Journal of Social Sciences of Mus Alparslan University

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Araştırma Makalesi ● Research Article

Strategies for Supporting Critical Thinking Skills in Children by Preschool Teachers Scale: Validity and Reliability Study

Okul Öncesi Öğretmenlerinin Çocuklarda Eleştirel Düşünme Becerilerini Destekleme Stratejileri Ölçeği: Geçerlik ve Güvenirlik Çalışması

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Öz: Bu çalışmanın amacı okul öncesi öğretmenlerinin çocuklarda eleştirel düşünme becerilerini destekleme stratejilerini belirlemek için bir ölçme aracı geliştirmektir. Araştırma için, Muş Alparslan Üniversitesi Bilimsel Araştırmalar Etik Kurulu, 25.11.2021 tarih ve 29798 sayılı kararı ile çalışmanının etik kurul izni alınmıştır. Araştırmada açımlayıcı faktör analizi (AFA) için 300, doğrulayıcı faktör analizi (DFA) için 390 okul öncesi öğretmeni katılımcıyla çalışılmıştır. Tarama modelinde gerçekleştirilen çalışmada ölçek 5'li likert şeklinde olup tek faktörden oluşmaktadır. Ölçeğin yapı geçerliği için açımlayıcı faktör analizi (AFA) ve doğrulayıcı faktör analizi (DFA) yapılmıştır. Tek faktörlü yapının açıkladığı varyans oranı %69 olup bu faktöre ait faktör yükü değerleri 0.70 ile 0.89 arasında değişmektedir. Ölçeğin uyum istatistiği incelendiğinde RMSEA değeri .071 ve SRMR değeri de .061 olarak bulunurken, CFI değeri .99, NFI=.98, NNFI=.99 ve χ^2/sd ise 2.84 olarak bulunmuştur. Ölçeğin asıl uygulamasından elde edilen ölçme sonuçlarının güvenirliğine ilişkin hesaplanan Cronbach Alpha değeri .97 bulunurken Spearman Brown İki Yarı yöntemleri için elde edilen güvenirlik katsayısı 0.98 olarak belirlenmiştir. Sonuç olarak "Okul Öncesi Öğretmenlerinin Çocuklarda Eleştirel Düşünme Becerilerini Destekleme Stratejileri Ölçeği"nin öğretmenlerin çocuklarda eleştirel düşünme becerilerini destekleme stratejilerinin belirlenmesinde kullanılabilecek geçerli ve güvenilir bir ölçme aracı olduğu söylenebilir.

Anahtar Kelimeler: Eleştirel düşünme, Okul öncesi dönem, Üst düzey düşünme, Geçerlik, Güvenirlik

Abstract: The aim of this study is to develop a measurement tool to determine the strategies of preschool teachers in supporting critical thinking skills in children. For the research, the ethics committee permission of the study was obtained from the Muş Alparslan University Scientific Research Ethics Committee with the decision dated 25.11.2021 and numbered 29798. In the research, 300 preschool teachers participated in the exploratory factor

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Cite as/ Atıf: Tozduman-Yaralı, K., Kavruk, S. Z., Ceyhan, G. & Saçan, S. (2024). Strategies for supporting critical thinking Skills in children by preschool teachers scale: validity and reliability study. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi*, *12*(2), 725-738 http://dx.doi.org/10.18506/anemon. 1507715

Received/Geliş: 30 Jun/Haziran 2024

Accepted/Kabul: 26 August/Ağustos 2024

Published/Yayın: 30 August/Ağustos 2024

analysis (EFA) and 390 preschool teachers participated in the confirmatory factor analysis (CFA). In the study conducted with a survey model, the scale is a 5-point Likert type and consists of a single factor. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed for the construct validity of the scale. The variance explained by the single-factor structure is 69%, with factor loadings ranging from 0.695 to 0.894. When the fit indices of the scale were examined, the RMSEA value was found to be 0.071, the SRMR value was 0.061, the CFI value was 0.99, the NFI was 0.98, the NNFI was 0.99, and the χ^2/df was 2.84. The Cronbach's Alpha value, calculated for the reliability of the measurement results obtained from the main application of the scale, was found to be 0.97, while the reliability coefficient obtained for the Spearman-Brown Split-Half method was determined to be 0.98. As a result, it can be stated that the "Strategies for Supporting Critical Thinking Skills in Children by Preschool Teachers Scale" is a valid and reliable scale that can be used to determine the strategies of teachers in supporting critical thinking skills in children.

Keywords: Critical thinking, Preschool period, Higher-order thinking, Validity, Reliability

Introduction

Critical thinking has been defined in various ways from past to present. It has been described as evidence-based thinking (Olson & Astington, 1993), the pursuit of valid and reliable information (Galinsky, 2019), thinking about thinking (Paul, 1990), and the development and evaluation of claims/evidence (Facione, 1984). The common point of these diverse definitions of critical thinking is its importance in today's world. In an era where concepts such as "post-truth" are discussed, seeking the truth and obtaining reliable information has become crucial for every individual. The acquisition of these skills spans from early childhood to adulthood (Ruggerio, 2019; Tozduman Yaralı, 2020). It is noted that the need for critical thinking increases with the level of education, and there is no period considered too early to start teaching critical thinking skills (Facione, 2019).

Critical thinking is cited as one of the higher-order thinking types, like problem-solving and creative thinking (Bruning, Schraw, & Ronning, 1995), and it is emphasized as a prerequisite for other thinking skills such as decision-making, creative thinking, and problem-solving (Ennis, 1985; Kurnaz, 2013; Sternberg, 1985). In the report "MEB 21st Century Student Profile" (2011) by the Ministry of National Education, efforts were made to outline a student profile suitable for global conditions, highlighting the importance of critical thinking in today's world and suggesting that the current education system should incorporate practices to develop this skill. The updated Ministry of National Education (MEB) Preschool Education Program (2024) emphasizes in its fundamental principles (principle 11) the necessity and importance of developing children's critical thinking skills, adding cognitive development-related achievement 21 to the program, aimed at encouraging children to demonstrate critical thinking abilities (MEB, 2024).

Although critical thinking can be developed at any age (Ruggiero, 2019), it evolves over a long process. In this respect, early childhood experiences are crucial. It is noted that maturation alone is not sufficient for the development of critical thinking skills, and the importance of environmental factors in this development is emphasized (Kurnaz, 2013; Tozduman Yaralı, 2019). The role of teachers in the development of critical thinking is a point of consensus among all researchers (Alkın Şahin & Gözütok, 2013; Aybek, 2006; Kaloç, 2005; Rahmawati & Harun, 2019; Tozduman Yaralı & Özkan Kunduracı, 2024). The question that comes to mind here is, "What is expected from teachers in developing preschool children's critical thinking skills?" When the MEB Preschool Education Program is examined from this perspective, teachers are seen as one of the most important determinants affecting the quality of preschool education and the development of the child. Additionally, the program highlights the importance of teachers being good role models, organizing the learning environment to support children's development, updating it to increase motivation for exploration, and providing opportunities in individual, small, and large group activities to achieve the program's goals (MEB, 2024). Although previous preschool education programs offered more indirect content in this regard (Tozduman Yaralı & Güngör Aytar, 2018), the updated new curriculum directly includes the acquisition of higher-order thinking skills like critical thinking (MEB, 2024).

There are studies in the literature that examine the teacher behaviors needed to support children's critical thinking skills (Beyer, 1985; Costa, 1985; Potts, 1994; Tama, 1989; Tozduman Yaralı & Özkan Kunduracı, 2024). While the importance of a classroom culture that includes a democratic environment and participation in decision-making processes is highlighted (Gürkaynak, Üstel & Gülgöz, 2008; Tozduman Yaralı, 2019), some specific teacher strategies have also been identified. For example, Potts (1994) stated that there are four fundamental strategies for developing preschool children's critical thinking skills: asking open-ended questions, allowing sufficient time for thinking, encouraging interaction among students, and teaching for transfer. Walsh, Murphy, and Dunbar (2007) described teacher behaviors that support children's higher-order thinking skills as being sensitive to children's needs, granting autonomy, providing encouragement and support, referring to previous learning when dealing with a new topic, using open-ended questions, including practices that encourage collaboration among children, and being a good observer. In a systematic review examining the critical thinking skills of preschool children (O'Reilly, Devitt & Hayes, 2022), it was determined that the most important elements of critical thinking investigated in young children are reasoning skills and problem-solving. Research on this topic has shown that classroom interactions that bring out critical thinking in preschool classes are (1) dialogue and questioning techniques, (2) the use of thinking language, and (3) story-based approaches (O'Reilly, Devitt & Hayes, 2022; Walsh, Murphy & Dunbar, 2007).

When the literature is examined in terms of critical thinking in the preschool period, it is observed that there are a limited number of studies, especially in Turkey. In this context, there are studies that emphasize the argument that preschool children can think critically (Leon, 2015; Heyman, 2008; Kuhn, 1999; Tozduman Yaralı & Güngör Aytar, 2021), studies that address strategies supporting critical thinking by preschool teachers (Tozduman Yaralı & Özkan Kunduracı, 2024), and studies that have developed measurement tools allowing the evaluation of critical thinking skills in preschool children (Chandra, 2008; Karadağ, Demirtaş & Yıldız, 2017; Tozduman Yaralı & Güngör Aytar, 2020). However, it has been determined that measurement tools related to teacher behaviors supporting critical thinking in education are limited to the primary education period (Alkın Şahin & Gözütok, 2013). In the literature, no measurement tools have been found for the supportive behaviors of preschool teachers regarding critical thinking. Identifying the strategies of preschool teachers that support critical thinking would also allow for the development of critical thinking skills. Therefore, to address this gap in the field, this study aims to develop the 'Scale for Strategies of Preschool Teachers to Support Critical Thinking Skills in Children.

Method

In this study, the aim is to develop the “Scale of Strategies for Supporting Critical Thinking Skills in Children by Preschool Teachers” and determine its psychometric properties. This research is fundamentally a survey study in this regard. The survey model is a research approach that aims to describe the current state as it is (Karasar, 2012).

Scale Development Process

Creating the Item Pool

In the context of the research, while creating the item pool, efforts were made to identify teacher behaviors aimed at developing critical thinking skills in preschool children. For this purpose, studies in the relevant literature were examined in detail, and an item pool consisting of 70 items was created (Beyer, 1985; Costa, 1985; O'Reilly, Devitt & Hayes, 2022; Walsh, Murphy & Dunbar, 2007; Potts, 1994; Tama, 1989; Tozduman Yaralı, 2019). While creating the item pool, items were written considering teacher behaviors and strategies aimed at developing critical thinking skills. The scale, intended to be developed in a Likert-type rating format, was rated in 5 categories, taking into account the measured characteristic, the age levels of the participants, and the item statements: "never," "rarely," "sometimes," "often," and "always."

Expert Opinion

Expert opinion was sought to determine the suitability of the items written for the draft form of the "Scale for Strategies of Preschool Teachers to Support Critical Thinking Skills in Children" (SSTCCTSC) to the intended construct, the clarity of the expressions, their comprehensibility, and whether they adequately represented the relevant scope. In this context, expert opinions were obtained from a total of 10 academics: 4 experts in preschool education, 4 experts in measurement and evaluation, and 2 experts in Turkish education. However, during the theoretical examination of the construct, the opinions of the Turkish education academics were not included. They were only asked to evaluate the items in terms of language. Based on the feedback from the research team developing the scale and the language experts, it was initially decided to remove 18 items from the scale due to measuring similar constructs or having issues with comprehensibility. Then, the remaining 46-item form was sent to the experts. The experts were asked to evaluate each item in the measurement tool using a list with three ratings: (1) appropriate, (2) appropriate but needs revision, and (3) not appropriate. In the study, expert opinions were considered as content validity. While determining the content validity of the items, the Lawshe (1975) approach was taken into account. The content validity ratio (CVR) was used to determine whether the items had sufficient coverage, and considering 8 experts, the minimum (critical) value was set at 0.693 (for $p = 0.05$) (Wilson, Pan & Schumsky, 2012). The CVR values calculated for each item were examined, and 12 items in the draft form were reviewed again by the researchers and removed from the scale as the experts' justifications were deemed appropriate.

A preliminary trial was conducted to determine the comprehensibility of the 34 items in the draft form of the scale by teacher candidates and to assess the duration of the scale's application. For this purpose, a preliminary trial was conducted with a group of 40 people who had similar characteristics to the target population of the research. It was observed that the items in the online scale were generally understood by the teachers and could be completed in an average of 15 minutes.

Population and Sample

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are methods used in psychometrics and social sciences to examine the structure of latent variables. EFA is conducted to explore the underlying structure of a dataset by identifying groups of related variables without prior assumptions. In other words, it is applied to determine the factor structure of the developed scale. On the other hand, CFA validates whether a pre-defined factor structure fits the data by testing hypotheses about the relationships between the dataset and the latent variables. These analyses are essential for validating the structures measured by surveys or tests (Kline,2015; Brown, 2015). For the pilot application of the scale, a two-stage sampling method was used to apply exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The study population in both stages consisted of preschool teachers who voluntarily participated in the research through a convenience sampling method. In the first stage of the study, data were obtained from 327 teachers for the EFA. However, during the data cleaning process, 12 teachers who did not respond to most of the items and 15 teachers who were outside the ±3 range in (Field, 2013; Tabachnick & Fidell, 2019) the outlier analysis were excluded from the analyses, resulting in a total of 300 teachers for the analyses. In the second stage of the study, data were obtained from 390 teachers for the CFA. Similarly, during the data cleaning process, 9 teachers who did not respond to most of the items and 16 teachers who were outside the ±3 range in the outlier analysis were excluded from the analyses, resulting in a total of 365 teachers for the analyses. Convenience sampling is a frequently preferred method in scale development studies. Additionally, it is stated that considering the structure of the scale and the characteristics of the method to be used in the analysis is a correct approach, especially in scale development studies (Erkuş, 2012). One of the main objectives during the pilot application process was to work with a sample representing the measured characteristic. Therefore, the convenience sampling method was preferred to economically and easily reach as many people as possible. Furthermore, considering the validity and reliability analyses to be conducted on the measurement results, it was ensured that the number of participants was at least five times the number (Büyüköztürk, 2012) of items in the scale. Indeed, it is stated in the literature that the

number of participants for the exploratory factor analysis to provide evidence for construct validity should be at least five times the number of items in the scale (Büyüköztürk, 2012).

Ethical Compliance

Both the pilot and the main application phases of this study were carried out in accordance with research and publication ethics rules. The ethical appropriateness of the study was also documented by the ethics committee of an official institution. Participants were clearly informed that they should answer the questions sincerely and honestly, that their responses would not be graded, and that their answers would not be shared with any other person or entity outside the scope of the study. The Scientific Research Ethics Committee of Muş Alparslan University approved the ethical suitability of the study with the decision dated 25.11.2021 and numbered 29798.

Data Analysis

The final version of the scale, theoretically comprising 34 items in a single factor, was applied to teachers in the pilot study. Based on the obtained measurements, Principal Component Analysis, one of the factor extraction methods in exploratory factor analysis, was used to determine the factor structure of the scale. To evaluate the suitability of the data for exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were used. A statistically significant result from Bartlett's Test of Sphericity indicates that the items in the scale are related and that the data matrix is suitable for factor analysis. A KMO value of 0.50 or above is also interpreted as suitable for factor analysis (Field, 2009; Büyüköztürk, 2012). The decision on the number of factors considered factor eigenvalues, the scree plot, expert opinion, and the content of the items. A factor loading threshold of 0.32 was deemed appropriate as a measure of the relationship between each item and the relevant factor (Tabachnick and Fidell, 2013). Items with loadings below this value were removed from the scale. Rotation methods were not required during the factor analysis. To determine the reliability of the measurements obtained from the scale, the Cronbach's Alpha reliability coefficient was used.

To determine the model-data fit of the factor structure in a different sample, the final 34-item version of the scale was reapplied to a new sample (N=365), and Confirmatory Factor Analysis (CFA) was performed. In the CFA analysis, which was conducted to provide evidence of the validity of the measurement results obtained from the scale, several fit indices were considered to determine whether the model fit the data. For this purpose, fit indices such as the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and Comparative Fit Index (CFI) were used. To provide evidence of the reliability of the measurement results obtained from the final version of the scale, Cronbach's Alpha (α) reliability coefficient and Spearman-Brown split-half reliability were calculated. Additionally, item-total correlation coefficients were reported as a measure of item discrimination. The criteria used to evaluate these fit indices are presented in Table 1 (Schermelleh-Engel, Moosbrugger, and Müller, 2003).

Table 1. CFA Model Evaluation Criteria

Fit Index	Good Fit Level	Acceptable Fit Level
χ^2	$0 \leq \chi^2 \leq 2sd$	$2sd < \chi^2 \leq 3sd$
χ^2/sd	$0 \leq \chi^2/sd \leq 2sd$	$2 < \chi^2/sd \leq 3$
RMSEA	$0 \leq RMSEA \leq 0.05$	$0.05 < RMSEA \leq 0.08$
SRMR	$0 \leq SRMR \leq 0.05$	$0.05 < SRMR \leq 0.01$
NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI < 0.95$
NNFI	$0.97 \leq NNFI \leq 1.00$	$0.95 \leq NNFI < 0.97$
CFI	$0.97 \leq CFI \leq 1.00$	$0.95 \leq CFI < 0.97$

In the study, the Cronbach Alpha (α) reliability coefficient was calculated to provide evidence of the reliability of the measurement results obtained from the pilot and main applications of the scale.

Additionally, item-total correlation coefficients were reported as a measure of item discrimination. Generally, a Cronbach Alpha (α) reliability coefficient value of .70 or above is interpreted as indicating reliable measurement results (Salvucci, S., Walter, E., Conley, V., Fink, S., & Saba, 1997). An item-total correlation coefficient value of .20 or above is interpreted as indicating that the item is consistent with the overall test (Crocker & Algina, 2006). CFA was performed using the LISREL 8.80 program.

Results

Results of the Exploratory Factor Analysis

To determine the factor structure of the scale, the suitability of the data for exploratory factor analysis was assessed using the Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity. The results are presented in Table 2.

Table 2. KMO and Bartlett's Test Results

Kaiser-Meyer-Olkin (KMO)		0.98
	χ^2	12295.10
	sd	561
	p	0.00

When examining the Kaiser-Meyer-Olkin Test results in Table 2, a KMO value of 0.98 was obtained. This value indicates that the data is suitable for factor analysis (Field, 2009). According to the Bartlett's Test of Sphericity results, the values were found to be statistically significantly different (χ^2=12295.10; $p< 0.05$). This indicates that the items on the scale are generally related. Furthermore, the significance of the sphericity test also demonstrates that multivariate normality is achieved (Büyüköztürk, 2012). After testing the suitability of the data obtained in the application for revealing the factor structure, an EFA was conducted initially without any restrictions on the number of factors. According to the findings, 2 factors with eigenvalues above 1 were formed in the initial situation. The eigenvalues and the explained variance rates for each factor are presented in Table 3.

Tablo 3. Table 3. Eigenvalues, Explained Variance, and Total Explained Variance Percentages

Factors	Eigenvalue	Explained Variance (%)	Total Explained Variance (%)
1	23.46	69.00	69.00
2	1.49	4.37	73.37

As seen in Table 3, the eigenvalue for the first factor is 23.46, accounting for 69% of the variance explained by this factor alone. The total explained variance by the 2 factors is approximately 73.37%. Upon examining the eigenvalues for the factors, it is observed that the eigenvalue for the first factor is more than 10 times greater than that of the second factor. This suggests significant evidence that the structure of the scale is unifactorial. However, to determine the number of factors, a scree plot based on eigenvalues was also examined.

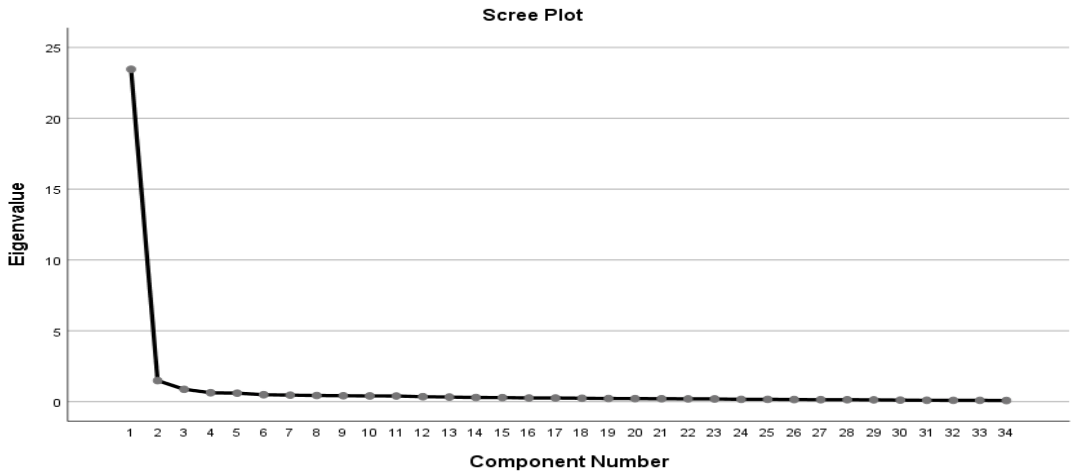

Figure 1. Scree Plot of Factor Eigenvalues

Based on Figure 1, the most significant break between eigenvalues is observed between the first and second factors. Especially noticeable is the relatively consistent decrease in eigenvalues after the first factor. According to the obtained Eigenvalues, Explained Variance, and Total Explained Variance Ratios, as well as the results from the scree plot, it can be concluded that the scale is unifactorial. After deciding on the number of factors, the factor count was fixed at 1, and no rotation process was applied before conducting EFA. The Factor Loading Values, Eigenvalues, and Explained Variance Ratios obtained after the application are presented in Table 4.

Table 4. Factor Loading Values, Eigenvalues, Explained Variance Ratios, and Cronbach's Alpha Reliability Coefficient for Items.

Item No	Factor Loading	Item No	Factor Loading	Item No	Factor Loading
ed2	.72	ed26	.84	ed47	.70
ed5	.78	ed27	.82	ed48	.82
ed7	.75	ed28	.88	ed49	.86
ed8	.77	ed29	.87	ed52	.87
ed10	.83	ed31	.85	ed54	.87
ed12	.80	ed32	.87	ed55	.78
ed13	.83	ed34	.87	ed57	.84
ed16	.87	ed36	.86	ed59	.86
ed17	.87	ed37	.89	ed61	.76
ed19	.81	ed41	.88	ed63	.84
ed22	.83	ed43	.87		
ed24	.76	ed45	.88		
Eigenvalue: 23.46					
Explained Variance (%): 69.00					
Cronbach Alpha: 0.98					

As seen in Table 4, the eigenvalue of the unifactorial structure is 23.46, explaining a variance of 69%. The factor loading values for this factor range between 0.695 and 0.894, all exceeding 0.32. This indicates that the scale maintains a unifactorial structure with its 34 items. Table 4 also shows a Cronbach's Alpha coefficient of 0.98 for the measurements, indicating high reliability of the scale.

Results from Confirmatory Factor Analysis

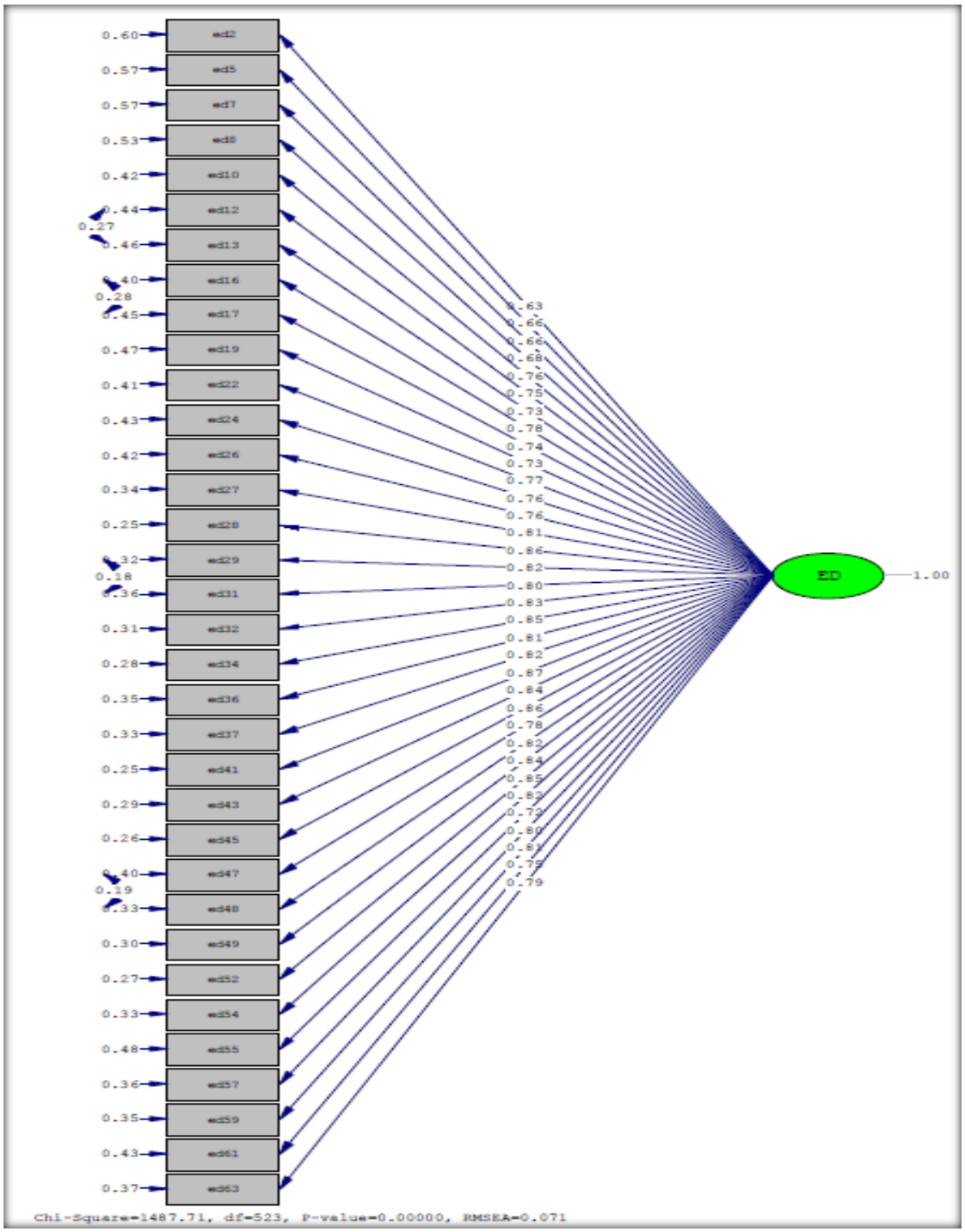

Figure 2. Factor Loadings (Standard Regression Coefficients) and Errors for CFA Model

Following the exploratory factor analysis resulting in a unifactorial structure with a final scale of 34 items, it was applied again to a different sample (N=365) for confirmation. The aim was to determine whether the unifactorial model fits similar data and to provide additional evidence of construct validity for the SSTCCTSC scale. The path diagram of the established model is presented in Figure 2.

As seen in Figure 2, standardized regression coefficients (factor loadings) for the single-factor measurement model consisting of the 34 items in the final version of the scale range between .63 and .87. All these coefficients are significant at the .05 level. Error variances range between .25 and .60. Tabachnick and Fidell (2001) noted that standardized regression coefficients (factor loadings) above .32 for each item indicate acceptable model data fit. Additionally, modifications were made to error variances between the associated items I12-I13, I16-I17, I29-I31, and I47-I48, where unexplained variances were considered related to the latent structure. Various fit statistics such as RMSEA, SRMR, χ^2 (chi-square), χ^2/df (chi-square / degrees of freedom), CFI, NFI, and NNFI were used to evaluate the model fit in this study. Table 5 presents the fit indices for the measurement results obtained from the main application of SSTCCTSC.

Table 5. Fit Statistics for the Single-Factor Scale

χ^2(sd)	χ^2/sd	RMSEA	SRMR	CFI	NFI	NNFI
1487.71 (523)	2.84	0.071	0.061	0.99	0.98	0.99

Table 5 shows that the RMSEA value is .071 and the SRMR value is .061. The CFI value is .99, NFI = .98, NNFI = .99, and χ^2/sd is obtained as 2.84. According to the findings, while χ^2/sd, RMSEA, and SRMR values indicate an acceptable level of fit, CFI, NFI, and NNFI values indicate a good level of fit (Schermelleh-Engel et al., 2003). The results of the CFA analysis show that the measurement results obtained from the main application of SSTCCTSC fit well with the established single-factor measurement model. In addition to the evidence provided above for the construct validity of the measurement results from SSTCCTSC, reliability was also determined by calculating Cronbach's Alpha (α) reliability coefficient, Spearman Brown Two-Halves Reliability, and corrected item-total correlations, which are presented in Table 6.

Table 6. Item Statistics and Reliability Values for SSTCCTSC Ö's Final Version

Item No	Item Mean	Factor Loading	Corrected Item-Total Correlation (*r*)	Item No	Item Mean	Factor Loading	Corrected Item-Total Correlation (*r*)
ed2	4.39	0.63	.53	ed32	4.39	0.83	.73
ed5	4.39	0.66	.58	ed34	4.31	0.85	.76
ed7	4.01	0.66	.61	ed36	4.31	0.81	.71
ed8	4.28	0.68	.62	ed37	4.43	0.82	.72
ed10	4.43	0.76	.68	ed41	4.38	0.87	.77
ed12	4.23	0.75	.69	ed43	4.28	0.84	.75
ed13	4.14	0.73	.68	ed45	4.11	0.86	.79
ed16	4.44	078	.69	ed47	3.97	0.78	.71
ed17	4.55	0.74	.63	ed48	4.10	0.82	.76
ed19	4.22	0.73	.65	ed49	4.42	0.84	.75
ed22	4.15	0.77	.68	ed52	4.14	0.85	.79
ed24	3.95	0.76	.67	ed54	4.14	0.82	.75
ed26	4.33	0.76	.65	ed55	3.83	0.72	.66
ed27	4.25	0.81	.73	ed57	3.98	0.80	.73
ed28	4.32	0.86	.78	ed59	4.07	0.81	.74
ed29	4.42	0.82	.73	ed61	4.04	0.75	.68
ed31	4.52	0.80	.69	ed63	4.39	0.79	.68
Overall Item Mean: 4.24							
Cronbach Alpha (α): 0.97							

The results in Table 6 indicate that the item mean scores for the 34 items in the scale range from 3.83 to 4.55, with an overall item mean of 4.24. These findings suggest that participants' scores on

SSTCCTSC are above the moderate level. Item-total correlation values for the scale items range between .53 and .79, indicating a strong relationship with the overall scale. The calculated Cronbach Alpha reliability coefficient for the measurement results from the main application of the scale is .97, while the reliability coefficient obtained using the Spearman Brown Two-Halves method is 0.98. These values suggest that the scores obtained from the scale are highly reliable.

Discussion and Conclusion

In the present study, a new measurement tool titled 'Preschool Teachers' Strategies for Enhancing Critical Thinking Skills in Children Scale' has been developed. The development process of the scale was conducted in two main stages. In the first stage, Exploratory Factor Analysis (EFA) was performed, which played a critical role in determining the structure of the scale and constructing a valid measurement tool. The results of EFA indicated the need to remove certain items from the scale, and these items were subsequently excluded before a second application was conducted. The outcomes of EFA demonstrated that the scale exhibited a single-factor structure with high explained variance, suggesting that it effectively covered the concept it aimed to measure and had high explanatory power.

In the second stage, Confirmatory Factor Analysis (CFA) was applied, and the reliability evidence of the scale was examined in detail. The results of CFA indicated that the scale fit well with the single-factor measurement model. In this phase, Cronbach Alpha and Spearman Brown Two-Halves methods were used to assess the reliability of the scale. The analyses revealed that the scores obtained from the scale were highly reliable. Additionally, modifications were made to address error variances associated with certain items (I12-I13, I16-I17, I29-I31, and I47-I48), indicating that the unexplained variances of these items were related to the underlying structure, possibly due to the similarity of these items with similar strategies. As a result of this two-stage study, a reliable measurement tool was obtained. The developed scale consists of 34 items and a single dimension. The scale employs a 5-point Likert-type structure, with scores ranging from 34 to 170. This scoring range can be interpreted such that as scores increase, teachers are more likely to use strategies to enhance critical thinking skills in children during the preschool period.

Critical thinking is increasingly recognized as one of the most valuable skills that the educational system can foster in students, and these skills need to be developed over time and through practice (Peter, 2012; Snyder & Snyder, 2008; Khun, 1999). Critical thinking is crucial from early childhood onwards, not only for grasping information but also for identifying and avoiding misinformation (Brosseau-Liard, 2017; O'Reilly et al., 2022). Moreover, critical thinking is often considered to reflect both the quality of life and thought (Fisher, 2013), underscoring the importance of promoting critical thinking from early childhood.

By imparting critical thinking skills to children during school years, they can learn to distinguish situations, assumptions, and claims in daily life. This enables children to analyze arguments and evaluate outcomes with a critical perspective (Özden, 1998). For the development of critical thinking through education, it is crucial for individuals to have opportunities in classroom environments to both observe and practice critical thinking (Akbıyık & Seferoğlu, 2006; ten Dam & Volman, 2004). Therefore, teachers can actively encourage critical thinking activities in lessons, allowing students to ask questions, participate in discussions, and freely express their ideas (Polat & Aydın, 2020). Although preschool children are supported by various instructional techniques, they may not be motivated to engage in critical thinking unless convinced that their actions are meaningful and valuable (Kuhn, 1999). When children participate in appropriate activities offered by educators, they begin to grasp the existence of topics worth discussing and new situations worth exploring (Kuhn & Dean, 2004). This process can provide a significant foundation for children to trigger their natural curiosity and desire for discovery, thereby developing critical thinking skills. Therefore, especially in early childhood education, it is crucial for teachers to have approaches and strategies to support children's critical thinking skills.

In conclusion, this study provides a valid and reliable tool for measuring preschool educators' strategies that enhance critical thinking skills development. This scale will enable educators and researchers to assess and improve teachers' impact in this area. The developed scale will contribute

significantly as a valuable resource that can be used in practical applications in the field of education. The developed scale is expected to serve as a practical tool for educators and researchers to evaluate and improve teaching strategies aimed at promoting critical thinking. Educators can use this scale to identify their strengths and areas for improvement, and plan more effective teaching practices that support students' critical thinking development. By adopting a flexible and student-centered approach in their implementation plans, teachers can create an environment that encourages curiosity and critical exploration. Additionally, by supporting students' critical thinking skills through various strategies, teachers can contribute to the development of individuals who are capable of reasoning, making judgments, and possessing effective problem-solving skills.

Disclosure Statements

1. Contribution rate statement of researchers: First author %40, Second author %30, Third author %20, Fourth author %10.

2. No potential conflict of interest was reported by the authors.

Kaynakça

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