ADAPTATION INTO TURKISH OF THE PLANT ATTITUDE QUESTIONNAIRE

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Introduction

Decreasing in urban green areas restricts the opportunities of learning more about the nature and experiencing it for both adults and children (Ju & Kim, 2011). Loss of contact with the nature affects children's acquisition of knowledge about the nature in a negative way; therefore, it causes continuing loss of the natural environments (White, 2004). Research shows that children of today know much less than their parents about the natural environment, because the way of people's acquisition of knowledge about the natural environment in today's society is differently than in the past and this affects the content and depth of what they know (O'Brien, 2010). Only if children experience the nature on the first hand learn better how to love it and try to protect it. As Dioum says "In the end we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught" (Almeida, Bombaugh & Mal, 2006). While teaching children to understand the nature, to be responsible individuals and to protect the nature, it is quite important to inform children about the common organisms in the natural world surrounding them (Bebbington, 2005; Cooper, 2008; Pilgrim et al., 2008; Randler, 2008), because attitudes and conceptions of a person about the environment are profoundly shaped by his/her attitudes, experiences and conceptions about the living organisms (Tunnicliffe & Reiss, 2000).

Plants are indispensable members of our world because of their roles in sustaining of the life in the nature. Galbraith (2003) argued the requirement of understanding the slogan "plant=life" for "modification of human behaviour in the 21th century in the world". Despite the ecological importance of the plants in the natural ecosystem many research (Wandersee, 1986; Reiss, 1993; Kinchin, 1999; Wandersee & Schussler, 1999; Tunnicliffe & Reiss,

Abstract. *Plants are indispensable living elements of the world due to their role in sustaining of life. However, many studies have shown that in general children and adults' knowledge and perceptions about plants are limited and they both find animals more interesting than plants. The purpose of this study was to adapt Plant Attitude Scale (PAS) developed by Fancovicova and Prokop (2010) into Turkish and to investigate the validity and reliability of the scale. Five hundred seventeen primary school students participated in the study. To determine the structural validity of PAS, exploratory and confirmatory factor analyses were conducted. The Cronbach alpha coefficient was calculated for the dimensions of scale. Results of the study indicate that Turkish version of the PAS is valid and reliable for measuring attitudes toward plants.*

Key words: *plant attitude scale, validity, reliability, scale adaptation.*

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2000; Tunnicliffe, 2001; Wandersee & Schussler, 2001; Schussler & Olzak 2008) shows that children and adults more interested in animals than plants, they have a natural tendency to animals rather than plants, conceptions and attitudes toward plants of them are poor. Besides this, both what students (Bell, 1981; Tunnicliffe & Reiss, 2000; McNair & Stein, 2001; Tunnicliffe, 2001), and teachers (Bebbington, 2005) know about the plants are limited. In different research, it is also reported that animals' names in comparison with plants' are learnt much easier, students' ability to recognize, identify and name the plants were poor and students recalled more animal images than plants (Barman et al., 2003; Bebbington, 2005; Fancovicova & Prokop, 2011a; Schussler & Olzak 2008). For the case the ignoring of plants as results of all these research shows, Wandersee and Schussler (2001) used the term "plant blindness" which is defined as the inability to see or notice the plants in one' own environment. They juxtapose the features of plant blindness as; the inability to recognize the importance of the plants in the environment and human affairs; the inability to appreciate of the plants' aesthetics and unique biological features; and the misguided, anthropocentric ranking of plants as inferior to animals, leading to the erroneous conclusion that they are unworthy of human consideration. Lindemann-Matthies (2005) summarize the results of different research for the reason of ignoring the plants as that the animals can move, they can communicate by means of eye contact and voice on the contrary of plants. It is stated that plants are considered as passive organisms and boring. Moreover, children and adults have a tendency to perceive animals individually, but plants as a whole and they are a part of animal habitat. As a result, many research shows that children have more information about animals than plants, they want to learn more about animals at school and they are more interested in their conservation.

Because of low student interest, teaching about plants is a pedagogical challenge (Wandersee, Clary, & Guzman, 2006). In some studies about attitude toward biology, it was found that children consider botany as difficult to learn (Prokop, Prokop & Tunnicliffe, 2007) and zoology as to be interesting for both sexes (Prokop, Tuncer & Chuda, 2007). However, teachers can increase students' interests by showing the plants in new perspectives with appropriate methods and specialist knowledge (Strgar, 2007). Lindemann-Matthies, (2005) found that students' interest has been increased as they know the organisms they see around their environment. Fancovicova and Prokop, (2011b) also reported that students' knowledge and attitude toward plants significantly increased after an outdoor programme. Since attitudes have not only emotional but also cognitive components, improving the attitudes towards the environment is facilitated by means of children's learning significant ideas about it (Hadzigeorgiou et al., 2011). Consequently students knowledge and interest about plants will play an important role in understanding the importance of the plants for the nature and human and developing positive attitudes toward plants so the environment.

The problem is that a lack of specific instrument in Turkish for measuring of attitudes toward plants. To introduce and adapt a research tool into Turkish would allow revealing attitudes and comparing the results of research in different countries on attitudes toward plants. Therefore, the aim of this study is an adaptation into Turkish and to examine the psychometric properties of "The Plant Attitude Questionnaire" developed by Fancovicova and Prokop (2010) to measure attitudes toward plants.

Methodology of Research

General Characteristics of Research

This research was carried out in March- May 2011 and survey method was used as a research methodology. Data were collected from three different primary schools in Ankara province from lower, middle and upper socioeconomic environments. While determining the sample of the study, the stratified purposeful sampling method was used. Some studies about attitudes (Uyeki & Holland, 2000; Yılmaz, Boone & Andersen, 2004) have shown that attitudes are related with socioeconomic status. Therefore, in stratifying, socioeconomic status was selected as a criterion to ensure that students from different socioeconomic levels are represented in the sample of the study.

Participants

Participants are consisted of 517 6th-8th grade students in 3 different primary schools. Overall 517 students 48.2% (n=249) is female and 50.7% (n=262) is male. Six students did not provide any information about this section. One hundred and ninety of the participants are 6th, 147 are 7th and 180 are 8th grade students. For the study of linguistic equivalence of the scale a group of 49 primary school students who know English the language of the original scale was selected.

Instruments

The original form of "The Plant Attitude Questionnaire", developed by Fancovicova and Prokop (2010) consist of 29 items and in responding 5-point Likert type scale was used. The questionnaire is formed by 4 factors which measure cognitive, affective and behavioural dimensions of the attitude. The first factor is about interest and enjoyment of plants (10 items), the second one is about the importance of the plants for humans and other livings' life (9 items), the third one is about the cost and benefits associated with urban trees (6 items) and the fourth one is about material benefits from plants in industry (4 items). Total variance explained by 4 factors is 37%. The alpha reliability coefficient calculated is 0.83 for the interest dimension, 0.78 for the importance, 0.71 for the urban trees and 0.70 for the utilization.

Procedure

Permission for the adaptation of scale was obtained from the researchers via e-mail who developed the original scale. By taking Hambleton and Patsula's (1999) steps of test adaptation process into consideration, these steps were followed:

In the first step, the original scale was translated into Turkish by three specialists in biology, biology education, measurement and assessment and biology education who are having a good knowledge of both languages. The differences and similarities between in these translations were examined; the opinion of a Turkish language specialist who has a good knowledge of both languages was taken. Later, this Turkish form was translated into English again by three specialists and the consistency between these two forms was examined. It has been found that the items in the original scale and the items in the translated from Turkish form again have linguistic equivalence in the panel meeting done with three specialists.

In the second step, the conceptual, semantic, idiomatic and experiencing equivalence of the items in the questionnaire was examined by eight experts in biology education and measurement and assessment. Some changes have been made according to their opinions. After these procedures, draft Turkish form of PAS was obtained.

In the third step, draft form was administered 15 students from 6th, 7th and 8th grade in a primary school and interviews with them were made after the administration. The students were asked to identify the statements that they had difficulty in understanding or were not clear and how many minutes it was going to take to answer was observed. After this administration, it has been determined that there are not any items that the students think as incomprehensible and the average responding period takes 6 minutes.

To get a statistical evidence for the consistency between the original form and Turkish form of the scale, both forms were administered to 49 primary school students who have a good knowledge of both languages with a 3 weeks interval. The questionnaire was administered to the big group formed by 6-8th grade student, after the identifications about the linguistic equivalence of Turkish form of PAS.

Data Analysis

The structural validity of Turkish form of PAS, factor structure in this context, was examined with exploratory factor analysis (EFA). Besides, the scale's determined factor structure validity, to what extent the structure was confirmed with the data obtained, model-data fit was examined with confirmatory

factor analysis (CFA). To evaluate model-data fit, Chi-Square Test, Goodness of Fit Indexes, Adjusted Goodness of Fit Indexes, Root Mean Square Residuals and Root Mean Square Error of Approximation were examined. The Cronbach alpha reliability coefficient was calculated for the scale. For the scale's reliability and validity analysis, SPSS and LISREL statistical software packages were used.

Results of Research

Linguistic Equivalence

The significance of the difference between the average scale scores obtained from the administration of linguistic equivalence of the original form of PAS and Turkish form of it was examined by dependent samples t-test. Findings are shown in Table 1.

Table 1.   t-test results of the original and Turkish form of PAS.

PAS	N	M	SD	df	t	P
Original Form	49	113.91	16.64	48	1.604	0.115
Turkish form	49	111.45	13.88			

There was no significant difference between the average score of the students which they got from the administration of the original and the Turkish scale (t (48) =1. 604, p>0.05). Pearson correlation coefficient calculated between the scores obtained from both administrations is 0.765. These findings show that Turkish Form of PAS has linguistic equivalence.

Structural Validity

Exploratory Factor Analysis

To determine that the data obtained from the administration of PAS and the sample size were suitable for EFA; KMO and Bartlett tests were analysed. For factor analysis, the result of a KMO test of the data should be 0.60 and above, the result of BST should be statistically significant (Büyüköztürk, 2011). The results of these tests were shown in Table 2.

Table 2.   KMO and Bartlett's test results.

Kaiser-Meyer-Olkin (KMO)test		0.851
Bartlett test of sphericity	Chi-square(χ^2)	3206.898
	df	378
	p	0.000

Table 2 indicates that the sample size is sufficient and the data is suitable for carrying out an exploratory factor analysis. A factor analysis was made for 29 items in total. In exploratory factor analysis, to find the items which show high relations with the factors, explore relatively independent factors and to comment the factors in a much easier way, oblique rotation technique was chosen. In the beginning, 8 factors were determined whose factor loads change between 0.316 and 0.747. However, it could not be possible to name the factors meaningfully. When the change in the factors' eigenvalue was examined, it was seen that the scale could be for 4 factors, the other factors' contribution to the variance was quite little. Therefore EFA was repeated by being limited with 4 factors. The results of the analysis show that the structure with 4 factors was consistent with the original questionnaire's factor structure. Only the item "Plants provide us with food" which is in the utilization factor in the original form was found in the

importance factor; and the item "Plants also suffer from diseases" which is in the importance factor was found in the utilization factor. Since "Plants provide us with food" item also indicates the importance of the plants, it was decided in the factor that this item stands was approved and included in the analysis. However, since it is not suitable to have "Plants also suffer from diseases" item in the factor it stands, it was excluded by getting the specialists' opinions and the analysis was conducted again for 28 items. The results of the analysis show that the 4 factors together explain 40.17% of the variance. The items' factor loads and the variance rates explained are given in Table 3. The factors were named by taking the factor structure in the original questionnaire into consideration.

Table 3. **EFA results of PAS.**

Factor	Item No	Factor 1	Factor 2	Factor 3	Factor 4
Interest	26	0.748			
	22	0.642	0.336		
	12	0.623			
	24	0.581			
	14	0.568	0.331		
	16	0.560			
	19	0.542	0.335		
	2	0.537			
	8	0.448			
	10	0.441			
Importance	7		0.652		
	27		0.619		
	17		0.614		
	11		0.586		
	28		0.542		
	15		0.517		
	3		0.512		
	6		0.480		
	1		0.404		
Urban Trees	25			0.745	
	9			0.719	
	29			0.718	
	5			0.617	
	13			0.388	
	20			0.369	
Utilization	23				0.742
	18				0.708
	4				0.670
Eigenvalue		5.507	2.489	1.861	1.391
Total variance explained (%) 40.17		13.037	12.221	8.654	6.260

*the ones whose load value is lower than .30 were not shown in the table.

The variance quantities that the factors explain are in a rank: the first factor (for interest) is 13.037%, the second factor (for importance) is 12.221%, the third factor (for city trees) is 8.654%, and the fourth factor (for use) is 6.260%. After factor rotation, the first factor (interest) is formed from 10 items whose factor loads ranged from 0.441 to 0.748, the second factor (importance) is formed from 9 items whose

factor loads 0.404 to 0.652, the third factor (city trees) is formed from 6 items whose factor loads 0.369 to 0.745 and the fourth factor (use) is formed from 3 items whose factor loads 0.670 to 0.742.

Confirmatory Factor Analysis

To confirm defined structure with 4 factors of PAS, confirmatory factor analysis (CFA) which is known as model-data fit test was conducted. Model fit indexes obtained from the analysis were examined and it has been seen that Chi Square Test value (χ^2=686.19, N=517, df=344, p<0.01) is significant. The values of the model were determined as χ^2/df=1. 99, RMSEA=0. 044, NFI=0. 91, NNFI=0. 95, CFI=0. 95, GFI=0. 91, AGFI=0. 90 and SRMR=0. 052. If (χ^2/df) value is under 3 and RMSEA is under 0.05, it shows perfect fitness. That NFI, NNFI, CFI, GFI, AGFI are above 0.95 indicate perfect fit; above 0.90 indicate good fit (Çokluk, Şekercioğlu & Büyüköztürk, 2010). According to these results, fit index values show that model has a good fit. The standard coefficients showing scale model with 4 factors and item-factor relations are shown in Figure 1.
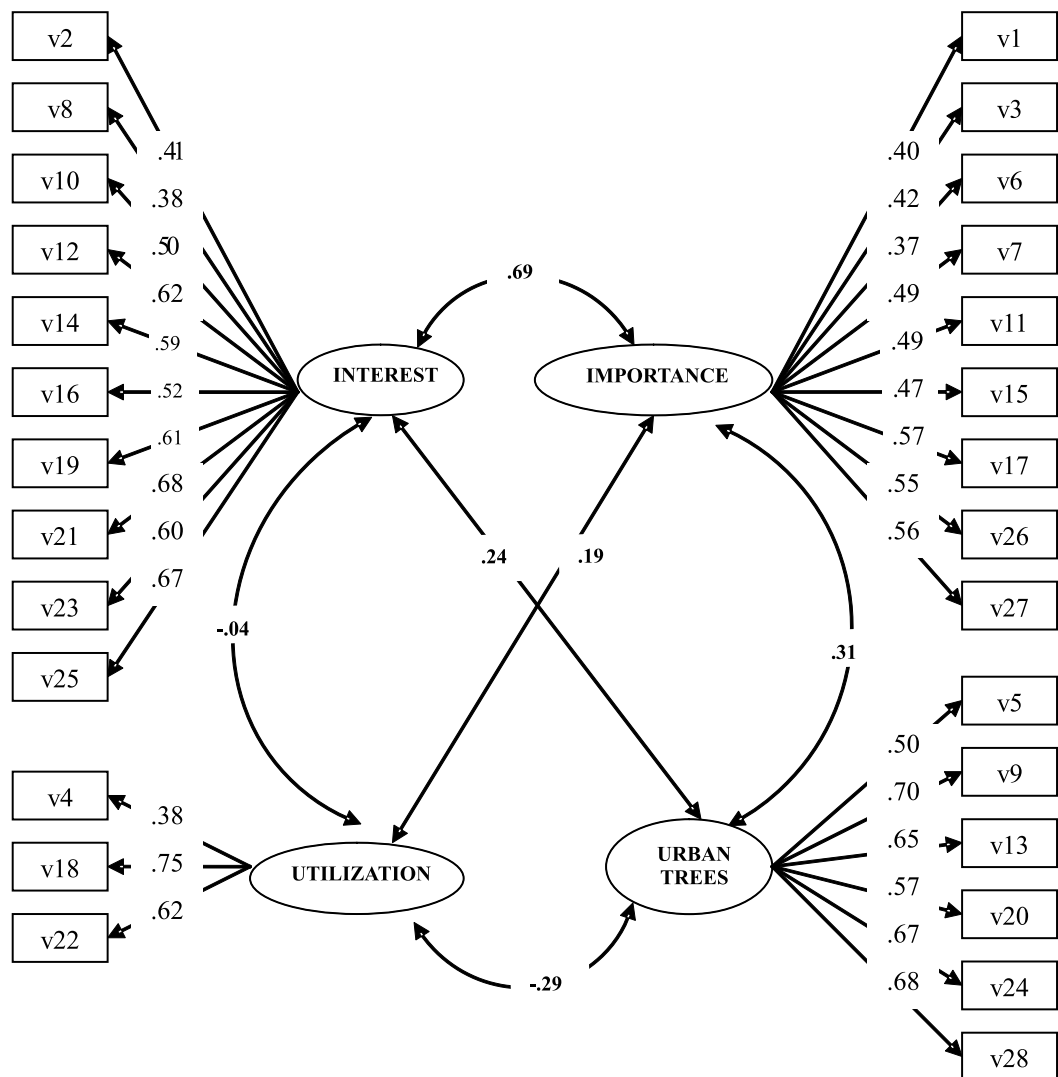

Figure 1.   Path diagram of PAS.

The standardized coefficients showing the relations of the items with their factors change between 0.37-0.75 and all of them are significant in 0.01 level.

Reliability Analysis

The scale's internal consistency coefficient was calculated for reliability study. Cronbach alpha values of Turkish and original questionnaire were given in Table 4.

Table 4.   PAS reliability coefficient.

Factors	Cronbach Alpha Coefficient	
	Turkish Form	**Original Form**
Interest	0.76	0.83
Importance	0.75	0.78
Urban trees	0.58	0.71
Utilization	0.59	0.70

According to Table 4, alpha internal coefficients calculated for the scores obtained from the scale were determined above 0.70 for "interest" and "importance" factors, but under 0.70 for "urban trees" and "utilization" factors.

Discussion

In this study, The Plant Attitude Questionnaire developed by Fancovicova and Prokop (2010) was adapted into Turkish. The original and Turkish forms of the scale were administered to the same group for linguistic equivalence and data obtained from the two forms indicated no significant difference between the scores. A positive high correlation was found between scores of both forms. These findings show that Turkish form of PAS has linguistic equivalence.

To determine the factor structure of PAS, exploratory and confirmatory factor analysis was conducted. The factor structure determined with EFA was consistent with the structure of the original scale formed with 4 factors. However, two items could not involve in the factors that they should be. "Plants provide us with food" item was found in the importance factor; "Plants also suffer from diseases" item was found in the utilization factor. This might be caused by the differences in cultural and education programs. "Plants provide us with food" item is decided to be in the importance factor, while "Plants also suffer from diseases" item should not be in the utilization factor. Therefore this item was excluded from the questionnaire according to specialists' opinion and the analysis was carried out again for 28 items.

To what extend the model with 4 factors of PAS is fit with the data obtained was examined by conducting CFA. The result of CFA showed that model-data fit was good. Alpha reliabilities for all dimensions of the original scale were found between 0.70 and 0.83. In this study, alpha reliability coefficients for interest and importance factors were calculated as above 0.70. Nunnally and Bernstein (1994) stated that reliability coefficients above 0.70 are regarded as satisfactory. However, alpha values calculated for urban trees and utilization factors were found relatively low. This is thought as a limitation of this study that to be focused in future studies.

Conclusion

When all the results obtained from reliability and validity studies of PAS are evaluated as a whole, they show that Turkish form of this questionnaire is a valid and reliable instrument which can be used to measure the attitudes toward plants. However, first promising results of this research will need to be replicated for standardization and the reliability and validity of this adapted questionnaire into Turkish.

It is thought to be fruitful to implement this questionnaire to the different samples whose variances are wide.

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