

## Research Article

# Analysis of the science and environment achievements in preschool curriculum for students with special needs

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### Abstract

This study was conducted to determine the distribution of science and environmental achievements in the "Cognitive Development Area" of the 2018 Turkish Preschool Special Education Curriculum according to the Revised Bloom's Taxonomy. The document analysis method, with a qualitative viewpoint, was used in the study. The achievements in "The Cognitive Development" sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were analyzed according to the Revised Bloom's Taxonomy. For this purpose, 22 learning achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were analyzed. According to the data obtained, a total of 22 learning achievements were classified as factual knowledge-remembering 8, factual knowledge-understanding 2, factual knowledge-applying 3, conceptual knowledge-remembering 2, conceptual knowledge-understanding 4, metacognitive knowledge-understanding 1 and metacognitive knowledge-applying 2. There were no achievements in the sub-dimensions of procedural knowledge, analyzing, evaluating and creating. While a total of 158 achievements are included in the cognitive development field, only 13.92% of them belong to the cognitive development sub-field of "Science-Scientific Skills and Methods" and "Science-Natural, Physical Environment and Life". From this point of view, it may be useful to increase the number of achievements given to science and environment topics. In addition, it was observed that the achievements analyzed did not show a homogeneous distribution according to age levels. In addition, it was concluded that the achievements related to high-level knowledge and cognitive process dimensions that make students more active were not sufficiently included.

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## Introduction

Preschool period is a critical period in which the basis of a child's cognitive, emotional, social and physical development is established (Shonkoff et al., 2000; Genç & Tolan, 2021; Luby et al., 2022; Sevim et al., 2023). Providing a correct and effective educational curriculum is of great importance for the healthy growth and development of children between 37-78 months. Especially for children with special needs, if developmental problems or special needs are identified and intervened in the preschool period, these problems can be prevented from turning into bigger issues in the future. Hence, it can be seen as an important priority to implement appropriate educational curricula for children with special needs at an early age. Since children begin to acquire basic skills in the preschool period, supporting basic skills such as language

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development, motor skills, social interaction and self-care in this period enables children to become more independent and capable individuals in their future lives (Adama, 2023; Beckley, 2013; Braslauskienė, & Turauskienė, 2021). Curricula designed for children with special needs in the preschool period help to meet their needs in developing social interaction skills and expressing themselves emotionally. Curricula designed for children with special needs in the preschool period aim to support the healthy development of children and enable them to maximize their potential. A functional and viable preschool special education curriculum will positively impact children's future lives and strengthen their social inclusion. Special education curricula enable children to be supported at home in collaboration with families. In addition, special education curricula prepared for preschool children support their social adaptation and participation (Mirzajonova & Parpiyeva, 2022). Children with special educational needs also have the right to education, and curricula specially designed for these children will provide them with equal opportunities. With the equal opportunity provided by the curriculum, the holistic development of cognitive, emotional, social and motor skills of preschool children with special needs will not be neglected.

Considering that the preschool period is a period in which children develop basic cognitive, emotional, social and motor skills, environmental and science education can be seen to have a special importance in this period. This is because it stimulates children's sense of curiosity and enables them to develop an understanding of their environment and discover basic science concepts. Environmental and science education should start from the preschool period and continue throughout the school years (Türkoğlu, 2019). Including environmental and science education achievements in the curriculum at an early age supports children to grow up as individuals who are sensitive to their environment, in harmony with nature and have a scientific mindset (Ardoin & Bowers, 2020). At the same time, a curriculum that includes environmental and science achievements increases children's interest in learning by encouraging their curiosity and willingness to explore. Children's natural tendencies to be curious and to notice differences between people can be utilized in their socialization and learning (Erwin et al., 2023). Environmental and science education, which can stimulate curiosity and the willingness to explore, can have an impact on increasing the environmental awareness of future generations by raising children's awareness of environmental protection, sustainability and nature at an early age. In preschool special education curricula that can enable children to become environmentally and scientifically sensitive, learning achievements based on realistic needs should be determined first. A curriculum can achieve the desired results only with targeted learning achievements based on realistic needs (Karacaoğlu, 2020a).

Examining environmental and science education achievements in preschool special education curricula will provide a structure that includes different thinking skills to assess learning achievements. Such a study also plays an important role in environmental and science education in preschool special education. This study can help students gain a clearer understanding of the environmental and science education learning achievements. This, in turn, allows students to receive a better education. This will allow students to receive a better education. Individualized education approach is important in special education (Smith, 1990; Florian, 2019; Fowler et al., 2019). Examining the targeted outcomes can help to create individualized education plans using the levels of Bloom's Taxonomy to better assess students' learning levels and skills. If environmental and science education is seen as an important component of preschool special education curricula, the achievements examined within the framework of the Revised Bloom's Taxonomy (RBT) can help to make the curricula more holistic and targeted. The evaluation of environmental and science education achievements in preschool special education curricula according to the RBT may contribute to evaluating more effective learning in the field of special education, developing curricula and providing better education to students.

It has been tried to be explained that environmental and science education of preschool special education students has a lifelong importance starting from early ages. It is clear that the environmental and science education to be provided through the preschool special education curriculum will also form the basis for further education. Different taxonomies can be used to determine the appropriateness of the targeted achievements in a curriculum of such importance to the achievements of the curriculum (Birgin, 2016). Bloom's taxonomy is one of them. Anderson and Krathwohl (2010) revised Bloom's Taxonomy into two dimensions: cognitive process and knowledge. This taxonomy enables the organization of learning-teaching processes and the examination of learning achievements the curriculum (Tutkun et

al., 2010). The fact that the learning achievements in the curricula used in Turkey consist of noun and verb roots has brought the RBT to the forefront in their evaluation. While the cognitive process dimension of the RBT is remembering - understanding - applying - analyzing - evaluating - creating, the knowledge dimension is organized as factual-conceptual- procedural- metacognitive knowledge (Tutkun et al., 2015; Zorluoğlu et al., 2016). Anderson and Krathwohl reviewed and updated the information on learning achievements, which is an important criterion for teaching, learning and assessment. In the re-adapted taxonomy, the view that Bloom's taxonomy should be changed according to the fields of study and usage in order to be used by educators continues. The main changes that differ from the taxonomy developed by Bloom are the renaming of the lowest level of the taxonomy, known as knowledge, as remembering, and the reversal of synthesis (level 5) and evaluation (level 6), which constitute the highest cognitive levels of the taxonomy, as evaluating (level 5) and creating (synthesis, level 6). Another important change in the taxonomy is related to its use. Although Bloom's original taxonomy was designed to assist educators in planning assessment tools, it has been found to be used more for educators to learn how to ask questions in the classroom and to plan teaching processes. The RBT emphasizes the importance of "planning the curriculum, the instructional process, the assessment, and the sequencing of these three." With this change in understanding, the RBT has become more usable for educators and curriculum development experts, and has also reduced misunderstandings arising from readers' interpretations. The taxonomy is written in the spoken language of the field in a user-friendly way and includes many examples of how the taxonomy should be used for effective planning (Karacaoğlu, 2020a).

In the preschool period, when children with special needs develop basic skills and make great progress in cognitive, emotional, social and motor fields, assessing environmental and science education achievements according to the RBT can provide information to encourage in-depth learning at different skill levels by providing a multidimensional learning experience. It can provide feedback that will contribute to children's in-depth understanding of learning by evaluating environmental and science education achievements at different taxonomic levels. This study will also contribute to integrating more appropriate and effective strategies into the learning processes of children in need of special education, thereby contributing to a better learning experience for these students and supporting their cognitive development at the highest level. The researchers were also motivated by the lack of a study on environmental and science education achievements related to preschool special education curricula. It is thought that the results of the research will shed light on curriculum development, environmental and science education practices in preschool special education. For these reasons, it has been a matter of curiosity how the evaluation of environmental and science education achievements in preschool special education curriculum according to the RBT can contribute to the development of cognitive and metacognitive skills of children in need of special education. It is necessary to conduct a research on the problem of how the number and level of achievements in the preschool special education curriculum are. As a result of this necessity, a qualitative and quantitative evaluation of the environmental and science learning achievements in the preschool special education curriculum in Turkey was conducted in accordance with the RBT .

### **Problem of Study**

The aim of this study is to analyze the achievements of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the cognitive development field of the 2018 preschool special education curriculum according to the RBT. The 22 achievements will be examined within the framework of the following sub-problems.

- How do the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Field of the 2018 Preschool Special Education Curriculum show a distribution in the knowledge dimension according to the RBT?
- How do the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Field of the 2018 Preschool Special Education Curriculum show a distribution in the cognitive process dimension according to the RBT?
- What is the ratio of the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Field of the 2018 Preschool Special Education Curriculum to the achievements in the total cognitive development field?

## Method

### Research Model

Document analysis method, with a qualitative point of viewpoint, was used in the study. In the document analysis, the number and levels of the achievements in the preschool special education curriculum were determined. In qualitative content analysis, the levels in the RBT were accepted as criteria.

### Participants

This research was conducted as a document analysis within the framework of qualitative method. With document analysis, which is based on the examination of written materials, information about the situation targeted to be investigated is obtained. Document analysis was utilized in data collection (Yıldırım & Şimşek, 2005). The advantage of document analysis is that many results can be obtained by examining documents without the need for observation and interviews about the field and subject of research (Bowen, 2009). In this study, 22 achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Area of the 2018 Preschool Special Education Curriculum were analyzed according to the RBT. For the analysis of the achievements, one science education expert and two academicians and one researchers with competence in the field of curriculum development worked independently of each other on the topics in the study. The experts put forward their opinions on which level the achievements should be placed in terms of knowledge dimension and cognitive process dimension in the RBT and then a comparison was made. Items with consensus and disagreement were identified. The formula determined by Miles and Huberman (1994) was used to determine the reliability of the analysis by using the data obtained from the two-dimensional comparisons made by the experts. As a result of the comparison of these codings, 19 of the 22 learning achievements were coded in the same way and the other 3 were coded differently. Thus, the percentage of agreement between the coders of the study was 86.36%. This result shows that the research is quite reliable.

Reliability formula determined by Miles and Huberman;

The formula for percent agreement is  $p = \frac{Cx100}{C+A}$ . In the formula, p: Reliability coefficient, C: Number of achievements on which consensus was reached, A: Number of achievements on which consensus was not reached (Miles & Huberman, 1994). Full consensus was achieved by working together again on the 3 achievements on which there was no consensus. The achievements in the curriculum are in the form of sentences and consist of two parts: verb and noun expressions. In order to find the place of the learning achievements in the taxonomy matrix, the sentence of the learning achievement is first analyzed. According to RBT, the verb expression of the achievement constitutes the cognitive process dimension and the noun expression constitutes the knowledge dimension. However, there are problems because some achievements contain more than one verb and noun expression (Anderson & Krathwohl, 2001; Yıldırım & Şimşek, 2005). In cases where the achievement includes more than one verb expression or noun expression, the higher dimension expression should be selected; if the achievement includes both applying and understanding, the higher dimension applying should be selected. If both factual knowledge and metacognitive knowledge are included, the metacognitive knowledge sub-dimension, which is the higher sub-dimension, is selected and coded in the cell where the dimensions of the achievement intersect (Anderson & Krathwohl, 2010; Yıldırım & Şimşek, 2005; Bekdemir & Selim, 2008). The learning achievements in the curriculum are coded by placing them in the cell where the column containing the cognitive process dimension and the row containing the knowledge dimension intersect (Amer, 2006; Krathwohl, 2002). For instance, the verb expression "names" in the achievements item "Says the ten small parts of his/her body" is in the remembering level of the cognitive process dimension. Based on the data obtained, the code of this achievement is decided by finding cell A1, which is the cell where the row with factual information and the column with the remembering level intersect in the taxonomy matrix of the achievement.

The achievements were coded according to the knowledge and cognitive process dimensions in accordance with the RBT Matrix (RBTM) in Table 1.

**Table 1.** Revised Bloom Taxonomy matrix (Krathwohl, 2002; Anderson, 2005)

		Cognitive Process Dimensions					
		1	2	3	4	5	6
Knowledge Dimension		Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
A	Factual K.	A 1	A 2	A 3	A 4	A 5	A 6
B	Conceptual K.	B 1	B 2	B 3	B 4	B 5	B 6
C	Procedural K.	C 1	C 2	C 3	C 4	C 5	C 6
D	Metacognitive K.	D 1	D 2	D 3	D 4	D 5	D 6

K: Knowledge

### Data Analysis

The knowledge dimension and cognitive process dimensions were coded according to the RBT matrix by taking Table 1 into consideration.

In order to determine the cell in the taxonomy matrix for the achievement "Defines objects and events in the environment by observing them", it was divided into the noun expression "objects and events in the environment" and the verb expression "defines them by observing them". While the noun phrase is in the factual knowledge dimension since it constitutes the knowledge of the components and the basic part of the subject, the verb phrase "defines by observing" is in the remembering and applying level. When two cognitive process dimensions are in one achievement, a higher level is taken. Since the cell where factual knowledge and application level intersect is A3, this code is included in this cell.

### Research Ethics

The subject of this study is educational curriculum evaluation. Within the scope of the research, human or animal subjects, data collection methods such as experiments, observations, questionnaires or interviews were not used. For this reason, it was not necessary to obtain an ethics committee report.

### Results

In this study, 22 achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Area of the 2018 Preschool Special Education Curriculum were examined according to the RBT and the place of the achievements in the RBT matrix was determined. The distribution of the data obtained according to the dimensions and sub-dimensions in the RBT is given in tables 2, 3 and 4. In order to better understand the distribution of the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life", the data were presented as graphs.

**Table 2.** Analysis of learning achievements for 37-48 months children with special educational needs

Sub-fields	Achievements	RBTM
SSSM	Ask questions about objects and events in the environment.	A2
	Describes objects and events by observing them.	A3
	Tells the similarities and differences of objects according to their physical characteristics.	B1
SNPEL	Says ten small parts of the body.	A1
	Identifies natural objects in the sky such as the moon, sun, clouds and stars.	A1
	Describes the physical characteristics of living things.	A1
<b>Total</b>		<b>6</b>

SSSM: Science-Scientific Skills and Method SNPEL: Science-Natural, Physical Environment and Life RBTM: Revised Bloom's Taxonomy Matrix

**Table 3.** Analysis of learning achievements for 49-60 months children with special educational needs

Sub-fields	Achievements	RBTM
SSSM	Makes detailed descriptions by observing the beings and events around them.	A3
	Uses tools or senses to collect and analyze information, observe processes and relationships.	D3
SNPEL	Tells the states of matter.	A1
	Describes the properties of the substances around them by comparing them in terms of color, size and shape.	B2
	Explains the changes by observing natural entities in the sky such as moon, sun, clouds, stars.	A3
	Explains the effects of seasonal changes on living things.	B2
	Group living things according to their characteristics and tell their common features.	A2
	Explains the similar and different characteristics of the habitats of living things.	B2
<b>Total</b>		<b>8</b>

SSSM: Science-Scientific Skills and Method SNPEL: Science-Natural, Physical Environment and Life RBTM: Revised Bloom's Taxonomy Matrix

**Table 4.** Analysis of learning achievements for 61-78 months children with special educational needs

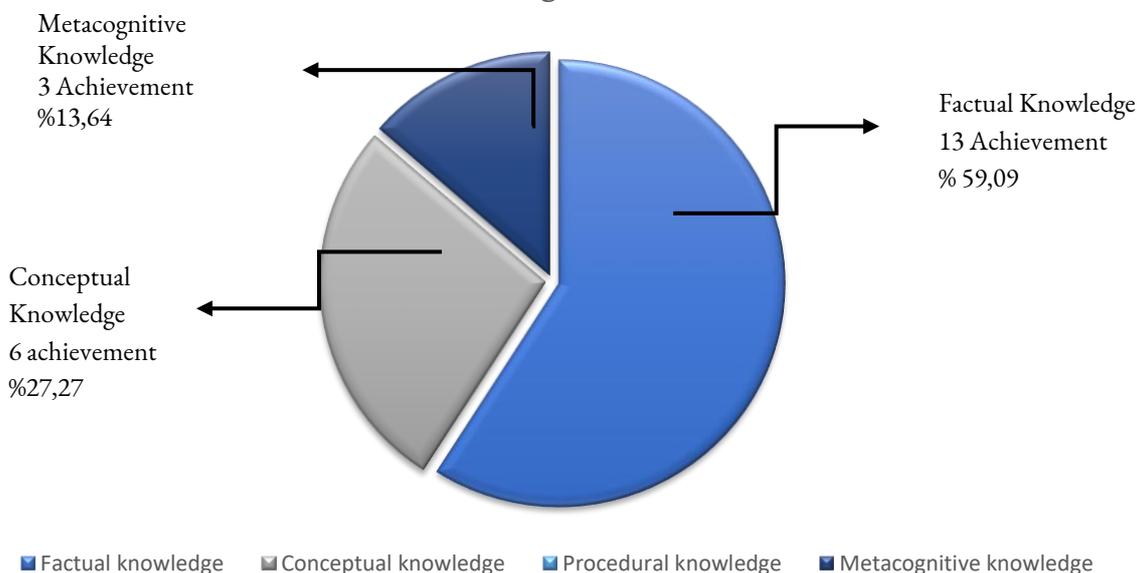
Sub-fields	Achievements	RBTM
SSSM	Explains the information he/she gathers about beings using his/her senses.	D3
	Explains why or how an observed event happened.	D2
SNPEL	Tells what material objects are made of.	A1
	Explains the transformation between the forms of matter in a simple way.	B2
	Explains the similarities and differences in the physical characteristics or behaviors of living things.	B1
	Say the characteristics of landforms such as mountains, rivers, oceans, deserts and seas.	A1
	Says the names of different time periods of the day.	A1
	Says the days of the week in order.	A1
<b>Total</b>		<b>8</b>

SSSM: Science-Scientific Skills and Method SNPEL: Science-Natural, Physical Environment and Life RBTM: Revised Bloom's Taxonomy Matrix

### Knowledge Subdimensions



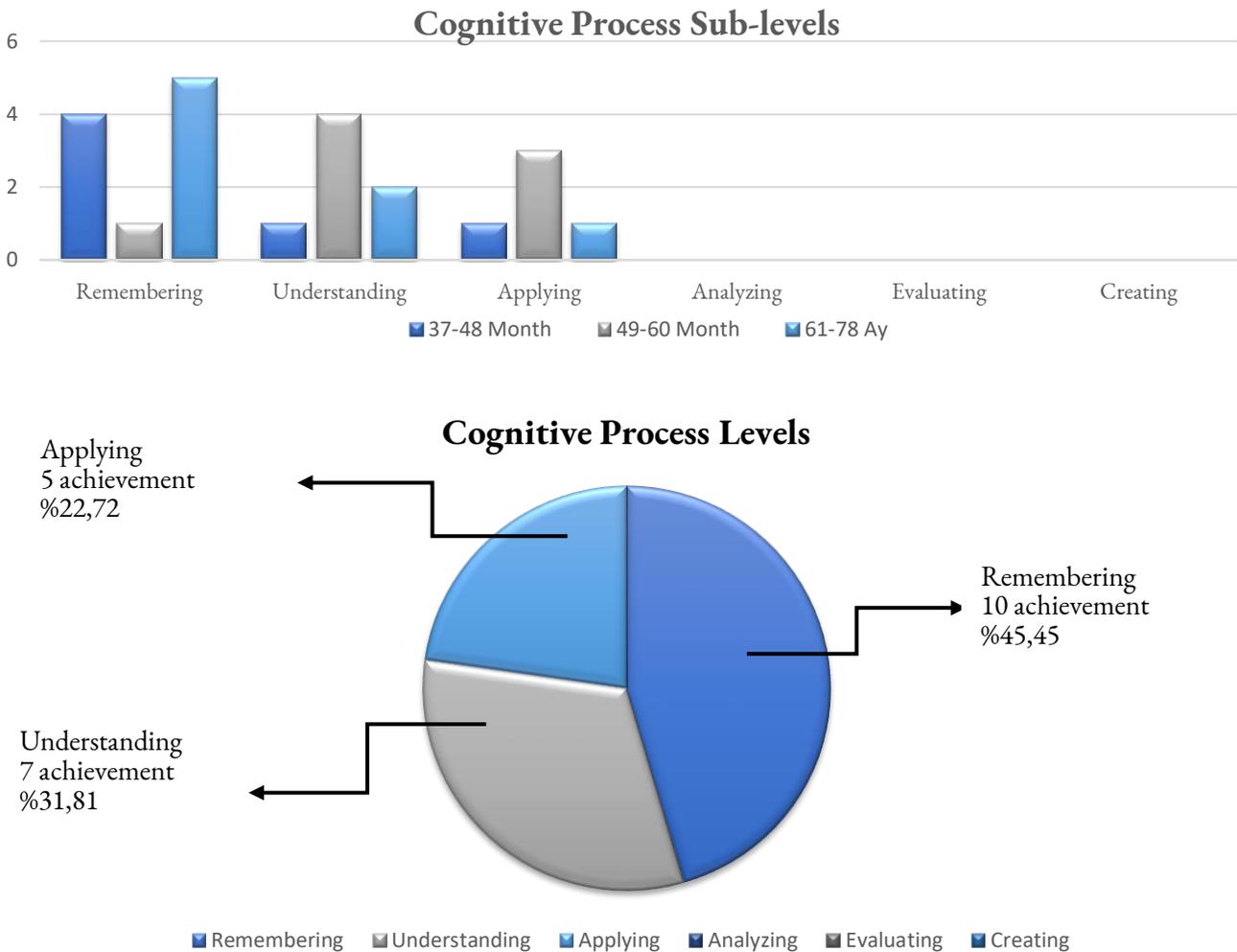
### Knowledge Sub-dimensions



**Figure 1.** Distributions of learning achievements for children with special educational needs at preschool level

In Figure 1, the achievements belonging to the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" are analyzed according to the knowledge dimension sub-levels according to the RBT. The achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" did not include any achievements related to the procedural knowledge dimension. It is seen that the most common knowledge dimension is the factual knowledge dimension. In Figure 2, it is possible to see the distribution of knowledge dimensions proportionally.

According to Figure 1, 59.09% of the learning achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were factual knowledge (13 learning achievement), 27.27% were conceptual knowledge (6 learning achievement), 13.64% were metacognitive knowledge (3 learning achievement), and no learning achievement was included at the procedural knowledge sub-dimension.



**Figure 2.** Distributions of learning achievements according to RBTM for children with special educational needs at preschool level

The evaluation of the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" according to the cognitive process dimension sub-levels of the RBT is given in the graph in Figure 3. When this graph is analyzed, it is seen that the highest number of achievements is at the remembering level with 10 achievements. This is followed by understanding with 7 achievements and applying with 5 achievements. No achievements were found in the sub-levels of analyzing, evaluating and creating.

According to Figure 2, 45.45% of the learning achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were remembering (10 learning achievements), 31.81% were understanding (7 learning achievements) and 22.72% were applying (5 learning achievements). There were no achievements in the levels of analyzing, evaluating and creating.

**Table 5.** Distributions of learning achievements according to RBTM for children with special educational needs at preschool level

Knowledge Dimension	Cognitive Process Dimension						Total
	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating	
Factual K.	8	2	3	0	0	0	13
Conceptual K.	2	4	0	0	0	0	6
Procedural K.	0	0	0	0	0	0	0
Metacognitive K.	0	1	2	0	0	0	3
Total	10	7	5	0	0	0	22

K: Knowledge

Table 5 shows the analysis of a total of 22 outcomes in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" in the Cognitive Development Field of the Preschool Special Education Curriculum according to the RBT. Table 5 shows the general trend of the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life". Table 5 and the graphs are instructive for teachers and provide information about the knowledge dimension of the subject to be taught and which dimension should be taught at least according to the sub-levels of the cognitive process dimension. When Table 5 is examined, it is seen that the learning achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" are not homogeneously distributed according to the RBT.

While a total of 158 achievements are included in the cognitive development field, only 13.92% of them belong to the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life".

### Conclusion and Discussion

In line with the main purpose of the study, environmental and science education learning achievements in the preschool special education curriculum implemented in Turkey were determined and these learning achievements were evaluated qualitatively and quantitatively in accordance with the RBT. Within the scope of this evaluation, the learning achievements belonging to the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were analyzed according to the sub-levels of the knowledge dimension according to the RBT. It was determined that the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" did not include any achievements related to the procedural knowledge dimension. It is seen that the most common knowledge dimension is the factual knowledge dimension. When Gülay and Ekici (2010) examined the preschool curriculum in general, it was found that there were no achievements and achievements for environmental education in the preschool curriculum in the developmental, psychomotor and language fields, but the environmental goals in the social-emotional, cognitive and self-care skills fields had a 25.9% share in the learning achievements in the entire curriculum. It was also determined that the learning achievements for environmental education constituted 15.5% of all learning achievements. In addition, it is understood that 29.0% of the concepts in the curriculum and 26.3% of the specific days and weeks in the curriculum are related to environmental education.

When the literature was reviewed, no research on environmental and science education related to learning achievements in the preschool special education curriculum in Turkey was found, so similar studies at the next higher level (primary school) were examined. Akinoğlu and Sarı (2013) emphasized that the third grade life science curriculum has more environmental learning achievements than the first two grades. Karacaoğlu (2020b), who examined according to taxonomy and levels, stated that two-thirds of the 2nd grade achievements of the life science curriculum are related to the cognitive domain and approximately one-third are related to the affective domain. Only 1 of the 50 achievements in the 2nd grade of the life science curriculum is related to the psychomotor domain. Similarly, Bahar et al. (2013) emphasized that in the life sciences curriculum, achievements at the cognitive level are included more than achievements in other domains (affective and psychomotor). In the 2005 life science curriculum, it was emphasized that the targeted

achievements covered the dimensions of environmental literacy more than the 1998 curriculum. Akınoğlu & Sarı (2013) found that the first grade life science achievements were mostly about natural disasters and the least about environmental cleaning and conscious consumption of resources. He found that the number of learning achievements related to conscious consumption of resources was higher in the environmental learning achievements of the second grade life science curriculum. According to Anderson and Krathwhol (2001), as the age level increases, it is expected that the achievements in the factual knowledge dimension will decrease and the achievements in the procedural knowledge dimension will increase. When different studies are analyzed, it is seen that these expectations are partially met.

Of the 22 learning achievements in the cognitive development sub-fields of "Science-Scientific Skills and Methods" and "Science-Natural, Physical Environment and Life", 10 were at the remembering, 7 at the understanding and 5 at the applying level. No learning achievements were found at the analyzing, evaluating and creating levels. The distribution of learning achievements in the cognitive development sub-field is not homogeneous according to the RBT. This result about the distribution of achievements according to their levels is supported by the research conducted by Akınoğlu & Sarı (2013). In the study, it is seen that the fourth grade social studies course has the lowest percentage (4.35%) in terms of achievements related to the environment, while the science and technology course has the highest percentage (17.73%). In the fourth grade social studies curriculum, there are no achievements on environmental cleanliness, environmental sensitivity or environmental awareness. Only one achievement is related to natural disasters and one to weather events. As can be seen, the distribution of environmental and science education achievements in the preschool special education curriculum and primary school courses is similar. This result about the distribution of learning achievements according to their levels is supported by the study conducted by Akınoğlu & Sarı (2013). In the study, it is seen that the fourth grade social studies course has the lowest percentage (4.35%) in terms of achievements related to the environment, while the science and technology course has the highest percentage (17.73%). In the fourth grade social studies curriculum, there are no learning achievements related to environmental cleanliness, environmental sensitivity or environmental awareness. Only one achievement is related to natural disasters and one to weather events. As can be seen, the heterogeneous distribution of environmental and science education achievements in the preschool special education curriculum and primary school courses is similar.

When the achievements in the cognitive development sub-fields of "Science-Scientific Skills and Method" and "Science-Natural, Physical Environment and Life" were analyzed according to the sub-levels of the cognitive process dimension of the RBT, it was determined that they were mostly concentrated in the remembering step with 10 achievements. The other achievements are followed by 7 understanding and 5 applying levels. In the sub-levels of analyzing, evaluating and creating, there are no achievements in the sub-levels of the cognitive process dimension of the curriculum. Of the 22 learning achievements in the cognitive development sub-dimension, 13 of them are at the level of factual knowledge, 6 of them are at the level of conceptual knowledge, and 3 of them are at the level of metacognitive knowledge with a rate of 13.64%. No learning achievement was found at the procedural knowledge level and it was determined that there was not an equal distribution quantitatively related to the levels. In the study conducted by Balkan and Atabek-Yiğit (2023), it was determined that learning achievements related to the environment were included more in the Brazilian science curriculum than in Turkey and the number of learning achievements aimed at preventing future problems was more in the Brazilian science curriculum than in Turkey. Similarly, in the study conducted by Aarsal (2014), few learning achievements were found at the application level of the science and technology curriculum learning achievements, very few learning achievements were found at the analyzing level, and no learning achievement was found for higher level cognitive learning. Kılıç et al. (2010), on the other hand, determined that the number of learning achievements for knowledge and skills learning fields was higher, while the number of learning achievements for science-technology-society-environment subjects was lower. In the study, it was emphasized that high-level science process skills were not sufficient in the curriculum and that students should design more experiments and gain skills through more extensive research. Brownne et al. (2011) emphasized the importance of developmental experiences in terms of environmental sustainability.

In the study, while a total of 158 achievements were included in the cognitive development area, only 13.92% of them belonged to the "science" cognitive development sub-area. From this point of view, it may be useful to increase the number of achievements given to science and environment subjects. Various studies show that studies on environmental and science education learning achievements in the preschool special education curriculum and the achievements, outcomes and concepts that will facilitate the examination of this subject are insufficient. In the study conducted by Güneş, (2018), activities related to science education and practices and environmental education were found to be among the intensively examined topics. In the scans conducted on the research on preschool science and nature education in Turkey, it was determined that children, teachers and prospective teachers were evenly distributed as the sample group, while the number of studies conducted with parents was limited. As with the research conducted with parents, evaluation studies on preschool special education curriculum and achievements should be increased, and quantitative and qualitative studies should be conducted as seen in the international literature.

Although Brenneman (2011) highlights the increased interest and funding investment in early science education in the United States and the expectation that high quality educational supports will lead to increased school readiness and achievement in science and related areas, research and program evaluation efforts lack appropriate assessments of learning and related areas. This article reports on a set of promising tools and approaches for assessing children's learning progress in science and the quality of instructional supports for this learning. Biedinger (2011), using data from a project on pre-school education and educational careers among disadvantaged migrant children in Germany, emphasized the importance of the home environment and parental education for children's futures. Both home environment and parental education play an important role in explaining the development of cognitive abilities of migrant children. He emphasized that it is very important to develop children's abilities at an early age and that parents need to be active with their children so that they can compensate for the disadvantage associated with their low educational background. Åström et al. (2022) noted that the Swedish preschool curriculum emphasizes child-centeredness, play and contact with nature. In the Norwegian preschool setting, high levels of play have been shown to have a strong relationship with engagement and well-being (Storli, & Hansen Sandseter, 2019). Kernan (2007) emphasizes that in the implementation of preschool education curricula in the Netherlands, the natural environment should be supported and organized in areas for children. As can be seen, natural environment, active participation of students, activities and student-centered practices are considered important in the implementation of preschool education curricula in many countries.

### **Recommendations**

If we need to address environmental and science education for sustainable development from the most basic curriculum, we need to turn our eyes to the preschool period. Another issue that we do not miss in the pre-school period is children in need of special education. Every activity related to environmental and science education should aim to develop awareness, competence, knowledge, skills and attitudes in the field of environmental protection to support meeting the needs of future generations. In the face of environmental and social challenges, as well as the disadvantage of preschoolers, work should continue to identify key competencies that require significant changes in curricula that support a sustainable and innovative economy (Zwolińska et al., 2022). In addition to emphasizing that environmental awareness and sustainability can be achieved through environmental education and curricula, environmental education, science education and curricula should be seen as a tool for solving global environmental problems (Orlovic Lovren et al., 2020).

School-based citizen science can be a powerful tool to engage disadvantaged preschool children in environmental education, but it is necessary to develop substantial curricula around citizen science activities (Bopardikar et al., 2023). In this study, the preschool special education curriculum in Turkey was analyzed in order to evaluate the curriculum in practice for the development of a reliable environmental education curriculum. By developing comparative studies with the curricula of other countries, the field of study can be improved and a common pool of achievements can be created and new curricula for environmental and science education in preschool and special education can be developed with

the necessary recommendations in terms of sustainability, universal environmental education and raising more sensitive world citizens.

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