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SCALE OF ATTITUDE TOWARDS GARDEN-BASED LEARNING APPROACH: THE STUDY OF VALIDITY AND RELIABILITY

(Research article)

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Abstract

The garden-based learning approach is becoming more popular as mediums where students can learn in an interdisciplinary manner. Garden-based learning is one of the important approaches and the teacher's attitude towards garden-based programs is very important for the success of the program. Therefore, in the present study, it was aimed to develop a scale to determine teachers' attitudes towards garden-based learning, which is titled "Teachers' Attitude Scale Towards Garden-Based Learning Approach". After a 42-item scale trial form was created according to expert opinions, it was applied to teachers working in different parts of Turkey. Results of the multi-step EFA analysis conducted invalidity studies showed that the 20-item scale was collected in 3 dimensions as a result of the load values of the items belonging to each dimension of the 42-item scale. As a result of the analysis, it is seen that the dimensions in which the 20-item scale is gathered under three dimensions, explain 37.11%, 12.46%, and 12.19% of the total variance and 61.76% of the total variance, respectively. Reliability coefficients were calculated as Cronbach's alpha 0.94 for the first dimension, 0.79 for the second dimension, and 0.70 for the third dimension. The Cronbach's alpha value for the whole scale was found to be 0.91. As a result of the study, it was revealed that the "Attitude Scale of Teachers towards Garden-Based Learning Approach" is a valid and reliable scale measuring teachers' attitudes towards garden-based learning.

Keywords: Garden-based learning, scale development, validity, reliability

1. Introduction

In recent years, innovative searches in education are increasing on a daily basis. Especially with the emergence of the Covid-19 pandemic, it became evident that a change in the direction and form of education is a must. Garden-based education approach is one of the best examples of this change. The garden-based approach to learning is becoming more popular as mediums where students can learn in an interdisciplinary manner.

Why do students need nature? What skills does the garden-based learning approach teach students? How can we support teachers and students with a garden-based learning approach? Recently, these questions are being discussed more and more by education politicians. The garden-based learning approach, which has various applications from preschool education to higher education, becomes even more important as it is integrated with the nature-based learning philosophy. It is seen that the garden-based education approach is effective when integrated to the higher education curriculum and especially when it is addressed in teacher education (Eugenio & Aragón, 2018).

Most teachers use the garden-based learning approach-gardens as a laboratory to introduce scientific methods to students (Tran, 2015). Teachers also report that garden-based learning helps children learn better, encourages experimental learning, and facilitates the teaching of environmental education (Skelly & Bradley, 2000; Swank & Swank, 2013). In addition, many researchers have determined that the garden-based learning approach can trigger students' curiosity and excitement towards exploration and learning.

In the programs implemented by teachers for the garden-based learning approach; various garden-based learning approaches are used ranging from authentic gardening experiences (planting, harvesting, weeding, etc.) (Murakami et al., 2018), creative arts activities, and cooking activities to book reading activities. In this context, the garden-based learning approach creates autonomous and enjoyable learning environments for both teachers and students.

Teachers applying garden-based learning approach programs found that students increased their competencies in many areas from physical development to cognitive development, as well as social-emotional development and self-care skills. For example, in a study by Mukarami et al. (2018), it is found that garden-based learning approaches increase students' sense of self-efficacy and achievement, as well as sensory experiences such as smell, feeling, and vision in the garden support cognitive development and STEM learning (doing research, etc.). Today, the garden-based learning approach movement offers students rich opportunities, especially for STEM skills, as well as providing information about various cognitive skills, physical, social, and emotional competencies, autonomy, health, environment, and nutrition (Murakami et al., 2018; Yu, 2012). In particular, it supports key development areas (Larimore, 2019) including:

- Cognitive development (Mathematics, science, language, art, music)
- Social-emotional development (Leadership, problem-solving skills, sharing, etc.)
- Physical development
- Spiritual development

Teachers play the most vital role in a new vision and paradigm shift in the field of education. Moreover, teachers should have a nature-integrated approach to education. Garden-based learning creates an interdisciplinary and experiential learning environment for both teachers and students (Tran, 2015). However, it is seen that the studies on garden-based learning approach mostly focus on student success relationship, support for students, and programs or difficulties encountered by the students. There is very little research on teacher attitudes towards the garden-based learning approach. For example, in a study examining teachers' perceptions of garden-based learning, it is found that teachers considered gardens as an effective approach to improving students' learning (Blair, 2009).

In many studies examining teacher attitudes in the garden-based learning approach, the obstacles that are faced with for integrating school gardens into their curriculum include lack of time, lack of funding, insufficient staff support, inadequate teacher interest and knowledge of gardening, not having a person to organize garden activities, insufficient space and materials; and lack of administrative support from school managers (DeMarco et al., 1999; Graham & Zidenberg-Cherr, 2005). In a similar study conducted in Los Angeles, the lack of funding, insufficient support of stakeholders such as parents and volunteers, inexperience in gardening, and field problems were stated in the failure of the programs created with the garden-based learning approach (Azuma et al., 2001). In addition, in another study conducted by Tepebağ and Aktas-Arnas (2017), preschool teachers stated accidents and injuries as one of the problems they encounter with regarding garden use. In the same study, the other problems experienced by teachers were stated as the inconvenience of the garden's structure, the distraction of the children, and the possibility of the children getting sick.

Some of the academic obstacles that are identified to hinder to the success of the garden-based education approach are as follows: Lack of time, insufficient program materials with regards to academic standards as well as the inadequate interest, knowledge, experience, and training of teachers in horticulture. In terms of schools that do not have a playground, the lack of financing, lack of materials, and time have been identified as obstacles (Austin, 2017; Graham & Zidenberg-Cherr, 2005; Ozer, 2007, Taşçı & Besiktaslı, 2019; Tepebağ & Aktas-Arnas, 2017). For example, some studies show that teachers wait for good weather conditions to take their students outside (Maynard & Waters, 2007).

It is important that the garden-based learning approach is generalized to all levels of education (Taşçı et al., 2021). In this context, teachers' interest, knowledge, experience (Graham & Zidenberg-Cherr, 2005), and attitude become important for garden-based learning to be successful despite the academic obstacles. According to Larimore (2019), one of the important factors in the implementation of nature-based programs is the teacher. Therefore, it cannot be denied that the teacher's attitude towards nature-based programs is very important. Thus, making the garden-based learning approach widely used is critical in the new world order. For these reasons, it was aimed to develop a scale to determine teachers' attitudes towards garden-based learning in the present study. Hence, answers to the following questions were sought:

1. Are the measurement results obtained from the garden-based learning attitude scale valid?

2. Are the measurement results obtained from the garden-based learning attitude scale reliable?

2. Methodology

2.1. Research Design

The used research method is survey model. In the survey model, made on the group's research it is intended to reveal the attitudes (Fraenkel et al., 2012). The present study is a scale development study. Within the scope of the present research, a scale was developed to determine teachers' attitudes towards garden-based learning. A literature search reveals that currently there is not a scale that has been developed regarding garden-based learning. The present scale, which aims to fill this gap in the field of education, is important at this point. Exploratory factor analysis (EFA) was used within the scope of the construct validity of the adapted scale. EFA is an analysis technique that aims to reveal and group the items measuring the same structure or quality among items determined by the researchers, as well as to explain the measurement with these few significant superstructures (factors) (Tabachnich & Fidell, 2001). In this context, the results of Exploratory Factor Analysis (EFA) in order to test the construct validity of the scale are as follows.

2.2. Sampling

The sample was obtained by using the random sampling method in the present study. A total of 292 teachers have been reached via the applications. Main analyses had been started with 292 forms. Applications were carried out for EFA in the 2020-2021 academic year. A total of 292 teachers working in schools affiliated to the Ministry of National Education constituted the working group.

According to Tavsancıl (2014), the size of the working group should be five times or more than the number of items. Thus, it can be said that the number of participants was sufficient; considering that the 42-item scale form was applied to the teachers in the study group. Table 1 shows the frequency and percentage values of the participants in the study group according to their gender, age, professional seniority, type of school and the regions they work in.

Table 1. *Demographic Characteristics of Participants*

Variable	Categories	f	%
Gender	Female	218	74.7
	Male	74	25.3
Age	20-26	36	12.3
	27-33	94	32.2
	34-40	98	33.6
	41-47	39	13.4
	48-54	22	7.5
	+55	3	1.0
Professional Seniority	1-5	73	25.0
	6-10	73	25.0
	11-15	72	24.7
	16-20	36	12.3
	20- +	38	13.0
Geographical Region	Marmara	71	24.3
	Eastern Anatolia	59	20.2
	Mediterranean	54	18.5
	Southeastern Anatolia	46	15.8
	Central Anatolia	29	9.9
	Egean	22	7.5
	Black Sea	11	3.8
School Type	Preschool	91	31.2
	Primary School	83	28.4
	Middle School	85	29.1
	High School	33	11.3
Total		292	100

In this study, demographic data shows that 74.7% (n = 218) of the teachers in the sample of the present study are female whereas 25.3% (n = 74) of the participants are male. When the age distribution of the teachers was examined, it is seen that 12.3% (n = 36) were 20-26 years old, 32.2% (n = 94) 27-33 years old, 33.6% (n = 98) 34-40 years old, 13.4% (n = 39) 41-47 years old, 7.5% (n = 22) 48- 54 years old and 1% of the participants (n = 3) are above 55 years old. Regarding the professional seniority of teachers, 25% (n = 73) of the participants have professional seniority of 1-5 years, 25% (n = 73) 6-10 years, 24.7% (n = 72) 11-15 years, 12.3% (n = 36) 16-20 years and 13% (n = 38) of them have 20 years and above professional seniority. When the distribution of teachers by regions is examined, it is understood that 24.3% (n = 71)

of the teachers are in the Marmara Region, 20.2% (n = 59) in the Eastern Anatolia Region, 18.5% (n = 54) in the Mediterranean Region, %15,8 (n = 46) in the Southeastern Anatolia Region, 9.9% (n = 29) in the Central Anatolia Region 7.5% (n = 22) in the Aegean Region, and 3.8% (n = 11) in the Black Sea Region. Finally, when the distribution of teachers according to branches is examined, it is seen that 31.2% (n = 91) work in kindergardens, 28.4% (n = 83) in primary schools, 29.1% (n = 85) in secondary schools and 11.3% (n = 33) in high schools.

2.3. Data Collection Process

The scale form was created electronically and delivered to preschool teachers via a link. The teachers filled in the created scale form online. Teachers' participated in the study voluntarily and the filling time of the scale was calculated as 15 minutes approximately. The data collection process continued for 30 days, and 292 pre-school teachers were contacted during this period.

2.4. Data Analysis

Prior to conducting the data analysis, missing, incorrect, and extreme values were examined in the obtained data. Regarding validity and reliability, Kaiser-Meyer Olkin (KMO) coefficient and Barlett Sphericity test were used to provide evidence for its suitability for exploratory factor analysis. Item test correlations for item validity were calculated. Exploratory factor analysis was performed for construct validity.

2.5. The Scale Development Process

During the scale development process, firstly a literature search was conducted and an item pool was created by creating five-point Likert-type draft items. The scale was presented for expert opinion afterward. Some items were removed from the scale and some items were corrected in line with experts' opinions. The prepared items were examined by 5 experts in the field (field experts, language experts, and scale experts). The necessary corrections have been made in the items as needed. As a result of these processes, 5 items were removed from the scale and 7 items were rearranged in line with the recommendations of the experts. Later, IRB (E-35760192-050.01.04-0000055470) the ethical approval of the study was obtained from Istanbul 29 Mayıs University.

The final version of the draft scale consists of 42 items. After a 42-item scale trial form was created according to expert opinions, it was applied to teachers working in different parts of Turkey. A pilot application was performed with a group of 50 people prior to the main study. Observations made in the pilot study were put into practice after some grammatical arrangements were made in the scale.

3. Results

In this section, the findings of exploratory factor analysis regarding the validity and reliability studies regarding "Scale of Attitude Towards Garden-Based Learning Approach: The Study of Validity and Reliability" are provided.

As can be seen, by the values given in Table 2, there are three dimensions with eigenvalues greater than 1. Initially, the first dimension explains 44.92% of the total variance of the scale whereas the second dimension explains 9.41%, and the third dimension 7.43%. After varimax rotation, the first dimension explains 37.11% of the total variance of the scale while the second dimension explains 12.46% and the third dimension explains 12.19%. After the said varimax rotation, the variance explained by these three dimensions for the scale is 61.76%. Here, the eigenvalue of the first dimension is 8.98, the eigenvalue of the second dimension is 1.88, and the eigenvalue of the third dimension is 1.49.

Table 2. *Eigenvalues, Variance Explained % and Cumulative Proportion of Total Variance From Principal Component Analysis*

Dimension	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance Explained	Cumulative % Variance	Total	% of Variance Explained	Cumulative % Variance
1	8.98	44.92	44.92	7.42	37.11	37.11
2	1.88	9.41	54.33	2.49	12.46	49.57
3	1.49	7.43	61.76	2.44	12.19	61.76

The factor load value should be .32 and above and should not be overlapped at the .10 level. In the selection of items in this scale, item load values were based on .32 (Tabachnick & Fidell, 2001). In this context, item 35 and 38 was excluded from the study because its load values were below .32. Since the value of .10 is taken as basis, the crossing is at the level of .10 (1,2,3,5,8,11,12, ,23,24,26,27,28,29,30,31,32,36,39,40,41,42.) items were removed from the scale. The values regarding item factor loadings and which items are included in which size are given in Table 3.

Table 3. *Rotated Factor Matrix with Loadings*

Items	**Dimensions**			
	1	**2**	**3**	**R^2**
I4	.641			.512
I6	.796			.649
I7	.775			.644
I9	.740			.588
I10	.778			.639
I14	.717			.584
I15	.676			.504
I16	.832			.725
I17	.709			.608
I18	.763			.666
I20	.776			.670
I25	.700			.613
I37	.654			.595
I33		.887		.808
I34		.625		.551
I43		.846		.739
I13			.819	.714
I19			.430	.268
I21			.833	.734
I22			.645	.541
Eigenvalues	7.421	2.492	2.439	
Explained Variance	%37.11	%12.46	%12.19	
The Kaiser-Meyer-Olkin Test			.925	
Bartlett's Test	$\chi 2$=3464.005; sd: 190;			p=.000

As a result of EFA, the load values of the items belonging to each dimension are given in Table 3. According to Table 3, it is seen that the 20-item scale is collected in 3 dimensions. It is seen that the load values of 13 items which comprise the first dimension are between .64 and .83. It is seen that the load values of the items in which the second dimension consists of 3 items are between .63 and .89. It is seen that the third dimension consists of 4 items and the load values of the items in the factor are between .43 and .82.

In the study, the KMO value was found as .925 and Barlett value as 3464.005 (p = .000). According to Tabachnick and Fidell (2001), in order for the data obtained from the study group

to be suitable for factor analysis, the KMO value should be higher than .60 and the Barlett value should be significant. Test results were found to be suitable for factor analysis.

3.1. Findings Regarding Item Analysis and Reliability

The reliability of the obtained scale was examined by calculating the related Cronbach's alpha coefficient, item-total correlations, and correlations between dimensions. Item-test total correlations of each scale item were examined. Cronbach's alpha coefficient and item-total correlation values of the dimensions are presented in Table 4.

Table 4. *Item-Total Correlations and Cronbach's Alpha Reliability Coefficients*

Dimensions	X	SS	Item-Total Correlations	Cronbach's Alpha If Item Deleted
1st Dimension (α = .94)				
I4	4.46	.59	.646	.941
I6	4.58	.56	.748	.938
I7	4.57	.57	.756	.938
I9	4.51	.57	.720	.939
I10	4.46	.55	.750	.938
I14	4.47	.67	.717	.939
I15	4.64	.51	.651	.942
I16	4.52	.58	.810	.936
I17	4.63	.54	.724	.939
I18	4.60	.51	.773	.937
I20	4.65	.50	.777	.937
I25	4.50	.57	.723	.939
I37	4.46	.59	.694	.940
2nd Dimension (α = .79)				
I33	4.63	.72	.731	.590
I34	4.59	.66	.516	.820
I43	4.57	.72	.644	.691
3rd Dimension (α = .70)				
I13	3.76	.90	.590	.560
I19	4.17	.82	.309	.723
I21	3.90	.95	.636	.524
I22	3.75	1.04	.410	.682
Total **(α = .91)**				

As a result of the analysis, Cronbach's alpha coefficients are .94 for the first dimension ("awareness"), .79 for the second dimension ("recycling and eco-transformation savings"), and .70 for the third dimension ("research"). The Cronbach alpha coefficient for the sum of all dimensions of the scale was determined as .91. If the reliability coefficient is considered to be highly reliable in the range of .80-1.00 (Akgül & Çevik, 2003), the findings suggest that the whole scale and its dimensions are highly reliable.

Correlation coefficients between dimensions are shown in Table 5. Examining Table 5 reveals the fact the correlation coefficients between the dimensions formed in the scale vary between .204 and .940. It is concluded that there is a low, medium, and high-level relationship between the dimensions and the three dimensions are not independent from each other.

Table 5. *Correlation Coefficients Between Dimensions*

Dimensions	1st Dimension	2nd Dimension	3rd Dimension	Total
1st Dimension	1	.456**	.483**	.940**
2nd Dimension	.456**	1	.204**	.593**
3rd Dimension	.483**	.204**	1	.702**
Total	.940**	.593**	.702**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4. Conclusion

In this study, a scale has been developed in order to determine teachers' attitudes towards garden-based learning. During the scale development process, firstly a literature search was conducted, and an item pool was created by writing five-point Likert-type draft items. It was then presented for an expert opinion. In line with expert opinions, some items were removed from the scale and some items were corrected. After a 42-item scale trial form was created by the expert opinion, it was applied to teachers working in different parts of Turkey.

The working group for EFA scale was created in the 2020-2021 academic year, by 292 teachers providing education in Turkey. The result of the multi-step EFA analysis conducted in the validity studies showed that the 20-item scale was collected in 3 dimensions as a result of the load values of the items belonging to each dimension of the 42-item scale. As a result of the analysis, it is seen that the dimensions, in which the 20-item scale is gathered under three dimensions, explain 37.11%, 12.46%, and 12.19% of the total variance and 61.76% of the total variance, respectively. Reliability coefficients were calculated as alpha 0.94 for the first dimension, 0.79 for the second dimension, and 0.70 for the third dimension. The alpha value for the whole scale was found to be 0.91. As a result of the study, it was revealed that the "Attitude Scale of Teachers towards Garden-Based Learning Approach" is a valid and reliable scale for measuring teachers' attitudes towards garden-based learning.

The most important limitation of this research is the fact that the data collection process has been limited in terms of contacting the participants due to the Covid-19 pandemic. Despite this limitation, the current study shows that the developed scale can be used as a valid and reliable measurement tool. In order to increase the generalizability of the obtained data in a better manner, it is recommended to the researchers to repeat the study with different and larger samples. Besides, the study can be supported by qualitative research. It is suggested that practitioners generalize the garden-based learning approach from theory to practice by determining the attitudes towards the garden-based learning approach with the developed scale.

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