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Development and Validation of an Instrument to Measure University Students' Attitudes toward Traditional Knowledge

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ABSTRACT Traditional knowledge includes intellectual inventories of local biological resources, animal breeds, and local plant species. This knowledge has been used for centuries by indigenous and local communities under local customs and traditions. Attitudes toward traditional knowledge are very important to the development, transmission and transformation of this knowledge. An extensive review of the literature on attitude toward traditional knowledge research also indicated that there are no instrument that can provide valid and reliable data on students' attitudes toward traditional knowledge. For this reason, this study deals with the development and validation of an attitude scale toward traditional knowledge. Data gathered from 396 university students provided evidence for the validity and reliability of the new instrument which consists of 17 attitude items on a four point likert type scale. Detailed information on development and validation process of the instrument is provided. It is believed that the instrument will serve as a valuable tool for both instructors and researchers in environmental education, ecology and ethnobotany to assess students' attitudes toward traditional knowledge.

INTRODUCTION

Traditional and indigenous knowledge is the information that people in a given community, based on experience and adaptation to a local culture and environment, have developed over time, and continue to develop (Hansen and Van-Fleet 2003; Briggs 2013). This knowledge has been used for centuries by local communities under local customs and traditions (Ugulu 2012). It has been transmitted and improved from generation to generation (Yilmaz et al. 2013). Traditional knowledge has played a substantial role in vital areas such as food security, the development of agriculture and medical treatment (Correa 2001; Dogan and Ugulu 2013).

Traditional knowledge is a prominent component for the daily life of millions of people in many countries (Dogan et al. 2013). Traditional medicine which is one of the important elements of traditional knowledge serves the health needs of a vast majority of people in developing countries, where access to "modern" health care services and medicine is limited by economic and cultural reasons (Ugulu and Baslar 2010; Dogan and Ugulu 2013). Traditional medicine also plays an important role in developed countries, where the demand for herbal medicines has grown in recent years (Correa 2001; Ugulu et al. 2009). Another essential element of the traditional knowledge is the information about plants and animals, and its diversity, living forms and conditions, reproduction, etc. For instance, many pharmaceutical products are based on, or consist of, vegetable and animal materials (Kate and Laird 1999; Khan et al. 2013). Moreover, the knowledge of traditional and indigenous farmers relating to cultivated plants has also been a central factor for the development of new plant varieties and food productivity on a global scale. Traditional knowledge is also the origin of a great variety of artistic expressions, including musical works and handicrafts (Correa 2001).

In the view of these explanations it is said that traditional knowledge is very important for social and cultural life and one of the main sources of many scientific and sociological researches (Ugulu et al. 2012). However, the continuation of this knowledge is endangered when transmission between the older and younger generation is no longer connected (Kargioglu et al. 2008). About the continuation of traditional knowledge, the loss of information considered as traditional knowledge, Wolff and Medin (2001) suggested that "with modernization, it may be that knowledge about living things has decreased, or as we say here, *devolved*." The concept of devolution was derived from their study of undergraduate students at Northwestern University who were provided a list of 80 trees. One result of the survey was that less than 50% of the students recognized a group of trees that were frequently

found in the area of their university. According to Wolff and Medin (2001), the results were suggested to support the devolution hypothesis that linked modernization directly with loss of knowledge about living things (Balick 2003).

Starting from this point, Balick (2003) identified some of the reasons for the loss of traditional knowledge, and the constraints to addressing this devolution based on experience derived from several projects in various regions. In this context, modernization is likely one of the prominent issues involved in changing the focus of people's educational endeavors. This modernization and also globalization have been accompanied by the inability of people, particularly the young, to recognize value in traditional ways, as related to their daily lives. On the other hand, in many places, the diffusion of the family as a unit or deterioration of family relationships has tended to decrease interest in traditional activities. Regarding this issue, Hezel (2001) has pointed out in Micronesia, these changes have resulted in a complete reshaping of daily life in this region. According to Balick (2003), the another factor causing the loss of traditional knowledge is the integration of the television in daily life and, in many locations, the introduction of television has become a substitute for family and village storytelling and conversations during which traditional knowledge was formerly transmitted. The major role model for the children had become a series of television shows, rather than the traditional leaders.

Whether the aims for a community include preserving, protecting, or sharing traditional knowledge, it is becoming increasingly important to record and document this knowledge (Yilmaz et al. 2013). Documentation is fundamental to preserving this knowledge for current and future generations (Hansen and VanFleet 2003). Therefore, young population of a community is very important that the process of the preserving of traditional knowledge. Dahlberg and Trygger (2009) claimed that children and youth should naturally be included, since their experience of social and environmental change is vital to the development, transmission and transformation of traditional knowledge. Education and its activities assume a great responsibility at this stage. Because students' attitudes must be changed to achieve this purpose. Student attitudes affect behavior of individuals, particularly the choice of action and persistence to make a decision. For example, students with high scientific literacy tend to make more appropriate decisions and seem more knowledgeable (Goodrum et al. 2001). From this point of view, it is important to examine student attitudes for the development, transmission and transformation of traditional knowledge.

Objectives

An extensive review of the literature on traditional knowledge researches indicated that there are no instruments that can provide valid and reliable data on students' attitudes toward traditional knowledge. For this reason, there is a lack of instrument on attitudes toward traditional knowledge which basically has lead to the emergence of this study. The present study reports on the development of an instrument to measure various constructs that explored important dimensions of students' attitudes toward traditional knowledge. The survey was conducted on a sample of university students.

MATERIAL AND METHODS

Sample

When the scale development studies carried out for the determination of appropriate sampling size were evaluated, it was seen that Comrey ve Lee (1992) rated 100 as weak, 200 as average, 300 as good, 500 as very good and 1000 as excellent. In their scale development studies, Guilford (1954) stated that minimum sampling size should be 200, while Aleamoni (1976) gave 400 as minimum. The sampling size in factor analysis was given as 10 times the number of items by Nunnally (1978), as 15 times by Gorusch (1983) and as between 5-10 times by Tavsancýl (2002). After the evaluation of related literature, "Traditional Knowledge Attitude Scale" development study was realized in the spring semester of 2011–2012 academic years with the participation of 396 students selected from two universities in Izmir and Balikesir Province of Turkey.

Stages in the Development of the Traditional Knowledge Attitude Scale (TKAS)

Traditional Knowledge Attitude Scale (TKAS) was developed in order to determine

university students' attitude toward traditional knowledge. Six-step model was used in order to develop TKAS. These stages were illustrated in Figure 1.

Stage 1: Development of Item Pool

Before the development of item pool, literature was searched and 30 university students were posed the question "What are your opinions on traditional knowledge?" and asked to write an assay on the subject. The answers that students gave to the question were listed. As a result, a pool of 38 items was formed.

Stage 2: Validation of Item Pool

Draft items were sent to three relevant specialists for formal review. Each item was placed into matrix and then asked for a response to evaluate four areas: *content validity, clearness and understandability, accuracy* and *distracters*. After the literature search, the essential elements of the traditional knowledge as traditional medicine, plant and animal knowledge (Correa 2001) and environmental knowledge and awareness (Ugulu and Aydin 2011) were analyzed for evaluation of attitudes toward traditional knowledge and the pool of 38 items were reduced to 31. As a result of this external review, numerous items were revised.

Stage 3: Taking Expert Opinion

Regarding the items of TKAS, opinions and suggestions were sought from faculty members (n=11) and instructors (n=5) from the science education departments of Dokuz Eylul and Balikesir Universities. The experts were asked to examine items with regard to their relevance to purpose of the instrument, content coverage, understandability and consistency. In light of the expert opinions and suggestions, corrections were made and 2 new items were added. Validation of scope was sought in accordance with the expert suggestions. As a result, a scale of 33 items was produced to be used in pilot test.

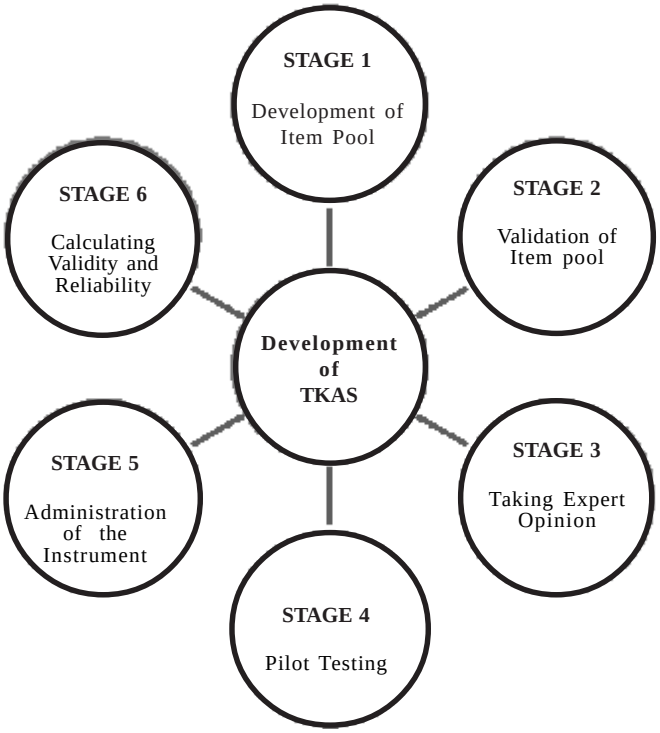

Fig. 1. Development process of traditional knowledge attitude scale

Stage 4: Pilot Testing

Trial form of TKAS, which was prepared according to expert opinions and suggestions, was applied to a group of 80 students studying in university and they were asked about the items they were having difficulty. The results of pilot testing showed that 4 of the 33 items were not clearly understood by most of 80 students. Based upon students' opinions and expert suggestions, these 4 items were excluded and the instrument was re-designed for real administration.

Stage 5: Administration of the Instrument

The application form of 29 items of TKAS was formed as a result of both expert opinions and corrections and additions during test application. Final draft of the instrument was administered to 396 university students for calculating validity (particularly construct validity) and reliability of the instrument. Students' responses were entered into an Excel file created for further analyses.

Stage 6: Calculating Validity and Reliability

The data collected from 396 university students were analyzed by means of factor analysis and reliability analysis using SPSS (Statistical Package for the Social Sciences) version 17.0. In order to examine the factor structure of the instrument, the data were subjected to factor analysis with principle component method. Then, reliability analysis was performed for each of the emerged sub-scales.

RESULTS

Factor Structure of Traditional Knowledge Attitude Scale (TKAS)

In order to determine the structure of the scale factor, varimax rotation method was used and principal components factor analysis methot was applied to scores obtained from answers given by 396 students to the scale. The suitability of the data for factor analysis can be tested by Kaiser-Mayer-Olkin (KMO) coefficient and Barlett Sphericity Test (Ugulu 2011). If KMO is higher than 0.60 and Barlett Test is meaningful, then data is suitable for factor analysis (Kline 1994; Buyukozturk 2003). KMO value was found to be 0.681 and acceptable in principal components factor analysis.

Another indicator of the strength of the relationship among variables is Bartlett's test of sphericity. Bartlett's test of sphericity is used to test the null hypothesis that the variables in the population correlation matrix are uncorrelated. The fact that chi-square obtained in this test is meaningful shows that data come from multivariate normal distribution. In this study, the observed significance level was $p < 0.001$. It is concluded that the strength of the relationship among variables was strong (George and Mallery 2001).

Factor analysis on Traditional Knowledge Attitude Scale (TKAS) derived 8 factors with eigenvalues exceeding 1.0. These factors altogether explained 76% of variance of results. Scree plot shows that three factors were in sharp descent and then started to level off. This was evidence that rotation was necessary for three factors. Overall, three of eight factors were represented just by one item per each factor with loading higher than 0.4. Twelve items were deleted because their factor loadings were lower than 0.4 (Yavuz 2005).

In summary, twelve out of 29 attitude items were deleted and the factor analysis for rotation was run again over the data set with 17 items. Varimax rotation was used. Thus, the factor analysis resulted in three independent factors with factor loadings greater than 0.4. Table 1 presents factor loadings and factor structures of the items.

These three factors accounted for 62.89% of total variance and were named according to the common characteristics of the items loaded on the same factor. This value is appropriate considering that other works focused on attitudes showed lower explained variance (Salta and Tzougraki 2004: 47%; Spinner and Fraser 2005: 42%). Eigenvalues of the factors are 6.588, 2.528 and 1.575, respectively. Table 2 gives the factors, eigenvalues and total variance explained. The proportion of explained variance by the prime factor in valid scales should be at least 20% (Reckase 1979). Because our Factor 1 accounted for 38.725% of total variance,-these results are considered satisfactory. This suggests the presence of one major factor and thus reinforces the prior evidence concerning the internal consistency of the TKAS.

Description of TKAS Dimensions

In light of the data obtained from factor analysis, it was seen that items constituting TKAS were grouped under three subfactors. When

Table 1: Factor structures and loadings of the 17 items in TKAS

Items	*F1*	*F2*	*F3*
Factor I (Attitudes Toward Traditional Medicine Knowledge)			
I think herbal teas and phytopreparations prepared at home help to drugs.	0.882		
I think home-made herbal teas and phytopreparations are beneficial in terms of health.	0.839		
I would like to drink home-made herbal teas (linden, sage, mint-lemon, etc.) when I am sick.	0.802		
I can prepare some herbal teas myself.	0.730		
I would be happy to learn recipes of the herbal teas and phytopreparations.	0.595		
Factor II (Attitudes Toward Plant and Animal Knowledge)			
The knowledge of the elderly people is a major source in terms of the biodiversity in our region.		0.779	
I enjoy getting information about plants and animals in our environment from my family and elders.		0.731	
I am aware of the benefits of plants and animals to humans.		0.711	
I am curious about the conditions and habitats of animals.		0.696	
I ask my family and elders which plants and animals live in our area.		0.597	
I think everybody should learn information about the benefits of plants and animals from elders.		0.564	
I would like to learn the growing conditions of various plant species.		0.542	
Factor III (Attitudes Toward General Environmental Knowledge)			
I know environmentally important places (wetlands, national parks, etc.) in my surrounding areas.			0.863
I talk with people around me on environmental matters such as endangered species.			0.787
I am curious about how the natural events occur.			0.666
I enjoy making trips to natural areas (prairie, forest, etc.) in my surrounding areas with my family and elders.			0.605
I would like to recognize the natural environment in my surrounding areas.			0.496

Table 2: Factor names, eigenvalues and variance of factors

Factor names	*Eigenvalues*	*Variance of factors*
Attitudes Toward Traditional Medicine Knowledge (ATTMK)	6.588	38.755
Attitudes Toward Plant and Animal Knowledge (ATPAK)	2.528	14.871
Attitudes Toward General Environmental Knowledge (ATGEK)	1.575	9.267

items constituting sub factors were evaluated within themselves, it can be said that the first factor contains attitude items related to traditional medicine or ethnobotanical knowledge, while the second factor contains items related to plant and animal knowledge. And the third factor contains, in general, attitude items related to environmental knowledge and awareness.

Factor 1 consisted of five items that focus on personal traditional medicine attitudes such as learning recipes of the herbal teas and phytopreparations, preparing and using phytoremedies. Thus, this factor was named as "Attitudes Toward Traditional Medicine Knowledge (ATTMK)". *Factor 2* included seven items which focus on items such as getting information about plants and animals in our environment and learning information about the benefits of plants and animals from elders. Since these items correspond to plant and animal knowledge, this dimension was named as "Attitudes Toward Plant and Animal Knowledge (ATPAK)". *Factor 3* consisted of five items such as talking with people on environmental matters and making trips to natural areas. Because these items were concerned with the general notion of environmental knowledge and awareness, this dimension was called "Attitudes Toward General Environmental Knowledge (ATGEK)".

Discriminant Validity and Reliability of TKAS

Series of reliability analyses were performed for each factor. Table 3 summarizes factor names, number of the items and reliability of each factor. The values of discriminant validity, or scale independence, the mean of correlation values of a sub-scale with other scales, are ranged from 0.08 to 0.24. Francis and Greer (1999) reported

Table 3: Reliability of each factor in the TKAS

Factor names	*Number of the items*	*Cronbach alpha values*
Attitudes toward traditional medicine knowledge	5	0.86
Attitudes toward plant and animal knowledge	7	0.86
Attitudes toward general environmental knowledge	5	0.77
Whole scale	17	0.89

alpha values for three science attitude dimensions from 0.64 to 0.72. Dhindsa and Chung (2003) reported alpha values for six science attitude dimensions from 0.59 to 0.75 and discriminant validity in their research ranged from 0.12 to 0.22. In this study, alpha values determined for each scale dimension ranges from 0.77 to 0.86. Cronbach Alpha coefficient for the whole scale was determined as 0.89. Liu (2003) stated that limit value for scale reliability could be taken as 0.70. However, he also reported that reliability values of 0.60 for preliminary studies, 0.80 for basic studies and 0.90-0.95 for applied studies were necessary. These results support that TKAS is internally consistent and reliable for interpreting traditional knowledge attitudes among university students.

DISCUSSION

In this study, a 17-item instrument to assess university student attitudes toward traditional knowledge was developed. This instrument (TKAS) consisted of three dimensions and 17 items with responses recorded on a four-point Likert scale, options ranging from strongly agree to strongly disagr ee (4-Strongly agree, 1-Strongly disagree). The maximum score that can be obtained from the instrument is 68 and the minimum score is 17. The TKAS was also subjected to: (1) factor analysis for exploring factor structures and (2) series of reliability analyses for investigating reliability of each factors emerged.

The construct validity of the TKAS was examined using factor analysis with varimax rotation. Our sample of 396 students, according to Tabachnick and Fidell (2001), is sufficiently large to allow meaningful factor analysis to scrutinize the construct validity of the TKAS. The results of the factor analysis revealed the three scales structure of the instrument which assessed Attitudes Toward Traditional Medicine Knowledge (ATTMK), Attitudes Toward Plant and Animal Knowledge (ATPAK), and Attitudes Toward General Environmental Knowledge (ATGEK). As a result of the factor analysis, twelve item from the TKAS was omitted from further analyses. It was decided to exclude any item that did not have a factor loading of 0.40. All the items of the instrument combined accounted for 62.89% of the total variability in students' TKAS scores. It may seem that about half of the variability is unaccounted for, however 62.89% explained variability is considered as sufficient variance explanation in social sciences studies (Tabachnick and Fidell 2001; Buyukozturk 2002). Because this study was preliminary, future studies with larger sample size might show an increased accounted variance. Overall, these results support the factorial validity of the TKAS.

Cronbach's alpha reliability coefficients were also examined for the three dimensions. Analyses showed that all of the coefficients were high enough to be considered adequate, namely, all items lead to a higher alpha coefficient for the overall scale reliability. The results of reliability for the scales ranged from 0.77 to 0.86. The highest alpha coefficients were for Attitudes Toward Traditional Medicine Knowledge and Attitudes Toward Plant and Animal Knowledge. As a result, it can be said that reliability coefficients of the scales exceed the value of 0.60, which is considered acceptable for research purposes (Nunnally 1967). As a result, it can be said that the TKAS consisting of 17 items is a valid and reliable instrument to assess university student attitudes related to traditional knowledge.

Integrating research and education is a fundamental goal of institutions and agencies supporting science because of the benefits to society of a more informed and scientifically literate population (Gould et al. 2010). In order for raising individuals who are sensitive towards environment and traditions, first their level of knowledge, awareness and attitude toward environment should be determined and then it must be improved upon (Unal and Dimiski 1999). Therefore, attitudes toward traditional knowledge of all university students should be measured and education practices must be put in place to change these attitudes for the better. In this context, valid and reliable scales have an important role to play in changing attitudes for the better, in terms of both time and cost.

CONCLUSION

Developing an attitude instrument which should be used in determining the attitudes of university students toward traditional is aimed by this study. To develop a qualified instrument, all the steps of constructing a Likert-type attitude scale were followed. The draft scale was composed of 38 attitudinal items. 21 of the items were excluded in case of item-total correlations and principle components factor analysis. Additional to the values obtained by Kaiser-Meyer-Olkin and Barlett tests which showed that 17-item scale had construct validity, the internal consistency reliabilities which were estimated both for the whole scale and for subscales dealing with (1) issues related to learning recipes of the herbal teas and phytopreparations, preparing and using phytoremedies, (2) issues related to getting information about plants and animals in our environment and learning information about the benefits of plants and animals from elders, and (3) issues related to talking with people on environmental matters and making trips to natural areas. Finally, research findings show that the scale is valid and reliable.

RECOMMENDATIONS

The TKAS is a promising instructional tool for in especially environmental education, ecology and ethnobotany to explore students' attitudes towards traditional knowledge. Instructors can use the instrument for measuring attitudes and obtaining more specific views in three dimensions. In addition, scale will also be a useful tool in applied quasi-experimental studies. Instructors can use the scale for the purpose of observing the effects of the education they applied on the attitudes of students. However, it is thought that it would be beneficial if the scale was used in other countries for both the testing of validity and reliability of the scale and for evaluating the attitudes of the public towards traditional knowledge from a wider perspective. Moreover, further evaluation of the scale could be validated with different grades of students and various age groups of the public. It is suggested that usefulness of this scale is not restricted only to university students, but also responses of younger or older students and the public can result in meaningful factor dimensions.

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