

# Development of Scale of Attitude Toward Social Sustainable Development Awareness

Dr. Mustafa Dođru<sup>1</sup>, Dr. Cem Oktay Güzeller<sup>2</sup>, Tuna Gencosman<sup>3</sup>, Dilara Saka<sup>4</sup>

## Abstract

The purpose of the study is to develop a scale of attitude in order to be used in determining the level of the attitudes of teacher candidates studying in Science Teaching toward sustainable development awareness as social perspective. 332 teacher candidates studying at Science Teaching Department had constituted the study group. According to the data obtained from the scales, exploratory and confirmatory factor analyses were performed in the process of testing the construct validity of the scale. As the result of exploratory and confirmatory factor analysis, it was found that the model consisting of 30 items and single factor was theoretically and statistically appropriate. And when the results obtained regarding reliability are considered, it can be said that the scale has reliability at sufficient level. It was observed that this Scale is usable in respect of revealing the attitudes of teacher candidates toward social sustainable development awareness.

*Keywords: Sustainable Development Awareness, Social Dimension, Science Education, Teacher Candidates*

## 1. Introduction

The development attempts made in the globalization process had caused the disruption of the world's natural balance and the arise of unlimited environmental problems. The natural resources had started to perish in our world which is gradually getting contaminated, and environmental deterioration had started to threaten the biodiversity in the world (Khor, 2001; Emrealp, 2005). Global effect of these problems had caused the search for balance in between development and nature. The countries had developed common solutions suggestions by gathering at international level, and negative effects caused by the current policies for development and improvement had started to be specified (Lerner& Lerner, 2006; Kaypak, 2011). At 1992 United Nations Environment and Development Conference (Rio Earth Summit-Agenda 21), the necessity of use of natural resources in a conscious and balanced manner for a well future were revealed, and the requirement of sustainable development awareness was accepted nearly by all the countries (Haubrich, Reinfried& Schleicher, 2007).

The widely known most general description of sustainable development concept was provided as "the process of meeting the requirements of today without sacrificing the facilities of future generations to meet their requirements" in the Brundtland Report prepared in 1987 by the World Environment and Development Commission. Despite clearly being specified in this report, the thing being perceived from the "requirement"

<sup>1</sup> Corresponding; Department of Primary School Teaching, Akdeniz University Antalya/TURKEY.

<sup>2</sup> Department of Educational Measurement& Evaluation, Hacettepe University, Ankara/TURKEY

<sup>3</sup> Department Science Education, Gazi University, Ankara/TURKEY

<sup>4</sup> Department of Primary School Teaching, Akdeniz University Antalya/TURKEY.

concept being specified in the description had differentiated as per the countries (Jeffrey, 2006). In this respect, sustainable development concept was comprehensively addressed in literature, and this concept was related with issues such as health, education, women's rights, global contamination, security, participation, peace, equality and population (Veenhoven, 1995; Bossel, 1999). Munasinghe (2002) had addressed the sustainable development concept in respect of its social, physical and environmental dimensions; Flening (2000) and Piet (2000) had focused on the socio-economic factors of sustainable development and the relation among these factors; and Goodland (1999) had dealt with the economic dimension of sustainable development covering the issues of scarce resource usage and non-consumptive use. When all these factors and their interrelation are considered, it is being specified that sustainable development consist of three components under the names of environmental, economic and social sustainability (Holmberg & Sandbrook 1992; De Kruijf & Van Vuuren, 1998; Harris 2000; Tutar 2011).

In a sustainable system in economic aspect, the factors preventing agricultural and economic production should be prevented; the principle of sustainable production of goods and services should be adopted. In an environmentally sustainable system, the resources

should be used without consuming them, and it should be allowed for them to renew themselves. Moreover, the factors such as biodiversity and atmospheric balance which are not included in the economic resources class should be preserved within this process. And in sustainability in social aspect, it should be intended to provide at sufficient level the social services including equal distribution, education, security, gender equality, political responsibility and participation (Holmberg & Sanbrood, 1992).

According to Littig and Grießler (2005), social sustainability is quality of society, and this also specifies the relations in between nature and society as well as social relationships. Social sustainability can be fulfilled by meeting the humane requirements, enabling social justice, preventing humanistic dignity and ensuring participation. According to MecKenzie (2004), social sustainability is the process of increasing the quality of life in the society and fulfilling the required conditions in order to ensure it. And this can be obtained by the comprehension of service enabling equality in issues such as health, education and accommodation, by protecting the cultures and values, by adopting the comprehension of equality in between generations, and by enabling social participation at political and especially at local level. In other words, the results caused by poverty, inequality and migration prevent the obtainment of environmental sustainability. The increase of poverty and thus the migration causes many environmental failures. For this reason, the integrity of economic and environmental perspectives required for enabling sustainable development is able to be provided only through social perspective (Harris, 2000).

There are structural differences in between development and growth. And one of these differences is the level of social structure. The strengthening of social structure in the society, which consists of individuals having the roles of both producer and consumer, is ensured by education. The individual is environmentally conscious at the level of the quality of education (Yücel, 2003; Shakir Hanna, Kendal, Osborne-Lee, Cesaretti, Misso & Andreopoulou, 2014). In other words, in order to actualize the fact of sustainable development, individuals believing in the necessity of sustainable

development are required. Education is an important tool in raising such individuals. (Alkış, 2007; Erdoğan&Tuncer, 2009). Complete understanding of sustainable development and its adoption as life style by the individuals can be provided by education. Teachers should be important guiding spirits in the education process existing along the lives of individuals from birth to death. Especially, it was observed that the quality of science courses is significantly effective in improving the sustainable development awareness of students (Gabro&Switzky, 1994; Hudson, 2006).

Science education for sustainable life is a new subject which required research of teaching methods on this issue. The subjects such as enabling the effective use of energy, recycling, protection of biological diversity requires the understanding of many scientific concepts in the improvement of education process for sustainable life. Sustainable life in the curriculum of schools requires the understanding of actual environmental issues and of key scientific concepts on such issues by the students. The understanding of these concepts will support the research of issues regarding sustainable life and the development of solution suggestions regarding these in the future. Sustainable life is relevant to enabling the continuity of life by educating the people towards explaining the potential solution means of environmental problems through scientific evidences (Hudson, 2006). If the teachers have sufficient awareness regarding sustainable development, they will provide the required education to their students (Tamkan, 2008). The teacher candidates to have sustainable development awareness will positively affect the success of individuals in their professional lives and the arise of awareness of students on this issue (Demiret *et al.*, 2007).

Determination of the attitudes of teacher candidates who will be teaching regarding sustainable development on this issue prior to their graduation will contribute to the increase of the quality of education to be given. Starting from this point, in this study it was intended to develop a scale of attitude in order to be used in determining the level of the attitudes teacher candidates studying in Science Teaching Department toward social sustainable development awareness.

## **2. Method**

### **2.1 Study Group**

In the research, the data was gathered from two independent work groups. 332 teacher candidates studying at the Faculty of Education Science Teaching Departments during the academic year of 2013-2014 had constituted the work group. The first work group (N=300) was used in determining the factor structure of the scale and in testing of this determined structure by model data conformity, and the second work group (N=32) was used in determining the reliability of the scale.

### **2.2 Collecting Data**

In the first phase of the development of tool intended to measure the attitudes teacher candidates regarding social sustainable development awareness, the sources on the subject were reviewed. And then the item tool, which would be able to express the social dimension of sustainable development awareness, was formed. Thus, 30 items consisting of a sub dimension which expresses the teacher candidates' sustainable development

awareness as “social (Factor 1)” were written. 10 of these items have the quality of negative items for the social dimension of attitude toward sustainable development awareness.

A 5 degree Likert type scale form consisting of 30 items obtained from the sentences formed for the social dimension of the attitudes of teachers toward sustainable development awareness was prepared by the researcher. The items prepared were submitted to the opinion of experts, and then they were applied to the first work group.

Each teacher candidate responding the scale had provided answers by marking one of the choices ranked in between 1-5 depending on how much the phrases suit them provided for the feelings, opinions and behaviors being specified in the items of the scale. The items for the attitude toward sustainable development awareness included in the scale were scored from 1 to 5 as starting from the choice of "definitely don't agree" to the choice of “definitely agree”.

### **2.3 Analysis of Study**

According to the data obtained from the scale, exploratory and confirmatory factor analyses were performed in the process of testing the construct validity of the scale. The model conformity of the item-factor structure obtained from the exploratory factor analysis was tested by the confirmatory factor analysis. And the reliability of the scale was examined by test-retest and by Cronbach Alpha coefficient calculated based on the internal consistency of items. In the research, statistical packaged software was used for exploratory factor analysis, for determination of internal consistency coefficients and for corrective factor analysis. The scale was named in accordance with the content of item.

## **3. Results**

In the research, the statistical operations were provided under the headings of validity and reliability.

### **3.1 Construct Validity of Scale of Attitude toward Social Sustainable Development Awareness**

#### **3.1.1 Explanatory Factor Analysis**

First exploratory factor analysis was made for the construct validity of Scale of Attitude toward Social Sustainable Development Awareness. For the performance of this analysis, first the KMO test which tests the sufficiency of sample was considered. The KMO value was found as .925. According to Büyüköztürk (2007), it was concluded that factor analysis over this data can be made as this value was higher than .70. Secondly, as the data obtained by considering the Bartlett Sphericity test ( $\chi^2 = 3968.709$ ,  $p=.000$ ) showed significant difference, it was determined that it was appropriate for making factor analysis (Büyüköztürk, 2007). After determining that the data was appropriate for factor analysis, the basic components factor analysis -without defining the dimension by 30 items- was made, and unrotated factor analysis was examined. It was observed that it was a factor whose eigenvalue was over 1. The criteria of factor load of items to be at least .40 (Stevens, 1996) and the difference of item factors loads included in two factors to be at

least .10 were accepted (Hinkin, 1998; Tabachnick&Fidell, 2001; Büyüköztürk, 2007). The 30 item form of the scale was obtained by enabling conceptual significance through examination of the specifications of items under factor and by considering the “scree plot” graph. Scree plot graph as per the analyses made is shown in Figure 1.

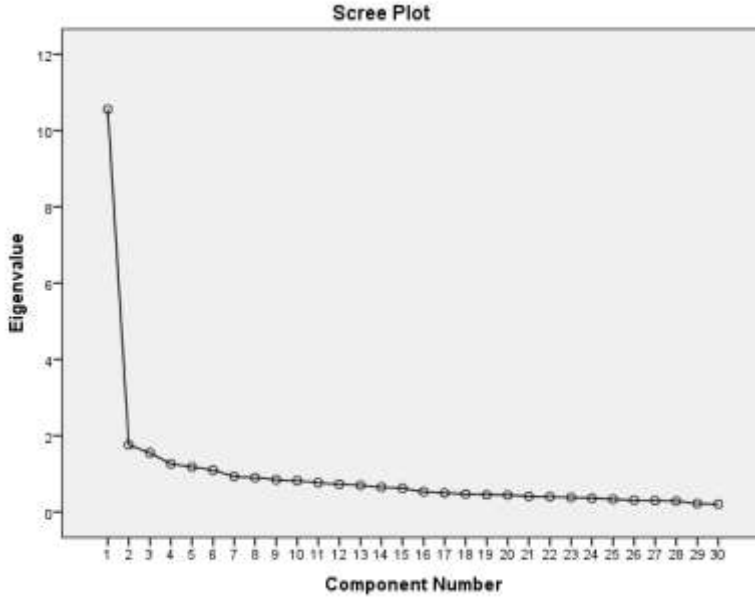


Figure 1. Scree Plot Gra

When the whole scale consisting of 30 items is considered, it shows a single factor structure. The load values of 30 items on the scale change in between 0.35-0.74. The factor on the scale defines 35.189% of the total variance. According to this, it can be said that the construct validity of the Scale of Attitude toward Social Sustainable Development Awareness is high. And the model conformity test of obtained values and structure was observed by confirmatory factor analysis.

### 3.1.2 Confirmatory Factor Analysis

The scale consisting of 30 items and single factor was tested by confirmatory factor analysis.

In the confirmatory factor analysis study of the research, chi-square goodness ( $\chi^2$ ), normed fit index (NFI), relative fit index (RFI), comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), parsimony normed fit index (PNFI) and incremental fit index (IFI) were used. As the result of all the analyses made, the statistics regarding the conformity of confirmatory factor analysis of Scale of Attitude Toward Social Sustainable Development Awareness are provided in Table 1.

**Table 1.** Values relevant to tests of goodness of fits for the Scale of Attitude toward Social Sustainable Development Awareness

$X^2$	$X^2/df$	P-Value	NFI	RFI	CFI	GFI	AGFI	IFI	RMSEA	90%CI RMSEA
1139.36	2.83	.000	0.93	0.92	0.95	0.80	0.77	0.95	0.078	0.073- 0.084

The ratio of calculated chi-square value to degree of freedom is very important. While this ratio ( $\chi^2/df$ ) being smaller than 2 specified a good conformity (Eminoğlu&Nartgün, 2009), it being in between 2 and 3 ( $2 < \chi^2/df \leq 3$ ) specifies the existence of an acceptable conformity (Schermelleh-Engel, Moosbrugger& Müller, 2003). When Table 3.1 was examined, it was observed that the chi-square value ( $\chi^2=1139.36$   $sd=402$ ,  $\chi^2/df=2.83$ ,  $p=.000$ ) was significant. In goodness of fit indexes, the GFI and AGFI values being higher than 0.90 indicates the existence of a good conformity (Marsh &Hocevar, 1988), and GFI value being in between 0.85-0.90 and AGFI value being higher than 0.80 indicates the existence of an acceptable conformity (Cole, 1987; Mars, Balla& McDonald, 1988). Moreover, from the goodness of fit indexes, the measures of  $>0.90$  for CFI and NFI values,  $<0.08$  for RMSEA value (Anderson &Gerbing, 1984; Hu &Bentler, 1999),  $>0.90$  for RFI and IFI values (Ayyıldız&Cengiz, 2006) indicate the existence of an acceptable conformity. Despite it is not clear which one of the provided goodness of fit indexes will be considered for the conformity of model (Şimşek, 2007), it is being observed that the RMSEA, NFI, CFI, RFI, AGFI and GFI indexes are frequently being used in the studies performed (Kayrı&Günüç, 2009).

The goodness of fit indexes calculated in the study had been found as GFI=0.80, AGFI=0.77, CFI=0.95, NFI=0.93, RMSEA=0.078, RFI=0.92 and IFI=0.95. When these values are considered, it can be said that the two factor structure obtained as the result of confirmatory factor analysis has an acceptable model.

As the result of confirmatory factor analysis made, item factors loads and ( $\lambda$ ) and disclosed variances ( $R^2$ ) were also examined as well as the goodness of fit indexes of the 30 item scale. The obtained data is shown in Table 2.

**Table 2.** Item Factor Loads Obtained by CFA and Disclosure Variances

Madde No	$\lambda$	SE	t	$R^2$
1	0.34	0.88	5.89	0.12
2	0.40	0.84	7.04	0.16
3	0.46	0.79	8.15	0.21
4	0.52	0.73	9.48	0.27
5	0.53	0.72	9.57	0.28
6	0.50	0.75	8.88	0.25
7	0.64	0.59	12.16	0.41
8	0.74	0.45	14.77	0.55
9	0.55	0.69	10.10	0.31
10	0.48	0.77	8.49	0.23
11	0.61	0.63	11.36	0.37
12	0.67	0.55	12.87	0.45

13	0.69	0.53	13.22	0.47
14	0.53	0.72	9.68	0.28
15	0.68	0.54	12.97	0.46
16	0.55	0.70	9.94	0.30
17	0.55	0.70	10.06	0.30
18	0.53	0.72	9.67	0.28
19	0.57	0.67	10.56	0.33
20	0.73	0.47	14.32	0.53
21	0.70	0.51	13.53	0.49
22	0.65	0.58	12.34	0.42
23	0.56	0.68	10.34	0.32
24	0.67	0.55	12.92	0.45
25	0.32	0.90	5.50	0.10
26	0.45	0.80	7.95	0.20
27	0.61	0.62	11.45	0.38
28	0.56	0.69	10.24	0.31
29	0.49	0.76	8.80	0.24
30	0.63	0.61	11.76	0.39

In Table 3.2, it was observed that the factor loads ( $\lambda$ ) according to confirmatory factor analysis changed in between 0.32- 0.74. The absolute value of these values are considered, and it is required to be higher than 0.10. If the value is smaller than 0.10, it is being specified as “small effect”, if it is around 0.30, it is being specified as “middle effect”, and if it is higher than 0.50, it is being specified as “high effect” (Kline, 2005). According to this condition, it can be said that the factor loads generally have high effect. Moreover, when the t values relevant to the obtained factor loads are examined, it is being observed that the t values of all the items are significant. As observed on the table, the  $R^2$  (disclosed variance) values of the items are very high. By the confirmatory factor analysis made, the final form of the scale consisting of 30 items and single dimension was obtained. When the obtained results are examined as a whole, all articles included in the model are in conformity with the model. Based on these findings, it can be said that each factor correctly represents the phrases consisting it and that the construct validity of the scale is ensured.

### 3.1.3 Reliability

The reliability of the scale was examined by test-retest and by Cronbach Alpha coefficient calculated based on the internal consistency of items. In the calculation of reliability by the test-retest method, it had been applied to 32 teacher candidates studying at Faculty of Education Science Teaching Department by 3 weeks intervals. The correlation in between the scores obtained by the teacher candidates from the scale was found as 0.86. This result indicates that the scale provides stable results in its implementation at different times. Cronbach Alpha value obtained based on internal consistency was calculated as per total scores of factors of the scale and as per general total scores. Cronbach Alpha internal consistency reliability coefficient was determined as .931 for the whole scale.

The Cronbach Alpha coefficient -used as the sub estimator of the reliability of test scores- being .70 and higher is generally being deemed sufficient for the reliability of test scores (Büyüköztürk, 2007). The value found in the study indicates that the reliability of the scale is high.

## Conclusions

In this study, it was intended to develop a scale of attitude in order to be used in determining the level of “Attitudes toward Social Sustainable Development Awareness” of teacher candidates studying at Science Teaching Department as social perspective. In this direction, the construct validity of the scale was examined by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

According to the result of exploratory factor analysis made for examining the psychometric specifications of the scale, the items of the scale had been collected under a single factor, and it was determined that the determined factor explained 35.189% of the total variance.

The model conformity of the structure obtained by exploratory factor analysis was tested by confirmatory factor analysis. The values of goodness of fit indexes obtained as the result of confirmatory factor analysis were found as  $\chi^2=1139.36$ , GFI=0.80, AGFI=0.77, CFI=0.95, NFI=0.93, RMSEA=0.078, RFI=0.92 and IFI=0.95. These findings indicate that the model shows conformity at acceptable level. As the result of exploratory and confirmatory factor analysis, it was found that the model -consisting of 30 items and single factor- was theoretically and statistically appropriate. Moreover, the results are evidence of the construct validity of the scale (Ayas&Horzum, 2010).

And the reliability of the scale was examined by test-retest and by Cronbach Alpha coefficient calculated based on the internal consistency of items. The result of the test-retest application of the scale was found as 0.86 for the whole score of the scale, and it had indicated that the scale was providing stable measurement results (Kaplan &Saccuzzo, 2005). The high level of internal consistency coefficients calculated for the whole scale (0.904) indicates that the scale measures a similar structure (Kabakçı& Owen, 2010). Considering the results obtained regarding reliability, it can be said that the scale has reliability at sufficient level.

The developed scale is a tool which is valid and reliable as per the analyses made. The scale is of a quality that can be used to measure the attitude of Science Teaching teacher candidates toward social sustainable development awareness.

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