



JOURNAL
OF BALTIC
SCIENCE
EDUCATION

ISSN 1648-3898 /Print/

ISSN 2538-7138 /Online/

Abstract. *The aim of this research was to analyze preschool teachers' types of science talks and the variety of concept-related words they used during these talks in class.*

A picture storybook with a light related concept as the main theme, was chosen as a data collection tool. Teachers were asked to analyze this wordless picture storybook and children were asked in their classes if they approved it. Ten preschool teachers in-service participated in this research. Data were qualitatively collected; it was recorded during story telling. Research results showed that teachers included science explanations, declarative scientific knowledge, questions, comparisons, and evidence talks supporting thinking skills, among types of science talks according to their frequency order, whereas they did not include personal connections talk. Besides, it was determined that they included light related concepts (natural and artificial), vision related concepts (daylight/darkness, like difficulty in vision) and light direction related concepts, according to their frequency order. It can be stated that the results obtained from this research shall contribute to framing of contents of professional development particularly scientific activities of teachers.

Keywords: *light concept, science teaching, storytelling, preschool teachers*

Özlem Yurt Tarakçı
Trabzon University, Turkey
Sadiye Keleş
Zonguldak Bulent Ecevit University, Turkey
Esra Betül Kölemen
Sakarya University, Turkey

PRESCHOOL TEACHERS' SCIENCE TALKS DURING PICTURE STORYBOOK TELLING

**Özlem Yurt Tarakçı,
Sadiye Keleş,
Esra Betül Kölemen**

Introduction

Many aspects of science instruction in early childhood (content, boundaries, effective science instruction practices, barriers in education, self-efficacy of teachers, child motivation, science achievements in future years) are among the topics that researchers have focused on for many years. Eshach and Fried (2005) presented a frame summarizing scientific findings on why science instruction should be a part of early childhood educations: (1) first of all, children pretty much enjoy the act of observing and thinking the environment they live in, (2) when children interact with science activities in their early years, they develop a positive attitude towards science, (3) interactions with science in early childhood, provides a better understanding of science concepts in future, (4) the use of scientifically enriched language affects children's final scientific concept development, (5) children can understand scientific concepts and their explanations scientifically, and finally, (6) science instruction in early childhood is effective in the development of scientific thinking. The question that should follow the frame of why science instruction should be a part of early education, is how science instruction should be. This question that starts with "how" can be answered in a holistic way only by examining the factors affecting the educational process. One of these factors is undoubtedly preschool teachers.

It was revealed in various studies that preschool teachers' self-efficacies in science instruction are lower than teaching mathematics or literacy (Torquati et al., 2013) and that they don't feel comfortable and sufficient in planning, practicing, teaching (Choi, 2016; Olgan, 2015) science and providing these activities to children (Greenfield et al., 2009). The finding that the state of being comfortable about science activities is a predictor of the amount of time they allocate to science activities in class (Blaylock, 2019), is in accordance with the studies which indicate that teachers' perception of low self-efficacy in science instruction (Gerde et al., 2018; Greenfield et al., 2009; Olgan, 2015; Simsar & Doğan, 2019) may set barriers in organizing and involving in science activities. In this context it is possible to say that it is a critical structure for teachers to feel confident and comfortable in terms of science instruction in the early period. In addition to this, there are findings that teachers' educational degree and years of experience are not a predictor of perception of self-efficacy (Gerde et al., 2018, Uğraş et al., 2013) but there

are findings on (Oppermann et al., 2019) teachers' science specific education and their involvement in professional development activities are in line with teachers' practices in science practice: Gropen and friends (2017) found that teacher education programs aiming to improve their Professional development in terms of science instruction increase the quality of science instruction they provide and improve their pedagogical content knowledge. Quality of science instruction provided by teachers is an important determinant of allocated time to science activities in early childhood education. It is already known that there is a positive relation between teachers' professional development and the frequency of science activities performed in class (Barenthien et al., 2019).

Obtaining information on teachers' science instruction practices is a main objective in terms of increasing quality of in class practices. It is known that teachers mostly use methods like dramatization (Karamustafaoğlu & Kandaz, 2006), demonstration/model use (Doğan & Simsar, 2018; Karamustafaoğlu & Kandaz, 2006), and experiment (Doğan & Simsar, 2018; Karamustafaoğlu & Kandaz, 2006) in their science activities. Since science activities carried out with science equipment (cooking activities are excluded) are not predictive of the science achievements of children at the end of preschool year (Saçkes et al., 2011), it brings the idea of lack of material that teachers claim to be one of the barriers (Doğan & Simsar, 2018) in science instruction may not be a rational obstacle. However, it opens its doors to the questioning of the effectiveness of experimental methods in early childhood science instruction. In addition to this discussion window, Saçkes and friends (2011) draw attention to another direction in terms of science instruction in the early childhood: It is observed that predictive structures questioning children's achievements in science at the end of kindergarten year and at the end of third grade found to be children's prior knowledge in preschool period, their motivations, socio economic statuses and their gender (Saçkes et al., 2011). This finding states that, children's prior knowledge, the improvement of their interest and motivation towards science in the early period, may be a key to improve their future science achievements in terms of behavior and energy economy.

Efficient Science Instruction Practices: Theoretical Basis

One of the factors that increases the quality of science instruction and improves children's interest and motivation towards science is teachers' practices in education. As a result of studies investigating the effectiveness of education practices related to early science instruction in recent years, it is observed that children's discovery based activities (Hong & Diamond, 2012), inquiry based games, especially use of drama and puppet in activities, based on teacher-child social interaction (Özgül, 2017), use of children's drawings, formal science activities enriched with stories (Yıldız et al., 2019) and open ended questions addressed to children, helped to obtain satisfactory results (Keleş & Menevşe, 2017).

In addition to those, there are studies that show an increase in education practices by combining various education methods and techniques or by using them consecutively (Hong & Diamond, 2012; Parsons & Bryant, 2016). It is possible to increase the effectiveness of education by combining explicit instruction with responsive teaching which enables discoveries and experiences for children both in acquiring science concepts and in improving their vocabulary (Hong & Diamond, 2012). Another research supporting this statement was carried out by Parsons and Bryant (2016): In the study, an eight-week education program was prepared by using three different teaching techniques- consisting of reading interactive information books, including children into reading and conversations and hands on applied activities in order to increase the scope and depth of the children's vocabulary.

One of the core structures of effective science instruction is to make the concept of teaching and science meaningful to children (Mantzicopoulos et al., 2009). Meaningful learning is only possible by deepening the concept with other words that it relates based on prior knowledge of children about the concept. In this respect, concept-related words are very important in terms of acquiring a science concept. For instance, a teacher, who wants children to acquire the concept of light, can easily facilitate it by using light related words such as darkness, daylight, and shadow that children have a prior knowledge. Guo and friends (2016), in a study where they synthesize seven different research, summarized that science instruction improved children's vocabulary.

Meaningfulness of education can be supported by using and maintaining the inferential language between teacher and child. Inferential language helps children relate their past with real life and contains teachers' questions for them to make various predictions (Morrow, 2007). Besides, teachers' statements like "why" and "how" (Cabell et al., 2008) and their hypothetical questions may be stimulating for using inferential language. Teachers can support inferential language by making various predictions and confirming children's various predictions or bringing some new questions (Cabell et al., 2008).



The effort to create an inferential language in science instruction is the basis that accelerates science talks. Science talk is an educational discourse practice that starts with children's curiosity, motivates their thoughts, and gives chance to communicate, support critical thinking while giving chance to make comparison (Braund & Leigh, 2013; Tu & Hsiao, 2008). Science talk offers children a rich opportunity to learn by letting them interact with the related concept, ask questions, and give an opportunity to think briefly in terms of structuring the knowledge/concept (Siry & Lang, 2010).

Social constructivist approach provides a strong theoretical background in terms of content of science talks and the quality of questions addressed to children by shedding light to practical applications during science talks. Social constructivist perspective of Vygotsky broadly emphasizes the key role of language in learning. According to him, psychological tools such as language, signs and symbols have a critical role in the development of higher mental functions. For children to acquire higher mental functions, they must gain and internalize the psychological tools (as language, signs, and symbols) at first. Once these psychological tools are internalized, they act as mediators for higher mental function processes. Environment and social interaction of an individual forms a basis for acquisition and internalization of psychological tools. Children acquire these tools by interacting with adults or with more experienced peers (Karpov, 2003; Wertsch & Toma, 1995). In other words, adults with whom children interact socially (in this study teachers) act as mediators in structuring and improving the child's knowledge. How this mediation process will be realized (teacher talk) is decisive on children's structuring the concepts.

Social constructivist approach suggests teacher talks should be adjusted according to the child's needs. From a social development view, experiences promoting child talk (as a joint book reading activity), is a very important tool for delivering a meaning and producing a new meaning (Rogoff, 1990). In other words, environments where children are expected to be silent, away from interaction and where most conversations carried out by adults, not only affect literacy and concept development in a negative way, but also leave children short (Hohmann & Weikart, 2000) from basic needs as communicating. Story reading activities, where children participate actively in the process of asking and answering questions and make various predictions instead of listening impassively, are shown as an effective practice. (Dickinson & Tabors, 2001). Therefore it is important for an adult, taking the task of the storyteller, especially teachers, to enable children to ask questions supporting their thinking skills, to make comparisons and discussions related to preconceptions of the subject, form deep understandings using evidence-based expressions and share their personal experiences related to the subject/concept (Callanan et al., 2017; Krogh & Slentz, 2001).

The Present Research

In this research it was aimed to examine preschool teachers' types of science talks and concept related words they use during these science talks. A fictional storybook, flashlight was used to facilitate the science talks between teacher-children. It is possible to list the reasons for choosing a fictional storybook. They are as follows:

- Teachers do not find appropriate to read information books aloud in class (Donovan & Smolkin, 2001) and the fictional books are the most selected genre to read aloud in classes (Gerde & Powell, 2009; Hindman & Wasik, 2008; Pentimonti et al., 2010; Stone & Twardosz, 2001),
- Science related activities are not the mostly participated activities in class by teachers (Tu, 2006) but however teachers find reading aloud in class as an important type of activity (Burgess, Lundgren, Lloyd, & Pianta, 2001; Hindman & Wasik, 2008) and teachers' familiarity with these education tools, picture storybooks (Saçkes et al., 2009),
- Fictional picture storybooks having an effect on the quantity and the quality of speech produced in the preschool education environment (Price et al., 2012),
- The effect of picture storybooks over children's acquisition of scientific words (Gonzalez et al., 2010; Leung, 2008; Okyay & Kandır, 2019) and increase in the probability of encountering terms and concepts not common in daily life (De Temple & Snow, 2003; Hayes & Ahrens, 1988).
- The advantage provided by fictional picture storybooks that establish a relationship with everyday life experiences that have a critical value in concept acquisition (Karina & Vidal, 2020).

The main theme of the picture storybook, Flashlight for this research is light concept, one of the physical science concepts. Concept of light is one of the scientific concepts that children experience in their daily routines. Light concept, one of physical science concepts, is a special and economic concept which has a broader effect beyond children's cognitive enhancement. Light concept can be a core concept that can create an advantage in



supporting children in many developmental areas. It is possible to support spatial perceptions of children (such as light direction), their physical awareness and their self-respect (such as shadow activities), emotional self-regulations (such as, fear of the dark) and their socio moral developments (such as, sense of responsibility and value building like energy saving) in early child education by using concept of light.

Activities that require body movements, contribute to speeding up the construction of visual-spatial concepts of young children and the improvement of their spatial reasoning (Worthington et al., 1980). Activities related to light and shadow take place in this scope. Children notice that light causes the shadow and that the movements and the direction of the shadow can change the shape and the size of the shadow (Worth & Grollman, 2003). In addition, children use spatial concepts and spatial relations, while making assumptions on the direction of the light during their discoveries and plays. Experiences realized with shadows do not only contribute to children's cognitive development. For example, Abdelmonem and Eldawy (2013) determined that children's self-esteem was increased by shadow plays lasting 8 weeks, in an experimental research carried out with children aged 5-7. It is also very valuable for children to gain their experiences about the concept of light in an educational environment. It is already known that one of the common fears of children is night-time fears (Staley & O'Donnell, 1984) and that it is prevalent especially in the 4-6 age period (Muris et al., 2001). The sources of nighttime fears (such as security, being lost) can be diverse. The fact of young children having nighttime fears who are experiencing fantasy-reality chaos (Zisenwine et al., 2013), suggests the option of illuminating darkness, maybe one of the options that will contribute eliminating this chaos and making children feel secure. Although the concept of source of light itself is not a mystery for young children, the experience of illuminating darkness can be quite exciting. Children who learn light and darkness by experiencing, know that light is needed to see everything in the environment (Herakleioti & Pantidos, 2016). Besides, the concept of light is closely related to the concept of energy. The concept of energy is one of the critical concepts for our planet's future. Young children's awareness of the diversity of sources of natural and artificial light will be the first step in developing their awareness in sustainable and renewable sources of energy. Naturally, it is not intended to develop an understanding that light is a source of energy while constructing the concept of light for young children. Because understanding of science events, like the absorption and refraction of light is rather abstract for this development period (Herakleioti & Pantidos, 2016). Although young children do not yet comprehend that light is an energy, some of them have prior knowledge and experience related to energy savings. It is known that picture storybook reading activities are effective for the adoption of efficient use of sources and energy savings for children. Hsiao and Shih (2015) in an action research they carried out with children aged 5-6, examined the effect of picture storybooks on young children's adoption of conservation of sources. Eight enriched different picture storybooks were used in various activities (like play, drama, music, movement, drawing) during this education period lasting eight weeks. At the end of the research, it was observed that there was a decrease especially in electricity, water, and paper consumption of children. The use of electricity that is a consumption of energy, can be associated with socio moral development. It is possible to explain the reductions in energy consumption with egoistic value and biosphere value tendencies, besides personnel value tendencies of an individual (Sahin, 2013).

As is seen, when the concept of light is examined through a broad perspective, it is possible to tell that it has a substantial concept network potentially. In research studies carried out with preschool children (Delserieys et al., 2017a; Delserieys et al., 2017b; Delserieys et al., 2018; Gallegos-Cázares et al., 2009; Herakleioti & Pantidos, 2016; Hsu et al., 2011; Impedovo et al., 2017; Pantidos et al., 2017), it is observed that research mostly focus on their explanations on the formation of shadows. In spite of this, there are a few studies based on (Hsu et al., 2011; Ntalakoura & Ravanis, 2014; Ravanis et al., 2013) that show how young children structure (Çakır & Uludağ, 2019) concepts of light in their minds and what educational practices affect this process.

When above mentioned information taken together, since teachers act as a strong mediator for children when they are structuring science concepts, a detailed research was carried out on teachers' science practices as an origin of this research. Besides, structures that may be an obstacle in realizing science talks were taken into consideration in the research. In this research, a wordless picture storybook about a concept of light was used as a tool both because of having a structure that comprises visual stimulator supporting and enriching teachers' science talks and because it has a structure that requires them to use verbal language.

In summary, this research was designed to answer the following questions:

- 1) Examining types of science talk that preschool teachers refer while narrating a book to children about a science concept (light),
- 2) Examining concept-related words used by teachers (while narrating a picture storybook about light) during science talks of preschool teachers.



Research Methodology

General Background

In the research the Phenomenology pattern which is one of the qualitative research methods was used. Phenomenology is a research pattern (Lester, 1999) that features perceptions and experiences from an individual point of view, is used to examine events, experiences, perceptions, tendencies, concepts and situations that we do not have in depth and detailed knowledge (Creswell, 2013). Phenomenology research tries to explain the perception of people about the phenomenon (something perceived by senses) about the phenomenon, which is perceived by senses, the meanings they attach to them and their feelings about this phenomenon (Patton, 2005).

Participants

Study group of this research was determined using convenience sampling of purposeful sampling methods. The participants were ten volunteer preschool teachers working in two independent kindergartens of the Ministry of Education in Hendek district of Sakarya province of Turkey and children 60 months and above who were attending these teachers' classes. Average age of teachers was 38. Teachers' professional experience year was between 8 to 16 ($M=12$). Data of the research were collected in the spring term of 2018-2019 academic year. Teachers were all female. All teachers were informed about the research goal and data collecting procedure and they were confident that all data would be kept secret. All teachers voluntarily participated in this research. Teachers were coded as T1, T2, T3.

Materials and Procedure

In this research, a picture storybook and a recorder were used as data collection tools. "Flashlight" a wordless storybook tells a story of a young child who gets out of his camping tent at night to discover the world at dusk with a flashlight. The teachers, volunteer participants of the research, were first asked to examine the wordless picture storybook Flashlight. Then, they were asked to form their own fictions related to this book. It was emphasized by researchers to teachers that the goal of using this book while forming their fiction, was to help children gain the concept of light easily. Teachers were asked to share this book as a whole class activity, in a daily education stream at a convenient time for them. Researchers left the education environment following the sharing of the necessary information about the research and the formed fiction and told text was recorded with a recorder. The time for teachers to tell the wordless picture storybook based on pictures lasted 20-30 minutes on average.

Data Coding and Analysis

During the telling of the picture storybook all talks were recorded by a voice recorder. Then the recorded material was transcribed verbatim by researchers. Raw data which were transformed into texts, analyzed with a content analysis method of a data analyzing method of qualitative research. In the first step, teachers' non textual talks¹ and statements which might lead to misconceptions², were sorted out and excluded from the research. In the second step, science talks in the story texts which teachers formed the fiction, were independently coded with different encoders. In the last step, light related concepts in the text were coded. When these categories analyzed, it is examined that there are questions supporting the thinking skills, scientific explanations, evidence-talks, personal liaison and comparison talks (Callanan et al., 2017; Crowley et al., 2001) and declarative scientific knowledge (Jmal et al., 2011) in the science talks category and there are sources of light, event of vision and the light direction in the

¹ **T3:** "I am coming to you now (to show the book)".

T7: "Hush. Would you listen to Beyza?"

² **T7:** And Ali saw a hedgehog. Yes, Hedgehog's quills were all up.

T8: Yeah children, an owl has a feature?

C: Their eyes shine in the dark,

T8: And they can only see in the dark, right?

C: Yes, because their eyes shine in the dark.

T8: Exactly,



concept-related words category. The identified categories and codes related to these categories and their detailed explanations are given in Table 1. Cohen Kappa coefficient (Cohen's κ) was used to analyze the concordance between the codes gathered from two independent coders. As a result of the calculation, Cohen Kappa Coefficients were calculated as $\kappa=0.78$ for science talks category; $\kappa=0.93$ for concept-related words category.

Table 1
Explanations Related to Categories and Codes

Category	Code	Explanation
Science talks	Questions supporting thinking skills	Involve open ended questions supporting making comparisons and explanations or inferences, creativity, and critical thinking
	Declarative scientific knowledge	Declarative scientific knowledge involves theoretical knowledge such as factual circumstances, rules, and acts.
	Science explanations	It involves making theoretical and evidence-based explanations using observations and measurements to explain something seen in the natural world.
	Evidence based talk	It involves clarifying thoughts by explaining how the evidence is used to come to a conclusion,
	Personal connections talk	It involves linking prior knowledge and experiences
	Comparison talks	It involves making simple comparisons of an event or situation with another object or event
Concept-related words	Light sources	Natural sources of light (Sun, stars, Lightning, Thunder, Firefly, and some fish like angler fish) Artificial Sources of light (Bulb, candle, lantern, kerosene lamp, traffic lights, oil lamp and torch)
	Vision event	It involves darkness, light, vision/vision difficulty and color concepts.
	Light direction	Light direction, states the path that the light from the light source falls on the object or the concept.

Research Results

In the research, data were analyzed under two categories; one is the types of science talks teachers used while narrating the light related book, and the second is the concept-related words they used during science talks.

Table 2
Frequency of Verbal Statements Related to Teachers' Types of Science Talk

Teachers	Types of science talks					
	Questions supporting thinking skills	Declarative scientific knowledge	Science explanations	Evidence talks	Comparison talks	Personal connections
T1	1	0	2	0	2	0
T2	1	4	2	0	0	0
T3	1	2	0	0	0	0
T4	1	0	2	0	0	0
T5	1	0	0	0	1	0
T6	0	0	1	1	0	0
T7	0	0	2	0	0	0
T8	0	2	1	0	0	0



Types of science talks						
Teachers	Questions supporting thinking skills	Declarative scientific knowledge	Science explanations	Evidence talks	Comparison talks	Personal connections
T9	0	0	3	0	1	0
T10	0	0	0	0	0	0
Total (f)	5	8	13	1	4	0

When Table 2 is analyzed, it is seen that the most frequent types of science talks that teachers used were science explanations ($f=13$) and the statements on declarative scientific knowledge ($f=8$), the least referred ($f=1$) type of science talks was evidence talks. It is also seen that none of the teachers referred to personal connections. It was also observed that only one teacher (T10) did not use any statement related to science types in science talks category; and only one teacher (T7) used statements only related to science explanations in types of science talks. It was also observed that only two teachers (T1, T2) used statements for three different types of science talks.

When teachers' questions supporting thinking skills of science talks were examined, it was observed that they used only question forms that begin with What out of Wh- ($f=5$)-questions forms (Who, What, Where, When);

T1: "Emre started to think. Just then an idea came to his mind. *What might be the idea that came to his mind?*"

T4: "If you were in Ali's shoes, *what would you do with a flashlight?*"

When teachers' verbal statements related to declarative scientific knowledge from types of teachers' science talks were analyzed;

T2: "Yesss, an owl got out. *Children, owls have a very good sight at night.*"

T3: "These are *skunks*. And these *spread odor around them.*"

T8: "Bats. Do you know where *bats* mostly live, don't you? *Yes, they like dark environments*, don't they?"

When teachers' scientific explanations in types of science were analyzed;

T1: "*The light was making him so blind that he could not see who was holding the light.*"

T2: *When skunks saw the light they suddenly got scared and children, do you know what they did to protect themselves? Skunks? When they shake their tails like this, they give off smell, they immediately begin to give off smell* and our friend was disturbed with this smell and walked away as soon as possible.

T7: By the way, he can see the animals lying on the tree and the leaves on it *by the reflection of the light.*

T8: "There is a skunk over there, yes". C: "They give smell". T8: "Yes, but do you remember? When did they give smell? *Isn't it when it is scared and it's protecting itself? Exactly at the time of danger.*"

T9: *Only when frogs grow up unhealthy and outside, they may spread germs and we can get sick as a result of this germ.*

When teachers' verbal statements related to evidence talks of types of science talks were analyzed;

T6: "Fox, mouse, hedgehogs, racoon, deer".

C: "It is not a racoon; it is a skunk".

T6: "Racoon, *look! we can tell it is a racoon from his eyes.*"

When teachers' verbal statements related to the comparison talks of types of science talk were analyzed;

T1: "Emre rushed to his father. Asked for his flashlight. He was so excited when he lit the light. Now *he can lighten his surroundings like the moon.*"

T5: "Yes, look please, He directs it to Cem's back, then his front, isn't he trying to identify it? *He says, "this does not look like us, I guess it is not a racoon."*"



Table 3*Teachers' Frequency of Concept Related Words*

Teachers	Sources of light									Vision event			Light direction
	Artificial source of light				Natural source of light					Darkness	Daylight	Color	
	Flashlight	Light	Candle	Phone Screen light	Lamp	Sun	Firefly	Star	Vision/ Difficulty in Vision				
T1	6	17	0	0	0	0	0	1	8	2	2	0	7
T2	21	18	0	0	0	0	1	0	8	8	0	1	10
T3	22	10	0	0	0	0	0	0	11	7	5	2	7
T4	12	2	0	0	0	0	0	0	4	1	1	1	3
T5	21	2	1	1	0	2	0	0	23	5	3	0	12
T6	9	6	0	0	0	0	0	0	19	4	1	1	9
T7	12	4	0	0	0	0	0	0	10	2	1	1	7
T8	8	2	0	0	0	0	0	0	5	2	2	0	4
T9	18	18	0	0	1	3	0	0	16	11	6	13	2
T10	13	0	0	0	0	0	0	0	5	2	1	2	9
Total (f)	142	79	1	1	1	5	1	1	109	44	22	21	70
Total category(f)	224			7					196			70	

When Table 3 is analyzed, teachers' most frequently used concepts are respectively as follows; light sources (artificial, natural) ($f=231$), concepts related to vision (vision- difficulty in vision, darkness, daylight, color) ($f=196$) and concepts related to light direction ($f=70$). It is observed that artificial light sources ($f=224$) used more than natural light sources ($f=7$) among light sources ; in the vision related category, concepts of vision and difficulty in vision ($f= 109$) were used more. Besides, it is observed that when "light" and "flashlight" evaluated ($f=221$) together³, six teachers (T3, T4, T6, T7, T8, T10) used only concepts related to artificial light sources. However, teachers who both used the concept of light and flashlight, did not use any other concept of light source other than light and flashlight. It is observed that four teachers (T1, T2, T5, T9) who were using natural light sources together with artificial light sources used only one concept of natural light source.

Discussion

The ultimate aim of science talks is to form a class culture, rich in conversation and supporting children to make comments, to improve language and to acquire knowledge of scientific events. Undoubtedly in forming a culture, reading activities that children have effective participation in the process of asking questions and answering questions and making guesses and inferences were shown as the most effective practices (Dickinson

³ Light concept means "a tool for illuminating a place" in Turkish (Turkish Linguistic Society [TDK], 2020). Therefore, teachers use the concept of "light" and "flashlight" interchangeably.



& Tabors, 2001). It is aimed to examine preschool teachers' utterances to types of science talks and concept-related words that teachers used during narrating of picture storybooks to children.

The first finding obtained from this research is that teachers' most common statements of the types of science talks are scientific explanations and declarative scientific knowledge. While scientific explanations are based on theory and evidence and reasonable explanations (Callanan et al., 2017), declarative scientific knowledge involves giving theoretic knowledge with facts (Jmal et al., 2011).

Considering the use of storybook, which was formed as a fiction, specifically having a light related concept, as a data collection tool, researchers envisaged that teachers would highlight other concepts like shadow, energy savings together with the light concept. But when teachers' statements on scientific explanations and declarative scientific knowledge were analyzed it is observed that teachers used non-light related statements. It is observed that teachers mostly made statements and provided information over animals and properties of animals (owl, skunk, bat etc.). Considering their practices are related to their education they have received and their knowledge they have acquired, teacher practices remind us what the targets are in terms of science education in the context of teacher education programmes. When undergraduate programmes for preschool teacher education in Turkey are analyzed, it is observed that teaching science concepts (physical sciences, earth and space sciences, life sciences concepts etc.) and teaching techniques and methods (questioning, child drawings, play-debrief-replay, inquiry based learning etc.) of scientific thinking skill is aimed in science education for prospective teachers. Although it is aimed to teach all science concepts in the content conducted studies (Saçkes, 2014; Ültay et al., 2018) showed that preschool teachers focused teaching concepts of life sciences more than concepts of physics and space sciences. In accordance with these findings, teachers' preferences sharing knowledge on biology from life sciences primarily might have been due to their feeling of safety and adequacy on this subject in terms of scientific knowledge.

In the research, it was determined that teachers' least frequently referred type of science talk was evidence talk. Evidence talk is composed of statements that use evidence for a conclusion. Findings of Callanan and friends study (2017), carried out with adults shows parallelism with the findings of this study: It is observed that evidence talks are rarely used in a study examining types of science talks carried out with parents in a museum tour. At the same time, it is known that teachers placed pretty less emphasis on the use of evidence in science instruction (Newton et al., 1999) and had hard times using evidence in their talks (McNeill & Knight, 2013). This finding, just to support this allegation, made us think that teachers need support in what it means to use evidence and how to use it. In another study carried out in class observations of preschool teachers, it is determined that teachers are not supporting in inferring children (Kefi et al., 2013). When it is considered that inferring skill is related with reasoning skill and use of evidence, it can be stated that this finding partially supports the research findings.

Another finding obtained from the study is that none of the teachers referred to personal connection's talks. Personal connection talks are the statements that link children's prior knowledge and their experiences. Among the other findings of the research, it was observed that, natural light sources such as sun, star, firefly, and artificial light sources such as candle, lamp (other than flashlight and light concept), were marked less frequently. Considering that these sources, are the concepts that children experience and frequently encounter in their daily routine, this situation shows that teachers do not take children's prior knowledge and lives related to light concept into consideration. It is emphasized that, especially in learning science concepts, sustained and shared talks between children and teachers are required to originate from children's daily experiences (Karina & Vidal, 2020). Simsar and Doğan (2019) presented a finding parallel to the one obtained from this research: In a study to reveal teachers' views related to preschool science instruction, it is observed that few teachers evaluated science activities with daily life. In fact, science talks provide an advantage to analyze prior knowledge of children and therefore determine the points in their progress in science understanding and points that need to be supported (Exploratorium, 2015).

It is determined that teachers use question forms only beginning with "Wh" for questions supporting their thinking skills of types of science talk. Conducted research indicated that teachers generally use question forms which start with Wh (What, Who, When, Where) and have Yes/No responses (Deshmukh et al., 2019), and ask fewer open ended questions like "Why" and "How" (Zucker et al., 2010) which need an explanation and a conclusion during shared storybook reading. But it is known that questions starting with "why" and "how" need detailed long answers with multiple word usage (Deshmukh et al., 2019).



The first finding on the concept-related research is that artificial light sources are used more than natural light sources. However, it is observed that more than half of teachers do not use any light source (artificial or natural) other than light and flashlight. Some of the natural light sources (like the sun) at the same time are renewable energy sources (Kabir et al., 2018). Nowadays, one of the factors affecting environmental issues is energy consumption habits. There is a strong relation between efficient use of energy sources and reduction of environmental pollution. In fact, the importance of teachers' increased awareness on these sources and providing it to educational practices is obvious. There against, while ecological concepts should be included in science instruction, it is known that environmental education is not the most often included fields of in-class practices (Johnson & Činčera, 2019). However, teachers' allowing practices on nature and environment by using different methods in class, affect especially young children's awareness of energy concepts and their level of consciousness (Hsiao & Shih, 2015).

Another finding is that statements related to vision or difficulty of vision are used more often. This finding shows that teachers' emphasis on the relation of vision and difficulty in vision is related with the concept of light. It is observed that teachers use dark, daylight, color, and light direction as concept related words at the same time while supporting this relation. When these words are examined it is possible to say that these words have semantic similarities with light sources and that it helps to acquire the concept of light.

Conclusions and Implications

The current research contains various limitations. The first limitation is to examine teachers' science talks and concept related words only in one type of activity (story telling) in a class environment. In the future stages, science talks may be evaluated in different environments (in class or out of class), in different time segments (in play time, in circle time or in different activities), with different tools (like experiment, drama) and with different adult groups (with parents, caregivers or preservice teachers).

Another limitation is that teachers' self-efficacy perceptions and in-class science activities are not taken as criteria while forming the study group. It may be examined in the future studies whether these properties of teachers can create a difference in science talks and concept related words. Another limitation of this research is the preference of using the wordless picture storybook related to light concept by telling it as a research tool. In order to overcome this limitation, it may be suggested to examine if the teachers' use of wordless and written picture storybook can create differences over science talks and concept-related words.

Consensus was reached by science education experts on the idea that teachers play a key role in increasing the effectiveness of classroom science activities. The planning and framing the education content of teachers' career development courses sensitively will determine the quality of science instruction. It may be suggested to establish a relationship between (a) obtaining children's prior knowledge about the relevant concept, (b) reducing children's possessed misconceptions, (c) balanced use of questions starting with Wh- Why, (d) current environmental issues of the relevant concept with this education program that is aimed at teachers' perception of acquisition of science concepts, as a strong tool.

Acknowledgements

The authors would like to thank teachers for their invaluable help.

Note

This research is presented as a verbal statement in the 6th International Early Childhood Education Congress (2-5, October 2019, Kars, Turkey)

References

- Abdelmonem, A., & Eldawy, N. (2013). The effects of shadow play on motor abilities and self-esteem for children. *Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health*, 13(2), 685-690.
- Barenthien, J., Oppermann, E., Steffensky, M., & Anders, Y. (2019). Early science education in preschools—the contribution of professional development and professional exchange in team meetings. *European Early Childhood Education Research Journal*, 27(5), 587-600. <https://doi.org/10.1080/1350293X.2019.1651937>



- Blaylock, D. S. (2019). *Preschool science: An examination of classroom and teacher predictors*. [Unpublished master's thesis]. Utah State University.
- Boyd, L. (2014). *Flashlight*. Chronicle book.
- Braund, M., & Leigh, J. (2013). Frequency and efficacy of talk-related tasks in primary science. *Research in Science Education*, 43(2), 457-478. <http://dx.doi.org/10.1007/s11165-011-9270-1>
- Burgess, K. A., Lundgren, K. A., Lloyd, J. W., & Pianta, R. C. (2001). *Preschool teachers' self-reported beliefs and practices about literacy instruction*. Center for the Improvement of Early Reading Achievement. <https://eric.ed.gov/?id=ED452513>
- Cabell, S. Q., Justice, L. M., Vukelich, C., Buell, M. J., & Han, M. (2008). Strategic and intentional shared storybook reading. In L. M. Justice, & C. Vukelich (Ed.), *Achieving excellence in preschool literacy instruction* (pp. 198-221). Guilford Press.
- Callanan, M. A., Castañeda, C. L., Luce, M. R., & Martin, J. L. (2017). Family science talk in museums: Predicting children's engagement from variations in talk and activity. *Child Development*, 88(5), 1492-1504. <https://doi.org/10.1111/cdev.12886>
- Choi, B. M. (2016). *Early science learning among low-income Latino preschool children: The role of parent and teacher values, beliefs, and practices* [Doctoral dissertation, UC San Diego].
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.
- Crowley, K., Callanan, M., Jipson, J. L., Galco, J., Topping, K., & Shrager, J. (2001). Shared scientific thinking in everyday parent-child activity. *Science Education*, 85(6), 712-732. <https://doi.org/10.1002/sce.1035>
- Çakır, Ç. Ş., & Uludağ, G. (2019). Okul öncesi dönemdeki çocukların "ışık" kavramına ilişkin bilgilerinin belirlenmesi. [Determining the knowledge of preschool children about the concept of "light"]. *Journal of Ankara University Faculty of Educational Sciences*, 52(1), 163-189. <https://doi.org/10.30964/aeubfd.460843>
- De Temple, J., & Snow, C. E. (2003). Learning words from books. In A. Van Kleeck, S. A. Stahl, E. B. Bauer (Ed.), *On reading books to children: Parents and teachers*. (pp. 15-34). Lawrence Erlbaum Associates Publishers.
- Delserieys, A., Impedovo, M. A., Fragkiadaki, G., & Kampeza, M. (2017a). Using drawings to explore preschool children's ideas about shadow formation. *Review of Science, Mathematics and ICT Education*, 11(1), 55-69.
- Delserieys, A., Fragkiadaki, G., & Kampeza, M. (2017b, August 21-25). Learning and drawing about shadows in early childhood education, European science education research association, (ESERA), Dublin City University, Dublin, Ireland.
- Delserieys, A., Jégou, C., Boilevin, J. M., & Ravanis, K. (2018). Precursor model and preschool science learning about shadows formation. *Research in Science & Technological Education*, 36(2), 147-164. <https://doi.org/10.1080/02635143.2017.1353960>
- Deshmukh, R. S., Zucker, T. A., Tambyraja, S. R., Pentimonti, J. M., Bowles, R. P., & Justice, L. M. (2019). Teachers' use of questions during shared book reading: Relations to child responses. *Early Childhood Research Quarterly*, 49, 59-68. <https://doi.org/10.1016/j.ecresq.2019.05.006>
- Dickinson, D. K., & Tabors, P. O. (2001). *Beginning literacy with language*. Paul H Brookes Publishing.
- Doğan, Y., & Simsar, A. (2018). Preschool teachers' views on science education, the methods they use, science activities, and the problems they face. *International Journal of Progressive Education*, 14(5), 57-76. <https://doi.org/10.29329/ijpe.2018.157.6>
- Donovan, C. A., & Smolkin, L. B. (2001). Genre and other factors influencing teachers' book selections for science instruction. *Reading Research Quarterly*, 36(4), 412-440. <https://doi.org/10.1598/RRQ.36.4.4>
- Eshach, H., & Fried, M. N. (2005). Should science be taught in early childhood? *Journal of Science Education and Technology*, 14(3), 315-336. <https://doi.org/10.1007/s10956-005-7198-9>
- Exploratorium (2015). Science talk: A tool for learning science and developing language. Educators guide for inquiry-based science and English language development. Institute for Inquiry. <https://www.exploratorium.edu/sites/default/files/pdfs/ifi/ScienceTalk.pdf>
- Gallegos-Cázares, L., Flores-Camacho, F., & Calderón-Canales, E. (2009). Preschool science learning: The construction of representations and explanations about color, shadows, light and images. *Review of Science, Mathematics and ICT Education*, 3(1), 49-73.
- Gerde, H. K., & Powell, D. R. (2009). Teacher education, book-reading practices, and children's language growth across one year of Head Start. *Early Education and Development*, 20(2), 211-237. <https://doi.org/10.1080/10409280802595417>
- Gerde, H. K., Pierce, S. J., Lee, K., & Van Egeren, L. A. (2018). Early childhood educators' self-efficacy in science, math, and literacy instruction and science practice in the classroom. *Early Education and Development*, 29(1), 70-90. <https://doi.org/10.1080/10409289.2017.1360127>
- Gonzalez, J. E., Pollard-Durodola, S., Simmons, D. C., Taylor, A. B., Davis, M. J., Kim, M., & Simmons, L. (2010). Developing low-income preschoolers' social studies and science vocabulary knowledge through content-focused shared book reading. *Journal of Research on Educational Effectiveness*, 4(1), 25-52. <https://doi.org/10.1080/19345747.2010.487927>
- Greenfield, D. B., Jirout, J., Dominguez, X., Greenberg, A., Maier, M., & Fuccillo, J. (2009). Science in the preschool classroom: A programmatic research agenda to improve science readiness. *Early Education and Development*, 20(2), 238-264. <https://doi.org/10.1080/10409280802595441>
- Gropen, J., Kook, J. F., Hoisington, C., & Clark-Chiarelli, N. (2017). Foundations of science literacy: Efficacy of a preschool professional development program in science on classroom instruction, teachers' pedagogical content knowledge, and children's observations and predictions. *Early Education and Development*, 28(5), 607-631. <https://doi.org/10.1080/10409289.2017.1279527>
- Guo, Y., Wang, S., Hall, A. H., Breit-Smith, A., & Busch, J. (2016). The effects of science instruction on young children's vocabulary learning: A research synthesis. *Early Childhood Education Journal*, 44(4), 359-367. <https://doi.org/10.1007/s10643-015-0721-6>



- Hayes, D., & Ahrens, M. (1988). Vocabulary simplification for children: A special case of "motherese"? *Journal of Child Language*, 15(2), 395-410. <https://doi.org/10.1017/S0305000900012411>
- Herakleioti, E., & Pantidos, P. (2016). The contribution of the human body in young children's explanations about shadow formation. *Research in Science Education*, 46(1), 21-42. <https://doi.org/10.1007/s11165-014-9458-2>
- Hindman, A. H., & Wasik, B. A. (2008). Head Start teachers' beliefs about language and literacy instruction. *Early Childhood Research Quarterly*, 23(4), 479-492. <https://doi.org/10.1016/j.ecresq.2008.06.002>
- Hohmann, M., & Weikart, D. P. (2000). *Education of young children*, (Saltiel-Kohen & Ü. Ögüt Trans.). Istanbul: Hisar Education Foundation Publications.
- Hong, S. Y., & Diamond, K. E. (2012). Two approaches to teaching young children science concepts, vocabulary, and scientific problem-solving skills. *Early Childhood Research Quarterly*, 27(2), 295-305. <https://doi.org/10.1016/j.ecresq.2011.09.006>
- Hsiao, C. Y., & Shih, P. Y. (2015). The impact of using picture books with preschool students in Taiwan on the teaching of environmental concepts. *International Education Studies*, 8(3), 14-23. <http://dx.doi.org/10.5539/ies.v8n3p14>
- Hsu, C. Y., Tsai, C. C., & Liang, J. C. (2011). Facilitating preschoolers' scientific knowledge construction via computer games regarding light and shadow: The effect of the prediction-observation-explanation (POE) strategy. *Journal of Science Education and Technology*, 20(5), 482-493. <http://dx.doi.org/10.1007/s10956-011-9298-z>
- Impedovo, M. A., Delsierieys-Pedregosa, A., Jégou, C., & Ravanis, K. (2017). Shadow formation at preschool from a socio-materiality perspective. *Research in Science Education*, 47(3), 579-601. <https://doi.org/10.1007/s11165-016-9518-x>
- Jmal, A., Michaud, F., Irle, M., & Ndiaye, A. (2011). Structuring and representation of scientific knowledge for a transfer through an electronic knowledge-book. In *2011 IEEE International Conference on Service-Oriented Computing and Applications (SOCA)* (pp. 1-7). <https://doi.org/10.1109/soca.2011.6166225>
- Johnson, B., & Činčera, J. (2019). Development of the ecological concepts of energy flow and materials cycling in middle school students participating in earth education programs. *Studies in Educational Evaluation*, 63, 94-101. <https://doi.org/10.1016/j.stueduc.2019.08.003>
- Kabir, E., Kumar, P., Kumar, S., Adelodun, A. A., & Kim, K. H. (2018). Solar energy: Potential and future prospects. *Renewable and Sustainable Energy Reviews*, 82(1), 894-900. <https://doi.org/10.1016/j.rser.2017.09.094>
- Karamustafaoğlu, S., & Kandaz, U. (2006). Okul öncesi eğitimde fen etkinliklerinde kullanılan öğretim yöntemleri ve karşılaşılan güçlükler. [Teaching methods and difficulties encountered in science activities in preschool education]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 26(1), 65-81. <http://www.gefad.gazi.edu.tr/tr/download/article-file/77213>
- Karina, A., & Vidal, C. C. (2020). Learning about science in preschool: play-based activities to support children's understanding of chemistry concepts. *International Journal of Early Childhood*, 52(1), 17-35. <https://doi.org/10.1007/s13158-020-00259-3>
- Karpov, Y. V. (2003). Vygotsky's doctrine of scientific concepts: Its role for contemporary education. In A. Kozulin, B. Gindis, V. S. Ageyev, S. M. Miller (Eds.), *Vygotsky's educational theory in cultural context* (pp. 65-82). Cambridge University Press.
- Kefi, S., Çeliköz, N., & Erişen, N. (2013). Okul öncesi eğitim öğretmenlerinin temel bilimsel süreç becerilerini kullanım düzeyleri [Preschool education teachers' use of basic scientific process skills]. *Eğitim ve Öğretim Araştırmaları Dergisi*, 3(2), 345-364. https://www.researchgate.net/publication/311924535_Egitim_ve_Ogretim_Arastirmalari_Dergisi_Journal_of_Research_in_Education_and_Teaching
- Keleş, S., & Menevşe, E. B. (2017). Okul öncesi dönem fen eğitiminde kavram kazanımı [Concept acquisition in pre-school science education]. In H.Ş. Ayvaci, & S. Ünal (Eds.), *Kuramdan uygulamaya okul öncesinde fen eğitimi* (148-175). Pegem.
- Krogh, S. L., & Slentz, K. L. (2001). *Early childhood education: Yesterday, today, and tomorrow*. Routledge.
- Lester, S. (1999). *An introduction to phenomenological research*. Stan Lester Developments.
- Leung, C. B. (2008). Preschoolers' acquisition of scientific vocabulary through repeated read-aloud events, retellings, and hands-on science activities. *Reading Psychology*, 29(2), 165-193. <https://doi.org/10.1080/02702710801964090>
- Mantzicopoulos, P., Samarapungavan, A., & Patrick, H. (2009). "We learn how to predict and be a scientist": Early science experiences and kindergarten children's social meanings about science. *Cognition and Instruction*, 27(4), 312-369. <https://doi.org/10.1080/07370000903221726>
- McNEILL, K. L., & Knight, A. M. (2013). Teachers' pedagogical content knowledge of scientific argumentation: The impact of professional development on K-12 teachers. *Science Education*, 97(6), 936-972. <https://doi.org/10.1002/sce.21081>
- Morrow, L. M. (2007). *Developing literacy in preschool*. Guilford Press.
- Muris, P., Merckelbach, H., Ollendick, T. H., King, N. J., & Bogie, N. (2001). Children's nighttime fears: Parent-child ratings of frequency, content, origins, coping behaviors and severity. *Behaviour Research and Therapy*, 39(1), 13-28. [https://doi.org/10.1016/s0005-7967\(99\)00155-2](https://doi.org/10.1016/s0005-7967(99)00155-2)
- Newton, P., Driver, R. & Osborne, J. (1999). The place of argumentation in the pedagogy of school science. *International Journal of Science Education*, 21(5), 553-576. <https://doi.org/10.1080/095006999290570>
- Ntalakoura, V., & Ravanis, K. (2014). Changing preschool children's representations of light: A scratch-based teaching approach. *Journal of Baltic Science Education*, 13(2), 191-200. <http://www.scientiasocialis.lt/jbse/?q=node/354>
- Okyay, O., & Kandir, A. (2019). The impact of interactive storybook reading programme on scientific vocabulary acquisition by children. *Early Child Development and Care*, 1-11. <https://doi.org/10.1080/03004430.2019.1685508>
- Olgan, R. (2015). Influences on Turkish early childhood teachers' science teaching practices and the science content covered in the early years. *Early Child Development and Care*, 185(6), 926-942. <https://doi.org/10.1080/03004430.2014.967689>



- Oppermann, E., Hummel, T., & Anders, Y. (2019). Preschool teachers' science practices: associations with teachers' qualifications and their self-efficacy beliefs in science. *Early Child Development and Care*, 1-15. <https://doi.org/10.1080/03004430.2019.1647191>
- Özgül, S. G. (2017). Sorgulama temelli oyunların çocukların dünya'nın şekli ve gece-gündüz kavramlarını algılamalarına etkisi. [The effect of interrogation based games on children's perception of the shape of the earth and day and night concepts]. *Journal of Balikesir University Institute of Social Sciences*, 22(41), 155-172.
- Pantidos, P., Herakleioti, E., & Chachlioutaki, M. E. (2017). Reanalysing children's responses on shadow formation: a comparative approach to bodily expressions and verbal discourse. *International Journal of Science Education*, 39(18), 2508-2527. <https://doi.org/10.1080/09500693.2017.1392644>
- Parsons, A. W., & Bryant, C. L. (2016). Deepening kindergarteners' science vocabulary: A design study. *The Journal of Educational Research*, 109(4), 375-390. <https://doi.org/10.1080/00220671.2014.968913>
- Patton, M. Q. (2005). *Qualitative Research*. John Wiley & Sons.
- Pentimonti, J. M., Zucker, T. A., Justice, L. M., & Kaderavek, J. N. (2010). Informational text use in preschool classroom read-alouds. *The Reading Teacher*, 63(8), 656-665. <https://doi.org/10.1598/RT.63.8.4>
- Price, L. H., Bradley, B. A., & Smith, J. M. (2012). A comparison of preschool teachers' talk during storybook and information book read-alouds. *Early Childhood Research Quarterly*, 27(3), 426-440. <http://dx.doi.org/10.1016%2Fj.ecresq.2012.02.003>
- Ravanis, K., Christidou, V., & Hatzinikita, V. (2013). Enhancing conceptual change in preschool children's representations of light: A socio-cognitive approach. *Research in Science Education*, 43(6), 2257-2276. <https://doi.org/10.1007/s11165-013-9356-z>
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. Oxford University Press.
- Saçkes, M. (2014). How often do early childhood teachers teach science concepts? Determinants of the frequency of science teaching in kindergarten. *European Early Childhood Education Research Journal*, 22(2), 169-184. <https://doi.org/10.1080/1350293X.2012.704305>
- Saçkes, M., Trundle, K. C., & Flevaris, L. M. (2009). Using children's books to teach inquiry skills. *YC Young Children*, 64(6), 24-26. <https://eric.ed.gov/?id=EJ868221>
- Saçkes, M., Trundle, K. C., Bell, R. L., & O'Connell, A. A. (2011). The influence of early science experience in kindergarten on children's immediate and later science achievement: Evidence from the early childhood longitudinal study. *Journal of Research in Science Teaching*, 48(2), 217-235. <https://doi.org/10.1002/tea.20395>
- Sahin, E. (2013). Predictors of Turkish elementary teacher candidates' energy conservation behaviors: an approach on value-belief-norm theory. *International Journal of Environmental and Science Education*, 8(2), 269-283. <https://doi.org/10.12973/ijese.2013.204a>
- Simsar, A., & Doğan, Y. (2019). Okul öncesi öğretmenlerinin fen eğitimi süreçleri üzerine görüşlerinin incelenmesi [Investigation of preschool teachers' views on science education processes]. *E-Kafkas Journal of Educational Research*, 6(2), 19-32. <https://doi.org/10.30900/kafkasegt.590361>
- Siry, C. A., & Lang, D. E. (2010). Creating participatory discourse for teaching and research in early childhood science. *Journal of Science Teacher Education*, 21(2), 149-160. <https://doi.org/10.1007/s10972-009-9162-7>
- Staley, A. A., & O'Donnell, J. P. (1984). A developmental analysis of mothers' reports of normal children's fears. *The Journal of Genetic Psychology*, 144(2), 165-178. <https://psycnet.apa.org/record/1984-25650-001>
- Stone, S., & Twardosz, S. (2001). Children's books in childcare classrooms: Quality, accessibility, and reasons for teachers' choices. *Journal of Research in Childhood Education*, 16(1), 53-69. <https://eric.ed.gov/?id=EJ643641>
- Turkish Linguistic Society [TDK- Türk Dil Kurumu] (2020). *General Annotated Dictionary*. TDK Publications.
- Torquati, J., Cutler, K., Gilkerson, D., & Sarver, S. (2013). Early childhood educators' perceptions of nature, science, and environmental education. *Early Education & Development*, 24(5), 721-743. <https://doi.org/10.1080/10409289.2012.725383>
- Tu, T. (2006). Preschool science environment: What is available in a preschool classroom?. *Early Childhood Education Journal*, 33(4), 245-251. <https://doi.org/10.1007/s10643-005-0049-8>
- Tu, T. H., & Hsiao, W. Y. (2008). Preschool teacher-child verbal interactions in science teaching. *Electronic Journal of Science Education*, 12(2), 1-23. [file:///C:/Users/ASUS/Downloads/7778-Article%20Text-26573-1-10-20110105%20\(2\).pdf](file:///C:/Users/ASUS/Downloads/7778-Article%20Text-26573-1-10-20110105%20(2).pdf)
- Uğraş, H., Uğraş, M., & Çil, E. (2013). Okul öncesi öğretmenlerinin fen eğitimine karşı tutumlarının ve fen etkinliklerine ilişkin yeterliliklerinin incelenmesi [Investigation of preschool teachers' attitudes towards science education and their competencies regarding science activities]. *Bitlis Eren University Journal of Science*, 2(1), 44-50. <https://dergipark.org.tr/pub/bitlisfen/issue/3702/48998>
- Ültay, N., Ültay, E., & Çilingir, S. K. (2018). Okul öncesi öğretmenlerinin fen konularındaki uygulamalarının incelenmesi [Investigation of pre-school teachers' practices on science]. *Journal of Graduate School of Social Sciences*, 22, 773-792. <https://dergipark.org.tr/pub/ataunisosbil/issue/36559/382873>
- Wertsch, J., & C. Toma. (1995). *Discourse and learning in the classroom: A sociocultural approach*. In Constructivism in education, Steffe and J. Gale. Lawrence Erlbaum.
- Worth, K., & Grollman, S. (2003). *Worms, shadows and whirlpools: Science in the early childhood classroom*. Heinemann.
- Worthington, R. K., Typpo, M., & Worthington Jr, E. L. (1980). Spatial concept learning in preschool children: Motoric experiences and verbal repetition as adjuncts to passive listening. *Perceptual and motor skills*, 50(1), 183-186. <https://doi.org/10.2466/pms.1980.50.1.183>
- Yıldız, E., Güçhan Özgül, S., & Saçkes, M. (2019). Bütünleştirilmiş fen ve türkçe etkinliklerinin okul öncesi çocuklarının Dünya'nın şekli ve gece gündüz kavramlarını anlayışlarına etkisi [The effect of integrated science and turkish activities on preschool children's understanding of the shape of the world and the concepts of day and night]. *Balikesir University Journal of Social Sciences Institute*, 22(41), 155-172 <https://doi.org/10.31795/baunsobed.581256>

- Zisenwine, T., Kaplan, M., Kushnir, J., & Sadeh, A. (2013). Nighttime fears and fantasy–reality differentiation in preschool children. *Child Psychiatry & Human Development*, 44(1), 186-199. <https://doi.org/10.1007/s10578-012-0318-x>
- Zucker, T., Justice, L., Piasta, S., & Kaderavek, J. (2010). Preschool teachers' literal and inferential questions and children's responses during whole-class shared reading. *Early Childhood Research Quarterly*, 25(1), 65–83. <https://eric.ed.gov/?id=EJ864538>

Received: July 09, 2020

Accepted: November 15, 2020

Cite as: Yurt Tarakçı, Ö., Keleş, S., & Kölemen, E. B. (2020). Preschool teachers' science talks during picture storybook telling. *Journal of Baltic Science Education*, 19(6), 940-953. <https://doi.org/10.33225/jbse/20.19.940>

Özlem Yurt Tarakçı
(Corresponding author)

PhD, Associate Professor of Preschool Education, Department of Preschool Education, Fatih Faculty of Education, Trabzon University, 61335, Trabzon-Turkey.
E-mail: ozlemyurt37@gmail.com
Website: <https://trabzon.academia.edu/ÖzlemYURT>
ORCID: <http://orcid.org/0000-0001-6851-9974>

Sadiye Keleş

PhD, Associate Professor of Preschool Education, Ereğli Faculty of Education, Zonguldak Bulent Ecevit University, 67300, Zonguldak-Turkey.
E-mail: sadiykeles@gmail.com
Website: <https://akademikcv.beun.edu.tr/cv/skeles.html>
ORCID: <http://orcid.org/0000-0003-3552-363X>

Esra Betül Kölemen

Research Assistant of Preschool Education, Department of Preschool Education, Faculty of Education, Sakarya University, 54300, Sakarya-Turkey.
E-mail: menevse@sakarya.edu.tr
Website: <http://menevse.sakarya.edu.tr/>
ORCID: <https://orcid.org/0000-0003-2435-4092>

