The Attitude Scale of Constructivist Approach for Prospective Science Teachers: A Study of Validity and Reliability*

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SYNOPSIS

INTRODUCTION

In recent years, the Turkish curricula have incorporated the constructivist approach which maintains that learning takes place as a result of an active process. The classroom organization suggested by this approach differs in many respects from that of the traditional approach. One of the characteristics distinguishing between constructivist and other classroom environments is the teachers who, instead of simply transmitting knowledge, serve as individuals orienting student opinions and helping them question a given piece of information (Vermette & Foote, 2001). Teachers guide students in constructing information, and help them to associate previously-learned information with newly-encountered information by providing them with examples from daily life. In brief, in the constructivist approach the role of the teacher is defined as a guide who is supposed to provide students with appropriate means in structuring information (Taber, 2000). Given the duties and responsibilities of teachers in the constructivist approach, it is considered to be of importance to identify the attitudes of prospective teachers, who will be the future implementers of the approach in the course of their professional lives, towards the approach in question.

PURPOSE OF THE STUDY

The study intends to develop a scale in order to determine the attitudes of prospective teachers of Science and Technology towards the constructivist approach.

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METHODOLOGY

The study is an attempt to develop an attitude scale. At the developing stage of the scale, the pre-applications were administered to 550 prospective teachers receiving education at the junior and senior grades of the department of Teacher Training in Science and Technology as part of the education faculties of nine universities located in different regions of Turkey. The analyses were performed taking the responses of 482 participants into account.

a) Generating Items and Obtaining Expert Opinion

With the aim of determining the attitudes of junior and senior students attending the Program of Teacher Training in Sciences at Dokuz Eylul University towards the constructivist approach, the study addressed 10 open-ended questions to the prospective teachers. Subsequently, the researcher constructed 130 items in line with the results obtained from the responses as well as from the related literature review (Berberoğlu, 1990; Ekici, 2002; Nuhoglu & Yalcin, 2004; Kan & Akbash, 2005; Çetin, 2006). Then, the created items were examined by four specialist academics so as to ensure the content validity. In line with the recommendations of these experts, 7 control items remained in the scale. After obtaining expert opinion, the pre-application form of the scale consisted of 47 attitude items.

b) Item Analysis

After excluding the control items out of the scale, items with an item total correlation of .40 were removed from the scale (2-10-18-37-44-45-47). Furthermore, during the process, in order to identify the item discriminations, the total scores of prospective teachers on the pre-application were calculated and subsequently categorized into two separate groups which are bottom 27% (n=130) and top 27% (n=130). Then, administering the t test to the independent groups, the researcher attempted to discover the item discrimination. As a result of the analysis, it was found that there was not any significant difference between the top and bottom average scores concerning item 38, and thus, they were removed from the scale (t=1.407; p=.161>.000).

c) Factor Analysis

The factor analysis of the scale was conducted on the 32 items remaining after the results of the item analysis. As a result of the initial analysis, the KMO value of the scale was calculated to be .96, and the Bartlett’s test was found to be significant ($\chi^2$=7075.425, df=435, p=.000<.001). In the exploratory factor analysis, the items were grouped under two factors by using the varimax and the principal components analysis. Items with factor loadings lower than .50 as well as those with high loading values in both factors were removed from the scale (5-6-7-9-15-23-25-26-27-36-41-42-46).

In order to check the accuracy of the two-factor structure, the study also presented a discussion of the confirmatory factor analysis (CFA), which has often been referred to by the relevant literature in recent years. In the result of first CFA analysis, $\chi^2$=682.84, df=152, p=.000<.001; RMSEA, .085; $\chi^2$/df=4.49; NFI=.82; NNFI=.83; CFI=.85; GFI=.87; AGFI=.84 are calculated. An examination of the modification indices demonstrated that there exists a relationship between the error variances of items 19 and 20. An examination of the items further revealed that they are categorized under the same factor and there exist certain items for measuring the same characteristics. Thus, the CFA was repeated by including into the model the inter-item error covariance. In the second CFA analysis,
\[ \chi^2 = 390.02, \text{ df} = 150, p = 0.000 < .001; \text{ RMSEA, } .058; \chi^2/\text{df}= 2.6; \text{ NFI} = .92; \text{ NNFI} = .94; \text{ CFI} = .95; \text{ GFI} = .92; \text{ AGFI} = .94 \] are founded out.

The factors remaining in the scale after the factor analysis were specified as “positive attitude” and “negative attitude.” The final version of the scale consists of a total of 19 attitude items, 11 of which are positive and 8 negative. As a result of the analyses, the eigen values was found to be 5.394 for the first factor and 4.538 for the second factor; while the explained variance was found to be 28.39% for the first and 23.88% for the second factor. The total variance explained by the scale is 52.27%.

d) Reliability

During the reliability process concerning the scale, the researcher calculated the alpha reliability coefficient for the factors and the scale, and found the half-split reliability for the overall scale. As a result of the analysis, alpha values were calculated to be .90 for the first and .87 for the second factor. The alpha value for the overall scale was found to be .93; and the half-split reliability as .83.

DISCUSSION, CONCLUSION and SUGGESTIONS

The educational curricula have recently shifted emphasis from teacher-centered to student-centered approaches where the teacher serves as a guide in the learning process. The constructivist approach is one of the approaches in question, and enhanced the role of the teacher during the learning process. Thus, the current literature includes numerous research and scale development studies intended to identify certain attributes of teachers and students concerning the constructivist approach (Karadağ, 2007; Fer & Cirik, 2006; Johnson & McClure, 2004; Çinar, Teyfur & Teyfur, 2006; Woolley, Benjamin & Woolley, 2004). However, our literature review did not reveal any attempt for developing a scale devoted to assessing teacher attitudes towards the constructivist approach, which was the motive behind the present study. The pre-applications of the scale were administered to prospective teachers receiving education at the junior and senior grades of the department of Teacher Training in Sciences at nine universities located in different regions of Turkey. The analyses performed following the pre-applications demonstrate the validity and reliability of the scale.

According to the findings of the present study, the following suggestions could be made.

- The scale can be employed in relevant studies taking its features into consideration.
- Similar scale development studies could be conducted in view of the size of teacher and student groups.
- Drawing upon different samples, further studies could be interpreted, and thus, provide more profound insights into the validity and reliability of the scale.
REFERENCES


