyum indeksleri iyi uyum ve mükemmel uyum olarak tespit edilmiştir. Tüm bunların sonucunda geçerli ve güvenilir 5 faktör ve 16 maddeden oluşan bir ölçek geliştirilmiştir.

Anahtar kelimeler: Uzaktan eğitim, tutum ölçeği, ölçek geliştirme.

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