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Investigation of Prospective Preschool Teachers' Skills of Evaluating the Learning Outcomes in the Preschool Curriculum in Terms of Scientific Process Skills

Okulöncesi Öğretmen Adaylarının Okul Öncesi Eğitim Programında Yer Alan Kazanımları ve Göstergeleri Bilimsel Süreç Becerileri Açısından Değerlendirebilme Becerilerinin İncelenmesi

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ABSTRACT

This study aimed to investigate prospective preschool teachers' ability to evaluate the learning outcomes and indicators in the preschool curriculum in terms of scientific process skills. A case study and purposeful sampling method were preferred in the study. This study involved 78 prospective preschool teachers studying at a private university in the Turkish Republic of Northern Cyprus in the fall semester of the 2019–2020 academic year. The data source for the study is the documents created by prospective preschool teachers. In this study, they were first given theoretical and then applied training about scientific process skills. Parallel to this, three interrelated learning outcomes in cognitive development in the 2013 Turkish Preschool Curriculum were examined together with prospective teachers, and applied training on what the scientific process skills were in them was carried out. Then, each prospective teacher was asked to examine and classify the learning outcomes and indicators in the cognitive development domain in terms of scientific process skills. The data gathered during the study were analyzed using the document analysis method. As a result of the data analysis, it was found that they can classify the learning outcomes and indicators included in the curriculum in terms of basic and intermediate scientific process skills. Moreover, it was understood that the views of the prospective preschool teachers on the science process skills, which they stated to be included in the learning outcomes in general, and the views of the experts were parallel to each other.

Keywords: Preschool curriculum, prospective teachers, scientific process skills

ÖZ

Bu çalışmada okulöncesi öğretmen adaylarının, okul öncesi eğitim programında yer alan kazanım ve göstergeleri bilimsel süreç becerileri açısından değerlendirebilme becerilerinin incelenmesi amaçlanmıştır. Çalışmada durum çalışması yöntemi ve örnek seçiminde amaçlı örnekleme tercih edilmiştir. Kuzey Kıbrıs Türk Cumhuriyeti'nde yer alan bir özel üniversitede öğrenim görmekte olan 78 okulöncesi öğretmen adayı bu çalışmanın örneklemini oluşturmaktadır. Çalışmanın veri kaynağı, okulöncesi öğretmen adaylarının oluşturduğu dokümanlardır. Çalışma kapsamında öğretmen adaylarına öncelikle bilimsel süreç becerileri hakkında teorik ve uygulamalı eğitimler verilmiştir.Buna paralel olarak, 2013 Türkiye Okul Öncesi Eğitim Programında yer alan bilişsel gelişim öğrenme alanında yer alana birbiriyle ilişkili üç kazanım öğretmen adayları ile birlikte incelenmiş ve bu kazanımlarda vurgulanan bilimsel süreç becerilerinin neler olduğu konusunda uygulamalı eğitimler gerçekleştirilmiştir. Ardından her bir öğretmen adayından okul öncesi eğitim programında yer alan bilişsel gelişim kazanımları ve göstergeleri bilimsel süreç becerileri açısından incelemesi ve sınıflandırması istenilmiştir. Araştırma kapsamında toplanan veriler doküman analizi yöntemiyle analiz edilmiştir. Verilerin analizi sonucunda öğretmen adaylarının, eğitim

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programında yer alan kazanım ve göstergeleri bilimsel süreç becerileri açısından değerlendirebildikleri ve sınıflandırabildikleri tespit edilmiştir. Dahası, öğretmen adaylarının genel olarak kazanımlarda yer aldığını belirttikleri bilimsel süreç becerilerine ilişkin görüşleri ile uzmanların görüşlerinin birbirine paralel olduğu anlaşılmıştır.

Anahtar Kelimeler: Okul öncesi eğitim programı, öğretmen adayları, bilimsel süreç becerileri,

Introduction

Learning is a long-term process that continues throughout life. Learning takes place quickly, especially in the preschool period. The preschool period is a process in which children's brain development is faster, their perception level is higher, and they can learn everything and every new information in a short time. In this way, while children develop their knowledge base, they also realize their potential. This is due to the intense interest and curiosity of the children, who do not have much information about their environment yet, while trying to understand the world in this state of uncertainty (Duran & Ünal, 2016, as cited in Gillingham, 1993). This curiosity allows children to interact with their environment. This interaction is actually a natural result of the development process and is their first learning experience (Büyüktaşkapu et al., 2012). During these learning experiences, children learn about what is happening in their environment and adapt to life. For this reason, it is important to teach science, which has an important place in children's understanding of nature from an early age.

Science is an effort to understand and make sense of nature and the universe at the same time discovering what natural events are and what the causes behind them are (Drons & Given, 2005; Tsung-Hui, 2001). This is essentially similar to children's efforts to understand the world and their environment because children begin to learn a lot about their surroundings with their instincts to discover and learn from the first moment they open their eyes to the world. Within this, children from an early age try to observe the events around them with their curiosity, interpret the events they observe and find answers to the questions they are curious about, and construct nature and natural phenomena in their minds as they find answers to their questions (Bingöl & Ünal, 2019). In this context, science offers children opportunities to increase their innate curiosity and explore the natural world (Mulyeni et al., 2019).

For scientists, science is the process of conceptualizing the facts and events in nature and revealing their reasons, while for children, science is to develop a thinking system as well as the effort to discover what is happening around them as a result of countless experiences. When we, as adults, pay attention to the young children around us, we see that they constantly ask us questions such as "why" about the events they encounter, and they continue to ask these questions until they get a satisfactory answer. Sometimes, we have observed that children play with the worms they find in the soil, watch the behavior of ants in a tree, or smell a flower they find in nature, in other words, they tend to connect with nature. These experiences of children are as valuable as the efforts and studies of scientists and form the essence of children's basic understanding of science (Kuru & Akman, 2017; Trundle, 2010). During these experiences, children explore the world and their environment by using their senses and asking questions, just as scientists do (Armga et al., 2002; Ayvacı, 2010; Conzeio & French, 2002; Trundle, 2010). Therefore, many of the events and phenomena that children notice with the help of their five senses are the subject of science, and in this way, children begin to learn science consciously or unconsciously (Şahin et al., 2018). In fact, there are two main reasons for teaching children science starting from the preschool period. The first of these is the tendency of children to observe nature and to think about it, as we mentioned above (Eshach & Fried, 2005; Ramey-Gassert, 1997). The second is that children are ready to acquire many skills by making observations, establishing a cause–effect relationship between the concepts or phenomena they observe, using research instincts, and measuring, that is, by using scientific processes (Ayvacı, 2010; Ünal & Akman, 2006). In this context, although it is a factor that starts curiosity in the processes of children acquiring information about their environment, the main driving force here is the reasoning ability that can only be satisfied with deliberate activities such as asking questions, testing hypotheses, conducting research, and evaluating evidence (Jirout & Klahr, 2012; Morris et al., 2012). So, all scientific applications and reasoning abilities are expressed as scientific process skills.

Scientific process skills are one of the most important tools to learn about the world and organize the acquired knowledge (Balım et al., 2013; Ostlund, 1992). According to Özmen and Yiğit (2005), scientific process skills are the skills and thinking processes that are used to examine nature and natural phenomena and generate scientific knowledge. Moreover, scientific process skills are basic skills that facilitate learning in science, provide research methods, enable students to be active in learning, develop a sense of responsibility in their learning, and increase the permanence of learning (Çepni et al., 1996; Taşar et al., 2002). In addition, it can be said that scientific process skills are vital skills that enable us to approach the problems encountered in daily life from a scientific perspective and to use scientific research methods (asking questions, observing, experimenting, drawing conclusions, etc.). Moreover, they are skills that can be utilized in every aspect of life and at any time.

It is seen that different groups are made in the literature regarding what scientific process skills consist of and their levels. By some researchers, scientific process skills are divided into basic and high-level process skills (Aydoğdu, 2006; Brotherton & Preece, 1995; Germann et al., 1996; Karahan, 2006; Saat, 2004; Tatar, 2006; Zeren-Özer, 2011; Padilla, 1990). Basic process skills consist of observing, predicting, measuring, classifying, presentation, and drawing conclusion skills, while high-level skills include defining and controlling variables, hypothesizing, experimenting, expressing results based on data, drawing graphics, deducting, and modeling skills (Can & Şahin-Pekmez, 2010). Keil et al. (2009) classified scientific process skills as basic process skills such as observing, predicting, interpreting, measuring, classifying, and communicating, while integrated process skills such as controlling variables, hypothesizing, interpreting data, experimenting, and formulating. In addition, Çepni et al. (2006) examined scientific process skills in three main groups: basic, casual, and experimental skills. Basic skills include observing, measuring, classifying, recording data, and establishing a relationship between numbers and space. Causal skills include predicting, identifying variables, and drawing conclusions. Experimental skills include hypothesizing, modeling, experimenting, controlling variables, and drawing conclusions. On the other hand, Dönmez and Azizoğlu (2010), Lind (1998) and Meador (2003) examined scientific process skills at three levels. These are:

- basic process skills: observing, comparing, classifying, measuring, recording data, and communicating.
- intermediate process skills: deducing and predicting
- advanced process skills: establishing and testing hypotheses, defining and controlling variables.

In this study, the scientific process skill classification specified by Dönmez and Azizoğlu (2010), Lind (1998) and Meador (2003) was used. Although scientific process skills are classified in different ways by different authors in the literature, the common emphasis by researchers is the belief that basic process skills form the basis of process skills at higher levels (intermediate and advanced or integrated, or higher level, or causal and experimental) (Balım et al., 2013; Padilla, 1990; Rambuda & Fraser, 2004). Among the scientific process skills, which is a way of thinking, there is a hierarchical structure, although it is not strict (Ergin et al., 2005; Harlen, 1999). In other words, there is a parallelism between the development of each skill in scientific process skills and the cognitive (mental) development process, and higher-level scientific process skills can be seen in individuals with more advanced cognitive competence (Ercan-Özaydın, 2010; Ferreira, 2004). In this context, it is possible for students to acquire more complex scientific process skills together with their progressive educational experiences, in other words, their progressive grade levels (middle school, high school, etc.) and their cognitive development (Aydoğdu, 2009; Çepni & Çil, 2009; Ergin et al., 2005). In parallel with this, basic process skills are expected to be acquired by students at preschool and primary school levels, while intermediate and advanced scientific process skills are expected to be acquired by students at secondary and higher levels (Balım et al., 2013; Martin et al., 2005). Scientific process skills are the general definition of logical and rational thinking that an individual will use throughout his life, and because research, critical thinking, and decision-making skills contain the basic components of many skills, they can be transferred not only to science but also to other disciplines and have an important place on students' success, they should be gained by students from early childhood (Carin & Bassa, 2001; Charlesworüh & Lind, 2003; Ercan Özaydın, 2010; Padilla, 1990). In this context, it would be especially beneficial to examine what these scientific process skills are.

Observation is the first step to gathering information and is the essence of science teaching. It is also an essential skill of scientific process skills. Children benefit from their senses such as listening to sounds, tasting, and sniffing the sounds of everything they encounter and are interested in order to perceive objects, events, phenomena, and their behaviors and characteristics (Bentley et al., 2007; Carin et al., 2005; Charlesworth & Lind, 2010; Morrison, 2012; Rezba Sprague et al., 2005). Until children construct information in their minds, they experience it countless times. Children can also use tools such as magnifiers, telescopes, and microphones to support their senses during observation (Carin et al., 2005; Charlesworth & Lind, 2010). After observations, students go through the process of comparing and classifying objects according to their colors, shapes, sizes, etc. (Jackman, 2012). Classifying skill is the process of categorizing objects or events based on the characters or properties of those objects or events (Bentley et al., 2007). Classifying skills are very useful in organizing knowledge in science (Carin et al., 2005). In other words, classifying skill constitutes the basis of concept teaching. Measurement is the act of comparing an object, event, or phenomenon with a standard or non-standard unit (Hammerman, 2006). During an activity, students make measurements by using quantity (more-less, heavy-light, etc.) or numbers in order to identify objects or events, to make predictions about them or explain them (Bentley et al., 2007; Carin et al., 2005). The arrangement of the data obtained from these measurements in a way that appeals to the sensory organs such as pictures, graphics, and tables is called recording the data (Bağcı-Kılıç, 2003). Children acquire both qualitative and quantitative data during science activities and record how they affect each other in an event/phenomenon in regulatory forms (painting, drama, etc.) (Rezba et al., 1995). In fact, communicating skills are frequently used skill during observing, classifying, and recording data. When something is observed, how it is classified, and why it is classified, we often resort to communication skills when talking about the results we have reached (Martin et al., 2005). During group activities in children, their friends participate in the verbal or non-verbal communicating process by interacting with them, animating a drama, or painting. Predicting is the act of predicting/making judgments about things that may happen in the future based on past experiences or knowledge (Ayvacı, 2010). By comparing the events they have experienced in the past with the events they are experiencing now, children can predict how their situation works and why it works this way, and how it occurs by establishing cause–effect relationships (Senemoğlu, 1994). Moreover, children try to make generalizations based on their observations and experiences, which is called inference (Akman et al., 2003; Martin et al., 2005). For example, a child observing the sea may observe that some objects such as a ship are swimming in the water; observing that the different toys and belongings that are standing above fall when they fall into space and noticing the gravity of the child is an indication that they are using their inference skills. In fact, all these scientific process skills are skills that children unconsciously develop while playing games, feeding street animals, and watering a flower they notice in the garden so that it does not fade.

Although children have developed their scientific process skills with their natural curiosity and learning motivation in their natural learning environments, they still need the support of an adult (teacher) to construct these skills in their minds in a healthier way (Kuru & Akman, 2017; Torres and Vitti, 2007). Recently, debates on the effects of preschool education, especially science education in this period, on children's future lives have led researchers to work on this issue. Parallel to this, many studies have been conducted investigating the effects of various teaching methods and techniques on children's scientific process skills in preschool science education (Akman et al., 2003; Ayvacı, 2010; Büyüktaşkapu et al., 2012; Hachey & Butler, 2009; Kunt et al., 2015; Mulyeni et al., 2019; Öztürk, 2016; Sarıtaş, 2010; Ünal & Sağlam, 2018). As a result of these studies, the importance of using appropriate teaching methods and techniques in the process of teaching children scientific process skills in preschool science education was emphasized. Similarly, Akman et al. (2003), Ayvacı (2010), and Şahin et al. (2018) stated that in order to effectively teach scientific process skills to children, a good learning–teaching environment must be prepared, supporting this environment with organized activities.

Moreover, the attitudes of teachers who introduce children to science and the effect of their interactions with children in this context are important (Bartan & Başal, 2018; Ünal & Akman, 2006). Because the interests of teachers in science and the practices they perform at the point of teaching them are determinants of children's efforts to learn science and develop scientific process skills at later ages (Akman et al., 2003; Büyüktaşkapu et al., 2012; Kuru & Akman, 2017; Murpy & Smith, 2014). Therefore, it can be said that preschool teachers and prospective teachers have significant responsibilities. In parallel with this, studies on preschool science education have come across studies that investigate preschool teachers and prospective teachers to develop scientific process skills in children with science and nature activities or the competence, attitudes, and beliefs of preschool teachers and prospective teachers in the development of children's scientific process skills (Afacan & Selimhocaoğlu, 2012; Ayvacı et al., 2002; Bartan & Başal, 2018; Batı et al., 2010; Cho et al., 2003; Doğan & Kunt, 2016; Ekinci-Vural & Hamurcu, 2008; Erden & Sönmez, 2011; Garbett, 2003; İnan, 2010; Karamustafaoğlu & Kandaz, 2006; Kefi et al., 2013; Kıldan & Pektaş, 2009; Kuru & Akman, 2017; Logan, 2015; Olgan et al., 2014; Özbey & Alisinanoğlu, 2009; Saçkes, 2014; Saçkes et al., 2012). It can be understood from the results of these studies that the teacher plays an important role in providing children with scientific process skills in preschool science education. Moreover, some of these studies show that preschool teachers say they use scientific process skills, but the examples they give do not support this enough (Bartan & Başal, 2018; Kefi, 2014; Kefi et al., 2013). In this context, it can be said that it is important for preschool teachers to develop their field knowledge about basic science (physics, chemistry, etc.) and their pedagogical knowledge to plan and apply teaching activities about how to relate these basic knowledge to which skills (Ayvacı, 2010; Bartan & Başal, 2018; Kefi & Çeliköz, 2014; Kuru & Akman, 2017; Özbey & Alisinanoğlu, 2009, 2010). In parallel with this, it can be said that it is important to eliminate the lack of knowledge of preschool teachers and prospective teachers about scientific process skills, and it is important to provide training about what these process skills are for them and what applications they can do in their classrooms to gain them.

In addition, as stated in Eliason and Jenkins (2003) and Kuru and Akman (2017), science education should be made about life and integrated into the curriculum and teaching activities. Thus, teachers/prospective teachers can be guided about science education in the preschool period. In this context, when the studies in the relevant literature are examined, some studies that examine the activities in the curriculum and textbooks in terms of scientific process skills have been found. The first of these is the study titled "Examination of MEB preschool science activities in terms of scientific process skills" conducted by Bingöl and Ünal (2019). In this study, the opinions of preschool teachers about the scientific process skills in the Ministry of National Education (MNE) preschool education activity book were investigated. Another is evaluating the learning outcomes of the preschool curriculum carried out by Nuhoğlu and Ceylan (2012) in terms of scientific basic process skills. In this regard, whether the learning outcomes of the MNE Preschool Curriculum in 2006 meet the basic scientific process skills is examined in the context of the views of the academicians. In this context, considering the situation in the relevant literature and the increasing importance of science education and scientific process skills in the preschool period, it was decided to conduct this study. Therefore, this study aimed to examine the skills of prospective preschool teachers to evaluate the cognitive domain learning outcomes and indicators in the 2013 Turkish Preschool Curriculum in terms of scientific process skills. Parallel to this aim, the problem statement of this study is given as follows:

How are the prospective preschool teachers skills in evaluating the learning outcomes in the 2013 Turkey Preschool Education Program cognitive domain in terms of scientific process skills?

How is the harmony between the views of experts and the views of the prospective preschool teachers on the relationship between the 2013 Turkey Preschool Education Program cognitive domain learning outcomes and scientific process skills?

Methods

Research Design

In this study, the case study method was preferred because it was attempted to determine the skills of prospective preschool teachers to evaluate the cognitive development field learning outcomes in the preschool curriculum in terms of scientific process skills. The case studies aim to develop possible explanations about a subject and to evaluate an issue (Yıldırım & Şimşek, 2018).

Study Group

The sample of the study was determined by the purposeful sampling method. Groups studied in purposeful sampling are homogeneously divided into groups provided that they have similar characteristics, and purposeful sampling is inevitable in special research situations (Çepni, 2014). In this context, when the sampling group was formed, attention was paid to the prospective teachers who were studying preschool teaching, early childhood science education, or preschool science education. In this context, 78 candidate preschool teachers studying at a private university in the Turkish Republic of Northern Cyprus in the fall semester of the 2019–2020 academic year constitute the sample of this study. The demographic characteristics of the participants are given in Table 1.

The study shown in Table 1 consists of 58.97% female and 41.03% male prospective preschool teachers.

Data Collection Tools and Processes

In this study, first, theoretical and applied training about scientific process skills were given to prospective teachers within the scope of "Early Childhood Science Education" and preschool "Science Education" courses. All of this training was given by a faculty member who has a bachelor's, master's, and doctorate in Science Education. In this context, first, scientific process skills especially the basic process skills that should be gained by students in the preschool period were explained to prospective teachers through examples. At the same time, a few practical activities were carried out in the classroom in order to develop these skills in prospective teachers. Moreover, while explaining scientific process skills, examples of activities related to how preschool students

Table 1.
Demographic Data on Prospective Preschool Teachers

Gender	*n*	%
Female	46	58.97
Male	32	41.03
Total	78	100

can acquire these skills are also included. Then, three interrelated learning outcomes in cognitive development in the 2013 Turkish Preschool Curriculum were examined together with prospective teachers, and applied training on what the scientific process skills were in them was carried out. After this stage, each prospective teacher was asked to examine and classify 21 cognitive development learning outcomes in the preschool curriculum and the indicators related to these learning outcomes in terms of scientific process skills. Candidate teachers were given 4 days to do this work. Subsequently, prospective teachers were asked to upload the documents related to scientific process skills they created to the relevant page opened in Moodle LMS within the scope of the course (https://moodle.ciu.edu.tr/mod/assign/view.php?id=63947). In this context, the source of the study's data is the documents related to scientific process skills created by preschool prospective teachers.

Data Analysis

The data collected within the scope of the research were analyzed using the document analysis method. Before the analysis, the table regarding the relationship between the learning outcomes and scientific process skills of the 2013 preschool curriculum, which Bingöl and Ünal (2019) included in their study titled "Examination of MNE's preschool science activities in terms of scientific process skills," was examined. Information on this is given in Table 2.

Table 2.
Learning Outcomes Including Scientific Process Skills (Bingöl & Ünal, 2019, s.162)

Scientific Process Skills	2013 Preschool Curriculum
Observing	Learning outcome 1. Pays attention to object/situation/event. Indicators: 1. It focuses on the object/situation/event that needs attention. 2. Asks questions about the object/situation/event that caught his attention. 3. Explain in detail the object/situation/event that caught his attention. Learning outcome 3. Remembers what is perceived. Indicators: 1. Retells the object/situation/event after a while. 2. Tells the missing or added object. 3. Uses what they remember in new situations. Learning outcome 5. Observes objects or entities. Indicators: 1. Tells the name, color, shape, size, length, texture, sound, smell, material from which it is made, taste, amount and usage purposes of the object/entity.
Classifying	Learning outcome 7. Groups objects or entities by their properties. Indicators: 1. Groups the objects/assets according to their color, shape, size, length, texture, sound, material, taste, smell, amount, and usage purpose.
Predicting	Learning outcome 2. Makes a prediction about object/sit uation/event. Indicators: 1. Tells the prediction about the object/situation/event. 2. Explains the clues about the predicting. 3. Examines the real situation. 4. Compares the prediction with the real situation.
Measuring	Learning outcome 11. Measures objects. Indicators: 1. Estimates the measurement result. 2. Measures in non-standard units. 3. Tell the result of the measurement. 4. Compares measurement results with predicted results. 5. Tell what the standard measurement tools are.
Recording Data	Learning outcome 20. Prepares graphics with objects/symbols. Indicators: 1. Creates graphics using objects. 2. Creates graphics by showing objects with symbols. 3. Counts the objects or symbols that make up the graph. 4. Examines the graph and explains the results.
Inferring	Learning outcome 17. Establishes a cause–effect relationship. Indicators: 1. Tell the possible reasons for an event. 2. Tells the possible consequences of an event.

As given in Table 2, it has been determined that Bingöl and Ünal (2019) associate the verbs with scientific process skills such as "gives attention to ..." with observing, "... groups" with classifying, and "... guesses" with predicting. Moreover, it was pointed out that the authors dealt with scientific process skills that emphasized learning outcomes and indicators.

Then, three experts in science evaluated the cognitive domain learning outcomes and indicators in the 2013 Preschool Curriculum. Experts were asked to consider the indicators and explanations of each learning outcome in the program one by one and to indicate which scientific process skill is emphasized in the relevant outcome, indicator, and explanation. This process ensured that all three field experts made independent and separate evaluations of each other. As a result, the percentage of agreement among researchers was calculated at 87.2%. After this stage, first, a list of scientific process skills that experts stated to exist in the learning outcomes, indicators, and explanations was prepared. Information on this is given in Table 4. Then, the frequency value reflecting the responses of the prospective teachers regarding the scientific process skills that they thought to be addressed in each learning outcome was calculated and translated into percentile from this. In the next step, the agreement between the opinions of the experts and the opinions of the prospective teachers was examined. The percentage of agreement between the opinions of the experts and the prospective teachers was calculated according to Miles and Huberman (1994).

Results

In this study, the ability of prospective preschool teachers to evaluate the cognitive domain learning outcomes and indicators in the preschool curriculum in terms of scientific process skills was examined, and percentage calculations were made for the data collected in the study. In this context, the frequency and percentage values of the scientific process skills that prospective teachers stated should be included in the cognitive learning outcome and indicators of the curriculum are given in Table 3.

As seen in Table 3, prospective teachers stated that the following skills are discussed: 61.02% frequent observing in learning outcome 1, 42.47% frequent predicting in learning outcome 2, 42.59% frequent observing in learning outcome 3, 37.68% frequency measuring in learning outcome 4, 54.29% frequent observing in learning outcome 5, 39.73% frequent classifying in learning outcome 6, 56.52% frequent classifying in learning outcome 7, 48.75% frequent comparing in learning outcome 8, 36.99% frequent classifying in learning outcome 9, 32.86% frequent each communicating and inferring in learning outcome 10, 37.23%

Table 3.
Percentage Values Related to the Scientific Process Skills That Prospective Teachers Stated to be Included in the Cognitive Domain Learning Outcomes and Indicators

Cognitive Development Learning outcomes	Observing %	Measuring %	Classifying %	Comparing %	Communicating %	Inferring %	Predicting %	Defining and Controlling Variables %
Learning outcome 1*	61.02	1.69	–	–	28.81	5.08	3.39	–
Learning outcome 2*	5.48	8.22	1.37	23.29	16.44	2.74	42.47	–
Learning outcome 3*	42.59	1.85	–	12.96	29.63	1.85	9.26	1.85
Learning outcome 4*	21.74	37.68	17.39	–	18.84	1.45	2.90	–
Learning outcome 5*	54.29	7.14	8.57	2.86	22.86	4.29	–	–
Learning outcome 6*	9.59	9.59	39.73	35.62	5.48	–	–	–
Learning outcome 7*	5.80	8.70	56.52	18.84	4.35	5.80	–	–
Learning outcome 8*	22.50	2.50	21.25	48.75	3.75	1.25	–	–
Learning outcome 9*	2.74	35.62	36.99	20.55	4.11	–	–	–
Learning outcome 10*	24.29	10.00	–	–	32.86	32.86	–	–
Learning outcome 11*	1.06	37.23	–	15.96	14.89	11.70	19.15	–
Learning outcome 12*	46.03	4.76	15.87	3.17	25.40	3.17	1.59	–
Learning outcome 13*	56.14	3.51	1.75	1.75	31.58	3.51	1.75	–
Learning outcome 14*	18.46	3.08	1.75	1.75	29.23	21.54	–	1.54
Learning outcome 15*	24.00	1.33	20.00	2.67	24.00	26.67	–	1.33
Learning outcome 16*	6.12	63.27	6.12	2.04	6.12	14.29	–	2.04
Learning outcome 17*	6.67	–	–	10.00	28.33	48.33	6.67	–
Learning outcome 18*	8.33	23.61	19.44	1.39	16.67	30.56	–	–
Learning outcome 19*	11.71	14.41	9.91	8.11	15.32	24.32	13.51	2.70
Learning outcome 20*	10.53	10.53	24.56	1.75	21.05	29.82	–	1.75
Learning outcome 21*	46.30	–	–	–	50.00	1.85	–	1.85

Note: *While calculating the percentage values, each learning outcome was evaluated in its context and independently from each other, and each learning outcome was considered as 100%. Moreover, the responses of all prospective teachers for the relevant outcome were collected, and the percentage values of their responses in terms of skills were calculated.

frequency measuring in learning outcome 11, 46.03% frequency observing in learning outcome 12, 56.14% frequency observing in learning outcome 13, 29.23% frequency communicating in learning outcome 14, 26.67% frequency inferring in learning outcome 15, 63.27% frequency measuring in learning outcome 16, 48.33% frequency inferring in learning outcome 17, 30.56% frequency inferring in learning outcome 18, 24.32% frequency inferring in learning outcome 19, 29.82% frequency inferring in learning outcome 20, 50.00% frequency communicating in learning outcome 21. In this context, it can be said that prospective teachers emphasize the following skills: observing in learning outcomes 1, 3, 5, 12, and 13; predicting in learning outcome 2; measuring in learning outcomes 4, 11, and 16; learning outcomes 6, 7, and 9; classifying in learning outcomes 10, 11, and 21; inferring in learning outcomes 10, 15, 17, 18, 19, and 20.

Table 4 shows the percentage values regarding the harmony between the expert opinions and the pre-service teachers' opinions regarding the relationship between the cognitive field learning outcomes and indicators and scientific process skills.

When the findings in Table 4 were examined, it was determined that the experts' opinions about the relationship between cognitive domain learning outcomes and indicators and scientific process skills were found to be 50% or more in agreement: with the answers given by the prospective teachers, learning outcome 1 has a frequency of 61.02%, and learning outcome 5 has a frequency of 54.29%. Learning outcome 7 has a frequency of 56.52%, learning outcome 11 has a frequency of 56.38%, learning outcome 13 has a frequency of 56.14%, learning outcome 16 has a frequency of 63.27%, and learning outcome 21 has a frequency of 50%. Moreover, the level of compliance with the answers given by the prospective teachers is as follows: learning outcome 2 has a frequency of 42.47%, learning outcome 3 has a frequency of 42.59%, learning outcome 8 has a frequency of 48.75%, learning outcome 12 has a frequency of 46.03%, and learning outcome 17 has a frequency of 48.33%. Thus, with 40–49% of opinions, at a good level, learning outcome 4 has a frequency of 37.68%, learning outcome 6 has a frequency of 39.73%, learning outcome 10 has a frequency of 34.29%, and learning outcome 18 has a frequency of 31.94% with the opinions of experts, at a moderate level. However, when the answers given by the prospective teachers were examined again, it was found that the experts conflicted with their views on the following learning outcomes: learning outcome 9 classification with a frequency of 36.99%, learning outcome 10 in 32.86% communicating and 32.86% in inferring; in learning outcome 14, 29.23% frequency of communicating; in learning outcome 18, inferring with a frequency of 30.56%; and in learning outcome 20 with a frequency of 29.82%. Considering all these results, it can be said that prospective teachers can generally read the scientific process skills, which are included in the objectives and indicators, at a good level and give answers in parallel with the opinions of the experts.

Table 4.
The Consistency of Expert Opinions on the Relationship Between Cognitive Domain Learning Outcomes and Scientific Process Skills with Prospective Teachers' Views

Cognitive Domain Learning Outcomes	Expert Opinions	Prospective Teachers' Views and Percentages	
		Answers	Percentage
Learning outcome 1	Observing	Observing*	61.02*
Learning outcome 2	Predicting	Predicting*	42.47*
Learning outcome 3	Observing	Observing*	42.59*
Learning outcome 4	Measuring	Measuring*	37.68*
Learning outcome 5	Observing	Observing*	54.29*
Learning outcome 6	Classifying	Classifying*	39.73*
Learning outcome 7	Classifying	Classifying*	56.52*
Learning outcome 8	Comparing	Comparing *	48.75*
Learning outcome 9	Comparing	Classifying*	36.99*
		Comparing	20.55
Learning outcome 10	Observing Measuring	Communicating*	32.86 *
		Inferring *	32.86*
		Observing	24.29
		Measuring	10.00
Learning outcome 11	Measuring	Measuring*	37.23*
	Predicting	Predicting	19.15
Learning outcome 12	Observing	Observing*	46.03*
Learning outcome 13	Observing	Observing*	56.14*
Learning outcome 14	Inferring	Communicating*	29.23*
		Inferring	21.54
Learning outcome 15	Inferring	Inferring*	26.67*
Learning outcome 16	Measuring	Measuring*	63.27*
Learning outcome 17	Inferring	Inferring	48.33*
Learning outcome 18	Observing Measuring	Inferring*	30.56*
		Observing	8.33
		Measuring	23.61
Learning outcome 19	Inferring	Inferring *	24.32*
	Establishing and testing hypotheses	Establishing and testing hypotheses	–
	Defining and controlling variables	Defining and controlling variables	2.70
Learning outcome 20	Measuring	Inferring *	29.82*
		Measuring	10.53
Learning outcome 21	Communicating	Communicating*	50.00*

Note: *It is the most frequent and high-rate responses of prospective teachers regarding the relationship between cognitive domain learning outcomes and indicators and scientific process skills;**Table 4 was created by making use of Table 3.

When the findings in Figure 1 were examined, prospective teachers stated that seven learning outcomes were written for gaining observing skills, six learning outcomes for measuring and recording data, three learning outcomes for classifying skills, two learning outcomes for comparing, three learning outcomes for communicating, seven learning outcomes for inferring, two learning outcomes for predicting, and one learning outcome for each defining and controlling variables and establishing and testing hypotheses skills. The opinions of the experts are also in line with the opinions of the prospective teachers, and it can be said that they contradict the opinions of the prospective teachers in the context of classifying, communicating, and inferring skills. Experts emphasized that there are two gains for classifying and three gains for communicating.

Discussion and Conclusion

In this study, the ability of prospective preschool teachers to evaluate the cognitive domain outcomes and indicators in the preschool curriculum in terms of scientific process skills was examined. In this context, prospective teachers' emphasis on observation skills such as "Learning outcome 1. Pays attention to the object/situation/event," "Learning outcome 3. Recalls what they perceive," "Learning outcome 5. Observing objects or entities" is generally used to develop observation and communicating skills or observation, and it was observed that they marked measurement–data recording skills together. This is not surprising in that the observation skill forms the basis for other skills. For this reason, it can be thought that they are dealt with by prospective teachers. Similarly, classifying and comparing are emphasized in learning outcomes such as "Learning outcome 6. Matching objects or entities according to their characteristics" and "Learning outcome 7. Grouping objects or entities according to their characteristics," "Learning outcome 8. Compares the properties of objects or entities," and "Learning outcome 9. Sorting objects or assets according to their features," on the other hand, it was observed that they dealt with comparing and classifying skills together and expressed their opinion in this direction. The reason for this is thought to be that comparing skill is the basis of the classifying skill. In other words, in order to make a classifying skill, it is predicted that these skills are perceived by prospective teachers as if they are complementary to each other, due to the determination of the similarities and differences of the object or event/phenomenon with the other object or event/phenomenon, and then a new grouping tendency at the point where they differ.

In learning outcomes such as "Learning outcome 4. Counting Objects", "Learning outcome 11. Measuring Objects," and "Learning outcome 16. Performing Simple Addition and Subtraction Using Objects," where the ability to measure is emphasized, the candidate teachers' measuring and inferring, measuring and predicting, and measuring and communicating skills are evaluated together. It is estimated that this situation is due to the fact that the ability to measure is a prelude to inferring and predicting skills and that these skills are mentioned together, and therefore, prospective teachers have such a tendency. Moreover, it can be said that although one of the forms of measurement and data recording skills is preferred, such as drawing a chart or creating a table, as a result, sharing them verbally or non-verbally with other people leads prospective teachers to consider measuring and communicating together. This suggests that it is actually a correct perception structure. Likewise, in learning outcomes such as "Learning outcome 14. Creates a pattern with objects" and "Learning outcome 15. Understands the part-whole relationship," where inferring skill is emphasized, prospective teachers marked inferring and observation and inferring and communicating skills together. In this case, it can be said that prospective teachers may have been marked with a perception similar to the one in measuring skill. In this context, it was determined that prospective teachers were able to determine the scientific process skills that are included in the objectives and indicators in the

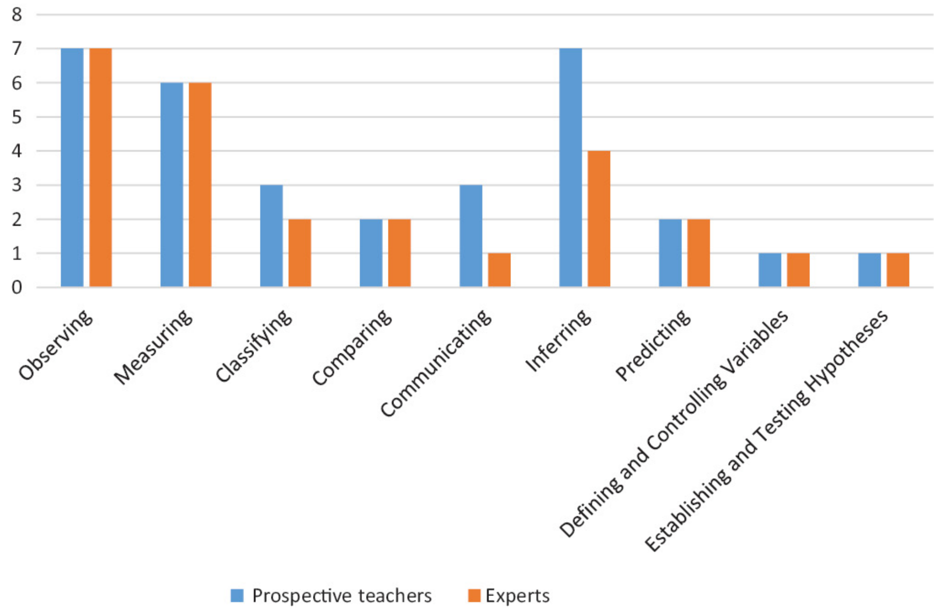

Figure 1.
Distribution of Scientific Process Skills in Learning Outcome According to the Responses of Prospective Teachers and Experts.

curriculum, and they could read basic- and intermediate-level scientific process skills from a good level of learning outcomes. In the relevant literature, Bingöl and Ünal (2019) examined the opinions of preschool teachers regarding the scientific process skills emphasized in the learning outcomes and indicators in science activities in the MEB (Republic of Turkish Ministry of National Education) preschool education activity book. He stated that 67% of the teachers had observation skills, followed by estimating (59%), inferring (29%), classifying (24%), and measuring (18%) skills, respectively. It can be said that the findings in this study are similar to the study of Bingöl and Ünal (2019). In our study, prospective teachers stated that most emphasis was placed on observing, measuring, classifying, communicating, and inferring skills. Similarly, Koray et al. (2006) and Yıldız and Tatar (2012) emphasized that observation skills are included more in science textbooks, but classifying, data recording, measuring, and inferring skills are not included in basic- and intermediate-level process skills. In this context, it can be thought that the results of the preschool program and the science teaching program are similar in terms of scientific process skills.

However, in the 19th learning outcome, which emphasized "establishing and testing hypotheses" and "defining and controlling variables," which are among the high-level scientific process skills, it was understood that prospective teachers had difficulty in reading the skills. While none of the pre-service teachers mentioned establishing and testing hypotheses skills in the 19th learning outcome, those who pointed out the ability to define and control variables constituted a very small proportion of all participants. In this context, it can be said that prospective teachers could not evaluate the emphasis of the verb stem in the 19th learning outcome in which the expression "produces solutions to problem situations" is used. However, it was understood that prospective teachers could be as successful as field experts in matching the aforementioned learning outcomes and skills, and they could make parallel matches with the expert even though there were partial mistakes. Considering the relevant literature, Nuhoğlu and Ceylan (2012) evaluated the conditions for meeting the basic process skills of the goals and learning outcome in the 2006 preschool curriculum in their study. In this context, a group of faculty members were asked to indicate the scientific process skills emphasized in the curriculum learning outcomes. As a result of this study, the faculty members stated that of the learning outcomes in the preschool curriculum, 29% support observing from scientific process skills, 29% measuring and recording data, 24% communicating, and 19% classifying. Similarly, Başdağ (2006), in his study, concluded that the 2005 Science and Technology Course Curriculum had some deficiencies in the curriculum for high-level skills, while teaching basic- and intermediate-level scientific process skills such as observation, predicting, measuring, and inferring to students was also good. Şahin et al. (2016) stated that there is not much difference between the science process skills between the Science Lesson Curriculum of 2015 and the Science and Technology Lesson Curriculum of 2005 and that it supports the findings of Başdağ (2006). It can be said that this situation is in parallel with the findings in this study. Because prospective teachers and field experts have stated that observing and measuring skills are mostly emphasized in the program outcomes.

Moreover, when all the results obtained from this study are evaluated, it can be said that they are parallel to the literature. Because researchers such as Ayvacı (2010), Bartan and Başal (2018), Kefi and Çeliköz, (2014), Kuru and Akman, (2017) and Ünal and Akman (2006) found that preschool teachers and prospective teachers perceived themselves inadequate in science education. Therefore, they stated that in-service and pre-service theoretical and practical training should be given to them. In this context, when looking at the results obtained in this study, it can be said that although they have been given theoretical and applied training in order to know the scientific process skills of prospective preschool teachers and to read them from the program, it can be said that they can be successful up to some point (in the context of basic and intermediate process skills) in gaining competence in this subject. Because, in the 2013 Preschool Curriculum learning outcomes and indicators, basic level process skills were included, as the curriculum aims (MNE, 2013). The case Cho et al.

(2003), Kefi et al. (2013), Munyeni et al. (2019), Saçkes et al. (2012), and Torres and Vitti (2007) support the argument of researchers such as science activities in the preschool period that the primary development of observing, classifying, comparing, and measuring skills in students, which is the determinant of their success in later years. Therefore, it can be said that the curriculum mostly includes basic process skills.

Recommendations

As a result of this study, it can be suggested that prospective preschool teachers should be given more theoretical and applied training in the context of scientific process skills. Moreover, considering the increasing importance of science education and the effect of preschool on children's advanced lives, the number of "early childhood science education" courses in preschool teaching undergraduate programs should be increased.

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Genişletilmiş Özet

Amaç: Öğrenme, yaşam boyunca devam eden uzun soluklu bir süreçtir. Öğrenme özellikle de okul öncesi dönemde hızlı bir şekilde gerçekleşir. Okul öncesi dönem; çocukların beyin gelişimin en hızlı gerçekleştiği, algı seviyesinin yüksek düzeyde olduğu ve çevresinde olup biten her şeyi ve her yeni bilgiyi kısa sürede öğrenebildikleri bir süreçtir. Bu sayede çocuklar bilgi dağarcıkları geliştirirken aynı zamanda kendi potansiyellerini fark ederler. Bu öğrenme deneyimleri sayesinde çocuk çevrelerinde olup biten şeyler hakkında bilgi edinir ve yaşama uyum sağlamaya başlarlar. Bu nedenle erken yaşlardan itibaren çocuklara doğayı anlamalarında önemli bir yere sahip olan feni öğretmek diğer bir ifadeyle fen eğitimi vermek önemlidir.

Fen; doğa olayların ne olduğu ve bunların ardından yatan sebeplerin neler olduğunun keşfedildiği aynı zamanda doğayı ve evreni anlama ve anlamlandırma çabasıdır (Drons ve Given, 2005; Tsung-Hui, 2001). Bu aslında çocukların, dünyayı ve çevrelerini anlama çabalarıyla benzerdir. Çünkü çocuklar dünyaya gözlerini açtıkları ilk andan itibaren sahip oldukları keşfetmeye ve öğrenmeye yönelik doğal içgüdüleriyle çevreleri hakkında birçok bilgi edinmeye başlarlar. Bu sayede de fen, çocuklara doğuştan gelen meraklarını artırma ve doğal dünyayı keşfetme fırsatları sunar (Mulyeni, Jamaris ve Supriyati, 2019). Dahası, çocukların çevreleri hakkındaki bu bilgi edinme süreçlerinde merak başlatıcı bir etmen olsa da buradaki asıl sürükleyici gücün soru sorma, hipotezleri test etme, araştırma yapma ve kanıtları değerlendirme gibi kasıtlı faaliyetlerle ancak tatmin edilebilen muhakeme yetisidir (Jirout ve Klahr, 2012; Morris, Croker, Masnick ve Zimmerman, 2012). İşte tüm bilimsel uygulamaların ve muhakeme yetilerinin tamamı bilimsel süreç becerileri olarak ifade edilir. Bilimsel süreç becerileri bireyin yaşantısı boyunca kullanacağı mantıksal ve rasyonel düşüncenin genel tanımı olup araştırma yapma, eleştirel düşünme ve karar verme becerileri birçok becerinin temel bileşenlerini içerdiği; yalnızca fende değil aynı zamanda diğer disiplinlere de aktarılabildiği ve öğrencilerin başarıları üzerinde önemli bir yere sahip olduğu için erken çocukluktan itibaren öğrencilere kazandırılması gerekir (Carin ve Bassa, 2001; Charlesworüh ve Lind, 2003; Ercan Özaydın, 2010; Padilla, 1990).

Yöntemler: Son zamanlarda okul öncesi eğitimin özellikle de bu dönemdeki fen eğitimin çocukların gelecek yaşamlarına etkileri konusunda yapılan tartışmalar araştırmacıları bu konuda çalışmalar yapmaya yönlendirmiştir. Buna paralel olarak da okul öncesinde fen eğitiminde çeşitli öğretim yöntem ve tekniklerinin çocukların bilimsel süreç becerileri üzerine etkisini araştıran birçok çalışma gerçekleştirilmiştir (Akman, Üstün ve Güler, 2003; Ayvacı, 2010; Büyüktaşkapu ve diğerleri, 2012; Hachey ve Butler, 2009; Kunt, Özel ve Kunt, 2015). Bu çalışmalar sonucunda, okul öncesi fen eğitiminde bilimsel süreç becerilerinin çocuklara kazandırılması sürecinde uygun öğretim yöntem ve tekniklerinin kullanılmasının önemine vurgu yapılmıştır. Bu nedenle de bu çalışmada okul öncesi öğretmen adaylarının, okul öncesi eğitim programında yer alan kazanım ve göstergeleri bilimsel süreç becerileri açısından değerlendirebilme becerilerinin incelenmesi amaçlanmıştır.

Bu çalışmada, durum çalışması yöntemi tercih edilmiştir. Çalışmanın örneklemi amaçlı örnekleme yöntemiyle belirlenmiştir. Bu bağlamda 2019–2020 eğitim-öğretim yılı güz döneminde Kuzey Kıbrıs Türk Cumhuriyeti'nde yer alan bir özel üniversitede öğrenim görmekte olan %58,97'si kadın ve %41,03'ü ise erkek olmak üzere toplam 78 okul öncesi öğretmen adayı bu çalışmanın örneklemini oluşturmaktadır.

Bu çalışmada öğretmen adaylarına "Erken Çocuklukta Fen Eğitimi" ve okul öncesi "Fen Eğitimi" dersleri kapsamında öncelikle bilimsel süreç becerileri hakkında teorik ve uygulamalı eğitimler gerçekleştirilmiştir. Ardından her bir öğretmen adaylarının 2013 yılı Türkiye Okul Öncesi Eğitim Programı'nda bilişsel gelişim alanında yer alan 21 adet kazanımı bilimsel süreç becerileri açısından incelemeleri ve sınıflandırmaları istenilmiştir. Bu bağlamda çalışmanın verileri kaynağı, okul öncesi öğretmen adaylarının oluşturduğu bilimsel süreç becerilerine ilişkin dokümanlardır. Araştırma kapsamında toplanan veriler doküman analizi yöntemiyle analiz edilmiştir.

Bulgular: Çalışma sonucunda; öğretmen adaylarının, "Kazanım 1. Nesne/durum/olaya dikkatini verir.", "Kazanım 3. Algıladıklarını hatırlar." "Kazanım 5. Nesne veya varlıkları gözlemler." gibi gözlem becerisinin vurgulandığı kazanımlarda genellikle gözlem ve iletişim becerisini ya da gözlem ve ölçme-verileri kaydetme becerilerini birlikte işaretledikleri görülmüştür. Benzer şekilde öğretmen adaylarının "Kazanım 6. Nesne veya varlıkları özelliklerine göre eşleştirir.", "Kazanım 7. Nesne veya varlıkları özelliklerine göre gruplar." gibi sınıflandırma becerisinin vurgulandığı kazanımlarda sınıflandırma ve karşılaştırma; "Kazanım 8. Nesne veya varlıkların özelliklerini karşılaştırır.", "Kazanım 9. Nesne veya varlıkları özelliklerine göre sıralar." gibi karşılaştırma becerisinin vurgulandığı kazanımlarda ise karşılaştırma ve sınıflandırma becerilerini birlikte ele aldıkları ve bu yönde görüş bildirdikleri gözlemlenmiştir. Ölçme ve verileri kaydetme becerisinin vurgulandığı "Kazanım 4. Nesneleri sayar.", "Kazanım 11. Nesneleri ölçer.", "Kazanım 16. Nesneleri kullanarak basit toplama ve çıkarma işlemlerini yapar." gibi kazanımlarda ise öğretmen adaylarının ölçme-verileri kaydetme ve sonuç çıkarma, ölçme-verileri kaydetme tahmin etme ile ölçme-verileri kaydetme ve iletişim becerisini birlikte değerlendirdikleri söylenebilir. Aynı şekilde sonuç çıkarma becerisinin vurgulandığı "Kazanım 14. Nesnelerle örüntü oluşturur.", "Kazanım 15. Parça-bütün ilişkisini kavrar." gibi kazanımlarda ise öğretme adayları sonuç çıkarma ve gözlem ile sonuç çıkarma ve iletişim becerilerini birlikte işaretlemişlerdir. Bu bağlamda, öğretmen adaylarının programda kazanımlarda yer alan bilimsel süreç becerilerini büyük oranda tespit edebildikleri; temel ve orta düzey bilimsel süreç becerilerini iyi düzeyde kazanımlardan okuyabildikleri belirlenmiştir. İlgili alanyazınında Bingöl ve Ünal (2019) çalışmalarında MEB okul öncesi eğitim etkinlik kitabında yer alan fen etkinliklerindeki kazanım ve göstergelerde vurgulanan bilimsel süreç becerilerine ilişkin okul öncesi öğretmenlerinin görüşlerini incelemişlerdir. Öğretmenlerin çok %67 ile gözlem becerisinin olduğunu, sonra sırasıyla, tahmin etme (%59), sonuç çıkarma (%29), sınıflama (%24), ölçme (%18) becerilerinin geldiğini belirttikleri ifade etmiştir. Nuhoğlu ve Ceylan (2012) ise çalışmalarında 2006 okul öncesi eğitim programlarında yer alan amaç ve kazanımların temel süreç becerilerini karşılama durumlarını değerlendirmişlerdir. Bu çalışma sonucunda öğretim üyelerinin okul öncesi öğretim programında yer alan kazanımların %29'u bilimsel süreç becerilerinden gözlem yapmayı, %29'u ölçüm ve verileri kaydetmeyi, %24'ünün iletişimi, %19'u da sınıflama yapmayı desteklediğini ifade ettiklerini belirtilmiştir. Dahası, bu çalışmadan elde edilen tüm sonuçlar değerlendirildiğinde alanyazınla paralellik gösterdiği söylenebilir. Çünkü Ünal ve Akman (2006), Ayvacı (2010), Bartan ve Başal (2018), Kefi ve Çeliköz, (2014) gibi araştırmacılar çalışmaları sonucunda okul öncesi öğretmen/öğretmen adaylarının fen eğitimi konusunda kendilerini yetersiz gördüklerini ve bu nedenle de onlara hizmet içi ve hizmet öncesi teorik ve uygulamalı eğitimler verilmesi gerektiğini belirtmişlerdir. Bu bağlamda söz konusu bu çalışmada elde edilen sonuçlara bakıldığında, okul öncesi öğretmen adaylarının bilimsel süreç becerilerini bilmesi ve bunları programdan okuyabilmesi konusunda onlara her ne kadar teorik ve uygulamalı eğitimler verilmiş olsa da onlara bu konuda yeterlilik kazandırabilme noktasında bir aşamaya kadar (temel ve orta düzey süreç becerileri bağlamında) başarılı olunabildiği söylenebilir. Bu çalışma sonucunda okul öncesi öğretmen adaylarına bilimsel süreç becerileri bağlamında daha fazla teorik ve uygulamalı eğitimlerin verilmesi önerilebilir.