Development and Validation of the Scale for Pre-service Science Teachers’ Attitudes towards Using Models in Science and Technology Courses

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Extended Summary

Purpose

Models are products and methods of science. Models are the main materials for learning and teaching in science (Harrison and Treagust, 2000). Models are provided to objectify of abstract concepts (Harrison, 2001; Treagust et al., 2002). Models are represented a complex object or process. Models are provided to understand the formation and behaviors of objects, development of process. Models are helped to make predictions about these (Harrison, 2001).

Students try to memorize abstract concepts that aren’t imagined in their minds. In order to prevent this situation, models that are facilitated perception in teaching abstract concepts (Lock, 1997) and models that are simplified complex phenomena should be used (Justi and Gilbert, 2002).

Students should use models in individual or group studies and students should understand models and modelling in order to gain scientific thinking skills and study skills that are the basic philosophy of science education (Güneş et al., 2004b).

Teachers have an important role in using the model and the modeling process. Teachers should guide students. Therefore, teachers’ opinions, understanding, perceptions and attitude about models, role of models in science education, using model in science and technology course and modelling are very important.

When the literature was investigated, it was seen that there were studies to examine the opinions about model and modelling (Grosslight et al., 1991), the students’ understanding about scientific models (Treagust et al., 2002), the pre-service teachers’ perceptions about role and purpose of models in science (Berber and Güzel, 2009), the teachers’ opinions about models that is used in science (Güneş et al., 2004a), the science teachers’ opinions about model and modelling (Ergin et al., 2012), the physics, chemistry, biology and science teaching staffs’ opinions

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about models and role of models in science education (Güneş et al., 2004b). However, a study that was done in order to examine attitude towards using model wasn’t seen. For this reason, the aim of the study is to develop a measurement tool that is determined pre-service science teachers’ attitude towards using model in science and technology course.

**Method**

In this research, an attitude scale was developed to determine pre-service science teachers’ attitude towards using model in science and technology course. This research was carried out with 386 pre-service science teachers who were attended in Department of Science Education in the spring semester of 2011-2012 academic year. Study sample consisted of 114 male and 269 female pre-service science teachers. Of these students 113 of them were second grade; 144 of them were third grade; 129 of them were fourth grade pre-service science teachers.

The following procedures were followed during the development of the attitude scale: Literature was reviewed, expert opinions was taken and a five point Likert-type trial scale consisting of 65 items was prepared. Trial scale was implemented 386 pre-service science teachers. Data that was collected from pre-service science teachers was prepared for analysis and SPSS 18.0. was used for analysis.

**Results**

Item analysis based on item-total correlation and difference of lower-upper group means was done and items of the scale was determined. In order to examine construct validity of the scale, factor analysis was done. The results of the factor analysis was supported the structure of attitude scale with five factors. As a result of analysis, attitude scale was decided to involve 55 items. The total variance that was explained by the five factors was 40.26 %. The variance percentages that was explained by Varimax rotation analysis were calculated to be 24.286 % for the first factor, 5.404 % for the second factor, 3.987 % for the third factor, 3.714 % for the fourth factor and 2.874 % for the fifth factor. The factors was named as “Development, Learning and Individual Approach” (20 items), “Effective Course and Success” (10 items), “Attention, Motivation and Representation” (9 items), “Perception of Using Model” (7 items) and “The Importance of The Model in Daily Living and Using By Student” (9 items). The Cronbach Alpha reliability coefficient of the attitude scale consisting of 55 items was calculated to be .94. Then, Cronbach Alpha reliability coefficient of each factor were calculated and ranged from .713 to .903. The final version of the a five point Likert-type attitude scale involves 55 items. There are 28 positive and 27 negative items in the scale.

**Conclusion**

In the study, the Cronbach Alpha reliability coefficient of the scale was found to be high (α=.94). A result of this study, a valid and reliable attitude scale was developed in order to determine pre-service science teachers’ attitude towards using model in science and technology course.