



MIDDLE SCHOOL STUDENT ENGAGEMENT SCALE: A DEVELOPMENT, VALIDITY, AND RELIABILITY STUDYⁱ

Kübra D. Çopur¹ⁱⁱ,

Gülay Ekici²

¹MEB Bilişim Teknolojileri Öğretmeni,
Niğde, Türkiye

²Prof. Dr.,
Balıkesir Üniversitesi,
Necatibey Eğitim Fakültesi,
Balıkesir, Türkiye

Abstract:

This study aimed to develop a psychometrically sound scale to measure middle school students' levels of student engagement. The study group consisted of 6th, 7th, and 8th grade students attending public schools in the central district of Niğde province. In the first stage, a draft scale form consisting of 59 items was administered to 267 students, and Exploratory Factor Analysis (EFA) was performed with the obtained data. As a result of EFA, it was determined that the scale consisted of four factors and 22 items, and the total variance explained was found to be 53.418%. The overall Cronbach Alpha reliability coefficient of the scale was found to be 0.767. In the second stage, the final scale was administered to 533 students, and the structural validity of the scale was tested using Confirmatory Factor Analysis (CFA). According to the results of the confirmatory factor analysis, the model's fit indices were found to be at a level considered "excellent" in the literature ($\chi^2/df = 1.228$; GFI = 0.984; AGFI = 0.980; RMSEA = 0.021; CFI = 0.994; TLI = 0.993). Thus, the Middle School Student Engagement Scale (MSES) has been developed as a valid and reliable measurement tool. In conclusion, it has been determined that the Middle School Student Engagement Scale is a valid and reliable measurement tool and can be effectively used in the field of education to assess student engagement.

Keywords: student engagement, cognitive engagement, behavioral engagement, emotional engagement, self-regulation

ⁱ ORTAOKUL ÖĞRENCİ BAĞLILIĞI ÖLÇEĞİ: GELİŞTİRME, GEÇERLİK VE GÜVENİRLİK ÇALIŞMASI

ⁱⁱ Correspondence: email kbcopur@gmail.com

Özet:

Bu araştırmada, ortaokul öğrencilerinin öğrenci bağlılığı düzeylerini ölçmeye yönelik psikometrik özelliklere sahip bir ölçek geliştirilmesi amaçlanmıştır. Çalışma grubu, Niğde ili merkezindeki devlet okullarında öğrenim gören 6., 7. ve 8. sınıf öğrencilerinden oluşmaktadır. İlk aşamada, 59 maddelik taslak ölçek formu 267 öğrenciye uygulanmış ve elde edilen verilerle Açıklayıcı Faktör Analizi (AFA) gerçekleştirilmiştir. AFA sonucunda ölçeğin dört faktör ve 22 maddeden oluştuğu belirlenmiş, toplam varyans açıklama oranı %53,418 olduğu tespit edilmiştir. Ölçeğin genel Cronbach Alpha güvenirlik katsayısı 0,767 olarak bulunmuştur. İkinci aşamada, 533 öğrenciye nihai ölçek uygulanmış ve doğrulayıcı faktör analizi (DFA) ile ölçeğin yapısal geçerliliği sınanmıştır. Doğrulayıcı faktör analizi sonuçlarına göre, modelin uyum indeksleri literatürde “mükemmel” kabul edilen düzeyde bulunmuştur ($\chi^2/sd = 1.228$; GFI = 0.984; AGFI = 0.980; RMSEA = 0.021; CFI = 0.994; TLI = 0.993). Böylece, Ortaokul Öğrenci Bağlılığı Ölçeği (ÖBÖ) geçerli ve güvenilir bir ölçme aracı olarak geliştirilmiştir. Sonuç olarak, Ortaokul Öğrenci Bağlılığı Ölçeğinin geçerli ve güvenilir bir ölçme aracı olduğu ve eğitim alanında öğrenci bağlılığının değerlendirilmesinde etkin şekilde kullanılabileceği tespit edilmiştir.

Anahtar kelimeler: öğrenci bağlılığı, bilişsel bağlılık, davranışsal bağlılık, duygusal bağlılık, özdenetim

1. Introduction

21st-century education systems adopt holistic approaches that focus not only on academic achievement but also on students' emotional, social, and behavioral development. The education model implemented in Turkey aims to raise students as competent and virtuous individuals equipped with knowledge, skills, aptitudes, and values. This contemporary educational approach focuses not only on academic development but also on emotional, social, and personal development (MEB, 2025). This holistic approach forms the basis of student engagement.

Student engagement is one of the fundamental components that play a critical role in achieving educational goals (Uğur & Akın, 2015). Student engagement, with its impact on the learning process encompassing not only academic but also emotional, social, and behavioral dimensions, has been receiving increasing attention in educational research in recent years. Student engagement, which is at the center of effective teaching and learning processes, is described as a multidimensional concept involving multiple factors. Günüş (2013) and Chiu (2021) have stated that student engagement is one of the main prerequisites for enabling a quality education and teaching process.

Student engagement is a multidimensional concept that encompasses students' active participation in the learning process, their assumption of learning responsibility, their sustained attention and motivation, their goal-directed effort, and their participation in classroom and out-of-class learning activities (Fredricks *et al.*, 2004;

Günüç, 2013; Hu & Kuh, 2001; Kuh, 2009). Similarly, Kuh (2003) defines student engagement as the time and energy students devote to educationally meaningful activities, while Dixon (2015) defines this concept as a multidimensional structure that includes effort to learn course content, meaningful interactions, and emotional involvement.

Axelson and Flick (2010) explain student engagement based on individuals' interest in the learning process, their level of participation in this process, and the network of interactions they establish with their class, school, and peers. Considering these definitions, student engagement is presented as a multi-layered structure that includes not only students' physical presence at school but also their mental focus on the learning process, their sense of belonging emotionally, and their participation with intrinsic motivation. This concept also encompasses attitudes and behaviors such as a student's persistence in the learning process despite academic or social difficulties, finding school life personally meaningful, and voluntarily participating in educational activities.

Student engagement is a dynamic structure that develops through interaction with many variables in the educational process. The literature contains numerous studies examining variables related to student engagement and the learning process. Among these, studies focusing on the relationship between student engagement and academic achievement and the learning process predominate (Bilir, 2020; Carini *et al.*, 2006; Fredricks *et al.*, 2004; Korobova, 2012; Peck, 2017; Ripski & Gregory, 2009; Walker *et al.*, 2006; Willms, 2003). However, there are also studies examining the relationship between student engagement level and the desire to continue education (Bilir, 2020; Carini *et al.*, 2006; Peck, 2017).

Additionally, there are studies examining the relationship between self-efficacy beliefs and student engagement (Breso *et al.*, 2011; Dadandı, 2017; Doğan, 2015) and research investigating the effect of technology use on engagement (Chen *et al.*, 2010; Günüç, 2013; Xu, 2010). This diversity demonstrates that student engagement is a multidisciplinary field of research that can be examined in its various dimensions. Achieving education goals in a sustainable manner largely depends on the design of curricula, pedagogical approaches, and learning environments that support students' levels of engagement.

2. Dimensions of Student Engagement

The diversification of research on student engagement contributes to the development of the concept in terms of both dimensions and content. Although the sub-dimensions of the concept of student engagement in the educational sciences literature are explained by Willms (2003) as two dimensions, psychological and behavioral, the most frequently used dimensions are defined through the three basic components identified in the study by Fredricks, Blumenfeld, and Paris (2004). These components are behavioral engagement, Emotional engagement, and cognitive engagement. Trowler (2010) examined student

engagement based on these three dimensions and discussed both their positive and negative aspects.

This model, consisting of cognitive, behavioral, and Emotional Engagement dimensions, was expanded upon by Appleton, Christenson, Kim, and Reschly (2006). It has been transformed into a four-dimensional structure consisting of cognitive engagement, psychological engagement, behavioral engagement, and academic engagement. In addition, the literature has been enriched with models addressing different dimensions of student engagement, such as relational Engagement (Heather, Summers, & Miller, 2012) and social engagement (Finn & Zimmer, 2012).

Behavioral engagement refers to students' observable actions both inside and outside of school. Finn (1993) defines behavioral engagement as behaviors that are directly related to and measurable in the learning process, such as the level of participation in learning activities and the effort demonstrated in completing tasks. In this context, behavioral engagement includes elements such as completing assignments and responsibilities on time, attending classes regularly, complying with classroom rules, ensuring active participation, and taking on roles in the school's academic or social activities (Appleton *et al.*, 2006; Ergün, 2014; Fredricks *et al.*, 2004; Günüş, 2013; Peck, 2017).

Emotional Engagement is also referred to as psychological attachment or Emotional attachment. Students' positive or negative emotional responses to school, teachers, academics, classmates, and lessons, as well as emotional states such as interest and appreciation, are considered within the scope of Emotional attachment (Finn, 1993; Ergün, 2014; Günüş, 2013). Furthermore, students' sense of belonging to the school, their positive feelings towards the school, and their perception of being part of a community are also evaluated within Emotional attachment. (Fredricks *et al.*, 2004; Trowler, 2010; Willms, 2003). This dimension is a strong indicator of students' attitudes toward school and their perceptions of the school environment.

Cognitive attachment is closely related to the student's mental attitudes towards the learning process and their ways of understanding and assimilating learning. Cognitive engagement refers to the desire and internal motivation exhibited by the student to understand complex and multi-component course materials (Uğur & Akın, 2015). This concept encompasses allocating time to learning and understanding the importance of the knowledge gained in class (Günüş, 2013). It also includes students' identification with academic goals, demonstrating intrinsic motivation towards learning tasks, active participation in the meaningful learning process, using critical thinking skills, and developing problem-solving abilities (Appleton *et al.*, 2006; Fredricks *et al.*, 2004; Trowler, 2010). Considering the definitions, cognitive engagement is considered a meaningful process necessary for personal development and lifelong learning beyond learning.

A review of national and international literature reveals that studies on student engagement are predominantly concentrated at the higher education level. Among the most well-known and frequently used scales in international research on student

engagement are the *National Survey of Student Engagement* (NSSE) in the United States, the *Australasian Survey of Student Engagement* (AUSSE) in Australia, and the *National Student Survey* (NSS) in the United Kingdom. In Turkey, however, there have been a limited number of scale development studies on student engagement (Çinkır *et al.*, 2021; Doğan, 2014) and more adaptation studies (Ergün & Koçak Usluel, 2015; Gün *et al.*, 2019; Önen, 2014; Uğur & Akin, 2015).

Student engagement is a multidimensional and comprehensive concept that is influenced by individual, environmental, and pedagogical variables and interacts with these variables. However, a review of the literature shows that there is no valid and reliable measurement tool for measuring student engagement at the middle school level. This situation necessitates the development of the "Middle School Student Engagement Scale." The developed scale aims to measure the engagement levels of middle school students and, unlike existing studies, includes new dimensions that reveal the multidimensional structure of the concept.

3. Method

This research is a quantitative study conducted within the scope of a descriptive survey model. Survey studies are studies that aim to reveal the opinions and characteristics of large groups of participants (Büyüköztürk *et al.*, 2018). In this direction, the scale development process was followed in the study. Tezbaşarır (2008) defines the scale development process as a systematic process consisting of the following stages: defining the structure to be measured, creating an item pool, determining the type of scaling, consulting experts on the designed form, selecting the scoring and analysis methods for the items, conducting a pilot study, evaluating the scale, and making the necessary adjustments. Similarly, DeVellis (2017) also describes the scale development process as a careful and systematic process that is planned and implemented in stages.

3.1 Research Group

The participants in the study were selected using purposive sampling. Purposive sampling is an effective method for discovering and explaining various situations by selecting information-rich cases that are planned to be examined in detail (Yıldırım & Şimşek, 2018). The research group consists of 6th, 7th, and 8th grade students attending middle schools in the center of Niğde province during the 2023-2024 academic year. The schools where the application was carried out were randomly selected centrally. Two separate working groups were formed to achieve the research objective and successfully complete the process.

The first group was used for exploratory factor analysis and reliability tests; the second group was used for confirmatory factor analysis. Data collection tools were applied face-to-face during the research process. In the literature, there are different approaches regarding the minimum sample size required for factor analysis in the measurement tool development process. Cattell (1978) stated that the number of

participants required for factor analysis in the measurement tool development process should be between 3 and 6 times the number of items. Comrey and Lee (1992), on the other hand, classified the sample size as weak for 100 people, moderate for 200 people, good for 300 people, very good for 500 people, and excellent for 1000 people and above. In line with this, the first study group consisted of a total of 267 students in grades 6, 7, and 8. Of these participants, 83 were in 6th grade, 100 were in 7th grade, and 84 were in 8th grade. The data obtained were used for the stage EFA.

The second study group was used for confirmatory factor analysis to test the structural validity of the items identified by exploratory factor analysis. The second study group consisted of a total of 533 students in grades 6, 7, and 8. Their demographic characteristics are shown in Table 1.

Table 1: Demographic Characteristics of the Students

Variable	n	%
Gender		
Female	254	47.7
Male	279	52.3
Grade		
6th Grade	165	31.0
7th Grade	200	37.5
8th Grade	168	31.5

3.2 Scale Development Stages

In this study, the scale development process was implemented in accordance with DeVellis' (2017) recommendations. DeVellis (2017) defines the scale development process as follows: Determining the concept to be measured, creating an item pool, selecting the appropriate scale type, evaluating the prepared scale draft by subject matter experts, determining the scoring and analysis methods for the items, conducting a pre-test of the scale, evaluating the results, and finalizing the scale.

- 1) Identifying the concept to be measured: The aim is to determine the level of student engagement based on middle school students' attitudes towards the subject, school, and education.
- 2) Item pool creation: When creating the item pool for the scales, theoretical information obtained from interviews with participants and literature reviews was utilized (Appleton, Christenson, Kim, & Reschly, 2006; Bilir, 2020; Doğan, 2014; Ergün & Koçak Usluel, 2015; Günüş, 2013; Kuh, 2009; Önen, 2014). As a result of the literature review conducted using keywords, it was decided to use three sub-dimensions of student engagement in the scale: behavioral, cognitive, and Emotional. Following interviews with participants and a review of the relevant literature, an item pool of 63 items related to the three dimensions (cognitive, Emotional, behavioral) was created, and items that could be included in the draft scale were identified.

- 3) Selection of the appropriate scale type: After reviewing the items, the scale was organized as a five-point Likert scale. Participants marked the appropriate option for each statement from "Strongly disagree," "Disagree," "Undecided," "Agree," and "Strongly agree."
- 4) Evaluation by field experts: The prepared item pool was sent to measurement and evaluation experts, psychological guidance and counseling teachers, and various academics who are experts in the field, both via email and through face-to-face interviews. Feedback from a total of 10 experts was quantitatively analyzed by calculating the Content Validity Ratio (CVR) using the Lawshe Technique, and the necessary adjustments were made to the items at. During this process, items with low content validity were removed from the scale, items with similar content were combined, and some items were restructured. Finally, the scale consists of 59 items. Based on the feedback received, the aim was to increase the content validity of the scale.
- 5) Determining the scoring and analysis methods for the items: In the stage of determining the item scoring and analysis methods, the scale was prepared using a five-point Likert-type rating: 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree. The data were analyzed using exploratory and confirmatory factor analysis methods. Cronbach's Alpha reliability coefficient was calculated to measure the internal consistency of the scale. Pearson's moment correlation coefficient was calculated to examine the relationships between the subscales of the scale. According to the analysis results positive and statistically significant relationships were found between the sub-dimensions ($p < .01$). These relationships between the sub-dimensions show that the characteristics measured by each sub-dimension are conceptually clear and consistent.
- 6) Conducting a pilot test of the scale: The developed scale was applied to the sample group.
- 7) Evaluation of results and completion of the scale with corrections: The scale is made ready for use by making the necessary adjustments.

3.3 Data Analysis

The data obtained after the pilot application were carefully examined for missing values, erroneous records, and outliers, and no data loss was encountered. Outliers were identified using z-scores and excluded from the data set for analysis. Furthermore, the normality of the data distribution was confirmed by examining the skewness and kurtosis coefficients and histogram graphs.

In the analysis of the data, the IBM-SPSS 27 software package was used for EFA, and the R program was used for CFA. In the factor analysis process, the minimum factor loading criterion for item selection was set at 0.40. Items with factor loadings below this threshold were excluded from the scale because they were considered likely to weaken its structural integrity (Can, 2018; Ho, 2006). A margin of error of 5% was used to evaluate the statistical analysis findings. The Kaiser-Meyer-Olkin (KMO) adequacy test and

Bartlett's Sphericity test were applied to assess the suitability of the data set for factor analysis.

4. Findings

4.1 Exploratory Factor Analysis

In exploratory factor analysis, for items measuring a construct to be included in the scale, their factor loadings must be above a certain threshold value. In the literature, a factor loading value of 0.45 and above is considered "good," while in some cases, tolerance may be shown for a small number of items with factor loading values as low as 0.30 (Büyüköztürk, 2005; Ho, 2006). Furthermore, the Varimax rotation method was applied in the study to increase the interpretability of the factors and to ensure that each item clearly settled into the factor with the highest loading.

When the EFA results obtained using the Varimax rotation method were examined, 37 items were excluded from the analysis because their factor loadings were below 0.40, they did not provide sufficient loadings to any factor, or they provided significant loadings to more than one factor. The EFA process was repeated with the remaining items, and the findings are presented in Table 2.

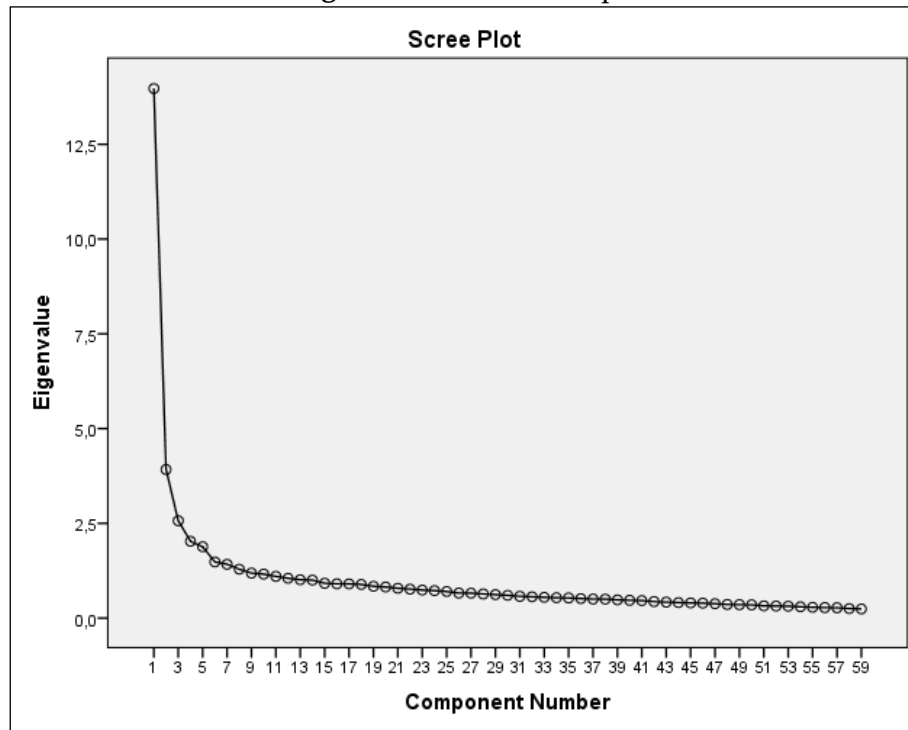
Table 2: EFA Results for the Student Engagement Scale

Factor	Item	Factor Load	Communal
Cognitive Engagement	MSES1	0.515	0.348
	MSES9	0.674	0.517
	MSES10	0.716	0.609
	MSES26	0.718	0.568
	MSES29	0.698	0.621
	MSES30	0.554	0.510
	MSES39	0.629	0.516
	MSES41	0.689	0.536
	MSES42	0.489	0.363
	MSES45	0.429	0.367
Behavioral Engagement	MSES44	0.509	0.402
	MSES54	0.748	0.570
	MSES55	0.758	0.625
	MSES56	0.641	0.546
	MSES59	0.762	0.598
Self-Regulation	MSES43	0.608	0.429
	MSES46	0.744	0.646
	MSES51	0.754	0.624
Emotional Engagement	MSES7	0.676	0.525
	MSES12	0.787	0.682
	MSES13	0.801	0.672
	MSES22	0.512	0.478

Table 2 presents the factor loadings and communality values of the items in the Middle School Student Engagement Scale. Upon examining the results, the items were grouped under 4 factors according to Kaiser's rule. It was observed that the factor loadings of all these items were above 0.40. In addition, it was determined that the communality values of the items were above 0.30. According to these findings, the student engagement scale was grouped under 4 factors with a total variance explanation rate of 53.418%.

One of the important methods used in evaluating the results of exploratory factor analysis is the scree plot analysis (Bursal, 2017; Büyüköztürk, 2005). In the scree plot, sudden drops in the eigenvalues of the factors are taken into account. The relevant scree plot is presented in Figure 1.

Figure 1: Scree Plot Graph



When examining the line graph in Figure 1, it can be seen that the eigenvalues of the four factors are greater than 1 and that the graph stabilizes as a horizontal line after the fourth factor. The Varimax axis rotation method and line graph results indicate that the scale has a four-factor structure. The resulting 22-item student engagement scale was analyzed using the Kaiser-Meyer-Olkin (KMO) adequacy test and Bartlett's Sphericity test. The analysis results are presented in Table 3.

Table 3: EFA Assumption Results for the Student Engagement Scale

KMO	0.910
Bartlett's Test of Sphericity	4028.65812
p-value	<0.001

Table 3 shows the EFA assumption results for the student engagement scale. The KMO test is accepted as a standard criterion for evaluating sample adequacy, and values below 0.50 of them considered insufficient for factor analysis; 0. Values between 0.50 and 0.70 are considered moderate, between 0.70 and 0.80 are considered good, between 0.80 and 0.90 are considered very good, and values above 0.90 are considered excellent sample adequacy (Çokluk *et al.*, 2010; Tabachnick & Fidell, 2013). When the findings were evaluated, it was seen that the data collected for the student engagement scale was excellent in terms of sample adequacy (KMO=0.910>0.70). The Bartlett Sphericity test was applied to test whether the relationships were significant. The analysis revealed that the correlation between the items was statistically significant ($p<0.05$). A p-value of <0.05 indicates that the relationship between the items is significant (Can, 2018).

4.2 Calculation of Scale Reliability

The reliability of the student engagement scale for middle school students was calculated using the Cronbach's Alpha internal consistency coefficient. The internal consistency coefficients for the scale as a whole and its subscales are presented in Table 4.

Table 4: Reliability Analysis Results of the Student Engagement Scale

Factor	Item	Mean	SS	DK	MSA	Alpha
Cognitive Engagement	MSES1	3.886	1.022	0.491	0.870	0.875
	MSES9	4.257	1.067	0.573	0.865	
	MSES10	3,824	1.152	0.693	0.855	
	MSES26	3,741	1.203	0.645	0.859	
	MSES29	3,979	1.178	0.697	0.855	
	MSES30	3,741	1.112	0.611	0.862	
	MSES39	3.497	1.158	0.618	0.861	
	MSES41	3,550	1.154	0.633	0.860	
	MSES42	3,946	1.091	0.499	0.870	
	MSES45	3,634	1.192	0.499	0.871	
Behavioral Engagement	MSES44	2.330	1.339	0.433	0.754	0.763
	MSES54	2.300	1.311	0.476	0.740	
	MSES55	2,139	1.383	0.634	0.683	
	MSES56	2,167	1.435	0.548	0.715	
	MSES59	2.317	1.329	0.574	0.706	
Self-Regulation	MSES43	3,679	1,219	0.424	0.685	0.685
	MSES46	3.178	1.305	0.567	0.499	
	MSES51	2,837	1.210	0.514	0.574	
Emotional Engagement	MSES7	3.405	1.245	0.505	0.680	0.731
	MSES12	3.585	1.307	0.616	0.614	
	MSES13	3,398	1.296	0.554	0.651	
	MSES22	3,009	1.395	0.421	0.732	
Avg: Average, SD: Standard deviation, RC: Adjusted correlation, MSA: Alpha when item deleted						

The Cronbach alpha reliability coefficient ranges from 0 to 1, with values below 0.40 indicating unreliability, values between 0.40 and 0.60 indicating low reliability, and

values between 0.60 and 0.90 indicating sufficient and high reliability of the scale (Can, 2018). When examining the findings presented in Table 4, it was determined that the overall Cronbach's alpha coefficient of the student attachment scale was 0.767. Furthermore, according to the analysis results in Table 4, the internal consistency coefficients for Cognitive Engagement, Behavioral Engagement, Self-Regulation, and Emotional Engagement were calculated as 0.875, 0.763, 0.685, and 0.731, respectively. In light of these data, it can be said that the developed scale is sufficiently reliable.

4.3 Confirmatory Factor Analysis

As a result of CFA and reliability analyses, it was determined that the "Middle School Student Engagement Scale" consists of 4 factors and 22 items. CFA was performed to validate the factor structure of the scale, and the analysis results are presented in Table 5.

Table 5: CFA Statistics for the Student Engagement Scale

Factor	Item	Beta	SH	z-statistic	p
Cognitive Dependence	MSES1	1			
	MSES9	1.213	0.072	16,878	<0.001
	MSES10	1.588	0.086	18,453	<0.001
	MSES26	1,503	0.084	17,870	<0.001
	MSES29	1.635	0.089	18,372	<0.001
	MSES30	1.377	0.077	17,815	<0.001
	MSES39	1.432	0.080	17,925	<0.001
	MSES41	1.441	0.080	17,903	<0.001
	MSES42	1.146	0.068	16,760	<0.001
	MSES45	1.234	0.073	16,804	<0.001
Behavioral Dependence	MSES44	1			
	MSES54	0.574	0.048	12.070	<0.001
	MSES55	1.098	0.071	15,531	<0.001
	MSES56	1.174	0.075	15,729	<0.001
	MSES59	0.857	0.059	14.567	<0.001
Self-Regulation	MSES43	1			
	MSES46	1.424	0.084	16,854	<0.001
	MSES51	1.097	0.068	16,126	<0.001
Emotional Engagement	MSES7	1			
	MSES12	1.151	0.071	16.267	<0.001
	MSES13	0.924	0.060	15.309	<0.001
	MSES22	1.117	0.068	16,423	<0.001
Beta: Coefficient, SE: Standard error					

Table 5 shows the CFA statistical results of the student engagement scale. Upon examining the findings, it was observed that the coefficients of the items included in the sub-factors of the student engagement scale were positive and statistically significant (Beta>0, p<0.05). The confirmatory factor analysis fit indices for the final version of the scale are presented in Table 6.

Table 6: Fit Index Values of the Student Engagement Scale

Chi-square (df)	GFI	AGFI	CFI	TLI	RMSEA
249.212 (203)	0.984	0.980	0.994	0.993	0.021
sd: Degree of freedom					

Table 6 presents the Confirmatory Factor Analysis (CFA) fit index values for the student engagement scale. In the literature, a Chi-square/df ratio below 3 indicates good fit (Tabachnick & Fidell, 2013); an RMSEA value below 0.08 is considered acceptable, while below 0.05 indicates excellent fit (Hu & Bentler, 1999). Furthermore, GFI, AGFI, CFI, and TLI fit indices above 0.90 indicate good fit, while those above 0.95 indicate excellent fit (Çokluk *et al.*, 2012).

When the analysis results are examined, the Chi-square/df ratio of 1.228 meets the excellent fit criteria; the RMSEA value below 0.05 indicates excellent fit, and the GFI (≥ 0.95), AGFI (≥ 0.95), CFI (≥ 0.95), and TLI (≥ 0.95) fit indices also support excellent fit. In light of these findings, it has been proven that the confirmatory factor analyses of the student engagement scale's factor structure show statistically strong and consistent fit. The diagram obtained from the CFA results is shown in Figure 2

Figure 2: CFA Path Diagram for the Student Engagement Scale

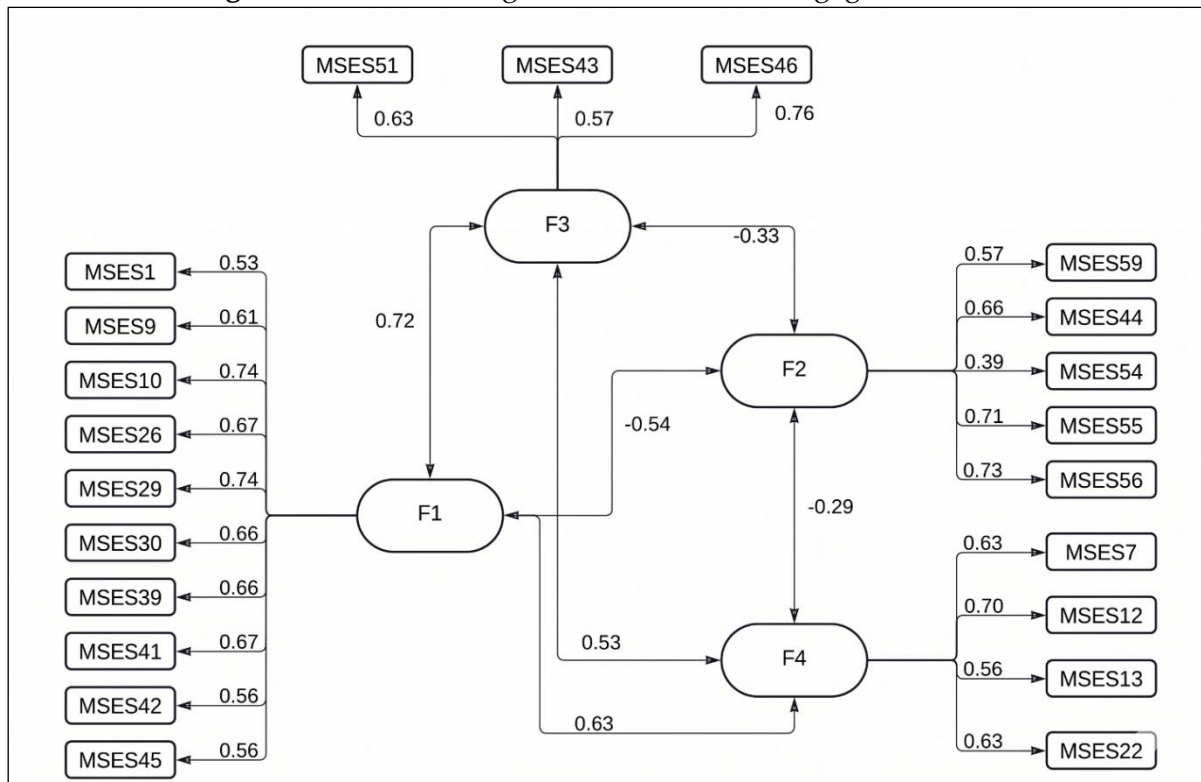


Figure 2 shows the CFA results for the student engagement scale. According to the path diagram obtained as a result of CFA, the standardized load values of all items are above 0.20 (F1= "Cognitive Engagement", F2="Behavioral Engagement", F3="Self-Regulation", F4="Emotional Engagement").

5. Discussion and Conclusion

In scientific research, it is crucial to accurately identify needs, develop effective and applicable solutions tailored to those needs, and adapt the results to the innovative understanding of a rapidly changing world. To this end, a wide variety of methods are used, including experimental studies, performance-based assessments, and digital data analysis. Scales, in particular, stand out as reliable measurement tools in the process of identifying the source of problems and developing targeted solutions to these problems. However, despite studies conducted on student engagement in the literature, there is a limited number of comprehensive scales that reflect local cultural and pedagogical characteristics and have undergone validity and reliability studies, and there is a lack of original measurement tools specifically designed for middle school level. In this context, the present study developed a psychometrically robust scale that assesses student engagement in a multidimensional manner to address this need.

The "Middle School Student Engagement Scale" was developed for middle school students, and validity and reliability studies were conducted. The analyses revealed that the student engagement scale consists of 4 dimensions and 22 items. None of the 22 items in the scale are reverse-coded. The structure revealed by the exploratory factor analysis explains 53.418% of the total variance. In the social sciences, a total variance ratio of 40–60% is considered sufficient for multi-factor scales (Büyüköztürk, 2005). In this context, the obtained ratio of 53.418% indicates that the factor structure of the scale is at an acceptable level. While the total variance in the scale developed by Doğan (2014) was 46.74%, the total variance value was determined as 54.88% in the study prepared by Çinkır, Kurum, and Yıldız (2021).

The Cronbach's Alpha value, which is the reliability coefficient of the scale, was determined to be 0.767. This value exceeds the threshold value of 0.70 generally accepted in the literature for reliability, revealing that the scale has a highly reliable structure and that there is strong internal consistency among the items. The construct validity of the scale was tested using Confirmatory Factor Analysis (CFA). The analysis revealed that the model fit the data at a high level. The fit indices obtained ($\chi^2/df=1.228$, GFI=0.984, AGFI=0.980, RMSEA=0.021, CFI=0.994, TLI=0.993) meet the excellent fit criteria accepted in the literature. These excellent fit values indicate that the structure measured by the developed scale is consistent with its theoretical foundations, that the factors can be meaningfully distinguished, and that the items are highly correlated with their own factors.

In the process of naming the factors included in the middle school student engagement scale, previous studies in the literature were reviewed, the items under each factor were reevaluated using a holistic approach, a literature review was conducted for the newly emerging fourth factor, and the most appropriate naming was determined by consulting two different experts. As a result of the research, considering the content of the items under the factor, the fourth factor was named "Self-Regulation" in addition to the three factors commonly used in the literature. This factor was named "Self-

Regulation" as it encompasses students' behaviors of consciously organizing their goal setting, planning, time management, and learning processes. Bandura (2015) defines self-regulation as an individual's ability to control and manage their own behavioral processes, while Zimmerman (2000) explains this concept as an individual's effective management of their cognitive, emotional, and behavioral processes in line with the goal of achieving objectives. Thus, the scale was named as follows: the first factor "Cognitive Engagement," the second factor "Behavioral Engagement," the third factor "Self-Regulation," and the fourth factor "Emotional Engagement."

As a result of all the analyses conducted, it was determined that the developed Middle School Student Engagement Scale successfully met the validity and reliability criteria. The findings strongly support that the scale is a scientifically sound and valid tool for measuring the phenomenon of Engagement among middle school students. In conclusion, it is anticipated that this scale will make a significant contribution to the field and serve as a valuable data collection tool for researchers and practitioners.

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Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Kübra D. Çopur is pursuing her doctoral studies at Gazi University, Institute of Educational Sciences, Department of Educational Programs and Teaching. She completed her master's degree at Erciyes University. She is currently working as an Information Technology teacher under the Ministry of National Education (MEB). Her research and study areas include student engagement, educational programs, 21st-century learning and teaching approaches, and information technologies.

ORCID: <https://orcid.org/0000-0002-7801-1055>

Gülay Ekici is a Professor in the Department of Educational Sciences at Balıkesir University. Her research focuses on curriculum and instruction, educational psychology, teacher training, educational assessment and measurement, learning and teaching approaches, and curriculum development. She has numerous publications in national

and international peer-reviewed journals and has advised on many scientific studies and research projects in the field of education.

ORCID: <https://orcid.org/0000-0003-2418-1929>

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