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INVESTIGATION OF THE RELATIONSHIP BETWEEN PRE-SCHOOL TEACHERS' EPISTEMOLOGICAL BELIEFS AND SCIENCE ACTIVITY EFFICACY IN TERMS OF SOME VARIABLES[1]

Semra Çevik[2]

Orkun Coşkuntuncel[3]

Gün Binzet[4]

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ABSTRACT

The aim of the study is to examine the epistemological beliefs of preschool teachers and their proficiency in science activities in terms of some variables, and also to investigate the relationship between their epistemological beliefs and their proficiency in science activities. The population of the study consists of 213 preschool teachers working in public schools affiliated to the Ministry of National Education in the province of Gaziantep in the 2021-2022 academic year. The "relational screening model", which is one of the quantitative research models, was used in the study. In the thesis study, in addition to the personal information form containing some demographic information, two scales, "Scale for Determining Preschool Teachers' Competence in Science Activities" and "Epistemological Beliefs Scale", were chosen as data collection tools and SPSS 26 package program was used in the analysis of the data obtained from the measurement tool. This research sought statistical answers to the main problem question and sub-problem questions determined in the study. According to the results obtained from the data analysis of the research, it has been determined that preschool teachers have developed/mature epistemological beliefs and their proficiency in science activities in line with these beliefs is high. These results show that preschool teachers are more efficient and competent in putting science activities into action when they search for knowledge, investigate how knowledge is obtained, add and apply their own interpretations. In addition to these results, as a result of the regression analysis, it was determined that epistemological beliefs predicted and explained their proficiency in science activities.

Keywords: Preschool science education, epistemological belief, science activity competence,

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[2] Mersin University, Türkiye, semracevik36@gmail.com, ORCID: 0000-0002-7244-6381

[3] Mersin University, Türkiye, orkunct@mersin.edu.tr, ORCID: 0000-0002-0599-1881

[4] Mersin University, Türkiye, gunbinzet@mersin.edu.tr, ORCID: 0000-0002-9601-9528

OKUL ÖNCESİ ÖĞRETMENLERİNİN EPİSTEMOLOJİK İNANÇLARI İLE FEN ETKİNLİK YETERLİKLERİ ARASINDAKİ İLİŞKİNİN BAZI DEĞİŞKENLER AÇISINDAN İNCELENMESİ

ÖZET

Çalışmanın amacı, okul öncesi öğretmenlerinin epistemolojik inançları ile fen etkinliklerine ilişkin yeterliklerinin bazı değişkenler açısından incelenmesi, ayrıca epistemolojik inançları ile fen etkinliklerine ilişkin yeterlikleri arasındaki ilişkinin araştırılmasıdır. Araştırmanın evrenini 2021-2022 eğitim öğretim yılında, Gaziantep ili sınırları içinde MEB'e bağlı resmi okullarda görev yapan 213 okul öncesi öğretmeni oluşturmaktadır. Çalışmada nicel araştırma modellerinden biri olan ″ilişkisel tarama modeli″ kullanılmıştır. Tez çalışmasında, bazı demografik bilgileri içeren kişisel bilgi formunun yansıra ″Okul Öncesi Öğretmenlerinin Fen Etkinliklerine İlişkin Yeterliliklerini Belirleme Ölçeği ile Epistemolojik İnançlar Ölçeği olmak üzere iki adet ölçek veri toplama aracı olarak seçilmiş ve ölçme aracından elde edilen verilerin analizinde SPSS 26 paket programı kullanılmıştır. Yapılacak olan bu araştırma ile çalışmada belirlenen ana problem sorusuna ve alt problem sorularına istatistiksel anlamda yanıtlar aranmıştır. Araştırma sonucuna göre okul öncesi öğretmenlerinin gelişmiş/olgun epistemolojik inançlara sahip olduğu ve bu inançlar doğrultusunda fen etkinliklerine ilişkin yeterliliklerinin de yüksek olduğu tespit edilmiştir. Bu sonuçlar okul öncesi öğretmenlerinin bilgiyi araştırdıklarında, bilginin nasıl elde edildiğini araştırıp kendi yorumlarını eklediklerinde ve uyguladıklarında, fen etkinliklerini işleve geçirme noktasında daha verimli ve yeterli olduklarını göstermektedir. Bu sonuçlara ek olarak yapılan regresyon analizi sonucunda, epistemolojik inançların fen etkinliklerine ilişkin yeterliklerini yordadığı ve açıkladığı tespit edilmiştir.

Anahtar Kelimeler: Okul öncesi fen eğitimi, epistemolojik inanç, fen etkinlik yeterliliği

1. INTRODUCTION

Preschool education is the education applied through families and institutions that covers the period from birth to the compulsory education period and ensures the mental, emotional, physical and social development of children (Köni & Aldemir, 2018). The pre-school period, when the growth and development of human beings is the most intense, is the period when the person is most open to stimuli and forms the basis of many developmental stages and one of the most important educational stages of human life (Akyol & Birinci, 2018). In the preschool period, which is the period in which the individual determines his/her basic characteristics, the child develops his/her cognitive field skills, increases the level of social maturity, learns to meet his/her basic needs and, supports his/her social life with his/her experiences. The education to be given to the individual in the right direction in this period will be capable of organising his/her whole life (Büyüktanır, 2014). It has been observed that children who receive pre-school education have differences in many developmental areas compared to children who do not receive pre-school education and that children who receive education are more advanced in their school life (Şahin, 2000). In line with all these generalisations, the importance of preschool education is clearly observed.

In the preschool period, children are very curious about the environment and try to satisfy this curiosity (MEB, 2013). According to research, it is seen that the brains of children between the ages of 1 and 4 are very open to learning mathematics and logic and are very important for future mathematical

skills (Chesloff, 2013). Based on these data, science activities should be intensively included among diversified activities in the preschool period.

Children begin to learn the most important concepts in their lives in the preschool period, and the desire for discovery in preschool children is one of the most important life activities for children to learn these concepts (Çetin et al., 2012). Preschool children internalize different types of activities that they experience by doing and experiencing themselves more easily, apart from the activities they do routinely (Çetin et al., 2012). With science education in the preschool period, the child is active in education and gains many experiences, the child gets to know the world by questioning and researching, allowing the child to develop aesthetic skills, attention skills, scientific thinking skills and other skills (Alisinanoğlu et al., 2015).

Science education in the preschool period aims to enable children to recognize their world and adapt to life easily by enabling them to develop their basic need skills instead of preparing them to have a profession (Aksüt, 2015). Şahin (1998) defined the purpose of science education in preschool as enabling children to make sense of and define their environment, protect themselves, develop scientific thinking skills, achieve physical competence, and develop problem-solving skills. The development of children in terms of education, social and skill development is ensured by providing science education in the preschool period (Hamurcu, 2003). The main purpose of science education is to provide children with first-hand experience and to enable them to investigate the events and objects around them from the first source (Güler & Bıkmaz, 2002). In line with this information, the importance of science education in preschool is obvious and the foundation of science-related concepts is laid in this period. There is a consensus in the studies on science education to date that science education should be continued starting from preschool period (Durdu, 2010; Öztürk, 2010).

Researchers have identified different topics and areas for science education in the preschool period:

Charlesworth and Lind (2012) categorized preschool science areas under 6 headings: "life sciences", "health sciences", "physical sciences", "earth and space sciences", "science and technology education", "history and nature of science". According to Şimşek &Çınar (2012), these topics are "nature and its events", "living and non-living things", "plants and animals", "microbes and our health", "our body", "our sense organs", "air and its properties", "water and its properties", "heat and temperature", "light", "sound", "space and time", "magnetism", "electricity" and "acids, bases and solutions". When the literature is examined, "physical science", "life science (ecology)" and "earth and space science" are considered as another subject grouping (Dağlı, 2014). By taking these topics into consideration and making the necessary plans, quality activities should be carried out so that children in this period can benefit at the highest level. When all the subject areas given above are integrated with quality activities and other activities and given as a process, they develop children's scientific process skills (Arı & Öncü, 2005).

Science education in the preschool period is education in which the child learns by doing, discovering and experiencing scientific subjects and develops in many areas instead of directly transferring them to the child (Aktaş, 2002). Preschool science education represents a very vivid, colorful, realistic and multidimensional field that includes multiple concepts about life, such as the production and consumption stages of the water drunk, the air breathed, and the food consumed in a routine day (Akyol & Konur, 2018; Durdu, 2010). However, it is observed that there are some problems while providing preschool science education, which is very rich in terms of content, to children. In order to overcome these problems, it is necessary to focus on teachers first and foremost. In order for this education, which is very important, to be efficient, the teacher should be equipped in every subject and put this equipment into practice.

Teachers' belief that the nature of knowledge consists of absolute truths and falsehoods and that it will not change will prevent students from reaching actual knowledge by constructing knowledge themselves. It will ensure that the teacher becomes a knowledge transmitter. In the opposite case, thanks to the teacher, students will construct knowledge themselves and realize that knowledge can change, encouraging them to create knowledge by the students (Şaşmaz, 2019).

Richardson (1996) observed in his study that there is a significant and positive relationship between the belief system existing in individuals, teacher behaviors and the education system. In many studies, it has been observed that epistemological beliefs of teachers in different branches affect the quality of education and its relationship with different categories (Alemdağ, 2015; Bayrak Demir, 2019; Demir & Akınoğlu, 2010; Doğan, 2014; Güngör, 2016; Hıdıroğlu, 2016; Olgun, 2018; Öner, 2019; Özdemir, 2019; Şaşmaz, 2019; Özeren, 2020; Şahin, 2020; Şahin, 2021). Considering these studies, knowing the epistemological beliefs of preschool teachers will enable the analysis of the program implemented by the teacher and provide an efficient education process.

In the literature, epistemological beliefs are generally explained as a system of beliefs about knowledge and the nature of knowledge (Hofer & Pintrich, 1997; Schommer-Aikins, 2004). Epistemological beliefs include beliefs about the source and accuracy of knowledge, the criteria of knowledge, the limits of knowledge, and beliefs about learning (Akyıldız, 2014).

Since educators' propositions about the nature and source of knowledge, in other words, their epistemological beliefs will determine the teaching methods and techniques they will include in the education process, the atmosphere of the classroom, and the quality of their relations with their students, knowing the epistemological beliefs of educators is important for the quality of education (Öngen (2003).

When the literature is examined, although it is generally mentioned how important it is to know the epistemological beliefs of teachers, there are very few studies examining the relationship between "preschool teachers' epistemological beliefs" and different variables (Bedel & Çakır, 2012; Gümüştekin, 2019; Şahin, 2021). In addition, there are no studies investigating the relationship between teachers' epistemological beliefs and their efficacy in science activities. The main purpose of this study is to

examine the relationship between preschool teachers' epistemological beliefs and their efficacy regarding science activities in terms of some variables. In a process in which the activities used in science education are important, since there is no study examining the epistemological beliefs of preschool teachers and their efficacy regarding science activities, it is thought that this study will make a qualified contribution to the literature.

In this context, the problem statement of the research is: "Is there a relationship between preschool teachers' epistemological beliefs and their efficacy regarding science activities?" and the sub-problems are listed as follows:

- What is the level of preschool teachers' epistemological beliefs?

- Epistemological beliefs of preschool teachers;

o Gender,

o Years of professional seniority,

o Education Level (High School, Associate Degree, Bachelor's Degree, Master's Degree, Doctorate, Other),

o Faculty of Graduation (Vocational School of Health, Faculty of Education, Other)

o Graduated Department (Child Development and Education, Preschool Teaching, Other)

o Type of school where the position is held,

o Receiving or not receiving education on science education (Yes, No)

o Do they differ according to the variables of whether or not they find them competent in teaching science and nature?

- What is the level of pre-school teachers' efficacy regarding science activities?

- Preschool teachers' competence levels regarding science activities;

o Gender,

o Years of professional seniority,

o Education Level

o Faculty of Graduation

o Graduated Department

o Type of school

o Receiving or not receiving education on science education (Yes, No)

o Does it differ according to the variables of whether or not they find it sufficient to teach science and nature?

- Is there a significant relationship between teachers' epistemological beliefs and their science activities efficacy levels?

- Do teachers' epistemological beliefs predict their science activities efficacy levels?

2. METHOD

2.1. Research Model

This study is a descriptive study using the "relational survey model". Studies in which the opinions of individuals on a particular subject or their skills, interests, attitudes, abilities, etc. are revealed and which are generally conducted on larger samples than other studies are survey studies. The relational survey model is a model in which the variables whose existence or amount is determined by collecting data separately are subjected to a relational analysis to determine whether they change together or not, and if there is a change, how it occurs (Karasar, 2012).

2.2. Population and Sample of the Study

The population of the study consists of 1000 preschool teachers working in official schools affiliated with the Ministry of National Education in Gaziantep province in the 2021-2022 academic year. In the study, the "simple random sampling method" was used for sampling. In this study, the sample size was 213, which is considered reliable in terms of representing the population (Yazıcıoğlu & Erdoğan, 2004). Teachers voluntarily participated in the scales.

2.3. Data Collection Tools

In the study, "Personal Information Form", "Epistemological Beliefs Scale" and "Scale for Determining Preschool Teachers' Efficacy Regarding Science Activities" were used as data collection tools.

2.3.1. Personal Information Form

"Personal Information Form" consisted of eight questions. In this information form, the participants were asked about their "gender", "level of education", "years of seniority", "types of schools graduated from", "types of schools in which they worked", "which age groups taught", "taking courses on science education during their education", and "finding themselves competent in teaching science and nature".

2.3.2. Epistemological Beliefs Scale (EBBS)

In this study, the "Epistemological Beliefs Scale" developed by Schoommer (1990) in English, adapted from English to Turkish by Deryakulu and Büyüköztürk (2005), and retested with advanced statistical techniques by Aydın et al. (2017) was used. The original scale consists of 63 items and a four-factor structure including "Innate Ability", "Fast Learning", "Certain Knowledge" and "Simple Knowledge". The scale was adapted into Turkish by Deryakulu and Büyüköztürk (2005), and according to the results of the factor analysis, 25 items that disrupted the factor structure were removed from the scale and the scale became 35 items. The new scale consisted of 3 sub-dimensions: "Belief that Success Depends on Effort", "Belief that Success Depends on Ability" and "Belief in the Existence of a Single Truth". Afterward, according to the results of exploratory factor analysis, confirmatory factor analysis, and reliability analysis conducted by Aydın et al.(2017) in the validity and reliability study of the Turkish form of the scale, shortened forms of 29 or 23 items were created. These shortened forms are shorter, more valid, and more reliable. The new scales, which have higher validity and reliability and

are shorter in terms of items, consisted of 3 sub-dimensions: "Belief that Learning Depends on Effort", "Belief that Learning Depends on Ability" and "Belief that There is only one truth" as in the study adapted into Turkish by Deryakulu and Büyüköztürk (2005). The five-point Likert-type scale ranging from (1) Strongly Disagree, (2) Disagree, (3) No Opinion, (4) Agree, (5) Strongly Agree consists of 23 items. In the "Belief that Learning Depends on Effort" dimension of the scale, there are 10 items (items 1-10), all of which are negative. In the "Belief that Learning Depends on Ability" dimension of the scale, there are 8 items (11th-18th items), all of which are positive. In the "Belief in the Existence of a Single Truth" dimension of the scale, there are 5 items (19th-23rd items), all of which are positive. The highest score to be obtained from the "Belief that Learning Depends on Effort" dimension of the scale is 50 and the lowest score is 10. In the dimension of "Belief that Learning Depends on Ability", the highest score is 40 and the lowest score is 8. In the dimension of "Belief in the Existence of a Single Truth", the highest score is 25 and the lowest score is 5. A high score on each factor of the scale indicates that the individual has undeveloped/immature epistemological beliefs related to that factor; a low score indicates that the individual has developed/matured epistemological beliefs (Deryakulu & Büyüköztürk, 2005).

In Table 1, the sub-dimensions of the epistemological belief scale are divided into three levels as "Low", "Medium" and "High Level" and the score ranges for these levels are calculated.

Table 1. Epistemological Belief Scale Sub-dimensions Score Ranges

Epistemological Belief Scale Subscales Score Ranges	Low Level (Advanced)	Medium Level (Less Developed)	High Level (Undeveloped)
Belief that Learning Depends on Effort Dimension (10≤x≤50)	10≤x<23,33	23,33≤x<36,66	36,66≤x≤50
Belief that Learning Depends on Ability Dimension (8≤x≤40)	8≤x<18.66	18.66≤x<29.33	29.33≤x≤40
Belief in the Existence of a Single Truth Dimension (5≤x≤25)	5≤x<11,66	11,66≤x<18,32	18,32≤ x<25

"Epistemological Beliefs Scale (EBBS)" The alpha coefficients for the factors of the Turkish form were 0.88 for the effort sub-dimension, 0.88 for the ability sub-dimension, and 0.85 for the single truth sub-dimension, and the fit parameters for the three-factor structure were found to be good (RMSEA = 0.05, NFI = 0.95, NNFI = 0.96, GFI = 0.90, AGFI = 0.88, CFI = 0.96) in confirmatory factor analysis (Aydın et al. 2017).

2.3.2. Scale for Determining Preschool Teachers' Efficacy in Science Activities

In the study, "Scale for Determining Preschool Teachers' Efficacy in Science Activities", developed by Özbey and Alisinanoğlu (2010), was used to determine the efficacy of preschool teachers regarding science activities. The five-point Likert type scale consists of 29 items and consists of the options "Strongly agree (5)", "Agree (4)", "Undecided (3)", "Disagree (2)", "Strongly Disagree (1)". 17 of the items in the scale are positive and 12 are negative items, and negative items are scored reversely.

The lowest score to be obtained from the scale is 29 and the highest score is 145. A high score from the scale indicates that teachers have high competence in science activities.

The Scale for Determining Preschool Teachers' Efficacy Regarding Science Activities″ consists of four sub-dimensions: "Materials and Methods Used by Teachers", "Teachers' Level of Knowledge Regarding the Application", "Teachers' General Level of Knowledge Regarding Science Activities" and "Teachers' Behaviors in the Process of Implementing Science Activities". The corrected item-total correlation values of the items in the scale vary between 0.63 and 0.16. The t test results between the scores of the upper 27% and the lower 27% group indicated that there was a significant difference for all items and subscale total scores. The Cronbach Alpha value of the scale is 0.82 for the first factor; 0.76 for the second factor; 0.63 for the third factor; for the fourth factor it is 0.36. The Cronbach Alpha internal consistency coefficient calculated for the overall reliability of the scale is 0.82. When the statistical findings were evaluated, it was emphasized by the researchers that the scale is a measurement tool that has validity and reliability that can be used to measure the efficacy of preschool teachers regarding science activities (Özbey and Alisinanoğlu, 2010).

2.4. Data Collection

The necessary permissions were obtained from Mersin University and the Provincial Directorate of National Education before starting the study. "Personal Information Form", "Epistemological Beliefs Scale" and "Scale for Determining Preschool Teachers' Efficacy in Science Activities" scales were applied to the participants. The scales were delivered to 1000 preschool teachers working in Gaziantep province via face to face or online with "Google form". However, 213 teachers provided feedback and the data of 213 preschool teachers were analyzed.

2.5. Data Analysis

First, the normality assumptions of the data were examined with Kolmogorov-Smirnova and Shapiro-Wilk normality tests. When the Kolmogorov-Simirnova and Shapiro-Wilk normality tests given in Table 2 are examined, it is seen that all scores do not have a normal distribution (p <.05 for all). According to these results, non-parametric tests were used in the research since the data did not show a normal distribution.

Table 2. Normality Analysis of Scale Sub-Dimensions

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OCBOI	.087	213	.001	.961	213	.000
OYBOI	.095	213	.000	.936	213	.000
TBDVOI	.127	213	.000	.915	213	.000
OKMY	.124	213	.000	.940	213	.000
OUIBD	.114	213	.000	.927	213	.000
OFEYGBD	.295	213	.000	.738	213	.000
FEUSOD	.135	213	.000	.961	213	.000
Science Activity Proficiency scores	.094	213	.000	.966	213	.000
Total Epistemology scores	.063	213	.040	.975	213	.001

ÖÇBOİ: Belief that Learning Depends on Effort,
ÖYBOİ: The Belief that Learning Depends on Ability,
TBDVOİ: Belief in the Existence of a Single Truth,
ÖKMY: Materials and Methods Used by the Teacher,
ÖUİBD: Teachers' Level of Knowledge Regarding the Application,
ÖFEYGBD: Teachers' General Level of Knowledge Regarding Science Activities,
FEUSÖD: Teachers' Behaviors in the Process of Implementing Science Activities.

During the data analysis process, frequency distributions of the results obtained from the questions in the information form were calculated and presented in tables. In order to measure the effect of demographic characteristics on the data obtained from the scales, Mann-Whitney U test was used for pairwise comparisons, Kruskal-Wallis H test was used for multiple comparisons, and to measure the relationship between the scales, the Pearson Product Moment Correlation Coefficient analysis technique was used.

Cronbach's Alpha Coefficient, calculated based on the data obtained from 213 teachers, was calculated as 0.793 for the "Epistemological Beliefs Scale" and 0.902 for the "Scale for Determining the Efficacy of Preschool Teachers in Science Activities", and this result shows that the research data is reliable.

3. FINDINGS

3.1. Demographic Information of Preschool Teachers Participating in the Study

Demographic information about the preschool teachers who constituted the sample of the study is presented in Table 3 below.

Table 3. Demographic Information of the Preschool Teachers Participating in the Study

	Categories	f	%
Gender	Female	190	89.2
	Male	23	10.8
Level of Education	Associate Degree	13	6.1
	License	165	77.5
	Master's Degree	33	15.5
	PhD	2	0.9
Years of Seniority	0-5	69	32.4
	6-10	46	21.6
	11-15	67	31.5
	16 years or more	31	14.6
Type of Graduated School	Girls Vocational High School (Child Development Department)	6	2.8
	Vocational School (Department of Child Development)	6	2.8
	Bachelor's Degree (Department of Preschool Teaching)	175	82.2
	Bachelor's Degree (Child Development Department)	20	9.4
	Other	6	2.8
Type of School Employed	Official Independent Kindergarten	141	66.2
	Private Independent Kindergarten Affiliated to the MEB	26	12.2
	Kindergarten Attached to a Public Primary School	38	17.2
	Kindergarten attached to a private primary school	5	2.3
	Other	3	1.4
Age Group	3 years old	9	4.2
	4 years old	44	20.7
	5 years old	155	72.8
	Other	5	2.3
Taking a Course on Science Teaching in Preschool Education	Yes	180	84.5
	No	33	15.5
Self-Sufficiency in Science and Nature Teaching	Adequate	109	51.2
	Somewhat Adequate	90	42.3
	Insufficient	14	6.6
	Total	213	100

When Table 3 was examined, it was found that the participants had at least a doctorate degree and at most a bachelor's degree when the education levels of the participants were examined in the study

conducted with preschool teachers in which there were few male participants. When the distribution of the participants' years of seniority in the teaching profession was examined, it was determined that the proportion of participant teachers with seniority between 0-5 years (32.4%) and 11-15 years (31.5%) was higher than the other groups. When the distribution of the type of school graduates was examined, it was determined that the highest proportion of "Bachelor's Degree (Department of Preschool Teaching)" graduates was 82.2%. When the participants were evaluated according to the type of school, it was observed that the highest number of participants were teachers working in the official independent kindergarten (66.2%), followed by teachers working in the kindergarten of the official primary school (17.2%). It was found that a large proportion of the participants (72.8%) taught the 5-year-old age group. It was stated that 84.5% of the participants had science education, but when the variable "finding oneself competent in teaching science and nature" was analyzed, 51.2% of the teachers found themselves competent. Very few participant teachers (6.6%) stated that they found themselves insufficient in this regard.

3.2. Descriptive Findings to Determine the Levels of Epistemological Beliefs of Preschool Teachers

In order to determine the level of epistemological beliefs of the participants, it was determined that they had developed epistemological beliefs according to the results of the scores obtained from all sub-dimensions in the scale (Table 4).

Table 4. Mean and Standard Deviation of EİÖ Sub-dimensions

Subscales	Min	Max	Mean.	sd
Belief that Learning Depends on Effort (ÖÇBOİ)	10	50	16.44	4.42
Belief that Learning Depends on Ability (ÖYBOİ)	8	40	15.92	5.30
Belief in the Existence of a Single Truth (TBDVOİ)	5	25	10.67	4.33

3.3. Findings Related to the Differentiation of Preschool Teachers' Epistemological Belief Levels According to Demographic Characteristics

The findings related to the second aim of the study, which is to determine the differentiation of preschool epistemological belief levels according to demographic characteristics, are given below.

It was determined that the scores of the teachers who participated in the study from the epistemological belief scale (EB) and its sub-dimensions did not have a significant difference according to the variables of "gender", "type of school graduated from", "age group of education" and "finding oneself sufficient in teaching science and nature".

The results of Kruskal-Wallis H-Test to determine whether preschool teachers' epistemological beliefs differed according to their "level of education" are given in Table 5.

Table 5. Kruskal Wallis H-Test Results for Comparison of Teachers' Epistemological Beliefs According to Education Level

Dim.	Level of Education	Mean Rank	df	χ^2	*p*	Sig. Difference (MWU)
ÖÇBOİ	1. Associate Degree	138.73	3	8.531	.036	Associate Degree - Master's Degree
	2.License	109.29				
	3.Master's Degree	85.20				License - Master's Degree
	4.PhD	71.25				
ÖYBOİ	1. Associate Degree	128.19	3	3.264	.353	-
	2.License	103.08				
	3.Master's Degree	117.50				
	4.PhD	119.75				
TBDVOİ	1. Associate Degree	135.23	3	4.376	.224	-
	2.License	105.83				
	3.Master's Degree	104.97				
	4.PhD	53.25				
Eİ	1. Associate Degree	144.15	3	5.410	.144	-
	2.License	104.78				
	3.Master's Degree	105.20				
	4.PhD	78.25				

According to the results of the Kruskal Wallis H-Test, it was found that the scores of the participants according to their level of education were not significant different (χ^2 =5.41, *p*=.144, *p*>.05) and that the level of education did not have any effect on EI. Based on the results, it can be said that the higher the level of education of preschool teachers, the higher their EI.

According to Table 5, a significant difference was found only in the sub-dimension of ÖÇBOI (*p*<.05). The ordinal mean of associate degree graduates in this dimension ($\bar{x}$=138.73) is higher than the other participants (χ^2 =8.53, *p*=.036 *p*<.05). In order to determine between which groups the significant difference occurred, the source of the difference was reached by Mann Whitney U test over pairwise combinations. When the ranked averages were examined, it was determined that the participants with a doctorate degree had the lowest score and the participants with an associate's degree had the highest score. The education levels at which significant differences were observed were between associate degree graduates and master's degree graduates and between bachelor's degree graduates and master's degree graduates. According to this finding, the difference between associate degree graduates and bachelor's degree graduates is in favor of bachelor's degree graduates and it is observed that bachelor's degree graduates have the degree that effort is necessary in learning. The other difference between bachelor's and master's degree graduates was in favor of master's degree graduates and their belief that learning depends on effort was higher. There is no significant difference between the views of the participants according to the level of education in the other sub-dimensions of the EI-scale (*p*>.05).

The results of the Kruskal Wallis H-Test given in Table 6, conducted according to the 'year of seniority' variable of the participants' EI, show that there is a significant difference (*p* <.05 for all).

According to this difference, participants with 0-5 years of seniority have more developed epistemological beliefs than participants with 11-15 years of seniority.

Table 6. Kruskal Wallis H-Test Results Regarding the Comparison of Teachers' Epistemological Beliefs According to Years of Seniority

Dim.	Years of Seniority	Mean Rank	df	χ^2	*p*	Sig. Difference (MWU)
ÖÇBOİ	**1**. 0-5 **2**. 6-10 **3.**11-15 **4**. 16+	106.89 124.04 108.05 79.68	3	9.691	.021	0-5 - 16+ 6-10 - 16+
ÖYBOİ	**1**. 0-5 **2.** 6-10 **3**. 11-15 **4.** 16+	92.58 102.57 128.63 98.94	3	12.854	.005	0-5 - 11-15 6-10 - 11-15
TBDVOİ	**1**. 0-5 **2**. 6-10 **3**. 11-15 **4**.16+	83.90 99.12 127.41 126.00	3	20.896	.000	0-5 - 11-15 0-5 - 16+ 6-10 - 11-15
Eİ	**1**. 0-5 **2**. 6-10 **3**. 11-15 **4.**16+	88.43 107.26 128.72 106.89	3	14.897	.002	0-5 - 11-15

There is a significant difference between the seniority year groups of the participants in the sub-dimensions of ESL ($p<.05$). According to the results of the analysis, participants with increasing seniority years believe that learning will be realized by making an effort.

The difference between the 0-5 - 11-15 years seniority groups and 6-10 - 11-15 years seniority groups in the sub-dimension of "ÖYBOİ" is significant. The data obtained show that the belief that learning depends on ability is more developed among the participants in the 0-5 years seniority group in the first pair group and among the participants in the 11-15 years seniority group in the second pair group.

In the last sub-dimension, TBDVOI, there is a significant difference between 11-15 years seniority group and 0-5 years seniority group, 11-15 years seniority group and 6-10 years seniority group, and 0-5 years seniority group and 16+ years seniority group. When the research finding is examined, the seniority year variable shows a significant difference between epistemological belief levels and the belief in a single truth decreases in parallel with the increase in seniority years.

Table 7 shows the results of Kruskal Wallis H-Test conducted to determine whether the participants' epistemological beliefs were significant according to the "school of employment" variable. The Kruskal Wallis H-Test data determined that there was a differentiation between some groups.

Table 7. Kruskal Wallis H-Test Results Regarding the Comparison of Teachers' Epistemological Beliefs According to the Type of School Employed.

Dim.	Type of School Employed	Mean Rank	df	χ^2	*p*	Sig. Diff. (MWU)
ÖÇBOİ	1.Official Independent Kindergarten	109.93	4	3.29	.510	-
	2.Private Independent Kindergarten Affiliated to the MEB	115.58				
	3.Kindergarten Attached to a Public Primary School	91.66				
	4.Kindergarten attached to a private primary school	101.20				
	5.Other	99.00				
ÖYBOİ	1.Official Independent Kindergarten	111.14	4	5.44	.245	-
	2.Private Independent Kindergarten Affiliated to the MEB	116.56				
	3.Kindergarten Attached to a Public Primary School	87.11				
	4.Kindergarten attached to a private primary school	98.30				
	5.Other	96.17				
TBDVOİ	1.Official Independent Kindergarten	107.63	4	10.83	.029	1-3 1-2 2-3
	2.Private Independent Kindergarten Affiliated to the MEB	134.92				
	3.Kindergarten Attached to a Public Primary School	84.07				
	4.Kindergarten attached to a private primary school	111.00				
	5.Other	119.00				
EI	1.Official Independent Kindergarten	110.41	4	10.46	.033	1-3 2-3
	2.Private Independent Kindergarten Affiliated to the MEB	128.79				
	3.Kindergarten Attached to a Public Primary School	81.34				
	4.Kindergarten attached to a private primary school	98.50				
	5.Other	97.00				

In the third dimension of epistemological beliefs, the TBDVOI dimension, it is seen that the opinions of the "type of school" groups differed significantly from the test results. It was observed that the participants working in kindergartens affiliated to the official primary school had more belief in a single truth compared to other institutions.

The results of the Mann Whitney-U Test, which was conducted to test whether the EI-scale and its sub-dimensions differ according to the variable of taking courses on science teaching, are given in Table 8.

Table 8. Mann Whitney-U Test Results of Epistemological Beliefs Scale Subscales According to the Variable of Taking a Course on Science Teaching

Dim.	Taking a Course on Science Teaching	Mean Rank	Sum of Rank	U	*p*
ÖÇBOİ	Yes	105.87	19057.00	2767.000	0.532
	No	113.15	3734.00		
ÖYBOİ	Yes	102.87	18516.00	2226.000	0.022
	No	129.55	4275.00		
TBDVOİ	Yes	99.80	17964.50	1674.500	0.000
	No	146.26	4826.50		
Eİ	Yes	101.19	18214.50	1924.500	0.001
	No	138.68	4576.50		

According to the results obtained, there is a significant difference except for the OCBOI sub-dimension of the Epistemological Beliefs Scale (p<.05). In the OCBOI sub-dimension, there is no significant difference according to the status of taking science courses (p>.05). In general, it can be said that participants who took science courses had more developed epistemological beliefs than participants who did not.

3.3. Findings Related to the Differentiation of Preschool Teachers' Efficacy Regarding Science Activities According to Demographic Characteristics

Statistical analyses were conducted on the four sub-efficacy related to the participants' science activities (Table 9).

Table 9. Mean and Standard Deviation of the Subscales of the Efficacy for Science Activities Scale

Sub Dimensions	Min	Max	Mean	se
ÖKMY	10	50	4,45	0,41
ÖUİBD	10	50	4,37	0,50
ÖFEYGBD	6	30	4,74	0,36
FEUSÖD	3	15	3,76	0,65
FEİY	29	145	4,41	0,35

ÖKMY: Materials and Methods Used by the Teacher,
ÖUİBD: Teachers' Level of Knowledge Regarding the Application,
ÖFEYGBD: Teachers' General Level of Knowledge Regarding Science Activities,
FEUSÖD: Teachers' Behaviors in the Process of Implementing Science Activities,
FEİY: Efficacy for Science Activities.

The mean of the participants' science activity efficacy ($\bar{x}$=4.41) shows that their science activity efficacy are at a high level. According to the mean scores obtained from the sub-dimensions of the scale of efficacy for science activities, the lowest mean was determined as the teacher's behaviors sub-dimension ($\bar{x}$=3.76).

As a result of the analyses, it was found that there was no significant difference in the participants' efficacy for science activities and its sub-dimensions according to the variables of "gender", "seniority year", "type of school graduated from", "type of school employed" (p>.05).

The results of Kruskal Wallis H-Test conducted to determine whether the participants' efficacy related to science activities differed according to the "level of education" variable are given in Table 10.

Table 10. Kruskal Wallis H-Test results regarding the comparison of teachers' efficacy regarding science activities according to level of education.

Dim.	Level of Education	Mean Rank	df	χ^2	p	Sig. Difference (MWU)
ÖKMY	1.Associate Degree	81.85	4	11.988	.007	1<3 2<3
	2.License	102.45				
	3.Master's Degree	137.05				
	4.PhD	150.50				
ÖUİBD	1.Associate Degree	60.73	4	9.206	.027	1<2 1<3
	2.License	107.71				
	3.Master's Degree	121.32				
	4.PhD	113.00				
ÖFEYGBD	1.Associate Degree	56.77	4	14.062	.003	1<2 1<3
	2.License	107.38				
	3.Master's Degree	121.88				
	4.PhD	156.50				
FEUSÖD	1.Associate Degree	87.88	4	3.950	.267	-
	2.License	105.12				
	3.Master's Degree	122.18				
	4.PhD	135.75				
FEİY	1.Associate Degree	57.04	4	14.912	.002	1<2 1<3 2<3
	2.License	105.45				
	3.Master's Degree	132.06				
	4.PhD	145.75				

A significant difference was observed when the relationship between the participants' FEIYs and their level of education was analyzed. The findings show that the FEIY of the participants with associate degrees is lower than the other education levels.

When the Kruskal Wallis H-Test was analyzed, no significant difference was found in the "FEUSÖD" sub-dimension of the scores obtained with the FEIY according to the education level of the participants. However, it was determined that the participant differed in the sub-dimensions of "ÖKYM", "ÖFEYGBD", and "ÖUİBD". According to the findings, master's degree graduate preschool teachers have a more advanced level in terms of the methods and materials they use during science activities compared to other education levels. Statistically, it was determined that the data collected with the participants' FEİY scale differed according to the participants' level of education in terms of the sub-dimensions of ÖUİBD and ÖFEYGBD. The data obtained in both sub-dimensions showed that the ordinal averages of associate degree graduates were the lowest.

The results of Kruskal-Wallis H-Test conducted to determine whether preschool teachers' efficacy related to science activities differed according to the "age group" variable are given in Table 11.

Table 11. Kruskal-Wallis H-Test results regarding the comparison of teachers' efficacy regarding science activities according to the age group

Dim.	Age Group	Mean Rank	df	χ^2	*p*	Sig.Diff. (MWU)
ÖKMY	**1.** 3 Year	50.11	3	9.386	.025	1<3
	2. 4 Year	100.34				
	3. 5 Year	112.27				
	4. Other	104.70				
ÖUİBD	**1.** 3 Year	81.50	3	3.971	.265	-
	2. 4 Year	95.89				
	3. 5 Year	111.18				
	4. Other	121.10				
ÖFEYGBD	**1.** 3 Year	74.44	3	4.092	.252	-
	2. 4 Year	101.76				
	3. 5 Year	110.63				
	4. Other	99.10				
FEUSÖD	**1.** 3 Year	88.56	3	1.167	.761	-
	2. 4 Year	103.55				
	3. 5 Year	108.85				
	4. Other	113.20				
FEİY	**1.** 3 Year	61.50	3	6.740	.081	-
	2. 4 Year	98.60				
	3. 5 Year	111.78				
	4. Other	114.70				

The Kruskal Wallis H-Test was used to examine whether the data collected with the scale used to determine preschool teachers' competence levels for science activities differed according to the age group of the students for which the teachers were responsible. According to the analysis, no differentiation was found between their efficacy regarding science activities. As a result of the Kruskal-Wallis H-Test, as seen in the table, a statistically significant difference was found at the $p<.05$ level only according to the sub-dimension of materials and methods used by the teacher among the four factors. No statistically significant difference was found in the sub-dimensions of the scale of preschool teachers' efficacy related to science activities, "ÖUİBD", "ÖFEYGBD" and "FEUSÖD".

Mann-Whitney U Test was conducted to determine between which groups there was a statistically significant difference in the sub-dimension of "ÖKMY". According to the results of the analysis, it was determined that preschool teachers' efficacy related to science activities were at a lower level in the age group of 3-year-old teachers than in the age group of 5-year-old teachers.

The findings related to the Mann-Whitney-U Test analyses conducted in relation to the sub-problem "Do preschool teachers' efficacy levels related to science activities show a significant difference according to taking a course on science teaching during their education?" are given in Table 12.

Table 12. Mann Whitney-U Test results of the subscales of the scale of efficacy regarding science activities according to the status of taking a course on science.

Dim.	Taking a Course on Science	Mean Rank	Sum of Ranks	U	*p*
ÖKMY	Yes	110.24	19844.00	2386.000	.072
	No	89.30	2947.00		
ÖUİBD	Yes	112.29	20212.50	2017.500	.003
	No	78.14	2578.50		
ÖFEYGBD	Yes	111.10	19997.50	2232.500	.014
	No	84.65	2793.50		
FEUSÖD	Yes	112.29	20212.50	2017.500	.003
	No	78.14	2578.50		
FEİY	Yes	113.25	20384.50	1845.500	.001
	No	72.92	2406.50		

According to Table 12, it was determined that there was a statistically significant difference in the levels of science activity efficacy of preschool teachers according to taking a course on science teaching. When the scores obtained by the teachers from the competence scale for science activities were analysed, it was determined that the sequential mean of the teachers who took the course on science teaching was higher than the sequential mean of the teachers who did not take the course, and it was observed that the preschool teachers who took the course were more competent in terms of science activities efficacy. Among the sub-dimensions of science activities efficacy, "ÖKMY" does not differ according to the status of taking a course on science teaching.

The second sub-dimension of the science activities efficacy scale, the "OUİBD" sub-dimension, statistically differentiates according to the status of taking a course on science teaching. As a result of the analyses made to examine between which groups the differentiation is between, the sequential averages of preschool teachers who took a course on science teaching are higher than the sequential averages of preschool teachers who did not take a course on science teaching. This finding is in favour of preschool teachers who took courses on science teaching.

The other sub-dimension, "ÖFEYGBD" sub-dimension, shows a significant difference according to the status of taking a course on science teaching. In other words, the status of taking a course on science is a variable that differentiates the opinions of the teachers in the sub-dimension of "ÖFEYGBD". Also, it is concluded that the general knowledge level of preschool teachers who take courses on science activities is also high.

According to Table 12, it was determined that preschool teachers' efficacy related to science activities differed significantly in the "FEUSÖD" sub-dimension according to the status of taking a course on science teaching, and it was observed that the differentiation was in favor of preschool teachers who took a course on science teaching.

The results of Kruskal-Wallis H-Test conducted to determine whether preschool teachers' efficacy related to science activities differed according to the variable "finding oneself competent in science teaching" are given in Table 13.

Table 13. Kruskal-Wallis H-Test results regarding the comparison of teachers' efficacy in science activities according to finding self-efficient in science teaching

Dim.	Self-Sufficiency in Science and Nature Teaching	Mean Rank	df	χ^2	*p*	Sig.Diff. (MWU)
ÖKMY	1.Adequate	50.11	2	12.904	.002	1>2 1>3
	2.Somewhat Adequate	100.34				
	3.Insufficient	112,27				
ÖUİBD	1.Adequate	81,50	2	0.351	.839	-
	2.Somewhat Adequate	95.89				
	3.Insufficient	111.18				
ÖFEYGBD	1.Adequate	74.44	2	2.984	.225	-
	2.Somewhat Adequate	101.76				
	3.Insufficient	110.63				
FEUSÖD	1.Adequate	88.56	2	6.145	.046	1>2
	2.Somewhat Adequate	103.55				
	3.Insufficient	108.85				
FEİY	1.Adequate	61.50		5.220	.074	-
	2.Somewhat Adequate	98.60				
	3.Insufficient	111.78				

According to the results of the analyses of preschool teachers' efficacy related to science activities according to the variable of finding oneself competent in science teaching, it is observed that there is no significant difference in "FEİY", "ÖUİBD" and "ÖFEYGBD" sub-dimensions.

When Table 13 is analyzed, it is seen that the opinions of the groups differed significantly in the first dimension of "ÖKMY", which is the first dimension of the science activity efficacy scale. With this finding, among the dimensions of preschool teachers' efficacy for science activities, preschool teachers who find themselves sufficient in science teaching in the sub-dimension of ÖKMY have lower efficacy for science activities than the teachers who find themselves insufficient. Preschool teachers who considered themselves competent in science activities were more competent in terms of the methods and materials they used than preschool teachers who considered themselves somewhat competent and inadequate.

In the "FEUSÖD" sub-dimension, a significant difference was found between the groups who found themselves competent in science teaching. In this sub-dimension, when the necessary analyses were made to find the difference between the sequential averages of the preschool teachers who found themselves adequate in science teaching, the sequential averages of the preschool teachers who found themselves somewhat adequate, and the sequential averages of the preschool teachers who found themselves inadequate, it was found that the preschool teachers who found themselves adequate had a more adequate level of behaviour when implementing science activities than the preschool teachers who found themselves somewhat adequate and inadequate. With this finding, it can be interpreted that the behaviours of teachers who find themselves adequate in science teaching have a higher science activity adequacy than the other groups.

3.4. Findings to Determine the Relationship Between Preschool Teachers' Epistemological Belief Levels and Their Efficacy Regarding Science Activities

Pearson Correlation analysis was performed for the significance level of the relationship between teachers' epistemological beliefs and their efficacy related to science activities, determination of the level of the relationship and the direction of the relationship and the results are presented in Table 14.

Table 14. Pearson correlation analysis results regarding teachers' epistemological belief levels and science activities

		Materials and Methods Used by the Teacher	Teacher's level of knowledge about the practice	Teacher's General Knowledge Level for Science Activities	Teacher Behaviour	Proficiency in Science Activities
Belief that learning depends on effort	r	-.440	-.264	-.403	-.251	-.442
	p	.000	.000	.000	.000	.000
	N	213	213	213	213	213
Belief that learning depends on ability	r	-.084	-.321	-.190	-.104	-.252
	p	.222	.000	.005	.132	.000
	N	213	213	213	213	213
Belief in a Single Truth	r	-.147	-.216	-.160	-.028	-.205
	p	.032	.001	.019	.687	.003
	N	213	213	213	213	213
Epistemological Beliefs	r	-.319	-.401	-.367	-.188	-.441
	p	.000	.000	.000	.006	.000
	N	213	213	213	213	213

According to Table 14, there is a significant relationship between the sub-dimensions of the Epistemological Beliefs Scale "ÖÇBOİ" and the sub-dimensions of the Efficacies Regarding Science Activities (p<.05). A moderate, negative relationship (r=-0.440, p<.001) was found between the ÖÇBOİ sub-dimension and ÖKMY sub-dimension; a weak, negative relationship (r=-0.264, p<.001) with ÖUIBD; a moderate, negative relationship (r=-0.403, p<.001) with ÖFEYGBD; and a weak, negative relationship (r=-0.251, p<.001) with FEUSÖD. Accordingly, the lower the scores of preschool teachers in the sub-dimension of ÖÇBOİ, the higher the score they received from their competences related to science activities.

There was no correlation between the Epistemological Beliefs Scale "ÖYBOİ" sub-dimension and the "ÖKYM" sub-dimension (r=-0.084, p>.05) and the "FEUSÖD" sub-dimension (r=-0.104, p>.05). A moderate, negative relationship (r=-0.321, p<.01) was found between the "ÖYBOİ" sub-dimension of the Epistemological Beliefs Scale and the "OÜİBD" sub-dimension, and a weak, negative relationship (r=-0.104, p<.05) was found between the "ÖFEYGBD" sub-dimension.

A weak, negative relationship (r=-0.147, p<.05) was found between the "TBDOI" sub-dimension of the Epistemological Beliefs Scale and the "ÖKYM" sub-dimension; a weak, negative relationship (r=-0. 216, p<.05); a weak, negative correlation (r=-0.160, p<.05) with "ÖFEYGBD"; and a weak,

negative correlation (r=-0.104, *p*<.05) with "ÖFEYGBD" sub-dimension. In the Epistemological Beliefs Scale, no significant relationship was found between the "TBDOI" sub-dimension and the "FEUSÖD" sub-dimension.

3.5 Findings Regarding Whether Preschool Teachers' Epistemological Beliefs are Significant Predictors of Their Efficacy in Science Activities

Multiple regression analysis was conducted to determine the level of explanation of preschool teachers' epistemological beliefs on their efficacy in science activities. According to the multiple regression analysis, the findings related to the predictive power of the independent variable (epistemological beliefs) used in explaining the dependent variable (efficacy related to science activities) are shown in Table 16.

Table 16. Results of multiple regression analysis of the relationship between epistemological beliefs and efficacy of science activities.

			Dependent Variables				
			Materials and Methods Used by the Teacher	Teacher's level of knowledge about the practice	Teacher's General Knowledge Level for Science Activities	Teacher Behaviour	Proficiency in Science Activities
Independent Variables	Belief that learning depends on effort	*β*	-.438	-.257	-.399	-.249	-.436
		t	-7.141	-4.083	-6.454	-3.744	-7,341
		p	.000	.000	.000	.000	.000
	Belief that learning depends on ability	*β*	-.010	-.277	-.140	-.112	-.192
		t	-.141	-3.874	-1.984	-1.483	-2.840
		p	0.888	.000	.049	.140	.005
	Belief in a Single Truth	*β*	-.136	-.080	-.088	.029	-.108
		t	-1.950	-1.123	-1.246	.389	-1.592
		p	.053	.263	.214	.698	.113
	Epistemological Beliefs	*β*	.142	-.092	.089	-.547	-.441
		t	1.271	-1.061	1.147	-3.705	-7.137
		p	.205	.290	.253	.000	.000
R=0,513	R^2=0,252						
F=24,870	*p*=0.000						

The three sub-dimensions of epistemological beliefs together showed a low but significant relationship with efficacy for science activities (PBI) scores (R=0.51, R2 =.25, *p*<.01). The three sub-dimensions of epistemological beliefs together explained 25% of the total variance in efficacy for science activities.

It was found that the score obtained from the epistemological beliefs scale predicted the efficacy for science activities at *p*<.001 level (β=-0.441, t=-7.137 *p*=0.00). It was found that the epistemological belief score explained 44.1% of the score obtained from the efficacy related to science activities. It was found that the score obtained from the epistemological beliefs scale did not have a statistically

significant prediction of ÖKYM (β=0.142, t=1.271 and p=0.205), ÖUIBD (β=-0.092, t=-1.061 and p=0.290) and ÖFEYGBD at p<.05 level. Except for this situation, it was found that epistemological beliefs score predicted ÖD efficacy at p<.001 level (p=0.000, β=-0.547). It was found that the epistemological beliefs score explained 54.7% of the ÖD efficacy among the efficacies related to science activities.

It was found that ÖÇBOİ score predicted ÖKYM at p<.001 level (β=-0.438, t=-7.141 p=0.000). It was found that the ÖÇBOİ score explained 43.8% of the ÖKYM competence score among the science activity competences. It was concluded that ÖÇBOİ score predicted the level of knowledge related to implementation at p<.001 level (β=-0,257, t=-4,083 and p=0,00). It was found that the epistemological belief score explained 25.7% of the FEYUIBD score. It was found that the ÖÇBOİ score predicted the FEYBD p<.001 (β=-0.399, t=-6.454 and p=0.00). According to this finding, it was found that the epistemological belief score explained 39.9% of the FEYBD score. It was found that ÖÇBOİ score predicted ÖD at the level of p<0.001 (β=-0.249, t=-3.744 and p=0.0) and epistemological belief score explained 24.9% of SC score.

It was found that the ÖYBOİ score did not have a statistically significant prediction level for ÖKMY (β=-0.010, t=-0.141 and p=0.888) and ÖD (β=-0.112, t=-1.483 and p=0.140). On the other hand, it was found that the score of ÖYBOİ predicted OUİBD at the level of p<.001 (β=-0.277, t=-3.874 and p=0.000). It was found that the score of ÖYBOİ explained 27.7% of the score of OUİBD. It was found that the score of OYBOİ predicted the level of teacher's knowledge about science activities among teacher competences at p<.05 (β=-0.140, t=-1.984 and p=0.049). The score of ÖYBOİ explained 14% of the score of ÖFEYBD.

TBDOI score was found to be related to ÖKYM (β=-0.136, t=-1.950 and p=0.053), ÖUİBD (β=-0.080, t=-1.123 and p=0.263), FEYBD (β=0.088, t=- 1.246 and p=0.214) and FEUSÖD (β=0.029, t=0.389 and p=0.698) were found to have no statistically significant predictive level.

4. DISCUSSION

4.1. Conclusion and Discussion on Determining the Epistemological Belief Levels of Preschool Teachers and Investigation of Belief Levels in Terms of Various Variables

In this study, the epistemological beliefs of preschool teachers were examined in terms of some variables (gender, education level, seniority year, type of school graduated from, type of school where they work, age group of children, taking a course on science teaching in preschool during their education, and finding themselves sufficient in teaching science and nature). According to the data obtained, it was determined that teachers had low-level (developed) beliefs according to the sub-dimensions of epistemological beliefs. Apart from having developed beliefs in all sub-dimensions, the epistemological belief that learning depends on effort is higher than the other sub-dimensions. When the literature is examined, in support of this study, it is revealed that preschool teachers' beliefs that learning depends on effort, beliefs that rely on the ability, and beliefs that there is only one truth are at a developed

level, they state that learning will increase with effort in the learning process, they support the ability for quality learning, their belief in a single truth is at a low level compared to other sub-dimensions and they have a mature belief level (Aypay, 2011b; Ekinci & Tican, 2017; Doğan S., 2019; Güven, 2009; İçen, 2012; Kaleci, 2012; Karataş, 2011; Kervan, 2017). The high level of preschool teachers' belief in the existence of effort for learning to take place may be the most significant factor that the recently used education programs are based on the constructivist approach. It is thought that a quality result can be obtained by applying effort for learning to take place and gaining quality in every aspect. In addition to the belief that learning can be realized through effort, preschool teachers who believe that talent should also be included can be considered as evidence that they leave the door open to all kinds of development. Having less developed belief levels in a single truth sub-dimension compared to the other sub-dimensions creates the perception that preschool teachers preserve their traditional belief structures and have traditional beliefs, no matter how much they are to develop. In short, it has been observed that no matter how open they are to innovation, they preserve the traditionalist structure and still assume these roles. Öner (2019), in his research with English teachers, concluded that teachers still preserve their traditional roles just like in this study. The reason for this situation can be interpreted as that although the current education programs are shaped by the constructivist approach, educators need qualified training to reach the belief structure required for this approach.

When the effect of gender variable on preschool teachers' epistemological beliefs was examined, it was found that female and male teachers had similar epistemological beliefs and there was no significant difference. However, studies in the literature show that gender is a controversial variable on epistemological beliefs. In some of the studies investigating the relationship between epistemological beliefs and gender variable, it was determined that women had more developed beliefs than men (Doğan S, 2019; İçen, 2012; Şaşmaz, 2019), while in others it was stated that men had more developed beliefs than women (Güven, 2009; Eroğlu & Güven, 2006; Terzi, 2005). The difference in these results may be attributed to variables such as the distribution of the number of participants, age, environment, etc. The lack of difference in terms of epistemological belief levels and sub-dimensions in this study may be due to the fact that the gender variable is personal.

In the study, it was examined whether there was a significant difference between the epistemological beliefs of preschool teachers according to the level of education variable. The findings revealed that only in the sub-dimension of "belief that learning depends on effort", preschool teachers with doctoral level of education had more epistemological beliefs than preschool teachers with associate degree level of education. Özdemir (2019) examined the relationship between primary school teachers' epistemological beliefs and teaching styles; a similar result was observed that the belief in effort-based learning was higher in preschool teachers with higher education level. Parallel results were reached with Karhan (2007) working with primary school teachers and Akyıldız (2014) working with high school teachers. In this direction, it is concluded that no matter how much the age increases, epistemological beliefs will not increase without increasing the quality of the education received. As a result, it was

observed that the content and practices of the education received in the following periods contributed to and improved epistemological beliefs.

There is a significant difference in the epistemological beliefs of the preschool teachers participating in the study in terms of seniority years in the sub-dimensions of the belief that learning depends on effort, the belief that learning depends on ability, and the belief that there is only one truth. According to the results obtained, it was determined that preschool teachers' epistemological belief levels and belief levels in the sub-dimensions had more developed belief levels in preschool teachers who were new to the profession compared to preschool teachers who were experienced in the profession. When the literature was examined, studies supporting this result were found (Doğan, 2019; Karhan, 2007; Murat & Erten, 2018;, Şaşmaz, 2019). It can be interpreted that this situation may be due to the fact that teachers who are new in the professional sense can learn information richer than the old ones, that they are new graduates of universities or that teachers who are older in their professional years do not update themselves and are closed to innovation. However, there are also studies that show that epistemological beliefs approach the traditional role as professional experience increases (Kösemen, 2012; Özdemir, 2019). This can be considered as the personal characteristics of teachers.

In the study, it was examined whether there was a significant difference between the epistemological beliefs of preschool teachers according to the type of school they graduated from. No difference was found in the sub-dimensions of "belief that learning depends on effort", "belief that learning depends on ability", and "belief in a single truth". Although it was expected that different results would be found due to having different opportunities and conditions, it was determined that regardless of the conditions, the school where the teachers work does not affect the epistemological beliefs of the teachers.

No significant difference was found in the epistemological beliefs of preschool teachers based on the age of the students in the school where they work. The reason for this can be said to be that teachers do not think that learning will be realized with the effort and ability of the student, that there is no single truth, and that this will change at different levels with age. Since epistemological belief is a personal concept, the variable of student age, which is an environmental factor, did not have any effect on preschool teachers' epistemological beliefs.

It is concluded that there is a statistically significant difference between preschool teachers' epistemological beliefs and the variable of taking science courses. According to this finding, the fact that preschool teachers take science courses during their education process improves their epistemological belief levels. Whether preschool teachers took science courses or not did not differentiate the dimension that learning depends on effort among the sub-dimensions. In line with this finding, preschool teachers have developed similar-level beliefs about whether they take science courses or not. In the study, in the dimension of belief that learning depends on the ability of epistemological beliefs, a significant difference was observed between preschool teachers who took science courses and teachers who did not take science courses. It can be said that the reason why preschool teachers who

took a course on science had higher levels of epistemological beliefs than teachers who did not take a course was that the teachers who received education witnessed the teaching event one-to-one or dominated the content. In another sub-dimension, belief in a single truth, it was seen that the status of taking a course on science differed significantly. This differentiation is in favor of preschool teachers who took science courses. The beliefs that there is no single truth and that complex problems can be explained by more than one explanation instead of a single answer are higher in teachers who took science courses compared to preschool teachers who did not take science courses. It was concluded that as the quality of education increases, epistemological beliefs reach an advanced level in the level of education variable. In parallel with this situation, teachers who expand their educational repertoire about science also expand their epistemological beliefs and raise their beliefs to the level of contemporary epistemological beliefs.

When the data obtained as a result of the research were examined, no significant difference was found according to the variable of finding oneself sufficient in science teaching. However, even though no significant difference was found when the averages were examined, it can be interpreted that preschool teachers who find themselves inadequate in teaching science have more developed epistemological beliefs. The same interpretation can be made for the epistemological beliefs sub-dimensions of belief that learning depends on effort and the belief that learning depends on ability.

4.2. Conclusion and Discussion on Determining Preschool Teachers' Efficacy Regarding Science Activities and Investigation of Science Activity Levels in Terms of Various Variables

Preschool teachers' efficacy related to science activities (materials and methods used by the teacher, teacher's level of knowledge about practice, teacher's general level of knowledge about science activities, teacher behaviors sub-dimensions) were examined in terms of some variables (gender, level of education, seniority, type of school graduated from, type of school where they work, age group taught, taking a course on science teaching in preschool during their education and finding themselves competent in teaching science and nature).

The obtained data revealed that preschool teachers' efficacy regarding science activities in all sub-dimensions were at a high level. According to the mean scores of the preschool teachers whose efficacy related to science activities were examined, it was observed that the sub-dimension with the lowest mean was the teacher's behaviors sub-dimension and the sub-dimension with the highest mean was the teacher's level of knowledge about science activities. According to this finding, it can be interpreted that although teachers have a high level of knowledge about science activities, they have difficulty in reflecting this knowledge in their behaviors. There are literature studies that are directly proportional to this result (Özbey, 2006; Türkyılmaz, 2018). Examining the relationship between preschool teachers' science activity efficacy and the basic scientific processes of 60-72-month-old children, Özoğlu (2020) reached the same results as this study and concluded that the general knowledge level of preschool teachers regarding science activities among the sub-dimensions was higher than the other sub-dimensions, while teacher behaviors were the sub-dimension with the lowest level of competence.

When the relationship between preschool teachers' efficacy related to science activities according to gender variable was examined, no significant difference was found between them. According to this finding, it was observed that whether preschool teachers were male or female did not affect their efficacy related to science activities and did not create a significant difference. Can & Şahin (2015), in a study conducted with pre-service teachers, observed that there was no effect on teachers' science attitudes and science activity efficacy in terms of gender.

When the relationship between the data collected to measure preschool teachers' efficacy in science activities and educational level was examined, a significant difference was found. According to this difference, the average competence scores of preschool teachers with associate's degrees are lower than the average scores of preschool teachers with bachelor's and master's degrees. It is thought that the lower level of efficacy of associate degree graduate teachers regarding science activities is due to the fact that the education they receive during their education process is short and has less content compared to other education levels.

No significant difference was found in the behaviors of the teacher sub-dimension of the scale used to determine the participants' efficacy related to science activities according to the education level variable. According to this finding, preschool teachers' behaviors do not change with the factor of education level and they have behaviors at a similar level.

It was concluded that the data collected with the scale used to determine the science efficacy of preschool teachers showed a significant difference in the sub-dimensions of "materials and methods" and "teacher's level of knowledge about practice". The findings showed that science efficacy increased as the level of education increased. It can be interpreted that preschool teachers with master's degrees choose more qualified materials and methods due to the quality of the education they receive and that these teachers have a high level of competence. On the other hand, associate degree graduates may have low knowledge efficacy in practice because they are subjected to shorter practice training time and course content.

When the relationship between preschool teachers' efficacy related to science activities and years of seniority was examined, no statistical difference was found between them. The data obtained showed that the new teacher and the specialized teacher have the same efficacy related to science activities. As a different interpretation, it can be interpreted that teachers who are not contented with their previous knowledge in their profession and leave themselves open to self-improvement (due to the fact that they focus on improving their science activity efficacy with the additional training they receive) did not observe any difference between them and newly graduated teachers in terms of science activity efficacy. When the literature studies were examined, similar results were obtained in studies conducted with preschool teachers (Elmas & Kanmaz, 2014; Uğraş et al., 2013; Türkyılmaz, 2018). This may be due to the individuality of the knowledge related to the implementation of science activities and it is usual that there is no difference in the year of professional seniority variable. In the study, they found parallel

results to these studies and reported that the year of professional seniority did not have an effect on their efficacy related to science activities.

No significant difference was found in the data collected with the scale of preschool teachers' efficacy for science activities according to their efficacy for science activities depending on the type of school they graduated from. Türkyılmaz (2018) reached a conclusion parallel to this study and suggested that the efficacy related to science activities did not change according to the type of school they graduated from and that this result was due to individual factors.

There is a statistical difference in the sub-dimension of the efficacy scale related to science activities in the sub-dimension related to the teacher's practice. This difference is between the group of teachers who graduated from other institutions and those who graduated from the undergraduate preschool teaching department and undergraduate child development department. The difference is due to the fact that the average scores of preschool teachers who graduated from other institutions are lower than the average scores of preschool teachers who graduated from the undergraduate preschool teaching department and undergraduate child development department. It is thought that preschool teachers who graduated from other institutions did not receive sufficient training to implement science activities during their education. Since preschool teachers who graduated from other institutions do not realize that their knowledge of how to implement science activities is not at a sufficient level, support can be provided with the necessary trainings to make them aware of this situation. A significant difference was found between the other sub-dimension, teacher's knowledge about science activities, and the type of school graduated from. The knowledge of preschool teachers who graduated from the Department of Child Development of vocational school is more inadequate than the knowledge of teachers who graduated from the Department of preschool teaching and the knowledge of teachers who graduated from the Department of child development. Preschool teachers who graduated from vocational colleges may have an inadequate level of knowledge about science activities due to the fact that they receive an education with less content in the course curriculum. In this type of variable, which is parallel to the level of education, it was observed that in school types where the quality of educational content increased, the efficacy related to science activities increased in parallel. Özbey & Alisinanoğlu (2010), unlike the results of this study, concluded that the type of school graduated from did not affect science activity efficacy. They attributed this to the fact that many teachers who graduated from girls' vocational high schools or open education only work in the private sector. They also stated that they felt that they had to improve themselves in order to continue working in the private sector.

When the relationship between preschool teachers' competences related to science activities and the type of school they work in was analysed, no statistical difference was found between them. When the relationship between the sub-dimensions of the scale and the school of employment was analysed, no difference was observed in all sub-dimensions according to the school of employment variable. It was found that no matter where the preschool teachers work, their competences regarding science activities do not change and they have a high level of competence. It is thought that the reason for this

is that the individual's own competence was measured in this study and environmental factors were not measured. Before starting the study, it was taken into consideration that the facilities of the schools were different and although it was thought that this situation would affect the science activity competence, it was concluded that it did not affect the preschool teachers' competence in science activities. As in this study, there are studies with parallel results that the type of school does not affect science activity competence (Gömleksiz & Serhatlıoğlu, 2013; Türkyılmaz, 2018; Özbey, 2006).

According to another result of the study, it was found that there was no significant difference between the relationship between preschool teachers' competences related to science activities and the age group in which preschool teachers taught. A significant difference was found in favour of the 5-year age group in the sub-dimension of materials and methods used by the teacher, one of the sub-dimensions of science activity efficacy. According to this finding, the competences of the teachers working in the 5 age group for science activities were higher in the sub-dimension of materials and methods used by the teacher than the teachers working in the 3 age group. Since the materials and methods used by teachers in the 5-year age group are more concrete or have more options, it can be said that they are at a higher level because they offer teachers the chance to increase their competences. Türkyılmaz (2018) obtained exactly the same results as this study, but as a different interpretation, he attributed the higher level of practical competences of teachers working with older age groups to the fact that children in this age group are ready for primary education and have a higher level of development.

When the relationship between preschool teachers' competences related to science activities and the variable of "taking a course on science" was examined, a statistical differentiation was found. According to this differentiation, preschool teachers who took courses on science education during their education have more competence level than those who did not. When the sub-dimensions were examined, a significant differentiation was found in the sub-dimensions of "teacher's knowledge level about practice", "general knowledge level" and "teacher behaviours". The differentiation is in favour of pre-school teachers who took a course on science education. It was concluded that teachers who took courses on science education during their education had high knowledge competences for practice. When preschool teachers take a course on science education, they increase their level of knowledge about how they should implement science activities and increase their competence in behaviours while implementing. According to these results, it can be said that taking a course on science education contributes positively to the science competences of preschool teachers. Unlike this study, Özoğlu (2020) also concluded that taking a course did not lead to any differentiation, but in parallel, a differentiation was found in favour of the teachers who took a course on science education in the sub-dimension of teacher behaviours.

When the relationship between preschool teachers' competences related to science activities and their self-efficacy in science teaching was analysed, no significant difference was found. A statistically significant difference was found in the sub-dimension of "materials and methods" used by the teacher among the sub-dimensions of the scale of competences related to science activities in terms of finding

oneself sufficient in science teaching. There is a significant difference between preschool teachers who find themselves sufficient in science and nature teaching and preschool teachers who find themselves somewhat sufficient and insufficient. This difference is in favour of pre-school teachers who find themselves sufficient in teaching science and nature. In this way, pre-school teachers who are self-confident and self-sufficient increase their level of competence in science activities at a qualified level. In the sub-dimension of "teacher behaviours" during the implementation, a statistical difference was found in the case of finding oneself competent in science teaching. There is a significant difference between preschool teachers who find themselves sufficient in science and nature teaching and preschool teachers who find themselves somewhat sufficient and insufficient. This difference is in favour of preschool teachers who find themselves adequate in teaching science and nature. It can be interpreted that preschool teachers who consider themselves sufficient in science activities increase their self-belief and thus improve their efficacy by easily reflecting their situations to their behaviours. In parallel with this study, there are studies in which the competence levels of the participants who found themselves competent were high (Akçay, 2022; Çakır, 2012; Güler & Bıkmaz, 2002; Gömleksiz & Serhatlıoğlu, 2013).

As a result, preschool teachers' competences related to science activities were found to be at a high level according to all types of variables. In spite of the high level, there were significant differences in some variables and these differences caused a difference in the level of competences related to science activities. However, in general, preschool teachers' competences related to science activities are at a high level. It was concluded that preschool teachers' gender, years of seniority and the type of school in which they worked did not show a significant difference, but they positively affected their competences. In the relationships where there was a significant difference, this difference was in favour of preschool teachers who had a longer education period, who found themselves competent, who had a higher age level, who took science courses and who found themselves competent. According to this finding, the pre-school teachers who had the most opportunities to receive education on science and who were self-confident about science education had higher levels of competence.

4.3. Conclusion and Discussion on the Investigation of the Relationship Between Preschool Teachers' Epistemological Belief Levels and Their Efficacy Regarding Science Activities in Terms of Some Variables

The relationship between preschool teachers' epistemological belief levels and their competence levels related to science activities was examined. As a result of the research:

A moderate, negative and significant relationship was found between preschool teachers' epistemological beliefs and their efficacy related to science activities. It is accepted that the lower the scores of preschool teachers from the epistemological belief scale, the higher their beliefs are. As a result, preschool teachers with high levels of epistemological beliefs also have high levels of science activity efficacy. A moderate, negative and significant relationship was found between epistemological beliefs and the sub-dimension of materials and methods used by the teacher; a moderate, negative and

significant relationship was found between epistemological beliefs and the sub-dimension of materials and methods used by the teacher; a moderate, negative and significant relationship was found between the teacher's level of knowledge about implementation; a moderate, negative and significant relationship was found between the teacher's general level of knowledge about science activities; and a low level, negative and significant relationship was found between the teacher's behaviours during implementation.

A moderate, negative and significant relationship was found between preschool teachers' belief that learning depends on effort and their efficacy for science activities. In other words, when the scores of preschool teachers' beliefs that learning depends on effort increase, their scores on the scale of their efficacy for science activities decrease. In other words, preschool teachers with high level of belief that learning depends on effort have high level of efficacy for science activities. As a result, it can be said that teachers who believe that learning depends on effort have the competence of using materials and methods and general knowledge levels for science activities.

There is a low level, negative and significant relationship between preschool teachers' "belief that learning depends on ability" and their "competences related to science activities". According to this relationship, as the score of preschool teachers' belief that learning depends on ability increases, the score of their competences related to science activities decreases. In other words, preschool teachers who believe that learning depends on ability have high efficacy for science activities. When preschool teachers believe that learning depends on ability, it affects and increases the level of knowledge about the application of science activities and the level of general knowledge about science activities, albeit at a low level.

There was no relationship between the "belief that there is only one truth" sub-dimension of the epistemological beliefs scale and only the "teacher's behaviours" sub-dimension of the efficacy for science activities scale; a low level negative relationship was found with the other sub-dimensions. The efficacy of preschool teachers who believe that there is only one truth decreases, albeit at a low level.

As a result, when preschool teachers' epistemological beliefs are at a developed/matured level, this development contributes positively to the materials and methods they use in science activities, to increase their knowledge about science activities and to their behaviours during implementation in terms of competence.

In this study, the predictive relationship between preschool teachers' epistemological beliefs and their level of competence in science activities was examined. As a result of the study, the strongest predictor of preschool teachers' efficacy levels related to science activities was the belief that learning depends on effort sub-dimension of their epistemological belief sub-dimensions. On the other hand, epistemological beliefs are significant and high level predictors of teacher's behaviours competence among the efficacy related to science activities. Epistemological beliefs predicted 54.7% of teacher behaviours during implementation. Among the two variables mentioned above, preschool teachers' epistemological beliefs predicted their efficacy for science activities at the level of 25.2%. According to

these findings, it is seen that the belief that learning depends on effort is the first, the belief that learning depends on ability is the second and the belief that there is only one truth is the third important predictor. In short, epistemological beliefs have a significant effect on students' competences related to science activities.

RECOMMENDATIONS

The suggestions that emerged as a result of the study on examining the relationship between preschool teachers' epistemological beliefs and their efficacy related to science activities in terms of some variables are presented below.

1. Preschool teachers' epistemological beliefs did not differ according to gender, type of school graduated from, type of school employed, age group educated and finding oneself competent in doing science activities; their efficacy related to science activities did not differ according to gender, seniority and school employed. The study can be supported with qualitative studies by interviewing preschool teachers about the reasons for this finding.

2. Considering that preschool teachers' efficacy related to science activities are influenced by their epistemological beliefs, it is recommended that preschool teachers should be trained to develop and mature their epistemological beliefs.

3. Based on the finding that preschool teachers' education levels affect teacher beliefs and competences, attempts can be made to increase the education levels of teachers.

4. Based on the finding that preschool teachers who receive science education in their education processes have more developed beliefs and competences, the course on science education should be included and diversified in the education processes.

5. The sample of this study includes preschool teachers in Gaziantep province. By using different sampling methods, a large sample of preschool teachers working in Turkey or in many different provinces can be formed.

6. In the study, quantitative research method was used among research methods. Studies using mixed research methods and qualitative research methods different from this research can be designed.

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GENİŞLETİLMİŞ TÜRKÇE ÖZET

OKUL ÖNCESİ ÖĞRETMENLERİNİN EPİSTEMOLOJİK İNANÇLARI İLE FEN ETKİNLİK YETERLİKLERİ ARASINDAKİ İLİŞKİNİN BAZI DEĞİŞKENLER AÇISINDAN İNCELENMESİ

Giriş ve Araştırma Problemleri ve Amaç:

Literatür incelendiğinde genel olarak öğretmenlerin epistemolojik inançlarını bilmenin ne kadar önemli olduğundan bahsedilse de "okul öncesi öğretmenlerinin epistemolojik inançları" ile farklı değişkenler arasındaki ilişkiyi inceleyen çok az çalışma bulunmaktadır (Bedel ve Çakır, 2012; Gümüştekin, 2019; Şahin, 2021). Ayrıca öğretmenlerin epistemolojik inançları ile fen etkinliklerindeki yeterlikleri arasındaki ilişkiyi araştıran herhangi bir çalışmaya rastlanmamıştır. Bu çalışmanın temel amacı okul öncesi öğretmenlerinin epistemolojik inançları ile fen etkinliklerine ilişkin yeterlikleri arasındaki ilişkiyi bazı değişkenler açısından incelemektir. Fen eğitiminde kullanılan etkinliklerin önemli olduğu bir süreçte okul öncesi öğretmenlerinin epistemolojik inançlarını ve fen etkinliklerine ilişkin yeterliklerini inceleyen bir çalışma bulunmadığından bu çalışmanın alan yazına nitelikli bir katkı sağlayacağı düşünülmektedir. Bu bağlamda araştırmanın problem cümlesi şu şekildedir: "Okul öncesi öğretmenlerinin epistemolojik inançları ile fen etkinliklerine ilişkin yeterlikleri arasında bir ilişki var mıdır?" alt problemler ise şu şekilde sıralanmıştır:

- Okul öncesi öğretmenlerinin epistemolojik inanç düzeyleri ne düzeydedir?
- Okul öncesi öğretmenlerinin epistemolojik inançları;
    - Cinsiyet,
    - Mesleki kıdem yılı,
    - Öğrenim Durumu (Lise, Önlisans, Lisans, Yüksek Lisans, Doktora, Diğer),
    - Mezuniyet Fakültesi (Sağlık Meslek Yüksekokulu, Eğitim Fakültesi, Diğer)
    - Mezun olunan Bölüm (Çocuk Gelişimi ve Eğitimi, Okul Öncesi Öğretmenliği, Diğer)
    - Pozisyonun bulunduğu okul türü,
    - Fen bilgisi eğitimi alıp almama (Evet, Hayır)
    - Fen ve doğa öğretiminde kendilerini yeterli bulup bulmama değişkenlerine göre farklılık göstermekte midir?
- Okul öncesi öğretmenlerinin fen etkinliklerine ilişkin yeterlilikleri ne düzeydedir?
- Okul öncesi öğretmenlerinin fen etkinliklerine ilişkin yeterlilik düzeyleri;
    - Cinsiyet,
    - Mesleki kıdem yılı,
    - Eğitim Düzeyi
    - Mezuniyet Fakültesi

- Mezun olunan bölüm
- Okul türü
- Fen bilgisi eğitimi alıp almama (Evet, Hayır)
- Fen ve doğa öğretmeyi yeterli bulup bulmama değişkenlerine göre farklılık gösteriyor mu?

- Öğretmenlerin epistemolojik inançları ile fen etkinlikleri yeterlik düzeyleri arasında anlamlı bir ilişki var mıdır?
- Öğretmenlerin epistemolojik inançları fen etkinlikleri yeterlik düzeylerini yordamakta mıdır?

Literatür Taraması:

Okul öncesi dönemde çocuklar çevreye karşı oldukça meraklıdır ve bu merakı gidermeye çalışırlar (MEB, 2013). Yapılan araştırmalara göre 1-4 yaş arası çocukların beyinlerinin matematik ve mantık öğrenmeye oldukça açık olduğu ve gelecekteki matematik becerileri açısından oldukça önemli olduğu görülmektedir (Chesloff, 2013). Bu verilere dayanarak okul öncesi dönemde çeşitlendirilmiş etkinlikler arasında fen etkinliklerine yoğun bir şekilde yer verilmelidir.

Çocuklar hayatlarındaki en önemli kavramları okul öncesi dönemde öğrenmeye başlarlar ve okul öncesi çocuklarda keşfetme isteği çocukların bu kavramları öğrenmesi için en önemli yaşam aktivitelerinden biridir (Çetin vd., 2012). Okul öncesi dönemdeki çocuklar, rutin olarak yaptıkları etkinliklerin dışında, kendileri yaparak ve deneyimleyerek deneyimledikleri farklı etkinlik türlerini daha kolay içselleştirirler (Çetin vd., 2012). Okul öncesi dönemde fen eğitimi ile çocuğun eğitimde aktif olması ve birçok deneyim kazanması, çocuğun dünyayı sorgulayarak ve araştırarak tanıması, çocuğun estetik becerileri, dikkat becerisi, bilimsel düşünme becerisi ve diğer becerilerinin gelişmesi sağlanır (Alisinanoğlu vd., 2015).

Okul öncesi dönemdeki fen eğitimi, çocukları bir mesleğe hazırlamak yerine, temel ihtiyaç becerilerini geliştirerek, dünyayı tanımalarını ve hayata daha kolay uyum sağlamalarını amaçlamaktadır (Aksüt, 2015). Şahin (1998) okul öncesi dönemde fen eğitiminin amacını çocukların çevrelerini anlamlandırıp tanımlamalarını, kendilerini korumalarını, bilimsel düşünme becerilerini geliştirmelerini, fiziksel yeterlilik kazanmalarını ve problem çözme becerilerini geliştirmelerini sağlamak olarak tanımlamıştır. Çocukların eğitim açısından gelişimi, sosyal ve beceri gelişimi okul öncesi dönemde fen eğitimi verilerek sağlanır (Hamurcu, 2003). Fen eğitiminin temel amacı çocuklara birinci elden deneyim kazandırmak ve etraflarındaki olay ve nesneleri ilk kaynaktan araştırmalarını sağlamaktır (Güler ve Bıkmaz, 2002). Bu bilgiler doğrultusunda okul öncesi dönemde fen eğitiminin önemi ortadadır ve fen ile ilgili kavramların temeli bu dönemde atılmaktadır. Bugüne kadar fen eğitimi ile ilgili yapılan çalışmalarda fen eğitiminin okul öncesi dönemden itibaren sürdürülmesi gerektiği konusunda görüş birliği bulunmaktadır (Durdu, 2010; Öztürk, 2010).

İçerik açısından oldukça zengin olan okul öncesi fen eğitiminin çocuklara sunulmasında bazı sorunların yaşandığı görülmektedir. Bu sorunların aşılabilmesi için öncelikle öğretmenlere odaklanılması gerekmektedir. Oldukça önemli olan bu eğitimin verimli olabilmesi için öğretmenin her konuda donanımlı olması ve bu donanımı uygulamaya koyması gerekmektedir.

Öğretmenlerin bilginin doğasının mutlak doğrular ve yanlışlardan oluştuğuna ve değişmeyeceğine olan inançları, öğrencilerin bilgiyi kendileri yapılandırarak gerçek bilgiye ulaşmalarını engelleyecektir. Öğretmenin bilgi aktarıcısı olmasını sağlayacaktır. Tam tersi durumda ise öğrenciler öğretmen sayesinde bilgiyi kendileri yapılandıracak ve bilginin değişebileceğini fark ederek onları bilgiyi öğrenciler tarafından oluşturmaya teşvik edeceklerdir (Şaşmaz, 2019).

Okul öncesi öğretmenlerinin epistemolojik inançlarının bilinmesi, öğretmenin uyguladığı programın analiz edilmesini sağlayacak ve verimli bir eğitim süreci sağlayacaktır. Literatürde okul öncesi öğretmenlerinin epistemolojik inançları" ile farklı değişkenler arasındaki ilişkiyi inceleyen çok sınrlı çalışmaya rastlanmıştır (Bedel ve Çakır, 2012; Gümüştekin, 2019; Şahin, 2021). Ayrıca öğretmenlerin epistemolojik inançları ile fen etkinliklerindeki yeterlikleri arasındaki ilişkiyi araştıran herhangi bir çalışma bulunmamaktadır. Bu çalışmanın temel amacı ise; okul öncesi öğretmenlerinin epistemolojik inançları ile fen etkinliklerine ilişkin yeterlikleri arasındaki ilişkiyi bazı değişkenler açısından incelemektir.

Yöntem/Desen:

Bu çalışma "ilişkisel tarama modelinin" kullanıldığı betimsel bir çalışmadır. İlişkisel tarama modeli, ayrı ayrı veriler toplanarak varlığı veya miktarı belirlenen değişkenlerin birlikte değişip değişmediğinin, değişim varsa nasıl oluştuğunun belirlenmek üzere ilişkisel analize tabi tutulduğu bir modeldir (Karasar, 2012).

Araştırmanın evrenini 2021-2022 eğitim-öğretim yılında Gaziantep ilinde Milli Eğitim Bakanlığına bağlı resmi okullarda görev yapan 1000 okul öncesi öğretmeni oluşturmaktadır. Araştırmada örnekleme amacıyla ″basit tesadüfi örnekleme yöntemi″ kullanılmıştır. Bu çalışmada örneklem büyüklüğünün 213 olması evreni temsil etmesi açısından güvenilir kabul edilmektedir (Yazıcıoğlu ve Erdoğan, 2004).

Araştırmada veri toplama aracı olarak "Kişisel Bilgi Formu", "Epistemolojik İnançlar Ölçeği" ve "Okul Öncesi Öğretmenlerinin Fen Etkinliklerine İlişkin Yeterliliklerini Belirleme Ölçeği" kullanılmıştır.

Öncelikle verilerin normallik varsayımları Kolmogorov-Smirnova ve Shapiro-Wilk normallik testleri ile incelenmiştir. Elde edilen sonuçlara göre veriler normal dağılım göstermediğinden araştırmada parametrik olmayan testler kullanılmıştır.

Verilerin analizi sürecinde bilgi formunda yer alan sorulardan elde edilen sonuçların frekans dağılımları hesaplanmış ve Tablolar halinde sunulmuştur. Ölçeklerden elde edilen veriler üzerinde demografik özelliklerin etkisini ölçmek amacıyla ikili karşılaştırmalarda Mann-Whitney U testi, çoklu karşılaştırmalarda Kruskal-Wallis H testi, ölçekler arasındaki ilişkiyi ölçmek amacıyla ise Pearson testi kullanıldı. Ürün Moment Korelasyon Katsayısı analizi tekniği kullanıldı.

Tartışma ve Sonuç

Okul öncesi öğretmenleri ile yapılan erkek katılımcıların az olduğu çalışmada; eğitim düzeyleri incelendiğinde katılımcıların en az doktora, en fazla lisans derecesine sahip olduğu, katılımcı

öğretmenlerin kıdem yılının 0-5 yıl (%32,4) arasında olanlarının diğer kıdem yıllarına göre yüksek olduğu görülmüştür. Katılımcıların %84,5'inin fen bilgisi eğitimi aldığı ancak "fen ve doğa öğretiminde kendini yeterli bulma" değişkeni incelendiğinde öğretmenlerin %51,2'sinin kendini yeterli bulduğu belirtildi. Katılımcı öğretmenlerin çok az bir kısmı (%6,6) bu konuda kendilerini yetersiz bulduğunu belirtmiştir.

Araştırma sonucuna göre okul öncesi öğretmenlerinin gelişmiş/olgun epistemolojik inançlara sahip olduğu ve bu inançlar doğrultusunda fen etkinliklerine ilişkin yeterliliklerinin de yüksek olduğu tespit edilmiştir. Bu sonuçlar okul öncesi öğretmenlerinin bilgiyi araştırdıklarında, bilginin nasıl elde edildiğini araştırıp kendi yorumlarını eklediklerinde ve uyguladıklarında, fen etkinliklerini işleve geçirme noktasında daha verimli ve yeterli olduklarını göstermektedir. Bu sonuçlara ek olarak yapılan regresyon analizi sonucunda, epistemolojik inançların fen etkinliklerine ilişkin yeterliklerini yordadığı ve açıkladığı tespit edilmiştir.

Çalışma sonucunda aşağıdaki maddeler önerilebilir;

1. Okul öncesi öğretmenlerinin epistemolojik inançlarının cinsiyete, mezun olunan okul türüne, görev yapılan okul türüne, öğrenim gördüğü yaş grubuna ve fen etkinlikleri yapma konusunda kendini yeterli bulma durumuna göre farklılaşmadığı; fen etkinliklerine ilişkin yeterlilikleri cinsiyete, kıdeme ve okudukları okula göre farklılık göstermemektedir. Bu bulgunun nedenleri konusunda okul öncesi öğretmenleriyle görüşme yapılarak çalışma nitel çalışmalarla desteklenebilir.

2. Okul öncesi öğretmenlerinin fen etkinliklerine ilişkin yeterliklerinin epistemolojik inançlarından etkilendiği göz önüne alındığında, okul öncesi öğretmenlerinin epistemolojik inançlarını geliştirecek ve olgunlaştıracak şekilde eğitilmesi önerilmektedir.

3. Okul öncesi öğretmenlerinin eğitim düzeylerinin öğretmen inanç ve yeterliliklerini etkilediği bulgusundan hareketle öğretmenlerin eğitim düzeylerinin artırılmasına yönelik girişimlerde bulunulabilir.

4. Eğitim süreçlerinde fen eğitimi alan okul öncesi öğretmenlerinin inanç ve yeterliliklerinin daha gelişmiş olduğu bulgusundan hareketle fen eğitimi dersinin eğitim süreçlerine dahil edilmesi ve çeşitlendirilmesi gerekmektedir.