EXAMINING THE PRE-SCHOOL CURRICULUM IN TERMS OF THE STEM APPROACH

Research article

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EXAMINING THE PRE-SCHOOL CURRICULUM IN TERMS OF THE STEM APPROACH[1] [2]

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Abstract

The aim of this study was to examine the pre-school curriculum in terms of the STEM approach. Qualitative method was adopted in the study. Document analysis was performed. In the data analysis, inductive content analysis technique was used. Seven themes related to the STEM approach were revealed in the pre-school curriculum. These themes included turning theoretical knowledge into practice/product, problem solving, development of skills, teaching of skills, the use of technology, integration and other statements related to the approach, respectively. The findings showed that the pre-school curriculum was adequate in terms of turning theoretical knowledge into practice, development and teaching of skills and problem solving with regard to the STEM approach, while being limited in integration, using technology, and including construction games. The issue that was emphasised the most in the curriculum was skills. No content regarding how children can properly use technology was encountered. As a result, there should be more emphasis on addressing the outcomes with an interdisciplinary approach, and the curriculum should be improved for the use of technology. The curriculum content should be re-structured to attach the same degree of importance to all themes mentioned in this study to make it compatible with the STEM approach.

Key words: Curriculum, pre-school, pre-school curriculum, STEM, FeTeMM.

1. Introduction

Today's world where rapid changes and transformations are experienced has been going through global-scale developments in the field of education as in every other field (Tofur, 2015). Due to globalisation and developments in technology, competition between countries is increasing rapidly, and thus countries make more investment in science, engineering and innovations. Accordingly, individuals of the 21st century are expected to possess creativity, critical-thinking, problem-solving and cooperation skills. Developing such skills in individuals is only possibly with schools' performing a transformation in a way to provide practice-oriented education and raise productive students. Current curricula fail to equip individuals with the skills required in the 21st century; in fact, science, mathematics and technology contents are taught in separate subjects independently (Akgündüz et al., 2015;

Büyüktaşkapu, Çeliköz & Akman, 2012). The changes that occurred in the nature and methodology of science in this century have an influence on the instructional processes in every area of life (Aşık, Küçük, Helvacı & Çorlu, 2017). Most countries seek for changing and developing their educational policies depending on constantly emerging technology (Balat & Günşen, 2017). The changes in educational policies also affect the competition between countries.

Countries' competing with each other (Corlu, Capraro & Capraro, 2014), being a leader in science and economy and maintaining their leadership depend on the importance they attach to innovative STEM education and the extent to which they raise individuals' awareness for acquiring a profession in such areas (Şahin, Ayar & Adıgüzel, 2014). The instructional processes that are referred to as STEM or Science, Technology, Engineering and Mathematics are the reflection of the changes in science to instruction (Aşık, Küçük, Helvacı & Çorlu, 2017). STEM involves many disciplines and various education systems (National Research Council, 2011). STEM education has characteristics such as being interdisciplinary, not limiting learning to class hours and the school, and producing knowledge-informed solutions for daily problems (Akgündüz et al., 2015). The primary objective of STEM education is to combine education, knowledge, skills and beliefs by promoting the productivity of today's generation, enable students to become aware of their thought processes, and increase their use of technology. A STEM curriculum consists of group activities, experiments and projects. These components can help students make better decisions in citizenship issues including public health, energy supplies, environmental quality, the use of resources and national security by equipping them with the basic skills of the 21st century. The STEM education also aims to develop students in STEM-related career fields, foster their scientific literacy and equip the workforce of the future properly so as to ensure the country's development. It helps them understand individual and universal problems as well as economic, political and cultural values (Bybee, 2010; Corlu, Capraro & Capraro, 2014; National Research Council, 2011).

The STEM education is a necessity for Turkey as it is for other countries in the world (Akgündüz et al., 2015). In order for Turkey to follow the developments in science and technology and stay in the global competition, effective STEM practices should be implemented at the earliest period possible, or in other words in pre-school (Tofur & Gökkaya, 2019). Children are eager to explore the world around them in pre-school, and this is the best period to start teaching them science. They form basic concepts by actively communicating with and exploring their environment (Büyüktaşkapu, Çeliköz & Akman, 2012; Faulkner & Schneider, 2005; Gökkaya, 2018; Kefi, Çeliköz & Erişen, 2013; Lind, 1988; Pawilen & Yuzon, 2019; Şahin, Güven, Yurdatapan, 2011; Ünal & Akman, 2006). In pre-school, children start acquiring many concepts related to science, technology and engineering (Balat & Günşen, 2017; Lind, 1998). They combine these concepts with those they have already formed, and need environments where they can turn the new concepts into practice. Children's curiosity and interests should be addressed through appropriate questions by preparing environments where they can develop STEM skills in the pre-school period (Balat & Günşen, 2017; Bray, Green & Kay, 2010). In this period, they often ask questions like "Why?", "For what?" or "How?" as they examine everything around them like a scientist. Children's curiosity should be exploited and they should be introduced with scientific questioning and research at early ages. Pre-school is thus the most suitable period for starting science education. Children should be taught scientific skills such as doing research and analysing at very early ages (Lind, 1998).

Technology, engineering, mathematics and science are natural motivators for children. During the pre-school years, they are interested in learning STEM through various ways and

thinking extensively and thoroughly about this subject (Clements & Sarama, 2016). Pre-school children are involved in STEM-related activities in every moment of their lives (Balat & Günşen, 2017). For instance, putting forks and spoons on the table for every individual, naming, recognising and examining the plants they see around, and making towers with blocks and building and shaping sandcastles are among the mathematics, science and engineering activities in which they are involved everyday. Today, children of all socio-economic levels are surrounded by technology, and consequently, digital media and technology rapidly change children's learning environment in the pre-school period. Those who are eager to examine and discover their environment are also affected from this change. Children are observed to use technological devices such as tablets and mobile phones very well. The use of tablets, smart phones, e-books, interactive whiteboards and other technological is vitally important in early childhood education. However, these technologies should be used in accordance with the age, developmental levels and needs of children (Blackwell & Wartella, 2015). When used appropriately, technology contributes to children's social and affective development. The conscious use of technology can be effective in supporting children's learning and development (Paciga & Donohue; 2017).

The most important investment that our country can make to pre-school children is to ensure the development of their STEM skills (Balat & Günşen, 2017). There are many opportunities for STEM education in the pre-school period. Children can acquire concepts and skills related to mathematics and science by means of traditional early childhood activities such as using blocks, water, sand and manipulative materials, dramatic games, cooking and open-air games (Lind, 1998). The knowledge that children gain at an early age is mostly related to science as in nature, life and the environment they live in. Therefore, in order to prepare children for elementary school and for life in general, opportunities for activities that help them gain research skills should be provided in the pre-school period. Science education aims not only to teach children scientific knowledge, but also to teach them how to engage in science through scientific process skills. They can gain these skills that enable them to carry out scientific examinations starting from pre-school (Büyüktaşkapu, Çeliköz & Akman, 2012). To be able to provide good science education to children, a suitable learning environment should be created to support their scientific process skills. The prerequisite for learning science permanently and for every individual in the society to be science literate is learning scientific process skills (Kefi, Çeliköz & Erişen, 2013; Şahin, Güven, Yurdatapan, 2011). These skills include observation, classification, scientific communication, measurement, prediction and inference (Akman, Uyanık-Balat, & Yıldız, 2010), and they constitute the basic building blocks of STEM education.

One of the methods that can increase pre-school children's levels of science achievement and using science process skills is project-based education (Anlıak, Yılmaz, & Şahin Beyazkürk, 2008; Helm & Katz, 2001; Helm & Beneke, 2003; Katz, 1994; Şahin, Güven, Yurdatapan, 2011). It aims to gain in-depth knowledge about the project topic and produce a product at the end of the process. The project-based learning approach enables practitioners to use many disciplines and learning-teaching approaches together (Korkmaz & Kaptan; 2002). In this approach, children's interests and curiosity are considered, and the instructional process is planned accordingly. Children show more active participation in project-based activities because these activities are formed based on their interests and they answer questions like "Why?", "For what?" and "How?" while being engaged in these activities. In project-based learning, children are active and their learning is maximised when activities are conducted in the form of games. This is because children of this period learn about life in this way, and games are the most basic learning tool in pre-school. The success of pre-school STEM activities depends on their being integrated with games as the most important struggle

of children (Koçyiğit, Tuğluk & Koç, 2007). All activities in education are carried out in accordance with existing curricula. Therefore, the activities in the pre-school curriculum should be reviewed in detail in terms of STEM education.

Previous studies on STEM education mostly focused on the course contents that constitute STEM. Although it is stated that current curricula should be re-organised in line with STEM, the research on organising the pre-school curriculum according to STEM is quite limited. This study thus focuses on the STEM approach in the pre-school education curriculum. The study would make a contribution to the literature and guide further projects/research on STEM in pre-school education. It is expected to contribute to practice by evaluating the pre-school curriculum so that quality STEM activities can be conducted in the future.

1.1. Aim of the Study

The primary aim of this study was to examine the pre-school education curriculum in terms of the STEM approach. For this purpose, the research question "What is the place of the STEM approach in the pre-school education curriculum?" was addressed in the study. Evaluating the pre-school education curriculum in terms of the STEM approach is of significance for revealing the strengths and weaknesses of the curriculum with regard to this approach. The study is thought to provide curriculum developers insights about the re-structuring of the curriculum towards the STEM approach. Moreover, it can also set an example for the examination of other course curricula in terms of STEM.

2. Method

In this section, the research model, data sources, data gathering, data analysis, validity, researcher's role and ethical considerations are presented in the context of this study.

2.1. Research Model

Qualitative method was adopted in the study and document analysis was performed. Yıldırım & Şimşek (2008) emphasized that document analysis can be used as a research method alone in cases where it is not possible to observe and interview in qualitative research. Documents are important data sources for qualitative studies They can consist of private or official documents (Creswell, 2005). Document analysis is the analysis of written materials that include information regarding the phenomena or events under examination. It is performed in five steps (Yıldırım & Şimşek, 2008): (i) accessing documents, (ii) checking originality, (iii) understanding documents, (iv) analysing the data, (v) using the data. In this study, document analysis was performed since the aim was to carry out an objective and comprehensive analysis of findings by examining the pre-school education curriculum (2013) in terms of the STEM approach. The document used in the study was the pre-school education curriculum of the Turkish Ministry of National Education (2013).

2.2. Data Sources/Analysis Unit

The data sources of the study consisted of the written documents in the pre-school education curriculum of the Turkish Ministry of National Education (2013). The evaluation of STEM, a practice-oriented approach, in pre-school education curricula was done on the contents of the 2013 pre-school education curriculum implemented by the Ministry.

2.3. Data Gathering

The data sources were accessed by the researcher, and the pre-school education curriculum was downloaded as a PDF document from the web site of the General Directorate of Basic Education, Ministry of National Education.

2.4. Data Analysis

In the data analysis, inductive content analysis technique was used. Inductive analysis is necessary when there is no theory about the phenomenon under examination (Strauss & Corbin, 1990), and it is based on coding. In this analysis, the researcher reads the data line by line, and tries to determine the important dimensions considering the research aim. In this way, the codes within the data and the relationships between these codes can be revealed (Yıldırım & Şimşek, 2008). In the present study, the analysis process included four steps: (i) *Coding the data:* This is the first step in content analysis. The coding process was carried out based on the data. The coding of the data was done independently by two faculty members who have experience in qualitative research. For the reliability of the analysis, the formula "Reliability=Agreement/Disagreement+Agreement x 100" was used on the codes revealed by the researchers (Miles & Huberman, 1994). According to Şencan (2005), the percentage of agreement between researchers should be 70% or above to ensure reliability in qualitative research. In this study, the agreement percentage was found to be 91%. (ii) *Forming the themes:* Participants, researchers and the literature can be used in forming the themes. In the present study, the themes were determined based on the researcher and the literature. The themes were obtained by grouping the codes considering their similarities and differences. It was paid due attention to the formation of the themes in a way that they formed a meaningful whole. (iii) *Organising the codes and the themes:* The compatibility of the themes with the subsequent codes were checked. A total of seven themes were obtained. (iv) *Presenting the findings:* The themes obtained in the study and the necessary information about them were presented descriptively (frequency(f)), and the results were revealed by interpreting these themes.

2.5. Validity

Validity in qualitative research means accuracy (Neuman, 2010). There are certain strategies that can be used to ensure validity in qualitative research. Qualitative researchers do not have to use all of these strategies. They are chosen according to their topic and applicability (McMillan & Schumacher, 2006). In this study, the following strategies were followed to address validity: (i) *Long-term interaction*: The researchers conducted the analysis of the pre-school curriculum in a period of one month by reviewing the components of the program repeatedly. (ii) *Triangulation:* In the process of and prior to data gathering and analysis, the relevant literature was reviewed, and the results obtained were compared. (iii) *Direct quotations:* In the presentation of the findings, the curriculum contents associated with each theme were reported with direct quotations. (iv) *Multiple researchers:* The steps of analysing the data, forming the themes, reporting the findings, making interpretations, discussing the findings and drawing conclusions were fulfilled by two faculty members, one of whom is an expert in educational administration and the other in pre-school education.

2.6. Researcher's Role and Research Ethics

The fact that one of the researchers is a scholar of educational administration and the other is a scholar of pre-school education is thought to have contributed to the formation and interpretation of the findings. As for ethical considerations, the necessary permissions were obtained from the authorities concerned.

3. Findings and Interpretation

A total of seven themes related to the STEM approach were revealed as a result of evaluating the pre-school curriculum in terms of this approach. Thirty-nine of the contents obtained were found to be related to STEM. The themes with the least content in the scope of the STEM approach were "the use of technology" (f=3) and "integration" (f=3). The theme

with the most content was "turning theoretical knowledge into practice/product" (f=10). The statements that were included in the curriculum with regard to the approach but could not be associated with other themes (f=2) were examined under the theme "other statements related to the approach". The themes that are related to the STEM approach in the pre-school curriculum are presented in Table 1.

Table 1. *Themes that relate to the stem approach in the pre-school curriculum*

No.	Themes associated with the STEM approach	Number of contents associated with the theme (f)
1.	Turning theoretical knowledge into practice / product	10
2	Problem solving	7
3.	Development of skills	7
4.	Teaching of skills	7
5.	Use of technology	3
6.	Integration	3
7.	Other statements related to the approach	2
	TOTAL	39

3.1. Findings Related to the Theme 'Turning Theoretical Knowledge into Practice/Product' in the Pre-school Curriculum

The theme with the most content that relates to the STEM approach in the pre-school curriculum was "turning theoretical knowledge into practice/product" (f=10). The contents under this category were coded as teachers' enabling students to produce something in their learning process, children's producing original products, being able to transfer what is learned to different situations in daily life, exhibiting the products, and planning the learning process in a way in which children can produce multiple products. Some of the content statements thought to be related to the theme "turning theoretical knowledge into practice/product" are as follows: (Page 14, Line 30): *Teachers should provide as many opportunities as possible for children to plan, practice, organise, question, do research, discuss and produce in the learning process.* (Page 16, Line 2): *Children's active participation in the learning process, transferring what they learn to different situations and use it in new situations are important in learning by discovery.* (Page 20, Line 16): *Children should be supported to use what they remember in different situations effectively (by associating it with daily life skills).* (Page 25, Line 29): *They appropriately use the words they have just learned in accordance with their meanings.* (Page 28, Line 12): *Children create products with original characteristics. Children's creating original products means making the product different from others by reflecting their feelings, thoughts and dreams in a way that is unique to them, and using their imagination.* (Page 40, Line 31): *It is a centre that aims to enable children to produce new ideas and original products based on their past experiences and learning, and in which they can make discoveries and have different experiences through interaction with different*

materials. (Page 41, Line 3): *Children's products should be exhibited by them and at their sight.* (Page 42, Line 38): *Groups implement their decisions and produce different three-dimensional products.* (Page 44, Line 10): *In assessment, children can be asked to prepare different materials such as posters and paintings.* (Page 45, Line 23): *The process is not planned merely to produce a single product.*

3.2. Findings Related to the Theme 'Problem Solving' in the Pre-school Curriculum

Another theme with considerable content that relates to the STEM approach in the pre-school curriculum was "problem solving" (f=7). The content statements within this category consisted of the codes including producing solutions for problems, developing problem-solving skills, developing creative problem-solving skills, and reasoning. Some of the content statements thought to be related to the theme "problem solving" are as follows: (Page 23, Line 13):…*They produce solutions for problems.* (Page 30, Line 35): *…The objective of this outcome is to develop children's problem-solving skills in their social relationships.* (Page 37, Line 3) *…well-designed educational environments support children's active learning and develop their creative problem-solving skills.* (Page 43, Line 6): *By means of the mathematics activities implemented, children should be able to realise the patterns around them, develop and test assumptions, solve problems, reason, and communicate by using mathematical concepts.* (Page 45, Line 6): *…Problem-solving and prediction activities.* (Page 45, Line 16): *These are the activities that enable children to solve problems and think critically and in a solution-oriented way by using their creativity and imagination.* (Page 49, Line 34)*:…Field trips aim to meet children's needs of direct and meaningful learning through research, problem solving and on-site observations.*

3.3. Findings Related to the Theme 'Development of Skills' in the Pre-school Curriculum

Another theme with content that relates to the STEM approach in the pre-school curriculum was "development of problems" (f=7). The content statements under this category comprised of codes including skills-development and improving the levels of skills based on age groups. The skills that were emphasised were children's imagination, language and communication skills, creativity and critical thinking skills, mathematical questioning skills, life skills, self-care skills, listening skills and basic pre-elementary school skills. Some of the content statements thought to be related to the theme "development of skills" are as follows: (Page 11, Line 24): *Children's imagination, creative and critical thinking skills, communication and behaviours to express their feelings should be developed.* (Page 38, Line 4): *Besides, different centres can be prepared for children to independently develop and apply life skills in places like a bank, a post office, a restaurant, a hospital or a store.* (Page 40, Line 2): *This learning centre that aims to develop positive attitudes towards reading-writing activities and books in children, and support their communication and language skills should be in a comfortable, bright and relatively quiet place.* (Page 43, Line 15): *Furthermore, mathematics activities should aim to develop mathematical questioning skills in children.* (Page 44, Line 35): *The examples presented below are for supporting the development of basic skills in preparation to elementary school…* (Page 45, Line 9): *Activities to develop self-care skills.* (Page 41, Line 1): *Simple materials should be used at the beginning of the semester and at a younger age, and materials should be more complex as children's levels of skills improve.*

3.4. Findings Related to the Theme 'Teaching of Skills' in the Pre-school Curriculum

A theme with content that relates to the STEM approach in the pre-school curriculum was "teaching of skills" (f=7). The content statements under this category were related to the

codes of teaching children listening, speaking and movement skills and the preliminary skills for them to learn basal reading and writing at elementary school. Moreover, it was emphasised that the acquisition of a skills took long years and was not an easy process. Some of the content statements thought to be related to the theme "teaching of skills" are as follows: (Page 46, Line 2): *The objective of Turkish language activities is to enable children to use Turkish properly, pronounce sounds, understand and use different syntactic structures, acquire listening skills, express their feelings in verbal and non-verbal ways, adjust their tone of voice and produce words accurately.* (Page 44, Line 29): *The aim of pre-school education is not to teach children reading and writing, but to equip them with the preliminary skills necessary to easily learn reading and writing at elementary school.* (Page 48, Line 23): *Children will both enjoy saying these and gain accurate and fluent speaking skills.* (Page 44, Line 16): *Children need long years to be able to fully acquire a skill.* (Page 48, Line 21): *Music activities have great contributions to children's motor development. Children gain the skill of moving in accordance with the character and rhythm of the music and in a certain order by combining physical movements.* (Page 48, Line 23): *Music activities also teach the hand-eye coordination and using both hands simultaneously by playing simple percussion instruments.* (Page 49, Line 26): *Movement activities can be used both for supporting children's motor development and movement skills and also as a transition activity.*

3.5. Findings Related to the Theme 'Integration' in the Pre-school Curriculum

A theme with content that relates to the STEM approach in the pre-school curriculum was "integration" (f=3). The content statements within this category gathered around the codes of preparing activities by bringing outcomes together, and planning an activity by combining multiple activities. Some of the content statements thought to be related to the theme "integration" are as follows: (Page 15, Line 5): *Teacher can bring together outcomes, indicators and concepts included in the curriculum in different ways, prepared activities in integrated or independent way, and enrich learning processes by exploiting various topics, activities, contexts and materials.* (Page 42, Line 25): *Activities can be planned and implemented individually, while they can also be prepared in an integrated way by bringing together multiple activities.* (Page 43, Line 7): *Integrated activities are made of bringing together multiple activities with smooth transitions. Integration does not mean simply listing activities one after another in the learning process of an activity plan.*

3.6. Findings Related to the Theme 'Use of Technology' in the Pre-school Curriculum

The last theme with content that relates to the STEM approach in the pre-school curriculum was "use of technology" (f=3). The content statements under this category consisted of codes including the use of movies, documentaries, videos, CDs and computers. Some of the content statements thought to be related to the theme "use of technology" are as follows: (Page 23, Line 34): *...For example, phenomena or stories such as Atatürk's place of birth, his father's and mother's names, his career as a soldier and commander, his love for children, and his present of a festival for children should be taught through role-plays, book reviews, movies and documentaries.* (Page 26, Line 4): *...the expression "What they watched" refers to what they heard and saw while watching a movie, a video, a TV show, a play and a concert.* (Page 40, Line 10): *...CDs that tell a story, computers, projectors ...*

3.7. Findings Related to the Theme 'Other Statements' in the Pre-school Curriculum

Two content statements that relate to the STEM approach in the pre-school curriculum were regarded as "other statements related to the approach" (f=2). The contents under this theme included the statements that were related to the approach, but could not evaluated within other themes. Some of the content statements thought to be related to this theme are as

follows: (Page 15, Line 17): *In this curriculum, in order to raise individuals needed in the 21st century and meet national needs, a synthesis was achieved by using the child-centred practices in various learning theories and models.* Raising individuals who meet the needs of the 21st century is an objective that is often emphasised in the STEM approach. Because this particulur statement points out raising individuals in accordance with the needs of this century, it is directly related to the objective of the STEM approach. (Page 39, Line 15): *It is a centre that enables children to realise the figures of different dimensions, shapes and colours in their environment and the relationships between them, and to use their creativity through construction games by using different figures.* The construction games emphasised in this statement can be regarded as an activity that ensures children's development related to engineering as in the STEM approach.

4. Discussion, Result and Suggestions

This study revealed seven themes related to the STEM approach in the pre-school curriculum implemented in Turkey. These themes were problem solving, integration, the use of technology, development of skills, teaching of skills, turning theoretical knowledge into practice/product, and other statements related to the approach.

The frequencies of the contents associated with the approach were considered in determining the proportion of the themes in the pre-school curriculum. Accordingly, the theme that was mentioned most in relation to the STEM approach in the pre-school curriculum was "turning theoretical knowledge into practice/product". This was followed in the second place by the themes "development of skills", "teaching of skills" and "problem solving" all with the same frequencies. The themes "integration" and "use of technology" were in the third place as they had the same frequencies. When the themes related to skills are considered together, this sequence seems to change, in that the issue that is emphasised the most with regard to the STEM approach in the pre-school curriculum is related to skills.

The content statements under the theme "development of skills" pertained to skills-development and improving the levels of skills based on age groups. Skills-development mostly referred to children's imagination, language and communication skills, creativity and critical thinking skills, mathematical questioning skills, life skills, self-care skills, listening skills and basic pre-elementary school skills.

In the pre-school curriculum, the content statements under the theme "teaching of skills" mostly features teaching children listening, speaking and movement skills and the preliminary skills for them to learn basal reading and writing at elementary school. Besides, it was stated that a skill could be fully acquired only in a long process. Kapıkıran, İvrendi and Adak (2006) highlighted the necessity of systematically teaching children social skills to adapt to the society by means of various methods starting from early ages. In this sense, the pre-school curriculum attached importance to the teaching of skills, and emphasised this frequently.

The theme "turning theoretical knowledge into practice/product" included more contents than the other themes. Therefore, it can be stated that the education aimed to be provided to children in the scope of pre-school education was planned by focusing on practice and producing a product. Accordingly, the curriculum emphasised children's producing original products, being able to transfer what is learned to different situations in daily life, exhibiting the products, and planning the learning process in a way in which children can produce multiple products. Today, designing and producing a product is increasingly gaining importance (Akdağ & Güneş, 2017). The fact that turning theoretical knowledge into

practice/product is frequently highlighted in the pre-school curriculum overlaps with the objective of STEM education in raising productive individuals. In this respect, the existing pre-school education curriculum can be said to enable raising productive individuals and forming a productive society.

The content statements within the theme "problem solving" were related to producing solutions for problems, developing problem-solving skills, developing creative problem-solving skills, and reasoning. Problem solving is about producing new solutions for a problem by going beyond the use of prior experiences (Korkut, 2002). It helps people overcome the difficulties they encounter by making their life easier, and thus it is an important life skill that individuals should acquire. The problem-solving skill also constitutes an important place in STEM education, and cooperation-based problem solving is of significance as well (Mulnix & Vandegrift, 2014). A variety of problems can arise today depending on the advancement of knowledge and technology, and solving these problems as an individual is getting more difficult every passing day. At this point, it is of great importance for all individuals to acquire cooperation-based problem-solving skills at the earliest time possible, which is the pre-school period. As a matter of fact, the importance of the problem-solving skill was featured in the pre-school curriculum and it was aimed to develop this skill at an earlier period. The pre-school education curriculum can be said to attach the necessary importance to the problem-solving skill that every individual of our century should have, and to have common objectives with STEM education in this regard.

In the theme "integration", the content statements touched upon preparing activities by bringing outcomes together, and planning an activity by combining multiple activities. Integration is the most important component of STEM education that includes an interdisciplinary education model. It refers to being engaged in science, technology, engineering and mathematics activities with an interdisciplinary approach (Meng, Idris & Eu, 2014). Integrated STEM activities provide pre-school children a natural environment for collaboration and communication. Integrated and exciting learning experiences in STEM improve students' interests and learning and help them prepare for the 21st century (DeJarnette, 2018). In the pre-school education curriculum, it was emphasised that different types of activities should be combined in the content of a single activity. The integration objectives of the pre-school curriculum and the interdisciplinary characteristics of STEM education identically overlap with each other. In the pre-school period, the purpose of integration is to implement an interdisciplinary educational process.

The appropriate use of technology has positive contributions to children's language and cognitive development. Therefore, technology should be presented to children in a way in which they can start using it as of early ages (Akkoyunlu & Tuğrul, 2002). Technology education for young children is about developing, designing, inventing and creating something related to engineering science. With technology education in children, it will be ensured how the objects are developed, how they work, what tools can be developed to solve a problem, and their curiosity and creativity to make changes in technology (Pawilen & Yuzon, 2019). In Te Whariki program implemented in New Zealand, digital technologies are seen as a part of children's lives. The program aims to ensure that children understand the technologies they encounter and make the best use of these technologies. Digital literacy and digital fluency are considered important in the program (The Whariki Online, 2020). In the pre-school curriculum, the content statements related to the use of technology focused on the use of movies, documentaries, videos, CDs and computers. However, no further explanations were provided with regard to how such technologies should be used in the instructional process. This may cause inappropriate use of technology in pre-school education. In order to teach children how to use technology, these tools should be purposefully integrated with the

instructional process. When the pre-school curriculum is evaluated in terms of the technology component of STEM, it can be stated that the curriculum is not sufficient for ensuring technology integration. The curriculum should put more emphasis on technology and its aspect of using technology should be improved to be able to raise individuals in accordance with the needs of this age.

The other content statements related to the STEM approach in the pre-school curriculum highlighted the objectives of pre-school education that overlapped with those of STEM education, and the relationship of construction games included in the curriculum with the engineering aspect of the STEM approach. '*Raising individuals needed in the 21st century*' is among the objectives of pre-school education (MEB, 2013). This objective is clearly consistent with the objectives of the STEM approach. STEM education aims to equip individuals with the skills of the 21st century. In the pre-school curriculum, it is aimed to develop individuals' 21st century skills through problem solving, teaching and development of skills, turning theoretical knowledge into practice and enhancing the use of technology. The construction games mentioned in the pre-school curriculum can be regarded as an activity that ensures children's development related to engineering as in the STEM approach. By means of construction games, pre-school children learn to distinguish the similarities and differences between objects by using their imagination (MEB, 2013). With these games played in this period, children gain their first experiences of engineering. When children experience engineering in this period, information about engineering increases, and their expectations for pursuing a career in engineering also increase (Pawilen & Yuzon, 2019). Özdemir (2016) reported that the block centres where children played construction games were among the centres in which children spent most of their time. Children are interested in engineering from the moment they are born. It can thus be stated that the pre-school curriculum should be improved by putting more emphasis on construction games in a way to support children's engineering skills in line with the STEM approach. Some pre-school education programs in the world have integrated the STEM curriculum into their programs. STEM is among the important elements of the programs in Head Start and Bank Street approach. In the Head Start approach, it is thought that scaffolding, play and social interactions are important opportunities for teachers to support children's STEM discoveries. In approach, daily materials and language seem to be important in supporting STEM. It is emphasized that STEM learning can be supported with books, songs, poems and games about STEM ("Bank Street College", 2020; Head Start ECLKC, 2020). A study by Aldemir, & Kermani (2017), found that a curriculum that instills STEM through child-centered and applied learning activities helps children to understand STEM concepts strongly and develop STEM skills that can increase their future learning. Consequently, STEM education has contributed significantly to increasing the success of children with Head Start education.

As a result, the findings obtained in the study and the suggestions that can be offered accordingly can be listed as follows: (i) The pre-school curriculum has overlapping aspects with the STEM approach in terms of its objective, turning theoretical knowledge to practice, problem solving, teaching and development of skills, integration and the use of technology. (ii) The theme that was mentioned the most in relation to the STEM approach in the pre-school curriculum was "turning theoretical knowledge into practice/product". (iii) The issue that was emphasised the most in the pre-school curriculum was the teaching and development of skills. (iv) While the integration theme showed that the pre-school curriculum included interdisciplinary planning, the proportion of this theme within the curriculum content was low. STEM education is an interdisciplinary approach and there should be more emphasis on achieving the pre-school outcomes with an interdisciplinary approach. (v) The content of the pre-school curriculum should be improved with regard to the use of technology. No further

explanations were provided in the curriculum regarding how technology should be used in the instructional process. No content for how children can use technology properly was encountered. (vi) The pre-school curriculum should be improved in terms of construction games in a way to support children's engineering skills in line with the STEM approach. (vii) The content of the pre-school curriculum should be re-structured to put the same emphasis on all themes mentioned in this study to make it compatible with the STEM approach.

5. Conflict of Interest

The authors declare that there is no conflict of interest.

6. Ethics Committee Approval

The authors confirm that ethics committee approval was obtained from Manisa Celal Bayar University with a number of 13/02/2018-E.14952.

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