

ARTICLE VALIDITY AND DEVELOPMENT OF TEACHER ENVIRONMENTAL ATTITUDE SCALE

Nazım Kaşot^{1,2*}, Kemal Akkan Batman³

¹Department of Science Teaching, Faculty of Education, Near East University North Cyprus, TURKEY ²Nature Biomonitoring, Protection and Research Center, Near East University North Cyprus, TURKEY ³Department of Primary School Teaching, Atatürk Teacher Academy, North Cyprus, TURKEY

ABSTRACT

The purpose of this paper is to develop an attitude scale for usage in the determination of the attitude of teachers concerning environment in the culture of Turkish Republic of Northern Cyprus. The focus of the research was designing and improving Teacher Environment Attitude Scale (TEAS) and determining its validity and psychometric characteristics. The following steps were taken in developing TEAS: Relevant literature on the topic was reviewed in order to determine the items to be included in the scale and essays were written by 530 teachers on environment. Literature review and essays were analyzed and a pool for attitude items was prepared. Expert opinions (n=11) were sought in order to see whether the determined expressions could be used as attitude expressions. Experiment scale was prepared upon consultation with experts,. Pilot application was applied to 500 randomly selected teachers who worked at secondary schools under Ministry of National Education and Culture of TRNC in 2015-2016 academic year. Exploratory factor analysis was calculated based on the obtained data in order to determine structural validity of TEAS. The revised final version of the scale was applied to 440 teachers in order to test the accuracy of the factor structure and Confirmatory Factor Analysis was conducted using the obtained data. As a result, TEAS appeared as a threedimensional, reliable and valid, Likert-type scale consisting of 15 items, $\alpha = .82$).

INTRODUCTION

KEY WORDS Attitude towards environment, Northern Cyprus, Secondary Education, Teacher

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*Corresponding Author Email: nazim.kasot@neu.edu.tr Tel.: +905428591499

Environment is the medium where living things continue their lives. In different words, it is the integrity consisting of energy, material things and processes which allows for the living things or the community to live and affect them constantly. Environment consists of almost all processes and fields [17].

In terms of its nature, environment can be examined in three sections, namely natural environment, artificial environment and socio-economic environment. Natural environment consists of non-living and living environment. Microorganisms, plants, fungi and animals are examples of living environment. Sunrays, soil, water, air and underground resources are examples of non-living environment. Human beings create artificial environment by using everything they find in natural environment. Villages, cities, roads, industrial establishments created by humans are examples of artificial environment. The environment created as a result of political, economic and social systems of human beings in a certain area are defined as socio-economic environment. Neighborhood relations, education-teaching, working conditions, relations between administrators and the administered are examples of socio-economic environment [35].

Disinger stated that the word "environmental education" dated back to IUCN Conference held in 1948 and that 1972 was a turning point in terms of environmental education [6].

The definition of environmental education provided by Stapp in 1964 created the foundation of studies conducted thereafter. According to Stapp, environmental education aims at training individuals who are knowledgeable about problems in biophysical environment and able to undertake active tasks in order to solve these problems as cited in [4].

At Turkish Environmental Education and Teaching Environmental Strategy and Application Plans Seminar, environmental education was defined as taking active role in environmental problems, active participation in environmental activities, protection of natural, historical, cultural and socio-aesthetic values, imposing environmentally-sensitive, positive, permanent behavioural changes and raising of environmental awareness in individuals [22].

Environmental education is the process of recognition of values between human culture and his biophysical environment and clarifying necessary concepts in order to develop skills and attitudes. Environmental education also consists of decision-making and solution-producing in topics including environmental quality [45]. If environmental education is examined in its historical context, it can be perceived among such fields as protection education, extra-class education, natural education, education for sustainable future, environmental literacy, resource-based education programs and other related fields [23]. One important feature of environmental education is that it teaches knowledge and skills required for environment in addition to making contribution to the academic success of students [36].

Environmental education is the process of developing attitudes, knowledge and skills and value judgments in order to protect the environment. In addition, it adds environmental-friendly behaviors to individuals and



indicates their possible outcomes [16]. Environmental education is imposing knowledge, skills and behaviours that allow for the individual to live in harmony with his environment and raise awareness in individuals on several issues such as exploitation of natural resources, energy and water consumption and garbage production who will also take active role in the solution of all kinds of environmental problems [10].

Education is an essential instrument in the process of attitude-changing. Determination of attitudes of teachers and students towards courses is the first step of increasing the quality of education. High-quality environmental education can allow for individuals to adopt positive attitudes and value judgments towards environment. Environmental education has three objectives:

- a) Improving the environmental sensitiveness of individuals and the society,
- b) Introducing managerial and other processes in the solution of environmental problems, raising awareness in and encouraging individuals for their operation,
- c) Making use of and expertizing on scientific-technological developments with a view to solve environmental problems [2].

An education which covers all three objectives as regards environment is in the interest of all individuals of the society. For this reason, environmental education must be directed towards all individuals of the society. The principle of equality should not be disregarded in extending this education to all segments of society. In other words, environmental education must not only be informative; it must also envisage a principle in including individuals in decision-making processes. It is clear that both the state and individuals have their roles in the formation and prevention of environmental problems. Individuals have as much responsibility as the state in environmental topics. Education is necessary and obligatory in order to perform these responsibilities and roles [2].

In order to raise individuals who are sensitive to environmental issues and able to prevent possible problems, environmental education can serve as an interdisciplinary approach which improves the knowledge, skill and attitudes of individuals. Environmental education is necessary in order to be able to analyse the environment, perceive the integrity of nature and the planet, create environmental awareness and gain environmental sensitiveness [11,15,28,47]. In order for this education to be effective, knowledge-level acquisitions in the curriculum should be balanced with affective and kinesthetic acquisitions and room should be provided for the students to be educated in that direction. [14] examined the intensity of environmental literacy elements in science curricula in Bulgaria and Turkey and concluded that curriculum elements mostly consisted of knowledge-level acquisitions but included attitude and behaviour acquisition elements only at negligible level. The science curriculum used in Northern Cyprus previously included affective acquisitions which had positive reflections on the environmental attitudes of pre-service teachers [31].

Effective environmental education emerges as a result of the interaction of individual experiences with nature and life. The experiences people obtain in natural environments allow for them to establish positive relations with the nature. Knowledge and experiences obtained during nature-life interaction creates positive impact on the perception by individuals of their natural environment and ensures that they respect and protect their environment. Environmental education and the relevant educator are essential in order to create positive perceptions. It is necessary to provide opportunity for students to explore the world in a safe environment. For this reason, providing environmental education outdoors, in natural environments, bears importance. Teachers are the people who will organize such learning. Determining the interest and attention of students and supporting their knowledge and skills related to environment is one of the important points that teachers should pay attention to. In order to realize this, teachers have to be friendly to the earth and provide guidance to students during education. Teachers also pay attention to the examples they give in order to avoid development of eco-phobia in students and take active part in ensuring that students love the environment [8,21,44].

Teachers have huge responsibilities in educating individuals who are aware of environmental problems, responsible for solving these problems and conscious [3,5,20,30,33,39,40,41]. For this reason, teachers are expected to provide good role models for their students concerning environment. Finding examples in good role models, students will be raised with positive attitudes towards environment. In order to allow for the education of teachers with environmental awareness, environmental education has to be offered to teachers both before and during their services [19]. Courses which provide teachers with environmental awareness in Northern Cyprus are partly provided in pre-service period. During their term as teachers, 2-3 hours of training are provided by the Ministry without following any certain program in certain periods for which attendance is not obligatory. There is no programmed in-service education in Northern Cyprus which will raise environmental awareness in teachers [31].

The environmental pollution in Northern Cyprus in recent years and negative attitudes and behaviours displayed by individuals towards environment are indicators that individuals are not raised with environmental awareness. Environmental education is a process which begins in family and has to be continued at school. It must be remembered that the families of individuals are also educated by teachers. The students who are educated by teachers with no environmental awareness will naturally lack environmental awareness, too. For this reason, educating teachers with environmental awareness bears extreme importance. It is believed that the developed measuring tool will serve this purpose.



It is the first environmental attitude scale in Northern Cyprus developed for teachers [32]. Until today most studies on attitudes towards environment have been conducted on students. There are not many studies on the attitude of teachers. The scale will be beneficial in Turkish literature with its environmental education, environmental protection and environmental problems sub-dimensions in environmental attitude studies which will be conducted with teachers and pre-service teachers.

MATERIALS AND METHODS

Two separate samples were used in order to develop TEAS and perform validation. The first sample was used in exploratory factor analysis in determining the validity of the structure of TEAS. The second sample was used in confirmatory factor analysis in order to test the validity of the obtained factor structure.

Sample 1 (n=456)

Sample 1 consists of 500 teachers in total at secondary and vocational technical teaching level of Ministry of Education and Culture of TRNC. Attention was paid to include teachers who wrote essays on the topic beforehand in choosing the sample. After the application, the scale forms which will not be included in evaluation (44 forms which were left blank, where the same option was marked for all questions, or patterns were created with answers) were separated as a result of which sample 1 consisted of 456 teachers in total. Sample 1 consisted of 66.19% female and 33.81% male teachers. 15.35% of teachers were 30 years old and younger, 46.43% were in 31-40 age interval, and 38.22% were 41 years old or older. Of the participant teachers, 37.17% are teaching science/maths, 42.28% are teaching social sciences/Turkish, 12.15% are teaching linguistics and 8.41% are teaching drawing/physical education. In addition, 6.19% of the teachers have 3 years or less experience, 16.23% have 3 to 6 years of experience, 18.58% have 7 to 10 years of experience, 41.29% have 11 to 15 years of experience and 17.71% have 16 years and more experience in teaching profession. The first version of TEAS consisting of 94 items is applied to sample 1. Using SPSS 15.0 version, exploratory factor analysis was conducted in order to identify the dimensions of the scale.

Sample 2 (n=440)

Sample 2 consists of 440 teachers in total who work under the general secondary and vocational technical education office of Ministry of Education and Culture of TRNC. Following exploratory factor analysis, a new sample was chosen so that the scale could be examined with confirmatory factor analysis and interviews were held with 440 teachers with simple random sampling method. While forming sample 2, attention was paid to exclude the teachers in sample 1. Sample 2 consisted of 63.86% female and 36.14% male teachers. 25.45% of teachers were 30 years old and younger, 42.50% were in 31-40 age interval, and 32.05% were 41 years old or older. Of the participant teachers, 32.95% are teaching science/maths, 43.86% are teaching social sciences/Turkish, 14.09% are teaching linguistics and 9.09% are teaching drawing/physical education. In addition, 7.95% of the teachers have 3 years or less experience, 19.32% have 3 to 6 years of experience, 22.73% have 7 to 10 years of experience, 31.82% have 11 to 15 years of experience and 18.18% have 16 years and more experience in teaching profession. The revised version of TEAS consisting of 15 items was applied to sample 2. Confirmatory factor analysis was conducted using AMOS 18 and the factors obtained in exploratory factor analysis were tested.

Instrumentation

The stages followed in validation and development of TEAS are explained below.

Analysis of teacher's compositions and review of literature and establishing item pool

Literature review and analysis of the essays written by teachers are used in the preparation of TEAS. The stages followed for this purpose are given below. During literature review, the publications on environmental education [4,27,36,45] and scientific studies on environmental education [1,5,8,11,13, 15,28,29,37,38,40,42, 47,48] were examined carefully.

In the next step, compositions written by teachers were analysed using descriptive analysis technique and items obtained from essays were used in creating a pool of items during when literature review was also utilized. The items in the item pool were ordered according to their frequencies and the first form of the questionnaire was prepared with 93 items with high frequency. Each of the 93 attitude items included in the scale which was prepared as testing scale was attached an answering chart consisting of five options. The options were ordered from 5 to 1 and for each expression "3 points" represented medium-level participation, "1 point" represented the degree of attitude at negative end, and "5 points" represented the score of the attitude at positive end. The options matching the items and their score provisions are as follows: 5=strongly agree, 4=agree, 3=neither agree nor disagree, 2=disagree, and 1=strongly disagree.

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The answering options are located at the upper part of the scale and a blank cell is located in the intersection of relevant item and answering option.

Obtaining expert opinion assuring the content validity

At this stage, it was conducted in order to determine the content validity of TEAS. Opinions of field experts (n=11) from science and environmental education were consulted for scope validity of the questionnaire and it was given its final form. After preparing the preliminary testing form of TEAS, it was e-mailed to the experts mentioned above. The experts were asked if TEAS measured attitude towards environment. The experts were also consulted about such problems as incomplete topics or existence of too many items about a certain subject. Considering the answers provided by experts, necessary corrections were made on the scale and TEAS was revised. Thus, the preliminary testing form of TEAS consisting of 93 items was obtained.

Pilot testing

At this stage exploratory factor analysis was conducted in order to determine the dimensions of the scale. Permissions required for conducting pilot application were obtained from Ministry of National Education and Culture. Afterwards, the preliminary testing form was applied to sample 1 consisting of 500 teachers in total under general secondary and vocational technical education department of Ministry of National Education and Culture of TRNC. After the application, the scale forms which will not be included in evaluation (44 forms which were left blank, where the same option was chosen for all questions, or patterns were created with answers) were isolated as a result of which the sample 1 consisted of 456 teachers in total. Afterwards, exploratory factor analysis was conducted in order to determine the dimensions of the scale.

Validating of the structure (confirmatory factor analysis)

At this stage, the factor structure of the scale determined through exploratory factor analysis was tested with confirmatory factor analysis. After conducting exploratory factor analysis, the revised TEAS was applied to sample 2 (440 teachers). AMOS programme was used on the data obtained from sample 2 and the model which was the result of exploratory factor analysis.

Data analysis

In order to determine the factor structure of TEAS, SPSS program was employed to use the data collected from Sample 1. Principal Component Analysis (PCA) was utilized for exploratory factor analysis. Factor structure of TEAS was determined and revised. New data were collected from sample 2 and exploratory factor analysis was conducted in order to verify the factor structure obtained from the previous application using AMOS program.

RESULTS

Initial form of TEAS

In the end of literature review and analysis of essays written by teachers, 5 Likert type TEAS consisting of 93 items was prepared. The scale was organized in the form of 5 Likert type from "strongly agree", "agree", "neither agree nor disagree", "disagree", and "strongly disagree". Experts approved the organization of TEAS in the form of 5 Likert type. The preliminary testing form consisting of 93 items evaluates three attitude components as regards Environment Literature, namely environmental education, environmental problems and environmental protection. The environmental education component was designed in the manner that teachers could evaluate their behaviours on environmental education. Environmental problems component was, on the other hand, designed so that the awareness of teachers could be revealed concerning the environment they are living in and the environmental problems they are facing in universal context. Environmental protection component is designed so that teachers could evaluate the correct behaviors required to obtain sustainable environment at both individual and social level.

EFA; Factor Structure of TEAS Using Sample 1

In order to display the structure validity of the scale, factor analysis was conducted on the 93 items in testing form of TEAS. Before conducting factor analysis, Kaiser Mayer Olkin (KMO) and Barlett tests were used to determine the conformity of the data to factor analysis. For the 456 preliminary testing scale forms consisting of 93 items which were included in evaluation, KMO value was found as .92 and Barlett test result was found as 9426,89 (p<.005). KMO value is recommended as .60 minimum so that factor

analysis could be conducted on data [18]. The .92 KMO value observed in this case is higher than the recommended KMO value. It is observed that the testing form data of the scale are suitable for conducting factor analysis. In the results of basic components analysis and exploratory factor analysis conducted by performing varimax transformation, the variances explained by factors are examined and it was decided that the scale was had a 3-factor structure with eigenvalue higher than 1. The items with factor loads lower than 0.5% were excluded from the scale and the exploratory factor analysis was repeated. In the end of exploratory factor analysis, it was found out that the scale consisted of 38 items and 3 sub-dimensions in total which explained 47.0% of the total variance.

Eigenvalue of factor I was 12.66 (accounted for 32.47 %), of factor II was 3.32 (accounted for 8.52 %) and of factor III was 2.35 (accounted for 6.04 %). The factors were interpreted by considering their size of factor loading, and then named according to conceptual framework used in the recent environmental education literature. [Table 1] summarizes factor names, eigenvalues v, and variances of each factor.

Factor name	Abbreviation	Eigen Values	% of Variance	% of Cumulative
Environmental Education	Factor 1	12,664	32,472	32,472
Environmental Problems	Factor 2	3,324	8,523	40,995
Environmental Protection	Factor 3	2,354	6,036	47,032

Table 1: Factor names, Eigen values and variances of factors

Item	Factor I	Factor II	Factor III	Communalities
41	0,75			0,616
44	0,79			0,721
48	0,73			0,638
49	0,57			0,439
51	0,59			0,627
38		0,59		0,465
43		0,57		0,386
45		0,61		0,441
57		0,62		0,472
58		0,66		0,528
55			0,71	0,627
73			0,57	0,383
74			0,55	0,418
75			0,55	0,502
94			0,58	0,538

Table 2: Factor loadings and communalities

When interpreted in total, results show that the revised scale consisting of 20 items has three factors (dimensions). Factor loads are given in [Table 2]. The items with factor loads below .50 are not included in the final test. Items under factor 1 are items numbered 41, 44, 48, 49 and 51. Thus, factor 1 consists of 5 questions and is called "environmental education". The items under factor 2 are items numbered 38, 43, 45, 47, 57 and 58. Factor 2 also consists of 5 items which are grouped under the title "environmental problems". Items under factor 3 are numbered 55, 73, 74, 75 and 94. Factor 3 consists of 5 items under the title "environmental protection".

CFA; Validation of factor structure using sample 2

In order to verify the factor structure which occurred as a result of exploratory factor analysis, a statistical package of analysis of moments structures (AMOS 18) was used based on the data in sample 2 [7]. As a result of the DFA conducted by the researchers, 23 items were excluded from the scale of 38 items determined by AFA and a final scale consisting of 15 items was created. Results of confirmatory factor analysis are given in [Table 3].



Table 3: Confirmatory Factor Analysis Goodness of Fit Index

χ²/df	4,20
RMSEA(Root Mean Square Error of Approximation)	0,06
GFI(Goodness of Fit Index)	0,91
NFI(Normed Fit Index)	0,91
CFI (Comparative Fit Index)	0,93

When the indexes given in [Table 3] are examined, according to Hooper, Coughlan and Mullen (2008) an χ^2 /df value at or below 5 indicates acceptable fit. The χ^2 /df obtained according to the model is 4.20 which shows that the model has acceptable fit. RMSEA value of the model is 0.06 which is below acceptable fit value, 0.08; thus, it has been found out that there is acceptable fit in terms of RMSEA. GFI index which means goodness of fit is above 0.90 which indicates acceptable fit; if it is above 0.95, it shows perfect fit [9]. The GFI value found in the study is 0.91 proving that there is acceptable fit. CFI value gives the difference between null model and the model established with the assumption of no relation between variables and envisages that there is no relation between variables. If the CFI value is above 0.90 it can be claimed that there is acceptable fit [9]. The CFI value calculated for the model is 0.93 which is above acceptable fit. In the light of these findings, it can be said that the model has acceptable fit. [Fig. 1] presents the significant path coefficient of three factors model of TEAS validated using CFA.

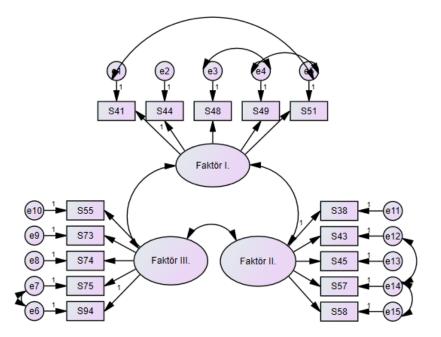


Fig. 1: When the path diagram is examined, it is found out that it consists of three sub-dimensions. The 5 items in the scale constitute Factor I sub-dimension (environmental education), 5 items constitute Factor II sub-dimension (environmental problems) and 5 items constitute Factor III sub-dimension (environmental protection).

Reliability coefficient(s) for TEAS

SPSS 21 package program was used in calculating the Cronbach's Alpha correlation which gives the internal consistency between the items in the scale for each sub-dimension. Cronbach's Alpha (α) reliability coefficient of TEAS was found as 0.93. According to the literature, this value is considerably favourable in terms of the reliability of the scale (Karasar, 2008). As regards the sub-dimensions of the questionnaire, Cronbach's Alpha (α) reliability coefficient of first factor with five items (environmental education) was found to be .86; of second factor with five items (environmental problems) was found to be .81 and of third factor with five items (environmental protection) was found to be .82.



Table 4: Cronbach's Alpha and KMO values indicating the reliability and validity of TEAS

Test	Value
Cronbach's Alpha	0,93
Cronbach's Alpha Value of Factor I	0,86
Cronbach's Alpha Value of Factor II	0,81
Cronbach's Alpha Value of Factor III	0,82
Kaiser-Meyer-Olkin	0,92

Final version of TEAS

Final version of TEAS with three sub-scales and 15 items, all measured using a five Likert type scale, is presented in [Table 5].

Table 5: Items in teacher environmental attitude scale on a five point Likert type scale

1. Municipalities must be spearheads in recycling.
2. In Northern Cyprus neither urban nor household wastes are recycled.
3. Environment cannot be protected by giving priority to mass transportation.
4. Oil should not be used and renewable resources should be preferred.
5. Faucets should be turned off while shaving or cleaning teeth.
6. Cooperation should be made with families on the insensitiveness of students towards the environment.
7. Environmental education department should be formed within Ministry of Environment.
8. In Northern Cyprus, administrators do not need environmental education.
9. Students should know why they should protect the environment.
10. Our cultural heritage resources are not part of the environment.
11. Human beings are not the only living things that cause environmental problems.
12. Chemicals used in struggle with mosquitos do not have any detrimental effect on environmental health.
13. Pesticides are effective in the increase of cancer in Northern Cyprus.
14. Throwing away batteries to the nature is not prejudicial.
15. Agrochemicals used uncontrolled don't harm the environment.

DISCUSSION

Attitude scales are among important measuring tools in displaying the attitude towards environment. In the literature various attitude scales can be found which aim at determining the attitude of pre-service teachers towards environment and examining various dimensions of the environment. This study was conducted with the purpose of developing a reliable and valid attitude scale in order to determine the positive and negative attitudes of teachers towards environment. TEAS scale consisting of three factors and 15 items was developed in the form of 5-point Likert type during when the following steps were taken: (1) detailed review of environmental literature and environmental attitude studies and essay-writing by teachers on attitudes towards environment, (2) creating a pool of items and seeking expert opinion for coverage validation (n=11), (3) pilot application of the first version of the scale in order to determine the factor structure of the scale with exploratory factor analysis, (4) using confirmatory factor analysis in order to validate the 3-factor model determined with exploratory factor analysis, and (5) calculating the reliability of sub-dimensions.

The confirmatory factor analysis conducted for validating the three-factor structure determined after exploratory factor analysis indicated acceptable (.50 to .90) and significant (p< .001) path coefficients. This means that each item has a significant contribution to the related sub-scale.

In order to determine the fit of the model, the value obtained from the ratio of suggested chi-square to degree of freedom was used. As shown in Table 3, the ratio of chi-square to degree of freedom was found as 4.20. In the literature it is discussed that if this value is 2 or below, the model is a good one; if its value is 5 or below, the model is acceptable in terms of goodness of fit [43,46]. Taking these criteria into consideration, it can be said that the model shows acceptable fit. All indexes are between acceptable limits (NFI, CFI and RMSEA).



It is stated that RMSEA value below 0.06 shows goodness of fit and below 0.08 shows acceptable goodness of fit [26]. The RMSEA value of the model was found as 0.06 which indicates favorable goodness of fit.

In order to determine the fit of the model, the value obtained by proportioning chi-square to its degree of freedom is mostly used. The first analysis in table 6 shows that the ratio of chi-square to degree of freedom is 4.12. If this value is 2 or below, it is regarded as a good model whereas a value at or below 5 shows that the model has acceptable goodness of fit (34,43,46]. Accordingly, it can be said that the model shows acceptable fit. The fit indexes of the model were found as NFI= 0.91 and CFI= 0.93. If NFI and CFI fit indexes are 0.90 and above, the model has acceptable fit; it is 0.95 and above, it has goodness of fit [34,43]. Accordingly, it can be claimed that the model has acceptable fit.

Cronbach's Alpha coefficient was calculated as 0.93 for all dimensions of the scale (15 items). In terms of reliability, a score not more than .80 shows that the scores obtained by TEAS are reliable [18,24]. In addition, Cronbach Alpha (α) reliability coefficient of first factor with five items (environmental education) was found to be .86; of second factor with five items (environmental problems) was found to be .81 and of third factor with five items (environmental protection) was found to be .82. These satisfactory results are indications of the acceptable properties of the final 15- item version of the TEAS.

The factors created in TEAS and their titles were determined as environmental education, environmental problems and environmental protection. As a result, according to the obtained findings in this study, TEAS was developed as a valid and reliable measuring tool which could be used with the purpose of determining the attitudes of teachers towards environment.

An examination of the Turkish literature shows that attitude scales have been developed in order to measure the attitude of students at various levels towards environment. This scale has been prepared with the purpose of identifying the attitude of teachers towards environment. For this reason it is a contribution and innovation in the research literature. It is a scale determining the tendencies of teachers concerning environmental education, environmental problems and environmental protection as well as their positive and negative attitudes. Researchers can use this TEAS in their future studies with its favorable psychometric characteristics. In addition, a pilot application can be applied with the scale on preservice teachers studying at universities and its psychometric characteristics can be determined. If it is found fit, an attitude scale which can determine the attitude of pre-service teachers as regards environment will be developed.

CONFLICT OF INTEREST There is no conflict of interest.

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