Adaptation of Astronomy Attitude Scale into Turkish: 
The Validity and Reliability Analysis

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SYNOPSIS
INTRODUCTION

Astronomy is one of the earliest sciences (Osborne, 1991; Pena & Quilez, 2001), and nowadays a strong emphasis has been placed on topics related to astronomy in science curriculum and standards (Kalkan & Kıroğlu, 2007; National Research Council [NRC], 1996) throughout the world. In Turkey, Turkish elementary science and technology curriculum was renewed in 2005 in accordance with the constructivist approach. Astronomy concepts were included into the new science and technology curriculum. Astronomy related topics in the new K-12 science curriculum are: shape and structure of earth (4th grade), size and shape of sun, earth and moon – moon and earth motion – day and night cycle (5th grade), orbs, solar system and space probes (7th grade), and formation of universe and earth 8th grade) (Turkish Ministry of National Education [TMNE], 2004, 2005). In this new science and technology curriculum, it has been pointed out that it is important for students to gain a positive attitude toward astronomy. Moreover, since the universe is a natural laboratory for many scientific laws, students’ positive attitude toward astronomy is closely related to their attitude toward physics, chemistry, and biology (Tunca, 2000). According to Smith (1968), attitude is “the tendency which is attributed to the individual and which includes one’s thoughts, feelings, and behaviour about a psychological object” (cited in Kağıtçibaşı, 2010, p. 110). Tezbaşaran (1997) defined attitude as the learned tendency to have a positive or negative reaction towards an object, situation, institution, concept or other people.
PURPOSE OF THE STUDY

Most of the research studies conducted in Turkey regarding astronomy education were carried out to identify students’ understanding of astronomy (Bayraktar, 2009; Ekiz & Akbaş, 2005; Emrahoğlu & Öztürk, 2009; Kalkan, Ustabaş & Kalkan, 2007; Küçüközer, 2008; Orbay & Gökdere, 2006; Ünsal, Güneş & Ergin, 2001). In the literature no quantitative studies can be located that carried out to investigate students’ attitudes toward astronomy in Turkey. Not only in Turkey but also in the worldwide, there are a limited number of studies about students’ attitudes toward astronomy (De Roberts & Delanay, 1993; Zeilik, Bisard & Lee, 2002; Zeilik et al., 1997; Zeilik & Morris, 2003; Zeilik, Schau & Mattern, 1999). The Astronomy Attitude Scale (AAS) is developed by Zeilik and his colleagues in 1999, is the most well-known scale for measuring attitude toward astronomy. The purpose of this study is to adapt AAS developed by Zeilik et al. (1999) into Turkish, and investigate the validity and reliability of the Turkish version of the scale.

METHODOLOGY

a) Instrument

The original AAS consisted of 22 five point likert scale (1=strongly disagree to 5= strongly agree) items in total with four factors (affect, cognitive competence, value, difficulty). Firstly, AAS was translated from English into Turkish by four bilingual experts. To determine whether the Turkish translation of an item was done correctly, at least three of the four experts’ agreement is considered as the accuracy of translation. Then the translated version of AAS was back-translated into Turkish by two bilingual experts, and the Turkish version of scale was compared with the English version of the scale. After this step, the Turkish version of AAS was checked by three Turkish language experts in terms of the grammar of the items and two experts of astronomy education examined the structure and content of the items in AAS. Necessary revisions were made and prior to the field testing, interviews were carried out with five undergraduate students in order to check if the items of the scale are understood in the intended way.

b) Participants

The AAS was administered to 255 undergraduate students during the spring semester of 2009-2010 academic years. 32.5% of them (n=83) were from the Department of Astronomy and Space Sciences, 56.9% (n=145) from the Department of Science Education, 6.7% (n=17) from the Department of Primary Education, 3.9% (n=10) from the Department of Elementary Mathematics Education.

c) Data Analysis

Exploratory Factor Analysis (EFA) was conducted with SPSS 11.5 package program in order to examine the construct validity of the Turkish version of AAS, and the factor structure. Confirmatory Factor Analysis (CFA) was performed with LISREL 8.7 package program in order to determine to what extent the factor structure of the scale determined by EFA adjusts with the data. Before EFA was performed, the appropriateness of the data to use factor analysis was assessed with Kaiser-Meyer-Olkin (KMO) and Bartlett’s test. The KMO value of 22 items was found to be .875 and Bartlett’s test of sphericity test was found significant ($\chi^2 = 1878.802$, df=231, $p<.001$).
FINDINGS

As a result of the EFA with oblique rotation method, since 1st and 8th items in the scale loaded on more than one factors and the difference in their factor loadings on two factors was less than .10, these items were respectively removed from the scale and factor analysis was repeated. Finally a total 15 items were retained with two-factor structure. First factor, named as “competency related to understanding of astronomy concepts” consists of nine items (2, 3, 5, 7, 14, 15, 17, 18, and 20); the second factor, named as “interest and value towards astronomy” includes six items (4, 9, 10, 11, 16, and 21). Factor loadings of these two factors ranged from .341 to .778, and the total variance explained was 40.50%.

CFA was conducted following EFA on the remaining 15 items of the AAS, specifying the two-factor structure derived through EFA. The model was tested in line with the results of fit statistics and modification indices. The results of CFA indicated that the model was well fit. Also, Chi-Square value ($\chi^2$=179.54, df=89, $p=.00$) which was calculated for the adaptation of the model was significant. The goodness of fit index values of the model were RMSEA=.06, RMR=.06, GFI=.91, AGFI=.88, CFI=.94, NNFI=.93, and NFI=.89. Cronbach’s alpha internal consistency coefficient of the whole scale was found as .80. The reliability coefficients of the two factors are .71 and .77 respectively.

CONCLUSION and DISCUSSION

Factor structure of the Turkish version of AAS was examined via EFA and CFA. As a result of EFA, the AAS’s factor structure is different from the original scale in terms of items but it has two factors similar to the original one. The CFA results showed that the factorial model of AAS that consists of two factors were at an acceptable degree of goodness of fit for Turkish sample. The internal consistency coefficients of the factors of AAS showed acceptable reliability. These findings generated from EFA and CFA indicate that AAS is a valid and reliable instrument, and it is concluded that Turkish version of the scale can potentially contribute to identify students’ attitudes toward astronomy.

REFERENCES


