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Examination of the Reasoning Skills of 60-72 Months-Old Preschool Students on Socio-Scientific Issues According to Epistemic Profiles: Isparta Example *

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60-72 Aylık Okul Öncesi Öğrencilerinin Epistemik Profillere Göre Sosyobilimsel Konulara Yönelik Muhakeme Becerilerinin Araştırılması: Isparta Örneği*

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Abstract

The purpose of this study is to examine preschool students' reasoning about socioscientific issues (SSI) according to their epistemic profiles. A qualitative case study was used in the study. The participant group of the study consisted of 22 children aged 60-72 months studying in a public kindergarten in the central district of Isparta province in the 2021-2022 academic year. Three scenarios about SBK developed by the researchers and two different question sets related to each scenario were used as data collection tools. Before starting the main study, researcher1 spent time with the participant group as a participant-observer within the scope of naturalistic inquiry approach and the main research process was started after she was seen as a natural member of the group. During the implementation process, researcher1 met with each student in a quiet environment with one-to-one interviews and read the scenarios and aimed to reveal the students' reasoning about the scenarios. The same process was followed for each scenario. The data collection process lasted four weeks. The interviews were recorded and converted into written format. The data obtained in the study were analyzed based on content analysis and Schommer and Kuhn's epistemological belief models. According to the findings, it was concluded that the participant group could not make sufficient reasoning and had naive epistemic profiles even if they had ideas about current issues within the scope of SBK. However, as the practices progressed and the scenarios changed, positive changes were observed in students' reasoning. The findings were discussed with reference to the literature and recommendations were presented.

Article Info

Keywords: Preschool education, socioscientific issues, reasoning, epistemological belief, science education

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Öz

Bu çalışmanın amacı, okul öncesi öğrencilerinin sosyobilimsel konulara (SBK) yönelik muhakemelerini epistemik profillere göre incelemektir. Çalışmada nitel durum çalışması kullanılmıştır. Araştırmanın katılımcı grubunu 2021-2022 akademik yılında Isparta ili merkez ilçesinde bir devlet anaokulunda öğrenim gören 60-72 aylık 22 çocuk oluşturmuştur. Çalışmada veri toplama aracı olarak araştırmacılar tarafından geliştirilen SBK ile ilgili üç senaryo ve her senaryoya ilişkin iki farklı soru seti kullanılmıştır. Araştırmacı1 ana uygulamaya başlamadan önce natüralistik sorgulayıcı yaklaşım kapsamında katılımcı grupla katılımcı-gözlemci olarak zaman geçirmiş ve grubun doğal bir üyesi olarak görülmesinden sonra ana araştırma sürecine geçilmiştir. Uygulama sürecinde araştırmacı1 biri birebir görüşmeler ile sessiz bir ortamda her öğrenci ile bir araya gelerek senaryoları okumuş ve öğrencilerin senaryolar hakkındaki muhakemelerini ortaya koymayı hedeflemiştir. Her senaryo için aynı süreç izlenmiştir. Veri toplama süreci dört hafta sürmüştür. Görüşmeler kayıt altına alınarak yazılı formata dönüştürülmüştür. Çalışmada elde edilen veriler içerik analizi ve Schommer ve Kuhn'un epistemolojik inanç modelleri esas alınarak analiz edilmiştir. Elde edilen bulgulara göre, katılımcı grubun SBK kapsamındaki güncel konular hakkında fikirleri olsa bile yeterli muhakeme yapamadıkları ve naif epistemik profillere sahip oldukları sonucuna varılmıştır. Ancak uygulamalar ilerledikçe ve senaryolar değiştikçe öğrencilerin muhakemelerinde olumlu değişimler gözlenmiştir. Elde edilen bulgular literatürden yararlanılarak tartışılmış ve elde edilen bulgulara yönelik öneriler sunulmuştur.

Makale Bilgisi

Anahtar Kelimeler: Okulöncesi eğitimi, sosyobilimsel konular, muhakeme, epistemolojik inanç, fen eğitimi

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Introduction

The preschool period is the period when development and learning are the fastest and the child interacts with the outside world and learning progresses actively. The experiences and gains that an individual will acquire in the first years of his/her life have the power to affect his/her social and emotional aspects in addition to his/her later education life (Kesicioğlu, 2019). In this direction, making children love science in the preschool period, which is an important point of educational life, has an important place in terms of both shaping the child's later life and the benefits it will provide for the majority of society. Science education and activities to be carried out within the scope of science education are of great importance in developing children's scientific skills in the preschool period (Önal & Sarıbaş, 2019). Science education in early childhood is organized according to children's ages, developmental characteristics, and the subjects they are curious about and implemented within the daily plan. Teachers should clearly understand the goals of science education and pay attention to the design of spaces where science education is applied while children play, research, and learn (Alisinanoğlu & Özbey, 2011). When planning science activities in the preschool period, it is important to keep the duration of the activity large so that children can establish cause-effect connections. Since the ability of children in early childhood to establish cause-effect connections is at a lower level compared to adults, it is important that they can provide this connection through direct observation (Yalman, 2018). When all these rationales are examined, introducing the concept of science in an understandable way to children who constantly encounter science-related events in their environment can help them understand the world better and achieve the necessary gains more easily.

According to the definition of Turkish Language Institution (TDK), the reasoning is defined as "seeking a way out to solve a problem" (TDK, 2013). Reasoning skill is a process that enables children to engage in problem-solving skills and reach a logical conclusion (Daempfle, 2012). The pattern and level of reasoning can be revealed by analyzing the answers given by children in this process. Through the answers, it can be determined whether the child's reasoning level is low, medium, or high. In this context, the selection of reasoning skills as an endogenous variable can determine the decision-making processes, stages, and patterns of children (Piaget, 1976). To reveal children's decision-making processes, it can be said that socioscientific texts prepared following children's developmental levels can be used. Socioscientific issues (SSI) are social events that are difficult to decide, complex, open-ended, generally open to discussion and do not have a clear answer, and are in close contact with science (Sadler, 2004; Topcu, 2015). These issues, which have counter theses in society, can be handled with different opinions, have a benefit and harm inferences, and have scientific foundations, are called "Socioscientific Issues" (Sadler, 2004; Topcu, 2015). The importance of teaching, research, and application of socioscientific issues in contemporary and future science education is emphasized by the need for students to interact with the world they live in, and it is emphasized that it is transformative and shaping it for future generations (Zeidler, Herman, & Sadler, 2019).

Epistemological Beliefs

Epistemological belief is more than awareness and comprehension of reality. Epistemological assumptions affect the development of actions and behaviors related to the person's way of learning and being (Reybold, 2002). In the process of education and training, especially the person's access to information, learning, and structuring are affected by epistemological beliefs. This effect has importance for learning for the rest of one's life (Hofer, 2001). People's epistemological beliefs are in contrast to sophisticated and naive. Schommer thought that epistemological beliefs may have different dimensions. He states that people may have a naive epistemic profile about any event, while they may have more complex beliefs about another event (Vecaldo, 2020). While people who are thought to have a naive epistemic profile have more inadequate epistemological beliefs in terms of quality, people who are thought to have a sophisticated epistemic profile are thought to have more adequate epistemological beliefs in terms of quality (Bahçivan, 2017). Epistemological beliefs have important effects on students' problem-solving and thinking stages. Epistemological beliefs have remarkable and important effects on problem-solving, comprehension, academic success, and high-level thinking skills (Phan, 2008). It can be said that the effect of epistemological beliefs will be very important in the preschool period, which is one of the periods when the mentioned skills develop the fastest. Early childhood is a very important period for the development of epistemological beliefs about the nature of knowing and knowledge (Brownlee et al. 2011). A good combination of epistemology and pedagogy is an important element for quality early science education. Preschool teachers who want to provide quality early science education should use this combination in their teaching methods and activities (Mercan & Kutluca, 2021). For this reason, it is thought that teaching epistemological beliefs to children in an understandable way will positively affect children's academic achievement, problem-solving skills, and reasoning. With academic success and permanent learning, children can be expected to apply the gains they have achieved to the problems they encounter in their lives.

Based on this context, this study aimed to determine the reasoning skills of preschool and preschool children toward SSI. The reasoning skills of preschool children between the ages of 60-72 months were analyzed according to

epistemic profiles through different scenarios developed by the researchers, including scenarios about getting vaccinated, forest fires, and zoos.

Related Literature

In this section, national and international studies on science education and SSI in the preschool period are included.

National Studies

Demiral and Türkmenoğlu (2018) aimed to investigate the relationship between pre-service science teachers' content knowledge and their decision-making processes about a socio-scientific issue. The participant group was determined as 15 pre-service science teachers who are continuing their education in the department of science teaching in the Central Anatolia Region of Turkey. Participants' decision-making strategies about genetically modified organism (GMO) foods, one of the popular SSI, were analyzed. As a result of the research, it was concluded that the participants first eliminated foods with chemical content and GMOs. When the decision-making strategies of the participants with high content knowledge were analyzed, it was concluded that they compared the beneficial and harmful aspects of the subject with logical inferences. As a result of the research, it was concluded that the participants with high field knowledge stood behind the decision they made.

The aim of the study conducted by Ayvacı, Bülbül, and Türker (2019) was to analyze the differentiation of pre-service science teachers' approaches to SSI according to their grade levels. From the Trabzon University science teacher education department, 30 students were randomly selected from each grade level and a total of 120 students constituted the participant group of the study. After the attitudes towards SSI scale was applied to the students, it was investigated whether there was a significant difference between the attitudes towards SSI and the class levels of the participant group by analyzing the data. As a result of the research, it was concluded that the attitudes of pre-service teachers studying science teacher education were lowest in the second grade and highest in the fourth grade. In light of the tests and analyses, it was concluded that the attitudes of pre-service teachers studying in the third and fourth grades were significantly higher than those of pre-service teachers studying in the second grade.

Durmaz and Karaca (2020) aimed to investigate the effect of socioscientific subject-based science education on the perspectives of socioscientific subject-based science education on the scientific and reflective thinking skills of seventh-grade secondary school students with the constructivist approach method. The participant group of the study consisted of 51 7th-grade students studying in a city located in the northwest region of Turkey. While 26 of the participants were in the control group, 25 of them were in the experimental group. As a result of the research, it was found that there was a significant difference between the posttest mean scores of the participants in the control and experimental groups corrected according to the pretest scores of the "Socioscientific Issues View Scale" according to the data provided related to the SSI views of the study group. As a result of the study, it was concluded that the use of SSI in educational models can be useful in terms of enabling children to exchange ideas about an SSI that they may encounter in their daily lives, to develop multiple perspectives, and to examine situations. However, it was found that there was no significant difference between the post-test averages of the control group and the experimental group adjusted according to the pre-test scores of the Scientific Thinking Ability Test. Despite this finding, it was concluded that Scientific Thinking Ability could be positively affected by SSI in a longer-term study with participants who were introduced to SSI at a young age.

Et and Gömleksiz, (2021) aimed to investigate the inclusion of SSI in the science curricula of primary and secondary school children, physics curricula of high school children, and biology curricula of secondary school children. In this study, the primary school, secondary school science, and high school biology and physics curricula were used as data sources. When the outcomes at the third-grade level of primary school were analyzed, it was found that only one outcome was included in SSI. It was found that the grade level with the most objectives within the scope of SSI in primary school was the fifth grade with four objectives. At the secondary school level, it was found that the minimum number of outcomes within the scope of SSI was in the sixth grade and the maximum number of outcomes was in the eighth grade.

International Studies

Levy, Baruch, and Mevarech (2013) based their study on the basic assumption that children's participation in science can be shaped by teachers' attitudes towards science and their scientific curiosity can be developed. Therefore, the main objective of this study is to examine the science-oriented behaviors of teachers actively working in preschool institutions and to reveal their views on the nature of curiosity. The participant group of the study consisted of 146 preschool teachers. In the study, it was found that children at a young age can take part in a research process, and conduct research and that scientific activities in the preschool period can affect the child's future life. When the results of the research

were analyzed, it was concluded that most of the participants argued that scientific science education should start in the preschool period.

Dejonckheere, et al. (2016) aimed to test the effects of an inquiry-oriented didactic method for preschool science education in a real classroom setting. The participant group of the study consisted of children aged between 48-72 months from four preschool classes. To elicit the participants' attention and understanding of causal events at the level of scientific reasoning skills, the researchers designed an easy task in which the need for knowledge acquisition occurred. The researchers applied 15 activities to the participant group. The researchers concluded that scientific programs should be designed in such a way that they have a well-thought-out structure on which children can build their discoveries and in which situations they can lead to new questions. The present results show that guided exploratory games in the preschool period can support children's learning through curiosity and scientific reasoning. At the end of the study, it was stated that the contribution of the activities was not clear and that time and observation were necessary for this.

In his study, Nuangchalerm (2009) aimed to develop and sample a method that facilitates the investigation of students' learning processes in classroom discussions about SSI. The participant group of the study consisted of 101 pre-service science teachers who participated in the seminar and development course in the second semester of the 2008 academic year. As a result of the research, it was concluded that most of the participants formed a unique concept about SSI and shared their ideas.

In his study, Fadzıl (2017) aimed to explore the problem-solving skills of pre-service teachers in the department of preschool teaching through a socioscientific inquiry approach. The participant group of the study consisted of 28 third-year students studying in the department of preschool teaching. The researcher obtained the data through classroom observation, questionnaires, individual interviews, and written reports of pre-service teachers. It was found that the inquiry-based learning approach guided the pre-service teachers in the research on SSI. As a result of the research, it was concluded that pre-service teachers understood that knowledge can be produced in a more meaningful way than other perceived passive learning methods. As a result of the research, it was concluded that a program that encourages innovations in teaching and learning and student participation should be reorganized.

When the studies on socioscientific issues were examined, it was concluded that both qualitative and quantitative studies were balanced in the literature. When the studies on preschool students' reasoning skills towards SSI were examined, it was observed that although there are studies conducted with primary school students (Özsoy & Kılınç, 2017), prospective teachers and teachers (Türkmen, Pekmez, & Sağlam, 2017) in the literature, not many studies have been conducted with preschool students on SSI. Topçu, Muğaloğlu, and Güven (2014) examined the socio-scientific studies conducted in Turkey in their study titled "Socioscientific Issues in Science Education: The Case of Turkey". As a result of their research, it was seen that the majority of the studies on this subject in Turkey were conducted with quantitative methods and there were very few in-depth qualitative studies.

In light of all these rationales stated at the end of the literature review, it can be said that this research will be important to examine preschool students' reasoning skills towards SSI in depth according to epistemic profiles.

Importance of Research

The years from birth to five years of age are seen as a critical period for developing the foundations of thinking, behavior, and emotional skills. Child development experts believe that children's linguistic, cognitive, social, emotional, and regulatory skills develop during these years and increase their functionality in many areas in the following years (Bakken, Brown, & Downing, 2017). It can be thought that science education to be given to children in this period will have a positive effect on children's later lives. Today, researchers and educational experts say that science education starts in preschool (Levy, Baruch, & Mevarech, 2013).

Today, science and technology literacy is assumed to be a vital component of the early childhood curriculum (Osborne & Dillon, 2008). Having a child-centered approach and providing a socio-constructivist environment in the preschool classroom enables children to explain the natural phenomena they encounter in their daily lives. In turn, children will become more competent in creating common and larger ideas by evolving from personal and small ideas (Harlen & Qualter, 2004). Research has shown the importance of starting scientific content and activities in early childhood. Children's competencies, attitudes, values, and understandings can be influenced during this period (French, 2004; Patrick, Mantzicopoulos, & Samarapungavan, 2009; Samarapungavan, Mantzicopoulos, & Patrick, 2008). It can be thought that introducing children to SSI in early childhood, when exploring, learning, asking questions, and making inferences are at a very high level, may have a positive effect on their abilities such as reasoning and expressing their opinions on a subject. SSI consists of open-ended questions that contain uncertainty and complexity. SSI includes daily issues that we may encounter in our lives. For this reason, understanding these issues thoroughly and teaching them to children in an understandable way is among the important goals of science education (Albe, 2008; Nielsen, 2012). Social concerns, ethical rules, and dilemmas examined in SSI should not be handled differently from science. People are aware

of ethical, psychological, medical, and legal factors when making decisions in a CPS encounter, and these factors affect the decision-making process (Demiral & Türkmenoğlu, 2018). Children who realize this situation grow up as a member of civilized society. For this reason, it is necessary to increase children's awareness of ethical dilemmas and their tolerance for opposing opinions on the subject and to play an active role in solving these dilemmas (Dawson, 2011). It can be said that there are many factors affecting preschool children's thinking, establishing cause-and-effect relationships, and prediction skills. Introducing SSI to children in a comprehensible way and using it in activities can be considered one of these factors. Children who were introduced to SSI in preschool activities may have developed their skills of prediction and establishing cause-and-effect relationships more than children who were not exposed to SSI, but since this is not the only factor, nothing definite can be said.

While in more traditional approaches to science, education knowledge is decontextualized in generality, the type of discourse and knowledge construction found in the progressive tradition is the result of students' deliberative talk about authentic problems that allows them to become active participants in democratic decision-making. In the latter case, both pedagogy and curriculum are necessarily contextualized because the type of sociocultural framing found in SSI is de facto linked to the quality of personal, societal, and global issues. Accordingly, SSI discourse is an important component in the formation of judgment, productive reasoning, and scientific identity (Simonneaux & Simonneaux, 2009). The Ministry of National Education (MoNE) first included SSI in the Science and Technology Curriculum in 2013. SSI, which was generally included in the curriculum in the form of a science-society-environment-technology approach before it was officially included in the curriculum, was directly included in the curriculum in 2013 (Topçu, Muğaloğlu, & Güven, 2014). Within the aims of the curriculum, it is clearly stated that primary school children should be aware that they have a role in solving social problems and gaining scientific thinking habits with the support of SSI (MoNE, 2013). Children's associating their lives with school and meaningful learning is supported by SSI (Dawson, 2015). SSI is valuable in terms of creating the opportunity for children to discuss a subject by utilizing their knowledge, standing behind the decisions they have made, and evaluating the opinions of their friends (Dawson & Carson, 2016). Eastwood, Schlegel, and Cook (2011) believe that curricula that include SSI will help children to make decisions by thinking logically about complex and real problems. In addition to all these, it is thought that conducting discussion and evaluation studies related to SSI during science activities can positively affect the social, rational, and sensory development of individuals (Topçu, 2008).

Method

This section includes the research design, participant group, validity and reliability of the research, data collection tools, implementation of the research, data collection process, and data analysis processes.

Research Design

This research was designed with the case study model, which is one of the qualitative research methods. The case study is a form of qualitative research in which one or several events limited in time are examined in depth with data collection tools including multiple sources (observations, interviews, audiovisuals, documents, reports) and situations and themes related to the situation are explained (Chmiliar, 2010; Creswell & Poth 2016). The results obtained as a result of the analyses reveal why the event occurred in that way and which points should be considered in future research (Davey, 1991). The situation determined in this study was determined as the socio-scientific issues in the daily life of preschool students and student reasoning about these issues, the epistemic profiles, and the final opinions of the students in these reasoning processes. Considering both the research and the importance of starting scientific content and activities in early childhood, it can be considered that introducing children to SSI in early childhood, when situations such as exploring, learning, asking questions, and making inferences are at a very high level, can have a positive effect on their abilities such as reasoning and expressing their opinions on a subject.

Participants

The participant group of the study consisted of 22 children (12 F, 10 M) studying in a kindergarten affiliated with the Ministry of National Education in the Central District of Isparta Province in the 2021-2022 academic year. However, not all children could participate in all scenarios. People conducting qualitative studies generally prefer the non-probability purposive sampling method. In determining the participant group, it is examined whether they are directly related to the subject of the research rather than whether they can represent the universe (Neuman, 2012: 320; Yıldırım & Şimşek, 2008: 107). Purposive sampling enables in-depth research in cases where the selected group is thought to have rich information (Yıldırım & Şimşek, 2008: 107). In the selection of the participants as children, factors such as the thought that addressing SSI in the preschool period may affect children's thinking skills, the thought that they may look at the events from different perspectives due to their age group, and the fact that there are not many studies on SSI

with children in the literature were effective. In the table below, the age group, gender, mother's education level, and father's education level of the children participating in the study are given in Table 1.

Table 1. Demographic Characteristics of the Participant Group

		Frequency
Gender	Girl	12
	Male	10
Mother's Education Status	Primary School	1
	High School	-
	Associate Degree	2
	High School	1
	License	14
	Master's Degree	4
Father's Education Status	Primary School	1
	High School	2
	Associate Degree	2
	Master's Degree	1
	License	15

It was observed that the school where the participant group was studying was a school that was in compliance with preschool education standards and offered more opportunities than many other schools. The school where the research was conducted is located on a large high school campus and has one floor. It has a cafeteria, an indoor playground, an outdoor playground, and a very large garden. The school is in greenery among the trees and has two very large gardens, front and back gardens. In the garden of the school, there is a traffic area to teach traffic rules to children and a picture of planets on the concrete floor. When the classroom where the participant group was receiving an education was analyzed, it can be said that the classroom was quite large. There is a smart TV, projection, and a normal blackboard in the classroom. There are an art center, music center, science center, and Atatürk corner on the walls of the classroom. There is an area similar to a balcony inside the classroom. In this area, there are activities such as germination, etc. that children have done in science activities. The corridor where the classroom is located is very wide and designed in a way that is suitable for children to play games. There are information boards on the walls of the corridor. At the entrance of the school, there are cupboards where children can put on their shoes. After the entrance, there is a small aquarium where children can get to know water creatures. There are recycling bins in the classrooms and corridors to raise recycling awareness among children. The school has one workshop. In the workshop, there are rotating world maps, human models with detachable organs, jigsaw puzzles, musical instruments, large and remarkable planet figures, a chalkboard, brain games, and many entertainment corners. During the observation process, it was observed that the classroom teacher of the participant group carried out activities with interesting and innovative methods. She uses an education model that allows children to think, learn, develop cognitively, generate ideas, and share their ideas, and that the researcher takes as a model and provides a lot of positive gains to the researcher. When the opportunities offered by the school to children are evaluated as coming, it is concluded that it has features that are unfortunately not found in many schools

Data Collection Tools

To find an answer to the main research question in the study, three different scenarios were developed by the researchers and four questions were prepared in each scenario to reveal student reasoning about the scenario. In the process of preparing the scenarios, the literature on the events that can be included in the scope of the socioscientific subject and the events that were on the agenda during the research period were utilized. In this context, it was decided that the scenario contents should be related to zoos, vaccines, and forest fires. While selecting these topics, the relevant literature was also taken into consideration and it was assumed that children would have prior knowledge that they could acquire from their daily lives and social learning environments and that they would be able to make better judgments on these topics. While developing the scenarios, care was taken to ensure that the selected topics were up-to-date. While determining the scenario topics, the pandemic process that has been affecting the world since March 2020, forest fires that occurred in our country and many parts of the world, and zoos that children were interested in were on the agenda at that time in the society. After determining the scenario topics, the researchers prepared three scenarios that were suitable for children's cognitive and language development and that they thought would not be boring. After the scenario texts were prepared, they were sent to three academicians who are experts in the fields of science education, preschool education, and socio-sciences for expert opinion. After the scenarios were updated in line with the expert opinions, a

pilot study was conducted with a limited number of participants. The results of the pilot study were discussed with the field experts again and it was decided that it was appropriate to apply the texts to children. After the prepared data collection tool was submitted to the ethics committee for approval and the approval was obtained, the data collection tool was also presented to the teacher of the participant group and a consensus was reached that it was appropriate for the developmental levels of the children (Research and publication ethics were followed. For this research, the ethical approval was obtained from the Human Research Ethics Committee of Istanbul Aydin University (Date: 21.04.2022, Number: 2022/07)). The flow chart summarising the process of developing the data collection tools is given below.

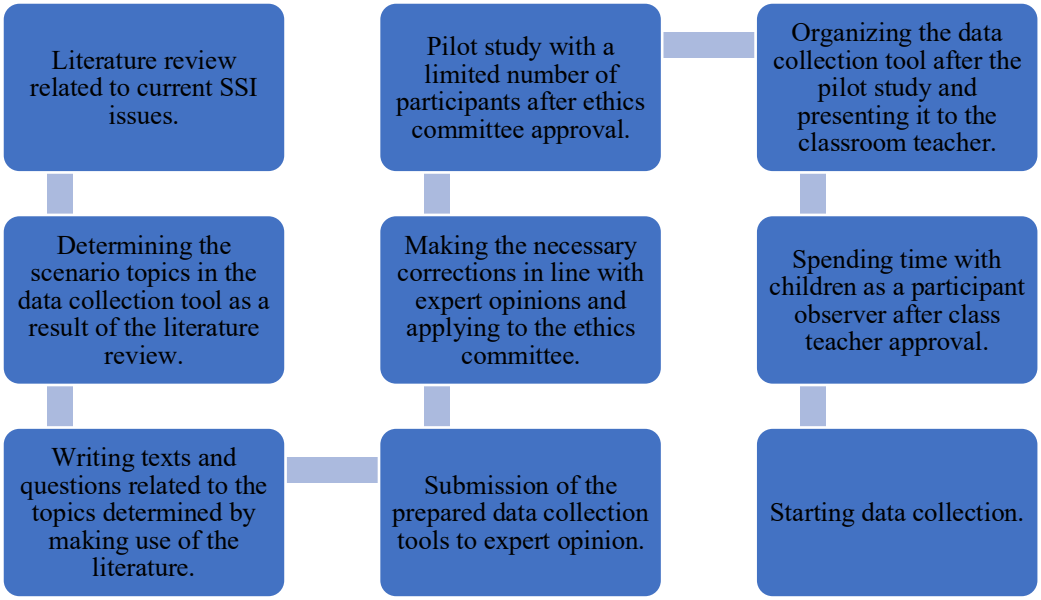

Figure1: Development process of data collection tools

Implementation and Data Collection Process

One of the researchers, Researcher 1, introduced himself to the class before applying the data collection tool to the group as a participant observer and spent two weeks with the participant group in the school (participant observer). During these two weeks, she participated in activities with the class teacher, planned and implemented her activities, and participated in every activity with the children in the indoor and outdoor areas of the school. Researcher 1 started the data collection process as soon as she felt that she was adopted (accepted, a natural element of the classroom) by the children. The data collection process lasted four weeks. Twenty children participated in the forest fires scenario and the average interview time was 7 minutes; 19 children participated in the zoo scenario and the average interview time was 8 minutes; 17 children participated in the scenario about vaccines and the average interview time was 9 minutes. Researcher 1 invited each participant individually to the interview room to prevent children from being affected by external factors and the interviews were conducted individually. The texts were read to each child separately. All interviews during the data collection process were audio recorded and then transcribed by the researchers. The data collection process is given below.

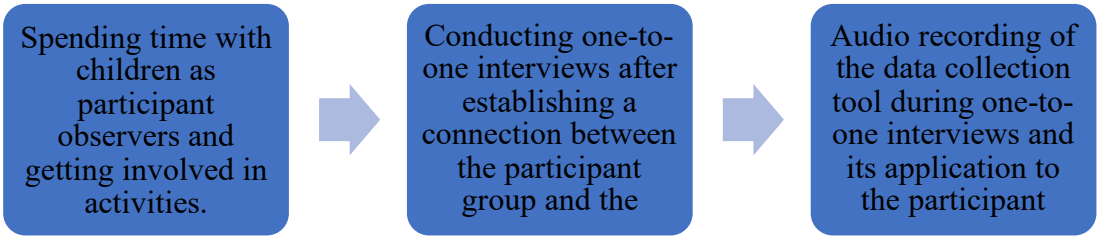

Figure2: Data collection process

This research was conducted in the 2021-2022 academic year, in a kindergarten located in the Central District of Isparta Province; while the researchers were planning the study, it was aimed to work with 30 children, but the study was limited to 22 children with class size; the researchers wanted to handle the scenarios prepared by the researchers in places suitable for the content of the scenarios, but due to physical impossibilities, the handling and reading of the scenarios were limited to the interview room. In the research, it was assumed that the duration of the activity planned for four weeks with the participant group was sufficient to obtain data, that a comfortable environment was provided to the children while reading the scenarios to the children, and that the thinking time given to the children was sufficient, and that the two-week process of doing activities with children outside the research (participant observer) was sufficient for the children to adopt the researcher.

Validity and Reliability of the Study

The credibility of the results obtained in scientific research is seen as one of the most important factors of scientific research (Başkale, 2016). When the research is analyzed in this respect, it is thought that validity and reliability are the two most common criteria used in research. Validity and reliability in qualitative studies are provided differently compared to quantitative studies (Yıldırım & Şimşek, 2018). Unlike the definitions of validity and reliability in quantitative studies, in qualitative studies, the credibility of the research, the accuracy of the results obtained, and the competence of the researcher are mentioned (Krefting, 1991). Validity in qualitative studies is the degree to which the researcher can solve the problem that the researcher has identified as objectively as possible (Baltacı, 2019). The degree to which the data obtained as a result of the research can reflect the situation that exists in real life is important. Examining all the features of the phenomenon under investigation in detail or examining the problem situation in the research as a whole are seen as important validity criteria. In addition to these, during the interviews with the participant group during the research, getting feedback and confirmation from the participants with questions such as "Did you mean this?" or "Should I understand this from your words?" increases the level of validity. The researcher can increase the validity of the study by allowing the data collected by the researcher to be analyzed by another expert, that is, by getting confirmation from experts or colleagues (Denzin & Lincoln, 2008; Sandelowski, 1986). The reproducibility of the research results obtained as a result of data analysis is related to the concept of reliability. The question "if this research is conducted a second time, can the same results be reached again?", which is frequently mentioned in the literature, is related to the problem of reliability. Reliability is one of the important factors affecting credibility and reliability must be ensured in scientific research. A study with low reliability has no scientific value, and high reliability cannot guarantee the validity of the study. However, to ensure the validity of a scientific study, it must first ensure reliability. In line with all these rationales, the reliability of the research is gained when continuity, rater consistency, and internal consistency are achieved (Baxter & Jack, 2008; Miles & Huberman, 1994; Patton, 1990; Sandelowski, 1986). In line with all these rationales, the researcher consulted expert opinions on the data collection tool before starting the study and shaped the data collection tool with expert opinions. The data collection tool, which was prepared with the recommendations of expert opinions, was finalized after a pilot study. Taking expert opinions while developing the data collection tool and conducting a pilot study with a limited number of participants ensured the credibility criterion, internal validity, and external control of the research (Yıldırım & Şimşek, 2018). Researcher 1 spent time with the participant group for two weeks before starting the study and spent time as a participant observer until he made the participant group feel that he was one of them. During this period, he examined the school where the research would be conducted in detail in terms of environment and physics. She also had the chance to observe the participant group and record the whole process. The researcher also shared the data collection tool with the classroom teacher and received approval that it was appropriate and applicable to the developmental levels of the children. All these factors mentioned above can be expressed as factors that positively affect the credibility criterion.

Analyzing the Data

The data obtained in the study were analyzed by inductive content analysis, which is one of the qualitative analysis methods. It is known that the content analysis method is frequently used in the analysis of qualitative visual and written data (Silverman, 2001). Researchers create the themes and categories they create using the inductive content analysis method by making use of the data set they collect (Zhang & Wildemuth, 2009). To put it differently, codes emerge, and meaning clusters are formed by utilizing the participants' discourses. According to the answers given by the participants, the data with similarities are examined together and the analysis process is carried out by systematically examining the documents related to the data (Yıldırım & Şimşek, 2018). The purpose of the researchers using the content analysis method is to reach the concepts and relationships that can explain the data by examining the data in depth (Yıldırım & Şimşek, 2018). Firstly, the digitally recorded responses of the children in the participant group were completely transcribed in the computer environment. Then, the answers that could be key among the answers given by each child

to the questions were analyzed and noted. After the answers of all children were analyzed and noted, the answers that were similar to each other and thought to express the same concept were carefully read and meaningful coding was made. The part of naming the meaningful sections (such as paragraphs, words, and sentences) in the data obtained as a result of the research is called the coding part. In this process, the aim is to examine, compare, compartmentalize, associate, and conceptualize the data (Karataş, 2015). After the formation of concepts and coding, meaningful concepts that are related to each other were analyzed and themes were formed. The process of putting the concepts reached as a result of content analysis under a certain theme is called the process of creating a category (theme). The concepts are analyzed in detail and their relationships with each other are revealed this relationship between them is expressed with a theme at a higher level. The theme or category is more abstract and general than the concepts reached as a result of content analysis (Karataş, 2015). Before starting the data analysis process, the researchers exchanged ideas with an expert about the formation of concepts, coding, and themes, and then started the data analysis. During the data analysis process, the collected data were shared with an expert and the analysis process continued with a simultaneous study. In coding, a common ground was reached in the formation of concepts and themes. The coders harmonized the codes they reached. Thus, it was tried to ensure reliability and validity in data analysis.

In the analyses of the collected data according to epistemic profiles, the answers given by the children were divided into three groups sophisticated-medium-naive. Schommer's and Kuhn's epistemological belief models were used in this grouping (Schommer, 1990). The answers that have a broader perspective, can address problems with different perspectives and solution proposals, and have qualified solutions to the problem are determined as sophisticated answers. Answers that are weak in terms of quality, cannot produce solutions to problems, are independent of the subject, meaningless, and memorized are determined as naive answers. In the distinction between sophisticated and intermediate answers, a comparison was made between how many different perspectives the participant can look at a problem and how many different solutions he/she can offer in solution suggestions. In question-based epistemological belief analyses, answers that can bring more solutions to a problem were analyzed as sophisticated, and answers that can bring fewer solutions than sophisticated answers were analyzed as intermediate. The data analysis process is given in the diagram below.

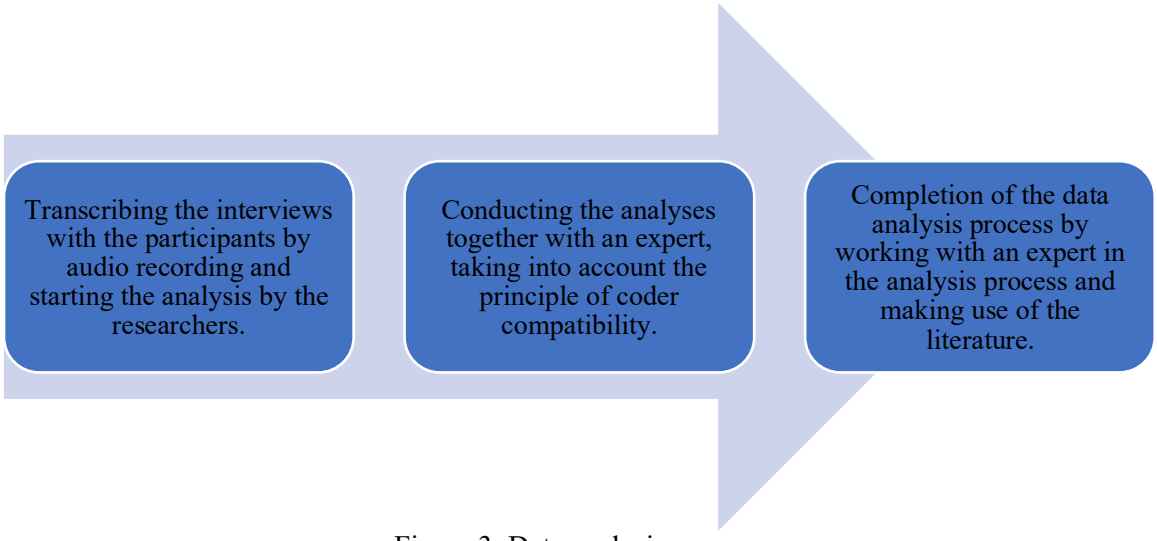

Figure 3: Data analysis process

Results

In this part of the study, which was conducted to reveal the reasoning of preschool students about SSI, the results of the qualitative analysis of the answers given by preschool students within the scope of the texts prepared by the researchers including the socioscientific topics of forest fires and vaccination and non-vaccination were included. In addition to the reasoning of the students participating in the study, their epistemological beliefs were also examined and Schommer's and Kuhn's epistemological belief models were used in their analyses. The data obtained from one-to-one interviews with the children participating in the study were analyzed through content analysis, one of the qualitative analysis methods.

A. Findings Related to the First Research Question

To find an answer to the first sub-problem of this study, "How are preschool students' judgments about whether or not to be vaccinated?", a text about vaccines was read to preschool students by one-to-one interview method and then questions related to the text were asked. The epistemic profiles of the participants were evaluated by using Schommer's

and Kuhn's epistemological belief models. Using the content analysis method, the answers given by the participants were coded and themes were determined.

Table 2. Epistemic Profiles of Preschool Students According to Their Responses to "Should We Get Vaccinated?"

	Epistemic Profiles According to Their Answers to the Text		
Questions	**Sophisticated**	**Centre**	**Naive**
Question 1 *If you were Ozgur, the undecided person, would you get vaccinated? Why?*	1	3	13
Question 2 *Do you think vaccination would be useful to fight against diseases and why?*	3	2	12
Question 3 *Can you tell us what you think the consequences are if we don't get vaccinated against infectious diseases?*	0	14	3
Question 4 *Can not be vaccinated against infectious diseases affect public health? How?*	0	12	5

When the data in Table 2 are analyzed, it is concluded that the participant group gave a balanced response to the text "Should We Get Vaccinated?" with a moderate and naive epistemic profile. While there were no participants who gave sophisticated answers to questions three and four, question two was the question with the most sophisticated answers. It was found that the participant group had a medium-naive epistemic profile.

Table 3. Preschool Students' Answers to the First Question of "Should We Be Vaccinated" Text

Sophisticated	**Centre**	**Naive**
"What Pelin said did not seem quite right to me, so I would get vaccinated. It doesn't have to be expensive, what is important is our health. I was a little indecisive at first, but I would get vaccinated. I also trusted Pelin a little bit according to the story. Sometimes we cannot get vaccinated because we cannot afford it, but if it is free or if I can afford it, I would get vaccinated." (P 12)	*"I would want to because I wouldn't want to get sick. Even if I got sick, I wouldn't want to infect someone else. When we are vaccinated, we are protected from coronavirus." (P 4)* *"I would get vaccinated because I would get vaccinated so that corona would end. I would get vaccinated so that I would not get sick and so that my friends would not be infected with corona." (P 6)*	*"I would get vaccinated. I would get vaccinated to avoid getting sick." (P 8)* *"I would like to be vaccinated because I would like to be protected from diseases." (P 2)* *"I would be vaccinated. I would want to be vaccinated to prevent coronavirus transmission." (P 3)*

Table 3 shows the sample answers given by the participants to the first question (If you were Özgür, the undecided person, would you get vaccinated? Why?). In total, one sophisticated, three moderate, and 13 naive answers were given to the question. One sophisticated, two moderate, and three naive answers are given in the table. The answer that dominates the story, follows the plot well and can make the judgment in this direction, produces many ideas about the problem, and looks from a wide perspective is considered sophisticated. The answers that had empathy, and handled the situation from different perspectives, but did not have as wide a perspective as the sophisticated answer was evaluated as medium answers. The answers given with a single point of view were evaluated as naive answers.

Table 4. Preschool Students' Answers to the Second Question of "Should We Be Vaccinated?" Text

Sophisticated	Centre	Naive
"I believe it is beneficial because red blood cells are getting stronger. I watched a video, there was a vaccinated red blood cell and it was strengthened and when the virus tried to enter the body, the vaccinated red blood cell expelled it from the body, and the virus could not do anything." (K 12) *"It is very useful. Because the cells in it enter our arm, wait for the microbes to enter, and when the microbes come, they fight them and win, protecting us." (P 17)*	*"Yes. Viruses can make us sick if they enter our body, but vaccines fight against them." (P 1)* *"It's useful. Because the vaccines protect everyone. The medicines in the injections fight viruses when they enter our bodies. "* *(K 16)*	*"Yes, it is useful. It is useful so that we get sick less." (P 3)* *"Yes, I think so because vaccination is a very good thing." (P 4)* *"It is useful. Because if we do not get vaccinated, germs can infect us." (P 10)*

Table 4 shows the remarkable answers given by the participants to the second question (Do you think vaccination would be useful to fight against diseases? Why?). In total, three sophisticated, two moderate, and 12 naive answers were given to the question. Two sophisticated, two moderate, and three naive answers are given in the table. The answers which are at a high level in terms of quality, address the problem situation with a broad perspective, and convey information about the subject are considered sophisticated. Answers with different perspectives but at a lower level in terms of quality compared to sophisticated answers were evaluated as moderate answers. Answers that addressed the problem situation with a single point of view were evaluated as naive answers.

Table 5. Preschool Students' Answers to the Third Question of the Text "Should We Be Vaccinated?"

Sophisticated	Centre	Naive
-	*"We can get sick, we can get infected with coronavirus, we can vomit, we can get very severely ill and infect others." (P 4)* *"If we don't have a disease, we could get a disease, we could get corona. We would not be able to go out, we would not be able to breathe and we would have to stay indoors." (P 10)* *"We'll get very sick. If we cry to avoid vaccination, we may have an operation. We cannot go out on the streets, we always stay at home, they give us disgusting medicines and we may have to drink them." (P 17)*	*"Coronavirus is transmitted, we will get very sick." (P 3)* *"We get corona, we go to the hospital." (P 7)* *"If we get coronavirus, we can die." (P 8)*

Table 5 shows the sample answers given by the participants to the third question (Can you tell us what kind of consequences you think may arise if we are not vaccinated against infectious diseases? No sophisticated answer was given to the question. In total, 14 moderate and three naive answers were given. Three moderate and three naive answers are given in the table. Since there was no answer to the question from a perspective that could be considered sophisticated, the answers that could add different perspectives and interpretations compared to the naive answers were evaluated as moderate answers. The answers given with a single point of view are considered naive answers.

Table 6. Preschool Students' Answers to the Fourth Question of the Text "Should We Be Vaccinated?"

Sophisticated	Centre	Naive
-	*"Effects. To keep germs away because vaccines fight germs. Weakened germs cannot easily infect others, so it affects." (P 3)* *"It does. Because coronavirus and its friends make everyone sick. If we get vaccinated, the virus is weakened and cannot infect anyone else." (P 9)* *"It affects because if a person who is not vaccinated sneezes at someone, it makes other people sick because there are germs in it. If someone is sick and sneezes, if there is no napkin with them, they should cover their arm and sneeze." (P 17)*	*"It may affect. When we wash our hands, viruses die, and the vaccine fights the virus, so it affects." (P 1)* *"It does. Everyone can get sick if not vaccinated." (P 8)* *"It affects them because if they get infected, they can infect everyone else." (P 11)*

Table 6 shows the sample answers of the participants to the fourth question (Can not being vaccinated against infectious diseases affect public health? How?) are given in Table 6. No sophisticated answers were given to the question. In total, 12 moderate and five naive answers were given. Three examples of moderate and three examples of naive answers are given in the table. Since there was no answer to the question from a perspective that could be considered sophisticated, answers that could add different perspectives and interpretations compared to naive answers were evaluated as moderate answers. The answers given with a single point of view are considered naive answers.

Table 7. Coding and Theme Table of Preschool Students' Coding and Theme Table for the Text "Should We Be Vaccinated?"

Questions	Theme	Codes
Question 1. *If you were Ozgur, the undecided person, would you get vaccinated? Why?*	Prevention of diseases	I would be (f=16) Protection from diseases (f=13) Not having coronavirus (f=3) Not infecting others (f=3) Dislike of germs (f=2) Being able to play freely (f=2) To be done in a short time (f=1) End of coronavirus (f=1) Not going to the hospital (f=1) Fast recovery (f=1) For health (f=1) Being able to afford the fee (f=1) Being keen to be vaccinated (f=1) Love vaccines (f=1) Not wanting to have an operation (f=1)
Question 2. *Do you think vaccination would be useful in to fight against diseases and why?*	Being healthy	Useful (f=17) Protection from diseases (f=5) Having medicine inside (f=5) Protection from germs (f=4) Fighting against viruses (f=3) Saving our body (f=1) Being less sick (f=1) Good vaccination (f=1) Feeling good (f=1) Not hurting at all (f=1) Improvement (f=1) Having vitamins in it (f=1) Strengthening the body (f=1) Fighting viruses (f=1)
Question 3 *Can you tell us what you think the consequences are if we don't get vaccinated against infectious diseases?*	Spread of diseases and viruses	Being sick (f=11) Coronavirus transmission (f=7) Staying at home alone (f=4) Vomiting (f=4) To infect others (f=4) Not having fun (f=4) Not being able to go out (f=3) Not going to school (f=3) Poor results (f=2) Coughing (f=2) Dying (f=2) Insertion of serum (f=1) Coronavirus does not end (f=1) Going to the hospital (f=1) Falling into bed (f=1) Not being able to go to the guest house (f=1) Not being able to breathe (f=1) Nausea (f=1) To be ruined (f=1) Not being able to have a holiday (f=1)

		Not being able to play games (f=1) Having an operation (f=1) Having to take medication (f=1)
Question 4. *Can not being vaccinated against infectious diseases affect public health? How?*	End of epidemics	Effects (f=16) Slowing down the transmission (f=11) The vaccine fights the virus (f=6) Everyone is sick (f=4) To infect people (f=4) Being sick (f=3) Easy transmission of the virus to the unvaccinated person (f=2) The vaccine fights the virus (f=1) Coronavirus can be transmitted (f=1) Being healthy (f=1)

When Table 7 is analyzed, it is concluded that almost all of the children will be vaccinated. The reason for this is that most of the group said that they would be vaccinated to protect themselves from diseases. All of the participant groups said that vaccination would be useful in combating epidemics. The reason for this was that vaccines protect against diseases, and fight viruses and vaccines contain medicines. The majority of the participant group said that if they were not vaccinated against infectious diseases, they could get sick and catch coronavirus. As a result, some children said that they could not stay at home alone and have fun. The majority of the participant group said that vaccination is necessary for public health. The number of students who said that the transmission rate would slow down if they were vaccinated is at a remarkable level. The one-to-one answers given by some children are shared below.

Some participant answers the first question:

"I would get vaccinated because I would get vaccinated to prevent diseases because if we don't get injections, we will get sick."

"I would want to because I wouldn't want to get sick, and even if I did, I wouldn't want to infect anyone else. When we are vaccinated, we are protected from coronavirus."

"I would like to be because I wouldn't want to make others sick if I got infected."

Some participant answers the second question:

"It's useful. Because they protect us and prevent us from getting sick." "It's useful. Because there are very powerful drugs in the vaccine."

"It's useful. Because the vaccines protect everyone. The medicines in the injections fight viruses when they enter our bodies."

Some participant answers the third question:

"You may need an IV drip and sometimes this takes a long time. We may vomit, cough like we are going to vomit, and be very sick."

"We can get sick, we can vomit, we can make people sick if we go out."

"We get sick, we can't go to school, we can't go to the sea, we can't have fun and we can't go on holiday."

Some participant answers the fourth question:

"It does. Because the vaccine fights viruses and cannot be easily transmitted to others."

"It does because if he is infected, he can infect everyone else."

"Yes. When we're vaccinated, corona can't attack us, it can't kill us, the vaccine kills it so it can't be transmitted."

B. Findings Related to the Second Research Question

To find an answer to the second sub-question of this study, "How are preschool students' judgments about forest fires and what can be done to prevent forest fires?", a text about forest fires was read to preschool students by one-to-one interview method and then questions related to the text were asked. The epistemic profiles of the participants were evaluated by using Schommer's and Kuhn's epistemological belief models. Using the content analysis method, the answers given by the participants were coded and themes were determined.

Table 8. Epistemic Profiles of Preschool Students According to Their Responses to the "Forest Fires" Text

Questions	Sophisticated	Centre	Naive
Question 1 *What measures do you think we can take to prevent forest fires?*	1	6	13
Question 2 *Should forest areas be active for people? Why?*	2	7	11
Question 3 *How do you think we should educate people to prevent forest fires?*	3	8	9
Question 4 *What precautions should officials take to reach places where fire trucks cannot reach?*	3	5	11(+1 no answer)

When the data in Table 8 were analyzed, it was concluded that the participant group mostly responded to the forest fires text with a naive epistemic profile. While sophisticated answers were given to all questions, it was observed that there was one participant who did not answer question four. It was found that the participant group had a naive epistemic profile.

Table 9. Preschool Students' Answers to the First Question of the Forest Fires Text

Sophisticated	Centre	Naive
"People should be banned from throwing rubbish, it should be recycled or thrown away. Some people should be controlled, when a person goes to nature, they should be kept under surveillance. If a person throws garbage, garbage collection vehicles should come immediately, but people should not throw garbage. Because if the garbage collection vehicles break down, there will be garbage everywhere." (P 13)	*"For example, if I go to the forest and see a fire, I call the fire brigade. I do not light barbecues and fires in the forest. We cooked our food at home and went to the forest because we did not want to harm the forest." (P 18)* *"We must protect our world. If we have a picnic in the forest, we should throw all our rubbish in the garbage. We need to call the fire brigade, we need to take a big hose and pour water." (P 20)*	*"We can keep water. We should throw our rubbish in the bin." (P 1)* *"We should not throw rubbish in the forest." (P 8)*

Table 10. Preschool Students' Answers to the Second Question of the Forest Fires Text

Sophisticated	Centre	Naive
"Sometimes you should show it and sometimes you shouldn't. Because some people are good and some people are bad, we don't know who is good and who is bad, so we should go occasionally. I would like to go to the forests to have a barbecue, sunbathe, eat a little food, take off my shoes and get grounded, and listen to nature and the songs of birds." (P 13) "If there are people who do dangerous things, I say stop them. A person makes a barbecue and then leaves without extinguishing the fire, I tell him not to go anywhere without extinguishing the barbecue. People should be able to go to forests, I would like to go to forests to see animals, trees, and flowers and to get fresh air." (P 18)	*"They can go if they are not going to do anything bad, but they should not go if they are going to do something bad. You are traveling in nature, sometimes you have an adventure, so people should be able to go to forests." (P 7)* *"It doesn't necessarily have to go, but I would like to go because I like animals very much. There are plants and flowers there, and I love them too, I would like to see them." (P 20)*	*"They should show it. Because to get fresh air." (P 1)* *"It should not be active. Because people can throw rubbish and some people can do harmful things." (P 19)*

Table 11. Preschool Students' Answers to the Third Question of the Forest Fires Text

Sophisticated	Centre	Naive
"Educational institutions should be built to go to the forest and training should be given there. There should be one expert and he should teach people and tell them "no, no rubbish will be thrown here, if you throw rubbish here, we will throw you out of here"." (P 13) *"You should be trained to collect your barbecue and throw your rubbish in the rubbish bin. If there is a fire, we should not approach, we should call the fire brigade. Those who know how to intervene with water can intervene with a hose, but those who do not know should not intervene, their own lives may be in danger. " (K 15)*	*"We should give training on extinguishing our fires after having a picnic. Fire extinguishing training can be given after a fire breaks out." (P 16)* *"We should provide fire extinguishing training. Training should be given on where to throw rubbish. Training should be given on extinguishing barbecues. " (K 19)*	*"We can say that they should throw away their coal." (P 5)* *"We can give fire extinguishing training. "(K 6)*

Table 11 shows the sample answers given by the participants to the third question (What kind of education do you think we should give to people to prevent forest fires? In total, three sophisticated, eight moderate, and nine naive answers were given to the question. Two sophisticated, two moderate, and two naive answers are given in the table. The answers that offered more qualified and varied solutions were considered sophisticated answers. Although they contain solution suggestions and qualifications, the answers that have a lower level of quality compared to sophisticated answers are considered moderate answers. Answers that were given from a single point of view and had a lower level of quality compared to sophisticated and moderate answers were evaluated as naive answers.

Table 12. Preschool Students' Answers to the Fourth Question of the Forest Fires Text

Sophisticated	Centre	Naive
"Helicopters can rescue people and pour water. They can widen the roads for cars to pass. Helicopters can take things from the road if there are things on the road that prevent traveling." (P 17) *"For example, we can call mechanics, diggers, etc. because if there were gaps in the roads, they would fix them and the vehicles would reach them easily. Vehicles should go slowly and be careful. Sometimes, if we find an expert in the work, we tell everyone, we tell the most expert person, if we can find a talented person, they can help us and we can do something accordingly. Fire extinguishing planes and helicopters also help us."(P 20)*	*"We can try to extinguish it ourselves. On closed roads, for example, firefighters can get out of their vehicles and reach on foot. Aircraft, helicopters can pull water from the sea with a rope and pour it over the fireplaces." (P 18)* *"There should be fire trucks everywhere. If fire trucks cannot reach, people should come everywhere. Helicopters should bring water." (P 13)*	*"We can call people and get help." (P 5)* *"It can be intervened by airplane. I cannot think of anything else." (P 9)*

Table 12 shows the sample answers given by the participants to the fourth question (What measures should the officials take to reach the fireplaces where fire trucks cannot reach? A total of three sophisticated, five moderate, and 11 naive answers were given to the question. One participant did not give any answer to the question. Two sophisticated, two moderate, and two naive answers are given in the table. The answers that evaluated the problem situation with a wider perspective, suggested more than one solution and had interesting but rational suggestions were considered sophisticated answers. Answers that were qualified but had fewer solution suggestions compared to sophisticated answers were evaluated as moderate answers. Answers with limited solution suggestions from a single point of view were evaluated as naive answers.

Table 13. Coding and Theme Table for Preschool Students' Forest Fires Text

Questions	Theme	Codes
Question 1. *What measures do you think we can take to prevent forest fires?*	Protecting nature	Throwing rubbish in the rubbish bin (f=10) Trying to extinguish with water (f=8) Extinguishing burning fires (f=6) Calling the fire brigade (f=4) Warning (f=3) Fire extinguisher (f=2) Not lighting a fire (f=2) Protecting animals (f=2) Controlling and supervising people (f=1) Protecting the world (f=1) Complaining to the police (f=1)
Question 2. *Should woodlands operate for people? Why?*	Forests are beautiful	Should show (f=17) Recognizing nature (f=7) Getting fresh air (f=5) Having fun (f=5) Loving animals (f=4) Having a picnic (f=4) Feeding animals (f=2) Being careful (f=2) Collecting garbage (f=2) Love for forests (f=1)
Question 3 *Should people be trained to prevent forest fires? What kind of training should be given?*	To be beneficial to the environment and nature.	Waste disposal training (f=10) Training on extinguishing the fire (f=8) Fire extinguishing training with water (f=5) Garbage collection training (f=3) No fire training (f=3) Fire brigade call training (f=3) Training on protecting the habitats of living things (f=1) Training on not eating at picnics (f=1) Expert warnings (f=1)
Question 4. *What precautions should officials take to reach fireplaces where fire trucks cannot reach them?*	Intervention with vehicles	Intervention by helicopter (f=14) Intervening by aircraft (f=7) Using small cars (f=3) Asking for help (f=3) Widening the roads (f=2) Carrying water on foot (f=2) Clearing obstacles on the roads (f=2)

When Table 13 is analyzed, the majority of the participants said that garbage should be thrown away to prevent forest fires. In the case of a fire, the idea of trying to extinguish it with water was also frequently mentioned in the group. Almost all of the participant groups said that forest areas should be active for people. For this reason, opinions such as getting to know nature, getting fresh air, having fun, and loving animals were mentioned. To prevent forest fires, most of the children said that garbage disposal training should be given. A considerable number of children said that they should be trained to extinguish the fire in the forest. Almost all of the participant groups said that helicopters can intervene in places where fire trucks cannot reach. One-to-one answers given by some children are shared below.
Some participant answers the first question:

"We can hold water, we should throw our rubbish in the bin."
"We can intervene with a fire extinguisher, we can take water from your neck and pour it into the forest."
"We can extinguish as much as our strength is sufficient. If someone has left a fire burning, we should extinguish it immediately, and we should not light a fire carelessly in forested areas."
"We must not throw rubbish on the ground, we must pick up what we eat, we must put out the fires we light."

Some participant answers the second question:

"He should. Because you should go to get fresh air and have a picnic. "
"He should. I'd like to go to the woods to play."
"Don't let the fire burners go. I think people should go to forests. People can go to the forests to breathe."
"Yes, he should be able to go because we need to get to know nature."

Some participant answers the third question:

"Yes, there should be education. Training should be given on how people can use forest areas. Training should be given on how to extinguish fires with water."
"We can teach them not to throw rubbish on the ground. We can teach them to recycle rubbish and collect rubbish in the forest."
"We can provide fire-fighting training."
"We should tell them not to litter. Even if they light a fire, we can educate them that they should put it out."

Some participant answers the fourth question:

"If there are narrow roads, bigger roads can be built."
"It can be intervened by airplane. I can't think of anything else."
"If there are helicopters or bigger vehicles, they can intervene."
"If we see a fire, we can phone in. Helicopters can draw water from the sea and drop water."

Discussion, Conclusion, and Recommendations

In this study, two SSI texts developed by the researcher and four questions at the end of each text were applied to the participants to examine preschool students' reasoning about SSI s. The study, which was conducted using a case study, one of the qualitative methods, was attended by 22 children aged 60-72 months attending preschool education. The data obtained were analyzed according to content analysis and Schommer's and Kuhn's epistemological belief model. The results obtained as a result of the data analysis are given below.

When the reasoning of the preschool students participating in the study was analyzed, it was seen that they had a naive-medium epistemic profile.

It was observed that the participant group was aware of current and potential SSI issues such as vaccines and forest fires applied in the research and had an opinion on the issues.

It was concluded that although the participant group was aware of current issues and SSI, they did not have an advanced epistemic profile in terms of reasoning on these issues and multidimensional thinking in the context of SSI.

The participant group's judgments in the first scenario differed from their judgments in the last scenario. For this reason, it was observed that children's previous encounters with SSI may affect their judgments.

In one-to-one interviews with the participant group, it was observed that children had more ideas, knowledge, and experience, especially about vaccines, and that their ideas and judgments on this issue were more adequate than in other scenarios.

When the participants who gave sophisticated answers were analyzed, it was seen that they were older than the other participants in terms of months. It can be concluded that more experience, physical maturation, and cognitive development are related.

It was observed that there was no relationship between children's family education level and their epistemological profiles.

The results obtained concerning the first research questions of the current study indicate that the reasoning of 60-72 month-old preschool children about forest fires has a naive epistemic profile. Based on these findings, it has been shown that the absence of SSI in the curriculum affects children's reasoning about these issues, even if SSI are included in environmental education in the preschool education curriculum. In his study with undergraduate students, Irmak (2021) found that the group participating in the study did not have a course based on the discussion of current issues in the courses they had taken before. For this reason, he concluded that the reasoning of the group participating in the study about SSI was not at a sufficient level in the first place. Later, he stated that the participant's understanding of the nature and meaning of SSI increased their interest in these issues. Even though the study was conducted with undergraduate students, it can be said that it is similar study to this study. In his study with secondary school students, Tüzüngüç (2019) concluded that the participant group's reasoning about SSI was inadequate. He concluded that the fact that the participant group in his study was not given any preliminary information about SSI before the study and that the participants had not encountered SSI before may affect their reasoning. Even though the study was conducted with secondary school students, it has similar results to the study we conducted in terms of the results it has reached and supports it. At the same time, since children's physical and experiential development may also affect their cognitive development, it is

thought that their reasoning may be at a lower level compared to older individuals. This view can be supported by Piaget's theory of cognitive development. Piaget defines the factors that affect cognitive development and constitute the process as physical maturation, experience, social transmission, and balancing (Piaget, 1977).

Tezel and Günister (2018), in their study titled "A Review of Studies on Socioscientific Subject-Based Science Teaching in Turkey", mentioned the benefits of SSI -supported teaching in which students take part. They concluded that SSI -supported teaching increased students' epistemological beliefs, and science literacy, improved their scientific discussion skills, increased their level of sensitivity to environmental problems, and improved their critical thinking skills. The fact that the participant group in our study had a naive epistemic profile suggests that SSI contents are not sufficiently included in the preschool education curriculum. The results of our study also reveal that SSI should be included in preschool education. It is thought that the mentioned positive developments will be seen in cases where SSI is included in education.

The result of the second sub-question of the study was different from the other questions. It was concluded that the reasoning of preschool children between the ages of 60-72 months about whether to be vaccinated or not was in a medium-naive epistemic profile. It is thought that the reason why children have a naive epistemic profile in other scenarios, but a medium-naive profile about vaccines is the effect of the pandemic process that has affected our country and the whole world for two years. In addition, the compulsory vaccination processes that have been going on since the birth of the participants are thought to be the reason why they have more knowledge and experience on this subject. It was observed that children had more ideas about this issue compared to other scenarios, and when the text was read to the children, it was seen that they talked about their experiences in this process compared to other scenarios. While answering the questions at the end of the text, it is thought that their reasoning is at an intermediate level compared to other scenarios because they have more command of the subject. Gedik and Demirbaş (2018) found similar results to our study in the findings of their study. The researchers, who studied the topic of global warming with eighth-grade students, concluded that the students in the high-achieving group were more successful in generating ideas and discussing the topic compared to the students in the low-achieving group. They attributed this result to the fact that the participants could show better reasoning and discussion skills in subjects with high content knowledge. In our study, it was concluded that the participants' having more knowledge and experience about the vaccine increased their reasoning and discussion skills compared to other scenarios. Keselman, Kaufman, and Patel (2004) conducted a study titled "You Can Exercise Your Way Out of HIV and other Stories: The Role of Biological Knowledge in Adolescents' Evaluation of Myths" which concluded that there was a positive relationship between students' content knowledge and the quality of the arguments they produced. The result we have reached in the second sub-problem supports the study conducted by Keselman, Kaufman, and Patel (2004). In their study conducted with eight preschool students, Süt and Kutluca (2021) examined the effects of nutrition education on children's nutritional behaviors and the change in reasoning patterns in the decision-making process. When the results of the study were examined, it was seen that the attitudes of children who received nutrition education changed. After nutrition education, the reasoning patterns of children who had information changed, and it was seen that they made logical decisions. In our study, since it was concluded that children can reason and reason better on the subjects they know, the aforementioned study and the study we conducted contain similar results and support each other.

When the studies in the literature were examined since there were no studies on SSI conducted with preschool students, studies that would support our study or that had different results from our study were selected from different age groups. Although the age groups were different, it was observed that the reasoning about SSI was similar to our study. It is thought that much more studies will be conducted with all age groups with the inclusion of SSI in the education curricula.

In this study, the reasoning of preschool students about socioscientific issues was examined. In this part of the study, the discussion of the results obtained and the suggestions that emerged are given.

1. To improve children's ways of thinking and to positively affect their reasoning skills about events, it is thought that it may be useful to include SSI contents in the preschool education curriculum.
2. It was thought that it would be useful to organize pieces of training for teachers and students to quickly integrate SSI content into the learning processes with the increased inclusion of SSI content in the curriculum.
3. It is thought that teachers' including situations that may be examples from daily life that may constitute SSI in their activities, observing how they will contribute to children's thinking skills, including the environment and teaching methods and techniques in which students can make discussions may be beneficial for children's cognitive development.
4. When the literature was examined; since there are not many studies investigating SSI in preschool students, it was thought that including SSI in the education programs of students in this period would improve students' reasoning skills and further studies on different SSI could add a different perspective to this field.

5. It was thought that introducing approaches such as SSI texts, activities, etc. prepared following the developmental levels of children at an early age could have a positive effect on children's reasoning, thinking, and decision-making skills. For this reason, it is thought that it may be useful to carry out such studies in early childhood, taking into account their age and developmental levels.

Contributions of the Researchers

First author contributed to the whole manuscript, while the second author particularly contributed to the theoretical background, analysis and result, and discussions.

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Conflict of Interest

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