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The adaptation of a scale for preschool teachers' attitudes towards science teaching

Merve Pepele Ünal^a*, Berrin Akman^b, Selahattin Gelbal^b

^a *Eğitim Fakültesi, İnönü üniversitesi, Malatya, 44280, Türkiye*

^b *Eğitim Fakültesi, Hacettepe üniversitesi, Ankara, 06800, Türkiye*

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Abstract

This study was designed to adapt into Turkish the “Early Childhood Teachers’ Attitudes towards Science Teaching Scale” developed by Hyung-Sook-Cho et al. (2003). The research data were collected from teachers, working with children at the age group of six in public or private nursery schools or nursery classes affiliated with the Ministry of National Education, in Ankara and Malatya, Turkey. For validity testing, factor analysis and item analysis were conducted; and for reliability testing, internal consistency and test-retest reliability methods were used. The findings of these tests demonstrate that the validity and reliability of the scale are at a sufficient level.

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Keywords: Science teaching; preschool period; teacher attitudes; scale adaptation; reliability test.

1. Introduction

For children, science is an effort to understand the world in which they live (Drons and Given, 2003). In preschool period, science teaching does not mean transferring scientific knowledge to children, but making them learn by doing and experiencing. In preschool years, it is important to develop research, examination and observation skills of children and to make them acquire sound scientific thinking (Gürdal et al., 1993). In other words, an effective science teaching provided in this period should develop research and observation skills of children and establish a sound scientific basis.

The curiosity and questions of children are nourished by the attitudes of a supportive preschool teacher who offers diverse materials and ensures that children acquire experience with these materials. The preschool teacher provides an environment where children access various materials easily, and plans activities to encourage children to generate products or acquire knowledge. S/he organizes the activities in line with interests and talents of children after observing them. The teacher attempts to ask open-ended questions that develop ideas of children, and enables them to preserve appropriately the products of their experience (Demiriz and Ulutaş, 2000).

* Merve Pepele Ünal. Tel.: +90 422 377 44 85; fax: +90 422 341 00 42

E-mail address: mpepele@inonu.edu.tr

The attitude of teachers towards science is an important component of an effective science education. Level of discomfort, knowledge and trust are among the factors that affect teachers' personal beliefs about teaching science to children (Cho et al., 2003).

A scale for teachers' attitude towards science was developed to make teachers become aware of their attitude towards science teaching and to identify how these attitudes affect science education of children. The aim of this study is to adapt to our country the "Early Childhood Teachers' Attitudes towards Science Teaching Scale" developed by Hyung-Sook-Cho et al. (2003).

2. Method

Two scales were used in the study to collect data. One of them is "Personal Inquiry Form for Teachers" designed by the researchers, and the other is "Early Childhood Teachers' Attitudes towards Science Teaching Scale".

The "Personal Inquiry Form for Teachers", developed by the researchers, contains items to collect demographical data about teachers' sex, age, most recent educational institution attended, level of education, year of experience in teaching, the type of school where they are working, the institution with which their workplace is affiliated, the province in which they work and in-service training programs they received.

The "Early Childhood Teachers' Attitudes towards Science Teaching Scale", developed by Hyung-Sook-Cho et al. (2003) comprises 22 items. The required permissions were taken from Cho et al. for the translation of the scale into Turkish before the scale was translated.

2.1. Translation Process

Five field experts who have excellent good of both languages translated the scale from English into Turkish. Then the English original and the Turkish translation of the scale were distributed to two groups of final-year students at English Language and Literature Department. The 20 students in the first group retranslated the English text into Turkish, and the other 20 students in the second group back translated the scale from Turkish into English. The correlation between translators is .81.

The attitude scale is composed of four dimensions: 1) Comfort–discomfort, 2) Classroom preparation, 3) Managing hands-on science, and 4) Developmental appropriateness.

1. Comfort–discomfort, there is no academic preparation at this dimension. However, the emotional aspect of science teaching is combined with effectiveness (Cho et al., 2003). This part is concerned with preschool teachers' fears about and interest in teaching science to children. Items 1 to 6 are included in this subcategory
2. Classroom preparation, this part is concerned with what teachers prepare when they are organizing scientific activities and how much time they spend for the preparation. It covers items 7 to 12.
3. Managing hands-on science, this dimension involves the preparations for the activities which require active participation of children and whether the mess produced as a result of these activities is important or not. Items 13 to 17 are related with this part.
4. Developmental appropriateness, this dimension is concerned with whether it is appropriate to make children encounter science at early ages and whether teachers are faced with problems in planning the curriculum appropriately for children. Items 18 to 22 are included in this part.

Each attitude was evaluated according to the following levels of agreement: "Never" "Rarely" "Sometimes" "Often" "Always". The scale is a five-level Likert and scored as 1, 2, 3, 4, 5. Negative statements are scored conversely. The Cronbach Alpha of the scale is .92.

3. Results (Findings)

After the scale was adapted into Turkish, the suitability of data for factor analysis was tested by Kaiser-Meyer-Olkin (KMO) and Bartlett tests. KMO value was .82 and Bartlett Test of Sphericity value was 594.135 ($p=.000$). Pallant suggests that minimum KMO value should be .60 to carry out factor analysis (qtd. in Kaya, 2005; 224). Factor analysis was applied to the data collected according to principal component analysis to test structural validity of the data collection tool. The items 2, 4, 5, 12, 13, 17, 18, 20, 22 in the data collection tool, whose factor loadings were low, were eliminated in the first stage. The factor analysis was repeated for the remaining 13 items. It was

found that these items with high factor loadings were distributed into two factors, and thus the scale has two dimensions. The items in both dimensions were examined, and the opinions of experts were taken for the items collected. As the content and meanings of the items categorized under the first dimension are related with what teachers do to develop oneself in science teaching, this dimension was named as “self-development”. The content and meanings of the items categorized under the second dimension have to do with self-efficacy of teachers, and thus this dimension was named as “self-efficacy”. The cumulative variance rate that the scale explains is 47.97% (Dimension I: 26.83, Dimension II: 21.14). The internal consistency coefficient (Cronbach Alpha) of Dimension I is .82 and Dimension II is .73.

Table 1. Factor loadings and total correlations of items in the scale

Dimension	Item	Factor		Item total correlation coefficients
		1	2	
Self-Development	1.(Q7) I enjoy reading resources books to obtain ideas about science activities for young children	.830		.705**
	2.(Q8) I am willing to spend time setting up materials for scientific exploration	.830		.734**
	3.(Q9) I am ready to learn and use scientific knowledge and scientific skills for planning hands-on science	.438		.422**
	4.(Q10) I like to discuss ideas and issues of science teaching with my colleagues.	.692		.573**
	5.(Q14) I enjoy collecting materials and objects to use in my science teaching	.795		.694**
	6.(Q15) I am interested in handling certain animals and insects to teach science.	.575		.434**
Self-efficacy	7.(Q1) I feel comfortable doing science activities in my early childhood classroom.		.496	.394**
	8.(Q3) I feel comfortable with the level of scientific knowledge necessary for teaching young children		.670	.371**
	9.(Q6) I am willing to get involved in children’s scientific inquiries		.434	.407**
	10.(Q11) I am familiar with raising open-ended questions to encouraging children’s scientific exploration.		.503	.476**
	11.(Q16) I am comfortable using any classroom materials (e.g., blocks, toys, boxes, so forth) for science activities.		.398	.356**
	12.(Q19) I am comfortable with determining the science curriculum that is developmentally appropriate for young children.		.753	.557**
	13.(Q21) I am familiar with the processes and ways that young children learn science		.800	.637**

**p=.001

As illustrated in Table 1, the factor loadings of self-development dimension vary between .438 and .830 whereas those of self-efficacy dimension vary between .398 and .800. The cumulative variance rate explained by the scale is 47.97%.

Table 2. Correlation between factors

Factor	Self-Development	Self-Efficacy
Self-Development	1	.499**
Self-Efficacy	.499**	1

**p=.001

As illustrated in Table 2, correlation between self-development and self efficacy dimension (p=.001)

4. Conclusion and Recommendation

Adapting a scale into Turkish enables researchers to save the time they would use for developing a new scale, make them spend more time on theoretical and practical research in their field and provides ease of communication and comparable information for researchers (Aksayan ve Gözüm 2002). That is why “Early Childhood Teachers’ Attitudes towards Science Teaching Scale” used to identify preschool teachers’ attitudes towards science education was adapted into Turkish.

After factor analysis, the scale which originally comprises four dimensions was reduced to two dimensions. The items in both dimensions were examined, and retaking expert opinions, the two dimensions were renamed as “self-development” and “self-efficacy”. Items 7-8-9-10-14-15 of the scale were placed under “self-development” dimension and items 1-3-6-11-16-19-21 were put under “self-efficacy” dimension.

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