African Educational Research Journal
Special Issue 8(2), pp. S306-S315, October 2020
DOI: 10.30918/AERJ.8S2.20.060
ISSN: 2354-2160
Full Length Research Paper

Self-efficacy perceptions of the preschool teachers on the field of science and science education

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ABSTRACT

The purpose of this study is to determine how adequate preschool teachers considered themselves in the field of science, to determine their awareness on this subject and to find out how adequate they are in the field of science. This study was planned by using a phenomenological approach among the qualitative research methods and was carried out interviewing with five preschool teachers selected by using maximum diversity sampling among the purposeful sampling methods. Semi-structured interview data was used as the data collection tool. After the interviews, interview texts were prepared, the content analysis was performed by open coding method, and the findings were reached. According to the findings of this study, it was concluded that most of the preschool teachers feel inadequate in the field of science and are not interested in science. Another finding of this study is preschool teachers include science activities into their programs but they cannot be creative in these activities, they neither know nor question why they do such activities and do not diversify the activities. In addition, it was observed in this study that preschool teachers had a lack of knowledge in the field of science and this caused misconceptions for the students.

Keywords: Preschool, preschool teacher, science education, self-efficacy.

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INTRODUCTION

Children try to explore their environment beginning from the day they were born, and since they learn to speak, they speak with hundreds of questions. These questions show us that; children look around them in a very different perspective than adults, and are much more willing to learn by adults. According to Piaget, children have completely their own mental functioning and points of view. Young children are not a miniature of adults (Oktay, 2002). For these reasons, the preschool period, which constitutes the first years of individuals' lives, is very important and valuable. It is the foundation of human life between pre-natal months and 0-6 years postpartum. An important part of our learning takes place during such periods. If all the faces of development are not supported by creating the necessary environment and opportunities in the early childhood period, it will be very difficult or even impossible to eliminate deficiencies in the later periods of life (Oktay et al., 2006).

Preschool education has been an educational process whose importance has been emphasized for many years in developed countries. For example, Sweden updated pre-school curricula in 2010 so that the educational age is between 1 and 5 years old (Anderson and Gullberg, 2012). In the early childhood period, which will form the basis of the students' educational life, the activities to be performed in the name of science are also very important. In line with the slowly appearance of literacy and math subject orientation in preschool also nature and nature phenomenon (nature science and technology science) are put on the agenda. This is visible in curricula from all Nordic countries. For example in the Norwegian curriculum in connection to the compulsory subject area “nature, environment and technology” many aims and a big numbers of science content is listed. The Swedish curriculum states that children are to “develop their understanding of science and relationships in nature as well as knowledge of plants, animals and also simple chemical processes and physical phenomena. “In the Danish curriculum the theme “nature and nature phenomenon”, which is one of six themes in the curricula,

it is stated, that “children should act and get first experiences with the nature’s animal, plants and materials, and get experiences with causes and connections” (Broström, 2015, p.108).
The reason why students should meet science education at an early age is explained as follows:

- Children naturally enjoy observing and thinking about nature.
- Exposing students to science develops positive attitudes towards science.
- Early exposure to scientific phenomena leads to better understanding of the scientific concepts studied later in a formal way.
- The use of scientifically informed language at an early age influences the eventual development of scientific concepts.
- Children can understand scientific concepts and reason scientifically.
- Science is an efficient means for developing scientific thinking (Eshach, 2006).

At every stage, science forms an integral part of life. For this reason, it would be a waste of time for children to start science education at a certain age. Children's curiosity and the desire to discover in the preschool period that corresponds to the 0-6 age range are very valuable for science education. In this context, it can be said that the adequacy of preschool teachers for the science and science teaching are extremely important. The adequacy and awareness of preschool teachers, who will realize the science experiences of the students in this early childhood period, are the matter of curiosity.

According to Bandura who is one of the most prominent figures regarding the self-efficacy, self-efficacy is very effective in the formation of behaviours and it is defined as one’s own thoughts about his/her capacity to achieve success by organizing necessary activities to realize a specific performance (Bandura, 1994).

The opinion of Bandura's self-efficacy perception regarding the individual's choice of activities, its persistence against the difficulties, its level of performance and its performance has been the subject of many researches (Çavuşoğlu and Özsoy, 2018). When taken into consideration that the areas affected by self-efficacy perception, it can be estimated that it is directly related to one’s success. From this point of view, self-efficacy perception is one of the important features to be emphasized in education (Aşkar and Umay, 2001).

Preschool teachers are expected to have a direct impact on the attitudes and perspectives of preschool students who have just met with the school. Therefore, preschool teachers must have appropriate adequacy in order for students to achieve the expected gains in science. Four skills that preschool teachers can develop and benefit from when teaching science have been identified. Those are:

1. paying attention to and using children’s previous experiences;
2. capturing unexpected things that happen at the moment they occur;
3. asking questions that challenge the children and that stimulate further investigation; and
4. situated presence, that is, ‘‘remaining’’ in the situation and listening to the children and their explanations.

In teacher education and in-service courses, teachers can develop pedagogical content knowledge by practicing these four skills in scientific activities (Anderson and Gullberg, 2012).

When the studies on this subject are examined, some of the studies on the adequacy perceptions of preschool teachers about the science and science teaching, the adequacy perceptions of some preschool teachers are at a low level while of some of them are at a high level. Elmas and Kanmaz (2015) found in their studies that they conducted to determine preschool teachers’ adequacy for the science activities, preschool teachers considered themselves adequate in their science activities. Afacan and Selimhocaoğlu (2012) also found in their studies that preschool teachers considered themselves adequate in the science activities. Sağlam and Aral (2015) reported that preschool teachers' awareness of science activities is high, they do not have any education about science activities other than their undergraduate education, they consider preschool science activities are necessary and they have a positive opinion about the effectiveness of science activities. Yildiz and Tukel (2018) have shown, in their study they conducted of determine if the preschool teachers include science activities into their programme, that the majority of teachers have included science activities once a week in their programme.

Turk (2018), who studied the current situation of preschool teachers in terms of astronomy, stated that teachers found themselves partially adequate in astronomy subjects.

Erdaş Kartal and Ada (2018) showed in their studies that the preschool teachers had inadequate knowledge and misconceptions about the nature of science. In another study, Ültay and Can (2015) showed that preschool teacher candidates lack conceptual information about heat and temperature. Supporting these studies, Ayvacı et al. (2002) have concluded, in their study, that most of preschool teachers do not have capacity to plan and conduct the science and nature activities; they do not develop original material; and they lack effective teaching methods (methods other than question-answer, demonstration etc.; play and drama, etc.) and they do not use the same.

According to the above studies, it is understood that positive results were found in the studies on the status and approach of preschool teachers to include science activities into their programs. However, some studies have shown that preschool teachers have deficiencies in

terms of conceptualization, implementation and planning of science activities.

When the studies mentioned above are evaluated in general, the differentiating points of this study can be listed as follows:

• In the research, detailed and in-depth information was obtained by conducting a qualitative research with a small number of teachers.
• The research focused on teachers' attitudes towards science, how often they do science activities, which sources they consult while doing science activities, and their knowledge of science. In addition to these headings, this study tried to investigate which activities teachers do for what purpose, whether they do the activities for the right purpose, what they feel while doing science activities, and how adequate they feel.
• One of the features that distinguishes this study from other studies is that it questions the way different teachers apply the same activity. Consequently, it was revealed in a concrete way how well the teachers grasped the purpose of the activity, how accurately they applied the activity, whether they caused misconception in explaining the activity.
• In this study, teachers gave answers to a sample student question. Thus, the misconceptions that the teachers have are also revealed.
• The answers given to the questions by teachers with different professional experiences and different educational backgrounds, who constitute the sample of the study, enabled us to have an idea about how professional experience and educational background affect their science applications.

This study was conducted to determine the self-efficacy perceptions of preschool teachers on the science. The research problem of this study is “How is the self-efficacy perception of preschool teachers on the science?” The sub-problems of this study can be listed as follows: “How much do the preschool teachers consider themselves to be adequate on the science?”, “What is the preschool teachers’ awareness on their adequacy regarding the science?”, “how is the adequacy of the preschool teachers regarding the science when they performed, based on their interviews, activities in their classrooms?” When their classroom practices are examined based on the discourse of preschool teachers, what is their competence in the field of science? "

METHODOLOGY

Research model

The method of this study was determined as the phenomenological approach among qualitative research methods. Since the purpose of the phenomenological approach is to reveal the phenomenon that people are aware of, but do not have detailed understanding (Holstein and Gubriem, 1996), and this study also focused on the adequacy perceptions of preschool teachers in the field of science and teaching, this research methods has being adopted. Phenomenological research is a method of examining and defining the existence of events and phenomena and focuses on the meaning that individuals attribute to the relevant situation through their subjective experiences (Baş and Akturan, 2008). In this study, not only the perceptions of teachers about how they feel about science were questioned, but also by asking questions through an exemplary science activity widely applied in preschool education, it was tried to determine their perceptions of themselves through their own experiences.

The universe and sample of the research

In the study, firstly, an easily accessible sample was used. In the first stage, the researchers announced the preschool teachers around them that there would be an interview for a research and determined the volunteer teachers. Then, it is aimed to provide maximum diversity by means of their professional experience, the department they graduated from and the type of institution they work in. Since it is a phenomenological research, in order to conduct an in-depth study, five preschool teachers with different qualifications were selected among the teachers who volunteered. Two of these teachers are preschool teachers working in the kindergarten, two are preschool teachers working in public schools, and one is a preschool teacher working in a private school. The demographic information of the teachers is given in Table 1. The real names of the teachers were not used in the study, and the participants were assigned names by the researchers.

Data collection tools

Semi-structured interview was used for data collection in the study. The semi-structured interview form was prepared by the researchers and its final form was obtained by taking the opinions of two preschool teachers and two field experts. Except for the drilling questions that differ for each participant, the basic questions posed to each participant are as follows:

• How many years have you been in the profession?
• What is the university and department you graduated from?
• Which courses did you take in science during your university education?
• Are the courses you took in your university education sufficient for your science applications?

Table 1. The characteristics of the teachers constituting the working group.

Name	City	Seniority	Type of the school	Graduated from
Esin Teacher	İstanbul	23	Standalone Kindergarten	Child Health
Selin Teacher	İstanbul	9	Private Kindergarten	Preschool Teacher
Gizem Teacher	Denizli	10	Kindergarten within a secondary school	Preschool Teacher
Derya Teacher	İstanbul	10	Kindergarten within a primary school	Preschool Teacher
Feyza Teacher	İstanbul	4	Kindergarten within a primary school	Physics / Preschool Teacher

• What kind of science activities do you do in your classroom?
• How do you feel during your science applications?
- Do you feel inadequate from time to time?
- When students ask you questions during or after these practices, are there any points that you could not answer or you also fell into doubt?
• Could you please explain one of your science applications in detail?
- Have you planned this event or bought it from a source?
- What is your purpose of doing this activity?
- What are the achievements you want to gain students while doing this activity?
• I know that many pre-school students do float-sink experiments. The experiment is as follows: the teacher asks the students to throw different objects into the water. Some of these objects float in the water, while others sink to the bottom.
- What are students asked to gain in this experiment?
- How can we explain to students at this level that some objects sink and some objects float in this experiment?
- If one of your students asked why the ship floated even though the coin was sunk in the water, how would you explain this incident?
• What is your personal interest in science? Is it a field you prefer?
• Would you like a science teacher to do the science applications in your classroom?
• Finally, if you were to grade yourself in science applications, how many out of 10 would you give?

The interviews were made by the researcher in person. Interviews were recorded with the permission of the participants, and the researcher took notes during the interview. The details of the interviews are explained below:

Esin Teacher: In the school environment where she worked, two face-to-face meetings lasting approximately 30 minutes were held. The teacher participated in the interviews voluntarily. In the interview, in addition to the questions in the interview form, seven drilling questions were asked and a total of 26 questions were asked.

Selin Teacher: One and a half hour face-to-face meeting was held in the home environment. The teacher participated in the meeting voluntarily. During the interview, 31 questions were asked to the teacher along with the drilling questions.

Gizem Teacher: An hour-long interview was held in the school environment where she worked and this meeting was supported by phone calls. The teacher participated in the meeting voluntarily. During the interview, 28 questions were asked to the teacher along with sounding questions.

Derya Teacher: An interview lasting about one hour was held in the school environment where she worked. The teacher participated in the meeting voluntarily. During the interview, 30 questions were asked to the teacher along with sounding questions.

Feyza Teacher: Two interviews, one of which lasted 40 minutes and the other about an hour, were held in the home environment. The teacher participated in the meeting voluntarily. During the interview, 36 questions were asked to the teacher along with sounding questions.

Data analysis

Content analysis was carried out after all records were transferred to the written environment. Open coding (Yıldırım and Şimşek, 1999), one of the data analysis techniques, was used. The interviews with each teacher were analysed separately, and then common and/or differentiating situations were revealed. Following the analysis of the interviews, the main themes that will reflect the content of the current situation in the best way were determined and the findings were shaped in the light of these themes.

Validity and reliability

In order to ensure the validity of the study, expert opinions were consulted for the suitability of the interview questions, and the answers from the teachers during the interview were repeated as understood by the researcher and it was confirmed whether the answer was understood correctly. While presenting the findings, “Gold-samples” (Mayring, 2000) were presented by making direct quotations from the statements of the participants. The

golden sample has a concrete function in explaining the encodings obtained as a result of content analysis. In order to explain the arguments reached in this research, exact quotations are used. In order to ensure the reliability of the study, it was ensured that data loss was prevented by recording the data, the data were examined separately by two researchers first, and then the examination records were brought together to discuss the disagreements and reach a consensus.

RESULTS

In the light of the data obtained from the interviews conducted with the participants pursuant to the research, it was deemed appropriate to collect the findings under two headings: "Preschool Teachers 'Self-Efficacy Perceptions towards Science" and "Preschool Teachers' Self-Efficacy Perceptions towards Science Education". In the first part, data on the past science education of the interviewed teachers and how adequate they felt after this learning process were discussed. In the second title of the findings, the participants' interests in science, how they felt while doing science activities, awareness of the purpose of doing science activities, the diversity of science activities, the appropriateness of science activities, and their misconceptions about some science concepts based on the answers they gave to the questions asked by the researchers, were evaluated.

Findings on the preschool teachers' self-efficacy perceptions towards science

Under this heading, it was questioned how much teachers found themselves adequate for the science and it is found that all of the five teachers but one found themselves inadequate for the science. According to the findings of the drillings on why the teachers find themselves adequate or inadequate and in which subject they find themselves inadequate, prevailing facts and determinations are gathered under four themes. These themes are summarized in Figure 1.

Arseven (2016) states that the perception of self-efficacy of an individual consists of information obtained from four basic sources, namely “the experiences formed as a result of the individual's experiences, the individual's indirect experiences, verbal persuasion and psychological state”. When the themes in Figure 1 are examined, it is seen that the teacher's lack of interest, inadequacy in self-development and lack of knowledge can be associated with the field of experiences of the individual. It is possible to associate the inadequacy of the education the teacher received with the indirect experiences. Explanations on each theme are given below:

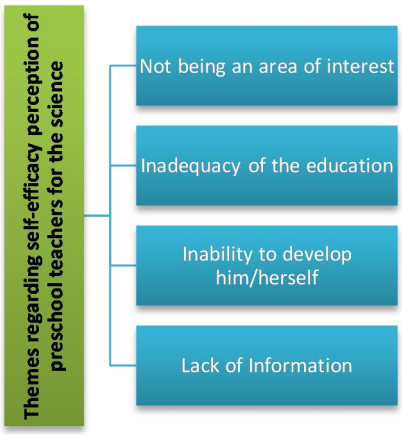

Figure 1. Themes regarding self-efficacy perception of preschool teachers for the science.

Not being an area of interest

While four of the teachers who participated in this study stated that they were not interested in science, only Feyza Teacher, whose major is physics, stated that she was interested in science.

Esin Teacher stated that the science is not the area of interest:

> “*Art and science aren't the ones I love so much, but I definitely use them. But I'm more creative in the areas I love, I feel more full*.”

Also Gizem Teacher’s expression of “*Science is not my area of interest. The things I enjoy most are drama, music and story. I enjoy this kind of activity more*” could be considered as an example of the same.

Inadequacy of the education

Feyza and Derya Teachers from the participants think that the education they had is inadequate for the classroom activities. In this aspect Feyza Teacher emphasized the university education is inadequate by saying:

> “*If you ask me if the education at the university contributes much to preschool education, I can say no, not much. There we see only the rules of physics, theoretical information. These are information that will be big challenge for a preschool student. It would be better if there were practical trainings that could be used in classroom activities*”.

Derya Teacher expressed the inadequacy of the education in the university by stating that:

> "*I cannot say that the theoretical information is useful. As if the activity-oriented courses would have been better. The problem with the classes is that we don't know how to teach what. We are just inadequate in the activities*".

It is noteworthy that the common emphasis in the expressions of both teachers is that the education should be activity-oriented rather than theoretical information.

Inability to develop him/herself

Selin Teacher and Esin Teacher from the teachers interviewed stated about their inability to develop themselves. For example, Selin Teacher expressly stated her inadequacy by stating "*I am just browsing the Internet to develop myself. If I said I read a lot, I'd be lying. I don't even know what we should read. I have textbooks for preschool, but I don't know if there is any based on practice*". It can be said that teachers' failure to renew themselves also causes inadequacy in their perceptions about their self-efficacy, by time.

Lack of knowledge

Teachers interviewed, except Feyza Teacher, stated that they had inadequate knowledge in the field of science, had difficulties from time to time in responding the questions of students. Considering that Feyza Teacher's major is physics, it is predictable that she feels she has adequate knowledge in the field of science.

Selin Teacher expressed her thoughts about this theme as follows:

> "*Science was my field in high school, but I have still difficulties. Sometimes I don't know how to explain the concepts of science at this level. I'm amazed that the questions asked by students at these ages. I search on the internet for the matters I don't know, I manage that way*."

It can be seen from the statements of Selin Teacher that teachers have difficulty to pass their knowledge in science to the students at the preschool level.

Gizem Teacher said, "*It would be better for children if science teachers come and do science activities. Because we can give simple answers"*. With this statement not only does she feel lack of self-efficacy in terms of knowledge, but she also expresses her opinion about leaving the preschool science activities to branch teachers. Similarly, Derya Teacher indicated that she share the same thoughts by stating *"Of course it would be better if the science teachers do the science activities. Obviously it is fun doing activities, but in terms of the explanations and clarifying the grounds, I am avoiding the questions of the children, I'm locking in. As such, I'm coming further away from the science unavoidably.".* Although Gizem and Derya Teachers work in different cities, they both agree that they need science teachers in the preschool period.

Findings on the preschool teachers' self-efficacy perceptions towards science education

Under this section, the findings obtained from the data on the self-efficacy perceptions of the participants in science teaching are included. Based on the coding obtained from the data, the findings in this section are discussed under five headings. These are "Inability to be creative in science education, inability to provide diversity in activities, frequently used applications in science education, awareness of the purposes of science activities, the participants' feelings while doing science activities, and finally, different practices in the selected activity (Float-Sink Experiment) and teachers' comments about this experiment".

Not being creative, not being able to provide diversity in the activities

All of the teachers who participated in the study stated that they could not be creative in the science activities and that the activities were not able to go beyond the ordinary activities they found on the Internet and books. Esin Teacher evaluated herself as following:

> *"We cannot provide diversity in the activities, we always do the same things. Every year new children come, time changes, the place changes but we always keep doing the same activities. I am having a lot of trouble creating new activities and providing diversity."*

Gizem Teacher stated how she could not differentiate in the activities as follows:

> *"Classical experiments actually. I cannot say that I can do something very different."*

The activities used often by the participants in science teaching

Teachers were asked what kind of activities they do in science teaching and the activities they frequently do are given in Table 2.

When the Table 2 is examined, it is seen that the activities of preschool teachers interviewed do not differ so much. It is also seen that the teachers are mostly focused on experiment, examination and observation

Table 2. The activities used often by the preschool teachers in science education.

Activity Type	Activities	Esin T.	Selin T.	Gizem T.	Derya T.	Feyza T.	Total
Observation	Soda, jelly tots, Sweetcorn Experiment					X	1
Observation	Fingerprint Experiment					X	1
Experiment	Candle-Jar Experiment					X	1
Experiment	Float / Sink Experiment	X	X		X	X	4
Experiment	Volcano Experiment		X		X		2
Observation	Making Grass Head			X	X		2
Observation	Plant Germination	X		X	X		3
Analyzing	Analyzing Soil	X			X		2
Observation	Night-Day Activity	X	X	X	X		4
Analyzing	Examining Tooth Model		X		X		2
Analyzing	Examining by Microscope		X				1
Observation	Generating Rain	X					1
Experiment	Making Yoghurt	X					1
	Total	6	5	3	7	4	

studies, float/sink experiment and day/night activity are the most preferred activities. Another remarkable point in the table is that Feyza Teacher, whose major is physics, prefers different activities from other teachers.

The awareness of the participants on the purposes of the activities they perform

The teachers stated that they accessed these activities on the internet and from the books of some publishing houses. During the interviews, the researcher's attention was drawn to the situation where the teachers were asked about the purpose of doing these activities and what they wanted to bring to the students, the teachers thought for a long time, they had indecision while answering, and many of them could not make a satisfactory explanation about the purpose of the activities.

For example, when Selin Teacher was asked about the purpose of the volcano experiment, she answered as follows:

> *"I have never thought about the purpose. I don't know, actually. We make them wonder. This is important. It's fun."*

Gizem Teacher, by saying:

> *"Ministry of National Education doesn't tell us what to do. Ready-made plans are just about how to do the activity. What it needs to gain in the activity stays in the air."*

Stated that they do not know about the purposes of the activities they make. As it can be understood from these statements, it is seen that teachers cannot determine their goals related to the activities and they do some activities without knowing what the students need to earn. It is thought that this is a very important finding and it is necessary to take measures.

On this, Selin Teacher's statement of *"We use ready-plans of different publishers. We cannot say we can perform such plans thoroughly. There is a gap on this."* makes it very clear that she needed to be guided.

Besides, Gizem Teacher's above statement (i.e. *Ministry of National Education doesn't tell us what to do. Ready-made plans are just about how to do the activity. What it needs to gain in the activity stays in the air*) also supports the views of Selin Teacher.

The feelings of the participants while doing the science activities

When asked about how the participants feel when doing the science activities, very different answers received. While Derya Teacher expressed that she felt nervous, Feyza and Selin Teachers have expressed that they had great pleasure. Esin and Gizem Teachers said that they did the activities because they had to, they did not enjoy the activities. Below are some teachers' views on this subject:

> *"Sometimes it is fun, but sometimes it is a mess and I'm getting a little nervous."* (Derya Teacher)
> *"This depends on children, this year has been very nice, but last year I had a hard time, children did not allow me to do the activities."* (Gizem Teacher)
> *"I cannot say it is a time that I feel so good."* (Esin Teacher)
> *"I am very happy, my students are also very happy."* (Selin Teacher)

Looking at the interview texts, it was seen that the main reason of the stresses of Derya and Gizem Teachers in science activities is the curious questions and excitement of the students in science activities and the teachers' inability to dominate the activities.

When looked at Selin Teacher's statements, it can be said that Selin teacher is, although she feels inadequate from time to time, a teacher who is generally interested in science and this affects her feelings positively in the science activities.

Different performances of the selected activity (float/sink experiment) and comments of the participants on such experiment

The researcher identified the float/sink experiment as one of the most common science activities, and examined the knowledge and adequacy of the teachers by asking each of them how they performed this experiment, what the purpose of this experiment was and how they explained the results of this experiment to the students at this age. Although there were minor changes in the performance of the experiment, it was found that the performances were close to each other, the teachers made this experiment for almost the same purpose, the teachers had similar mistakes about this experiment and they did not have enough knowledge to explain the results of this experiment.

In this experiment, teachers were asked whether students had awareness about why some items were sinking while others floated, whether they asked questions about the reason and, if so, how they explained this situation and the answers given in Table 3 were obtained.

In the preschool period, it is aimed to support children's curiosity about science and nature and to gain basic scientific process skills on the basis of inquiry and exploration. For this reason, making theoretical explanations to children, trying to gain information about the subject by a teacher-centred perspective are not suitable for the essence of the program. Therefore, teachers are of course not expected to make any explanations to children after science activities. However, on the other hand, they should not allow a situation that would constitute misconception, and therefore they should be able to master the correct scientific explanation about their activity. When the explanations of the teachers were examined, it was seen that Selin Teacher was the person approaching the right answer the most. This result is not surprising given that Selin Teacher is interested in science and is happy to do the activities. Deniz Teacher does not know the scientific explanation of the question and does not use misleading statements to the students. Unfortunately, the answers of Esin and Feyza Teachers to the question are scientifically flawed and can create misconceptions for the students. Although Feyza Teacher's major is physics, it is noteworthy that she makes such scientific error.

After the inquiries in the float/sink experiment, all the teachers who were interviewed were asked a drilling question. The question was:

> *"In your float/sink experiment, what if the students, who saw that the coins were sinking in the water, asked how the ships made of metal materials float, how would you explain to them?"*

The responses received from the teachers are shown on the Table 4.

Table 4 clearly shows that; preschool teachers were unable to answer the question correctly and could not manage the crisis properly. In general, it is seen that this is caused by the lack of knowledge of teachers and their inability to use their knowledge appropriately to the age level. It is considered that this situation caused teachers to feel inadequate in the field of science, to move away from the field of science and not to perform at the desired level.

Table 3. Explanations of the teachers to the float/sink experiment.

Name of the teacher	Explanations of the teachers to the float/sink experiment
Esin Teacher	*"I say the heavy sinks, the light floats."*
Selin Teacher	*"My students ask why some of them float and some sink. In fact, I know this is due to the self-mass, but I can't tell them, they can't understand. I'm not saying anything, in fact, I just say some of them sink and some of them float."*
Gizem Teacher	*"I have never done this experiment, I have no idea."*
Deniz Teacher	*"I'm saying that each material has different characteristics and some materials have floating capacity and some materials do not."*
Feyza Teacher	*"Generally it is expressed as heavy-light."*

Table 4. Teachers' responses to the drilling question.

Name of the teacher	Response
Esin Teacher	*"I couldn't answer. I would tell the student that I did not know and needed to search, and then I would definitely answer."*
Selin Teacher	*"The fact that ships don't sink is actually about the surface area. They would sink if they were upright."*
Gizem Teacher	*"I couldn't answer this question, or I would find a video and get students to watch."*
Deniz Teacher	*"I guess it is able to float by its engine, by its propeller."*
Feyza Teacher	*"We can talk about the surface. Or I can tell that the water in the sea is more and the buoyancy of water is more. I can say that the body of water that lifts the ship is more. I can say that water cannot lift the weight and density of coins."*

DISCUSSION

Considering the findings of the study, it was concluded that most of the preschool teachers felt inadequate in the field of science and were not interested in science. The situations in which the study group felt inadequate can be listed as the applied science courses they took at the university, teaching science concepts at pre-school level, answering students' questions, designing creative and different activities, ensuring and scheduling classroom dominance during science activities, basic knowledge of science and planning. However, Elmas and Kanmaz (2015) stated in their study that teachers found themselves adequate in the methods used and the level of knowledge. Likewise, Afacan and Selimhocaoğlu (2012) found in their studies that teachers find themselves competent in the methods they use and the level of knowledge. Sağlam and Aral (2015) stated in their study that teachers are adequate to be effective in gaining, planning, knowledge and science concepts. These studies have reached the opposite results of the present study's findings. In addition, Türk (2018) supported the findings of the study by drawing attention to the lack of knowledge of teachers and the deficiencies in their undergraduate education. In addition, Erdaş Kartal and Ada (2018) found that pre-school teacher candidates had knowledge deficiencies and misconceptions in the field of science. The findings of Ültay and Can (2015) that pre-school teacher candidates have lack of knowledge in some basic science concepts support the findings of the study.

Another finding of this study is that the preschool teachers include science activities into their programs. Yıldız and Tükel (2018), in their research they made to determine if preschool teachers include science activities into their programs, found that the majority of teachers included science activities once a week.

According to the adequacy of the preschool teachers to make effective science activities, teachers were found they were not creative in their activities, they do not know why they do the activities, they do not question the activities, they do not diversify the activities and they cause misconceptions when doing activities. In the same way, the conclusion of Ayvacı, Devecioğlu and Yiğit (2002), by stating that most of the preschool teachers do not have the ability of planning and doing the science and nature activities at the desired level of quality, they do not develop original material and they are not aware of the effective teaching methods (other than question-answer, demonstration etc.; play, drama etc) when doing the activities and do not use such teaching methods, fully supports the results of this study. Similarly, in another study, Alkış Küçükaydın and Uluçınar Sağır (2018) stated that *"preschool candidate teachers have a traditional approach, such candidate teachers consider themselves adequate in terms of science teaching, however there is no similarity between the adopted approach and the teaching methods and techniques used"*.

Another result of this study is that preschool teachers should be supported more in science education when they are students at the universities. Doğan's (2018) study's result of *"the idea of what science is should be included directly or indirectly in preschool teacher education programs"* supports as well.

One of the results of this study is that most of the teachers are aware of their lack of knowledge and some of them feel uncomfortable for not developing themselves. However, it can be seen that teachers who consider themselves adequate in science give misleading information to students by falling into scientific misconceptions.

The following recommendations are given according to the results of this study:

- Preschool teachers should receive in-service training in the field of science.
- Preschool teachers and science teachers should cooperate in schools.
- The Ministry of National Education should provide resources to guide preschool teachers in science.

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Citation: Yağmur Kolcu, E., and Öztuna Kaplan, A. (2020). Self-efficacy perceptions of the preschool teachers on the field of science and science education. African Educational Research Journal, 8(2): S306-S315.