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The Relationship Between Preschool Teachers' Attitudes Towards Science Education and Cognitive Flexibility Levels*

Fatmagül Soylu¹ & Banu Özkan²

¹ Preschool Teacher, MEB. ORCID: 0000-0002-1318-5193

² Kütahya Dumlupınar University, Kütahya, Turkey. ORCID: 0000-0001-7844-6115

Correspondence: Banu Özkan, Kütahya Dumlupınar University, Faculty of Education, Preschool Education Department, Kütahya, TURKEY. E-mail: banu.ozkan@dpu.edu.tr

Abstract

The aim of the research is to investigate the relationship between the preschool teachers attitudes towards science education and their cognitive flexibility levels. In this context, personal information of 207 pre-school teachers was collected with the Personal Information Form prepared by the researcher. Attitude Scale of Preschool Teachers Towards Science Education (Cronbach alpha coefficient: 82) and Flexibility Scale (Cronbach alpha coefficient : 81) used in the research. The Kolmogorov-Smirnov and Shapiro-Wilktest tests were used to determine the distribution of the data and Mann-Whitney U and Kruskal Wallis H tests were used in the research. It was seen that there was a positive and significant relationship between pre-school teachers' attitudes towards science education and cognitive flexibility levels.

Keywords: Attitudes Towards Science Education, Cognitive Flexibility, Preschool Teachers

1. Introduction

Preschool period covers the first years of life and greatly affects the future life of the child. With the gains acquired in this critical period, the personality of the child begins to form. Establishing the appropriate environment is very important, especially for science education to be carried out efficiently and effectively. Daily events such as boiling water at a certain temperature, falling of a pencil left from above with the effect of gravity are subjects of science education. It can be said that teachers in this period have important effects on the lifelong behaviors of children. Due to this effect, the teacher should have this feature in the first place in order to give children cognitive flexibility. Because, by nature of teaching, it requires reaching individuals with different characteristics and personality structures and knowing how to behave when unexpected situations are encountered. In the face of the aforementioned situations, the ability of the teacher to adapt thanks to his

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cognitive flexibility is also important in terms of providing personal development for his students (Çuhadaroğlu, 2013).

It can be said that the concept of metacognition has an effect on the decision-making of children. According to Özcan (2007), individuals with advanced cognition skills, can determine their strategies and know how to use these strategies at the appropriate time and situation. When it is considered in terms of teaching profession, it is possible for individuals to use their metacognitive skills while transferring their experiences and strategies to children, as they have experienced these skills and also learning strategies. Dennis and Vander (2010) state that the individual should have cognitive flexibility in order to be able to change existing cognitive clusters in order to adapt to different environmental conditions.

Teachers should have cognitive flexibility in order to provide a good science education because of the fact that science education is affected by the developing technology and includes the conditions that cannot be calculated with its active structure. In addition, the use of scientific process skills while teaching science shows that cognitive flexibility and science education have common grounds. Based on these reasons, determining the relationship between attitude towards science education and cognitive flexibility and examining the effect of various variables on these two concepts made this research necessary.

2. Method

2.1. Research Model

This research is a descriptive study in the relational screening model to examine the relationship between pre-school teachers' attitudes towards science education and their cognitive flexibility levels.

2.2. Universe and Sampling

Target population of this study consists of pre-school teachers in Turkey. The sample of the study is 207 (12 males, 195 females) pre-school teachers living in Erzurum, Kütahya, Burdur, Gaziantep, Ağrı and Bitlis provinces in 2017-2018. These teachers were selected with the appropriate sampling method depending on the easy accessibility factor.

2.3. Data Collection Tools

2.3.1. Personal Information Form

Data collected with the Personal Information Form prepared by the researcher.

2.3.2. Attitude Scale Towards Science Education

“Attitude Scale of Preschool Teachers Towards Science Education” was first developed by Hyung-Sook-Cho, Kim and Choi (2003). Cronbach's alpha coefficient of the original version of the scale was calculated as .92. In 2010, adapted to Turkish culture by Pepele Ünal, Akman and Gelbal, the scale has a five-point Likert type consisting of 13 items in total (1- Never, 2- Very Low, 3- Occasional, 4- Mostly, 5- Always) is a scale. It consists of two sub-scales: Self-Development (6 items) and Self-Efficacy (7 items). The Self-Development sub-scale includes the following items: “I like to spend time collecting materials for scientific discoveries,” “I like to discuss with my colleagues about the ideas and subjects of science teaching.” In the Self-Efficacy sub-scale, there are items such as “I feel comfortable in my class while doing science activities,” “I will happily put children in scientific inquiries.” The Cronbach alpha coefficient, which was calculated to test the reliability of scale, was found as .82 in Self Improvement and .73 in Self Efficacy (Pepele Ünal, Akman & Gelbal, 2010).

2.3.3. Cognitive Flexibility Scale

Cognitive Flexibility Scale was developed by Martin and Rubin (1995) to determine the cognitive flexibility of the person. The original version of the scale was applied to university students in two different samples. Accordingly, Cronbach alpha coefficients; It was calculated as .76 for the sample consisting of 247 people (142

women, 105 men) and .77 for the sample consisting of 275 people (158 women, 117 men). The scale, adapted to Turkish culture by Altunkol (2011), consists of 12 items and 6-point likert type rating (1- Strongly Disagree, 2- Disagree, 3- A little Disagree, 4- A little Agree, 5- Agree, 6- Strongly Agree) is a scale used. The scale includes items such as: "I feel like I can never make a decision," "My behavior is the result of conscious decisions I make." It is seen that the internal consistency Cronbach alpha coefficient of the scale is .81 (Altunkol, 2011).

2.4. Data Analysis

SPSS 22 program was used for the analysis of the data obtained from the research and for statistical analysis. The Kolmogorov-Smirnov, Shapiro-Wilk test, Mann-Whitney U and Kruskal Wallis H tests were used.

3. Results

Table 1: Mann Whitney U Test Results for Preschool Teachers' Total Attitude towards Science Education, Attitude towards Science Education Sub-Scale (Self-Development, Self-Efficacy) and Cognitive Flexibility Scores on Gender

Dimensions	Gender	N	Rank mean	Sum of rank	Z	U	p
Attitude towards science education	Women	187	100.44	18782.50	-1.77	702.50	.08
	Men	11	83.50	918.50			
Self-development	Women	187	101.24	18932.50	-2.23	619.00	.03
	Men	11	69.86	768.50			
Self efficacy	Women	187	101.69	19016.00	-.96	852.50	.34
	Men	11	62.27	685.00			
Cognitive flexibility	Women	187	98.03	18331.50	-1.49	753.50	.14
	Men	11	124.50	1369.50			

According to Table 1, there is a significant difference in the self-development sub-scale of preschool teachers by gender ($Z: -2.23; p < 0.05$). When the rank averages are examined, it is determined that women have higher averages than men. However, there is no significant difference in attitude towards science education ($0.08 > 0.05$), cognitive flexibility total score ($0.14 > 0.05$) and self-efficacy sub-scale ($0.34 > 0.05$)

Table 2: Age-Related Kruskal Wallis Test Results of Preschool Teachers' Total Attitude Towards Science Education, Attitude Towards Science Education Sub-scales (Self-Development, Self-Efficacy) and Cognitive Flexibility Scores

Dimensions	Age	N	X ²	p
Attitude towards science education	18-23	22	4.28	.23
	24-29	112		
	30-39	56		
	40 age +	8		
Self-development	18-23	22	2.47	.48
	24-29	112		
	30-39	56		
	40 age +	8		
Self-efficacy	18-23	22	8.65	.03
	24-29	112		
	30-39	56		
	40 age +	8		
Cognitive flexibility	18-23	22	1.03	.79
	24-29	112		
	30-39	56		
	40 age +	8		

It is seen that there is a significant difference in the self-efficacy sub-scale (X2 (3): 8.65; $p < .05$). The result of the Mann Whitney U test to understand which groups differ is given in the table 3.

Table 3: Mann Whitney U Results According to Age of Self-Efficacy Sub-Scale Scores of Preschool Teacher

Age	N	Mean rank	Sum of rank	Z	U	p
18-23	22	88.82	1954.00	-2.83	763.00	.005
24-29	112	63.31	7091.00			
18-23	22	45.86	1009.00	-1.57	476.00	.12
30-39	56	37.00	2072.00			
18-23	22	16.07	353.50	-0.60	75.50	.55
40 age +	8	13.94	111.50			
24-29	112	80.70	9038.00	-1.44	2710.00	.15
30-39	56	92.11	5158.00			
24-29	112	59.80	6697.50	-0.83	369.50	.41
40 age +	8	70.31	562.50			
30-39	56	32.28	1807.50	-0.26	211.50	.80
40 age +	8	34.06	272.50			

There was a significant difference between the participants between the ages of 18-23 and those between the ages of 24-29. Accordingly, self-efficacy scores of the participants between the ages of 18-23 are significantly higher than the average scores of the participants between the ages of 24-29 ($p < .0083$). In addition, there was no significant difference in total attitude towards science education ($0.23 > 0.05$), self-development ($0.48 > 0.05$) and cognitive flexibility scores ($0.79 > 0.05$).

Table 4: Pearson Correlation Coefficients (Rho) Between Total Attitude Towards Science Education, Attitude Towards Science Education (Sub-Scales) and Cognitive Flexibility Levels

	1	2	3	4
1. Attitude towards science education	-	.88**	.84**	.31**
2. Self-development		-	.48**	.22**
3. Self-efficacy			-	.31**
4. Cognitive flexibility				-

When Table 4 is examined, a positive and significant relationship was found between attitude towards science education and cognitive flexibility ($r: .31$; $p < 0.05$). In other words, as the cognitive flexibility averages of the participants increase, their attitude towards science education also increases. In addition, as the cognitive flexibility scores increase, both the self-development sub-scale ($r: .22$; $p < 0.05$) and the self-efficacy sub-scale ($r: .31$; $p < 0.05$) increase significantly.

4. Discussion

According to the results of the analysis, it was observed that there was a positive relationship between total attitude scores and sub-scales (self-development, self-efficacy) and cognitive flexibility towards science education. Accordingly, teachers with high cognitive flexibility level are expected to show a positive attitude towards science education. Similarly, there are different studies in the literature that have a positive and significant relationship between cognitive flexibility and other dependent variables. As an example of these researches; Bilgiç and Bilgin (2016) found relationship between the cognitive flexibility and logical decision-making scores, Akçay Özcan and Kıran Esen (2016) found relationship between cognitive flexibility and emotional, academic, social and general self-efficacy, Alper and Deryakulu (2008) found a positive and

significant relationship between flexibility and students' attitudes, achievements and permanence in their learning, and Esen Aygün (2018) investigated relationship between cognitive flexibility and interpersonal problem-solving skills in their research and found a positive relationship.

Science education should be prepared for new situations, especially in the application part, teachers should be flexible and open to innovations. Otherwise, it will be difficult for teachers who can not think functionally, have a fixed mind and whose coping strategies are not developed, to provide sufficient efficiency in science education. It was observed that there was no significant difference in terms of gender variable in the total attitude and self-efficacy sub-scale of preschool teachers towards science education. However, it is seen that there is a significant difference in favor of female preschool teachers in the sub-scale of self-improvement attitude scale towards science education. Similar to this result, there are studies in which the gender variable shows a significant difference (in favor of female teachers) on attitude towards science education or teaching (Babaroğlu & Okur Metwalley, 2018; Can & Şahin, 2015). According to the research, the age variable has no effect on the total scores of attitude towards science education and the self-development sub-scale. According to this situation, it can be said that younger teachers and older teachers have a close attitude towards the lesson while they are giving science education and in their personal development activities. It is seen that other situations such as professional interest, motivation, working conditions, environmental conditions are more effective than the age factor of the teachers. Elmas and Kanmaz (2015), examined the science efficacy competencies of teachers, reached the same result and stated that age factor had no effect in science education. Okur Akçay (2014) supports this result by stating that there is no statistically significant difference in age and science education attitude scores in the study where pre-school teachers examined their attitudes towards science education according to some variables. Likewise, in his research on preschool teachers Sönmez (2007), concluded that science education does not differ significantly according to the age variable. However, it was concluded that age variable had a significant effect on self-efficacy, which is the sub-scale of attitude towards science education. It was observed that there was a significant difference between the teachers between the ages of 18-23 and 24-29, and the scores of the teachers between the ages of 18-23 were significantly higher. According to the items within the scope of the self-efficacy sub-scale, it can be said that the knowledge of the new graduates in this age range, who have the necessary knowledge in terms of academics and who have mastered the course contents, is a possible result of the freshness and use of student-centered new methods and methods.

Suggestions for Researchers

- In other studies, it can be suggested that the relationship between cognitive flexibility and more different variables should be examined.
- Qualitative methods can be used in new studies on this subject.

Suggestions for teachers

- There is a significant relationship between the cognitive flexibility of preschool teachers and their attitudes towards science education. Accordingly, teachers can participate in courses, seminars, workshops that will develop themselves in the direction of cognitive flexibility.
- Teachers can create learning environments to increase their cognitive flexibility levels by using problem solving method in their experiments and activities within the scope of science education.

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