Chapter 5

A Review of Postgraduate Theses on STEM/ STEAM in Early Childhood Education

Serap Özbaş[1]

Abstract

This research examined master's theses on STEM and STEAM (science, technology, engineering, arts, and mathematics) in early childhood education published in Turkey. The data in the research consisted of master's theses on STEM and STEAM in early childhood education published in full text in the Higher Education Council (YÖK) Thesis Center database. The PRISMA method was used in reporting the theses. The research material consists of 59 graduate theses on STEM+STEAM that are fully accessible from the YOK Thesis Center database, according to the convenience sampling method. Descriptive content analysis was performed on the theses using the Paper Classification Form (PCF). The validity and reliability of the theses were checked in the analysis. According to the results obtained, most of the theses on STEM+STEAM in early childhood education are master's theses, depending on the program in which they were published. It was observed that theses on STEM+STEAM predominantly focused on the theme of scientific process skills. When examined in terms of research methodology, it was found that theses frequently used a semi-experimental design. It was determined that convenient sampling, purposive sampling, and random sampling were often preferred in sampling methods in theses. It was observed that children were frequently included in the sample group. When data collection tools were examined, it was found that theses often used activities related to the STEM+STEAM approach, as well as scales, interviews, and observation forms. In conclusion, the trend of theses on STEM+STEAM in the field of early childhood education was discussed within the scope of the literature.

1 Prof. Dr., İstanbul Beykent Üniversitesi, sozbash@gmail.com, ORCID ID: 0000-0002-3194-4018

https://doi.org/10.58830/ozgur.pub1044.c4166

1. Introduction

In sustainable development, educational approaches that incorporate innovative ideas play a key role. One of these is the STEM approach (Kelley & Knowles, 2016). The first letters of the words science, technology, engineering, and mathematics make up the STEM approach. The first letters of the words science, technology, engineering, and mathematics make up the STEM approach. The United States started the STEM way of teaching (Jolly, 2009). While the STEM approach is increasingly used in education in the United States (Dugger, 2010), many countries (Australia, England, etc.) have incorporated the STEM approach into their education systems at all levels, and it is also growing globally (Bissaker, 2014). In general terms, STEM is an approach that enables learners to acquire problem-solving skills by combining disciplines (Şahin, Ayar & Adıgüzel, 2014). The STEM approach encompasses engineering design, scientific research, technological literacy, and mathematical thinking (Kelley & Knowles, 2016). The STEM approach aims to increase individuals' scientific and technological literacy and equip them with skills such as problem-solving and critical thinking. The main goal of the STEM approach, which enables individuals to use the knowledge and skills necessary to solve the complex and difficult problems they encounter, is to cultivate STEM-literate individuals (Bybee, 2013). In other words, it is emphasized that the purpose of developing STEM is to equip 21st-century individuals with the necessary skills (Sander, 2009). Studies indicate that STEM activities foster 21st-century skills such as critical thinking skills (Duran & Şendağ, 2012) and problem-solving skills (Yalçın & Erden, 2021) (Fajrina et al., 2020). Simultaneously, the benefits of the STEM approach, such as improving academic performance, are also highlighted (Khamhaenpol et al., 2021).

The STEM approach is a teaching and learning approach (Gonzalez & Kuenzi, 2012). STEM-focused teaching, which emphasizes teaching that focuses on problems and issues, enables the integrated use of two or more STEM disciplines (Dass, 2015). STEM, an educational approach based on the understanding of integrating knowledge and skills through an interdisciplinary approach, represents learning and teaching. In the STEM education approach, it is important to select appropriate teaching and learning methods (Robert & Cantu, 2012). The inclusion of appropriate teaching and learning methods in the STEM approach plays an important role. Similarly, a study examining the views of preschool teachers in Turkey on the STEM approach revealed that teachers were not knowledgeable about STEM, defined STEM education as a method, and supported scientific process skills in science activities (Abanoz & Deniz, 2021).

A literature review indicates that the STEM approach is articulated as STEAM and STEM+C. The goal of STEAM is to help students become more creative and better at design by adding art to STEM. The integration of art and the STEM approach encompasses effective learning experiences and comprehensive strategies (Wynn & Harris, 2012). STEAM offers students more skills in education, such as analytical and creative skills (Land, 2013). The STEAM approach points to effective learning based on inquiry, problem solving, and creativity, providing opportunities to establish connections between many disciplines (e.g., Keane & Keane, 2016). Programming is used with the STEM+C approach. A recently published study also proposes STEAM-X to expand the interdisciplinary foundation of the STEAM approach (Bedewy & Lavicza, 2023). According to the researchers, X is defined as a variable that can represent any discipline not included in the STEAM disciplines. In short, STEAM-X is transdisciplinary STEAM practices (architecture, culture, history).

In a globalizing world, it is crucial for countries to focus on qualified individuals in order to be competitive in the economic race. The STEM approach is considered an educational approach that can respond to the needs of the time (Arleback & Albarracin, 2019). In other words, the STEM approach aims to equip students with the knowledge and skills they will need in global competition. STEM education is provided worldwide from early childhood education to university education (Çetin & Demircan, 2020). In this context, it is deemed essential to incorporate the STEM approach into the Turkish education system to meet the need for qualified human resources. Studies show that STEM activities are conducted at a minimum, with early childhood students (Çalışkan & Okuşluk, 2021). This is because the experiences and skills individuals acquire at an early age significantly affect their future lives (Abanoz & Deniz, 2021; Uyar & Ormancı, 2016). It is also a period when the foundations of early childhood STEM education are laid (Ata Aktürk & Demircan, 2017). The growing interest in the STEM approach and teaching practices underscores the importance of conducting further studies to enhance the use of the STEM educational approach. In the field of early childhood education, the effective implementation of STEM/STEAM approaches also highlights the value of research in this area. In this context, examining the general trends in theses written on STEM/STEAM approach in early childhood education is considered important for guiding future research on STEM topics. A review of the literature reveals that there are studies examining STEM-related work in Turkey (e.g., Aydın & Yel, 2024; Batur, 2025; Çoşkun, 2021; Gökçen, 2021). Among these studies, it is seen that research examining STEM/STEAM approach studies related to

early childhood education is quite limited (Ata Aktürk & Demircan, 2017; Erol & Erol, 2022). The examination of theses concerning STEM/STEAM in early childhood is anticipated to elucidate prevailing trends in this domain and enhance subsequent research on STEM/STEAM.

1.2. The Aim of the Research

This research is to examine the general trends in terms of bibliography, subject matter, and methodology of postgraduate theses on STEM and STEAM published in the field of early childhood education in Turkey. Within this framework, the research problem and subproblems are as follows:

1. What are the general trends in postgraduate theses on STEM and STEAM in the field of early childhood education?
    - What is the distribution of postgraduate theses in terms of educational programs?
    - What is the distribution of postgraduate theses in terms of publication years?
    - What is the distribution of postgraduate theses in terms of the universities where they were produced?
    - What is the distribution of graduate theses in terms of theme?
    - What is the distribution of graduate theses in terms of research design?
    - What is the distribution of graduate theses in terms of the sample selection method?
    - What is the distribution of graduate theses in terms of the sample group?
    - What is the distribution of graduate theses in terms of data collection tools?

2. Method

2.1. The Design of the Research

The research was conducted between July and August 2025. This research was carried out within the scope of qualitative research methods. Descriptive analysis is a research methodology employed to delineate trends and advancements in extant studies (Çalık & Sözbilir, 2014).

2.2. Research Materials

The research material comprises postgraduate theses on STEM and STEAM in the field of early childhood education published in Turkey. The research data was gathered utilizing the Higher Education Council (YOK in Turkish) thesis search database. In August 2025, the simple search button in the database was used to search for the words "STEM (Turkish: FETEMM)" or "STEAM." Based on the correct sampling method, this study uses 59 theses on STEM/STEAM in early childhood education. The full text of these theses can be found in the YÖK Thesis Center database.

2.3. Data Collection Tool

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) checklist, which is a scientific standard, was used to collect data during the process of choosing the right target theses (Figure 1). The Paper Classification Form (PCF) developed by Sözbilir et al. (2012) was considered as the data collection tool in the target theses determined according to the PRISMA checklist. The theses chosen based on the PRISMA checklist were analyzed by reviewing the title, abstract, and keywords

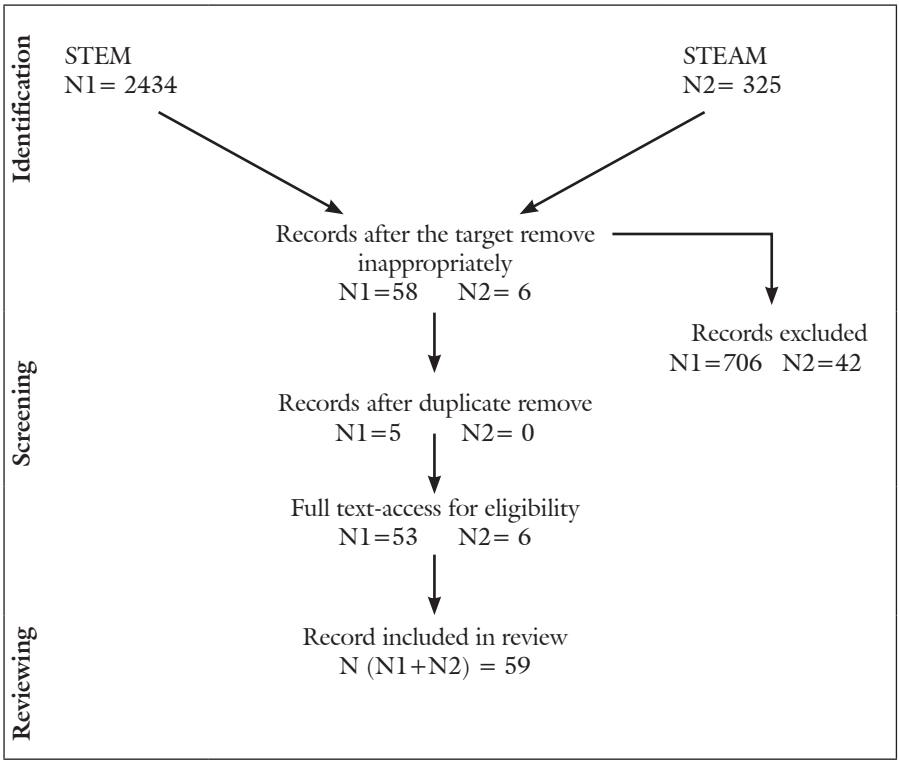

Figure 1. PRISMA (Resource: Nurhidayah et al., 2025).

2.4. Data Analysis

The theses were analyzed using descriptive content analysis. In the analysis of the theses, the bibliography, main topic, method, sampling method, sample group, data tools, and analysis information of the theses were transferred to an Excel file in order, taking PCF into account. In the transfer process, the concepts of each section were written in alphabetical order. For example, in the "analysis" section, concepts such as frequency and T-test were listed in alphabetical order. In the subject and data tools sections, STEM and STEAM concepts were only written as the first concept when written in the relevant unit, and the alphabetical order was again followed in the expressions to be written in these sections. Sections related to the design, sample, sampling method, etc., which were not specified by the author in the thesis, were left blank. For example, if the sample selection method is not mentioned, the relevant section in Excel for that thesis's sample selection method is left blank. When writing concepts, abbreviations, and/or special expressions are capitalized, while other concepts are written in lowercase.

The bibliographic information, topic, method, sample selection method, sample group, data tools, and analysis sections of the theses examined in the Excel analysis were reviewed for their frequency (f) and percentages (%). The validity of the data was examined multiple times by comparing the obtained data with the research review format. In terms of data reliability, coding accuracy was checked using the Miles & Huberman (1994) formula (Reliability = Consensus/(Consensus + Disagreement)) through a researcher working in the field of science education in preschool education (cited in Balcı, 2017). According to this formula, the reliability of the data was calculated as 88%.

3. Findings

3.1. The Distribution of theses on STEM+STEAM by Publication Type

The distribution of theses on STEM+STEAM in early childhood education according to the program in which they were published is shown in Table 1.

Table 1. Program type

Degree	f	%
MSc	42	71.2
PhD	17	28.8
Total	59	100.0

Table 1 shows that 71.2% (42) of the theses were completed in master's programs, while 28.8% (17) were completed in doctoral programs.

3.2. The Distribution of theses on STEM+STEAM by Year of Publication

The distribution of theses on STEM+STEAM in early childhood education by year of publication is shown in Table 2.

Table 2. Year of publication

Year	f	%
2018	4	6.8
2019	13	22.0
2020	4	6.8
2021	9	15.3
2022	6	10.2
2023	8	13.6
2024	12	20.3
2025	3	5.1
Total	59	100.0

According to Figure 2, early STEM+STEAM-related graduate theses were most frequently studied in 2019 (f=13, p=22.0), followed by 2024 (f=12, p=20.3).

3.3. The Distribution of theses on STEM+STEAM According to the University Where the Thesis Was Prepared

The distribution of theses on STEM+STEAM in early childhood education according to the university where the theses were prepared is shown in Table 2.

Table 3. University where the thesis was prepared

University	**f**	**%**
Aksaray University	1	1.7
Alanya Alaaddin Keykubat University	1	1.7
Anadolu University	2	3.4
Aydin Adnan Menderes University	1	1.7
Bahçeşehir University	4	6.8
Bolu Abant Izzet Baysal University	1	1.7
Burdur Mehmet Akif Ersoy University	1	1.7
Bursa Uludağ University	2	3.4
Çukurova University	1	1.7
Dicle University	1	1.7
Erzincan Binali Yıldırım University	2	3.4
Eskişehir Osmangazi University	1	1.7
Fırat University	3	5.1
Gazi University	4	6.8
Gaziantep University	1	1.7
Hacettepe University	2	3.4
İstanbul Aydın University	2	3.4
Kastamonu University	2	3.4
Kırklareli University	1	1.7
Kilis 7 Aralık University	1	1.7
Kutahya Dumlupınar University	1	1.7
Manisa Celal Bayar University	1	1.7
Marmara University	2	3.4
Middle East Technical University	1	1.7
Necmettin Erbakan University	3	5.1
Ordu University	3	5.1
Pamukkale University	1	1.7
Recep Tayyip Erdoğan University	2	3.4
Sinop University	1	1.7
Sivas Cumhuriyet University	2	3.4
Süleyman Demirel University	1	1.7
Trabzon University	1	1.7
Uskudar University	1	1.7
Usak University	1	1.7
Yıldız Technical University	4	6.8
Total	59	100.0

Table 1 shows that the highest number of theses on STEM%STEAM in early childhood education were published at Bahçeşehir University (6.8%), Gazi University (6.8%), and Yıldız Technical University (6.8%). The universities with the second highest frequency of publications are

Fırat University (5.1%), Necmettin Erbakan University (5.1%), and Ordu University (5.1%).

3.4. The Distribution of theses on STEM+STEAM According to the Themes

The distribution of STEM+STEAM-related theses according to their themes is shown in Table 4.

Table 4. Themes

Thema	**f**	**p**
STEAM, augmented reality, science learning	1	1.7
STEAM, creative thinking skills	1	1.7
STEAM, E5 Model	1	1.7
STEAM, science process skills	1	1.7
STEAM, Web 2.0 Tools	1	1.7
STEM, 21st century skills	2	3.4
STEM, academic self-esteem, Montessori education	1	1.7
STEM, action research	1	1.7
STEM, awareness	2	3.4
STEM, awareness, self-efficacy	1	1.7
STEM, awareness, opinion	1	1.7
STEM, cognitive field, science process skills	1	1.7
STEM, cognitive skill, problem-solving	1	1.7
STEM, communication skills	1	1.7
STEM, creativity	2	3.4
STEM, creativity, critical thinking skills	1	1.7
STEM, creativity, problem solving	1	1.7
STEM, critical thinking skills, science process skills	2	3.4
STEM, disaster education	1	1.7
STEM, drama, creative thinking, science process skills	1	1.7
STEM, drama, environmental awareness, science process skills	1	1.7
STEM, ecological footprint awareness	1	1.7
STEM, effectiveness	1	1.7
STEM, engineering approach	1	1.7
STEM, engineering design curriculum	1	1.7
STEM, ideas, in-class application	1	1.7
STEM, learning skills, Montessori education	1	1.7
STEM, maths and science process skills	1	1.7
STEM, metacognitive skills	1	1.7
STEM, metaphorical perception, self-efficacy	1	1.7
STEM, mobile application	1	1.7
STEM, Montessori education, science process skills	1	1.7
STEM, Montessori education	1	1.7
STEM, opinion	1	1.7

STEM, opinions	1	1.7
STEM, practicability	1	1.7
STEM, problem solving	2	3.4
STEM, problem solving, science process skills	1	1.7
STEM, program effectiveness	1	1.7
STEM, reflection	1	1.7
STEM, science, and math's implementation	1	1.7
STEM, science process skills	8	13.6
STEM, science process skills, social skills	1	1.7
STEM, self-sufficiency perception	1	1.7
STEM, social skills	1	1.7
STEM, suitability	1	1.7
STEM, teacher reflection	1	1.7
Total	59	100.0

Table 4 shows that in theses on STEM+STEAM in early childhood education, the most frequently addressed theme is scientific process skills (13.6%). The second most frequent themes are 21st-century skills (3.4%), creativity (3.4%), and problem solving (3.4%).

3.5. Distribution of theses on STEM+STEAM According to the research design

The distribution of theses on STEM+STEAM according to research designs is shown in Table 5.

Table 5. Research Design

Design	**f**	**%**
convergent parallel design	1	1.7
action research design	4	6.8
case study design	3	5.1
collaboration-based action research design	1	1.7
convergent pattern design	1	1.7
cross-sectional design, relational survey design	1	1.7
descriptive case study design	1	1.7
design based research design	1	1.7
embedded design	1	1.7
embedded mixed design	1	1.7
experimental design	2	3.4
explanatory mixed design	3	5.1
mixed design	7	11.9
mixed experimental design	2	3.4
multi-stage mixed design	1	1.7
nested embedded design	1	1.7

qualitative research design	4	6.8
quantative research design	1	1.7
quasi experimental design	19	32.2
quasi experimental design, case study design	1	1.7
survey design	3	5.1
Total	59	100.0

Table 5 shows that among theses written in the field of early childhood education between 2018 and 2025, the most frequently used research design was the quasi-experimental design (32.2%). The second most frequently used design was the mixed design and mixed design variants (28.8%). According to the table, 6.8% of the theses were qualitative research and action research designs, and 5.1% were case study and survey designs.

3.6. Distribution of theses on STEM+STEAM According to the sampling methods

The distribution of theses on STEM+STEAM according to the sampling methods is shown in Table 6.

Table 6. Sampling method

Sampling	**f**	**%**
cluster sampling	2	3.4
convenient sampling	13	22.0
convenient sampling, criterion sampling, purposive sampling	2	3.4
convenient sampling, maximum variation sampling	1	1.7
criterion sampling	6	10.2
goal-oriented sampling	1	1.7
non-probability sampling	2	3.4
purposive sampling	12	20.3
purposive sampling, random sampling	1	1.7
random sampling	8	13.6
similar sampling	1	1.7
snowball sampling	1	1.7
missing	9	15.3
Total	59	100.0

Table 6 shows that, in terms of sampling methods used in theses written in the field of early childhood education between 2018 and 2025, the most

frequently used method was appropriate sampling (22%), followed by purposive sampling (20.3%). It was observed that purposive and random sampling methods were frequently used together (13.6%) and criterion sampling was also frequently used (10.2%). According to the table, 15.3% of the theses examined did not specify the sampling method.

3.7. Distribution of Theses on STEM+STEAM According to the sample groups

The distribution of theses on STEM+STEAM according to the sample groups is shown in Table 7.

Table 7. Sample group

Sample	**f**	**%**
36 month-old boy	1	1.7
48-72 month-old children	1	1.7
5 year-old children	3	5.1
56-68 month-old children	1	1.7
6 year-old children	3	5.1
60-72 month-old children	7	11.9
60-72 month-old children, families, pre-school teachers	1	1.7
60-72 month-old children, pre-school teachers	1	1.7
families, pre-school students, pre-school teachers	7	11.9
pre-school students	13	22.0
pre-school students, pre-school teachers	4	6.8
pre-school teacher candidates	3	5.1
pre-school teachers	14	23.7
Total	59	100.0

Table 7 shows that, based on the sampling method used in theses written in the field of early childhood education between 2018 and 2025, children (approximately 45%) constitute the largest sample group. According to the table, 28.8% of the theses have a sample group consisting of preschool teachers and teacher candidates. When examining theses that addressed more than one sample group, 8.5% of the theses included children and teachers, while 13.6% included children, teachers, and families as the sample group.

3.8. Distribution of theses on STEM+STEAM According to the Data Collection Tools

The distribution of STEM+STEAM-related theses according to data collection tools is shown in Table 8.

Table 8. Data collection tools

Tool	f	%	Tool	f	%
M-STEM activity, SPS scale	1	1.7	STEM activity, Good Enough Harris test, SPS scale	1	1.7
STEAM activity, 5E learning model, interview, reports, scientific concepts and process skills scale, video, etc.	1	1.7	STEM activity, interview	2	3.4
STEAM activity, interview, PSS scale ect.	1	1.7	STEM activity, interview, lifelong learning tendency, self-managed learning skill	1	1.7
STEAM activity, interview, diary, Torrance creativity test	1	1.7	STEM activity, interview, observation	2	3.4
STEAM activity, SPS scale	1	1.7	STEM activity, interview, observation, science learning assessment test	1	1.7
STEM activity, interview	1	1.7	STEM activity, interview, PSS scale	1	1.7
STEM activity, interview, PSS scale	1	1.7	STEM activity, interview, scienti□c concepts and scientific inquiry process scale, reflection note, rubric	1	1.7
STEM activity, test	1	1.7	STEM activity, interview, Torrance creativity test	1	1.7
STEM activity, PSS scale	1	1.7	STEM activity, PSS scale, SPS scale	1	1.7
STEM activity, STEM perception scale, observation, report, rubric	1	1.7	STEM activity, social skills assessment scale	1	1.7
STEM activity, 21st century skills scale	1	1.7	STEM activity, SPS scale	6	10.2
STEM activity, academic self-esteem, interview, observation	1	1.7	STEM activity, SPS test, social skills assessment	1	1.7
STEM activity, assessment of critical thinking, hybrid creativity test	1	1.7	STEM activity, STEM attitude and efficacy, interview, self efficacy scale	1	1.7
STEM activity, Cambridgeshire independent learning, diary, observation, train track task	1	1.7	STEM activity, STEM attitude scale	1	1.7
STEM activity, cognitive field development form, SPS scale	1	1.7	STEM activity, STEM attitude scale, STEM self-efficacy scale, efficacy beliefs form, interview, self-evaluation form	1	1.7
STEM activity, communication skills scale	1	1.7	STEM activity, STEM awareness scale, interview	1	1.7
STEM activity, critical thinking skill rubric, SPS scale	1	1.7	STEM activity, STEM awareness scale, interview, observation	1	1.7
STEM activity, design sheets, interview, learning and renewal skills scale, observation, rubric	1	1.7	STEM activity, STEM awareness scale, STEM teaching questionnaire, SPS scale	1	1.7
STEM activity, diary, interview, maths education, SPS scale	1	1.7	STEM activity, STEM checklist, interview, observation	1	1.7

STEM activity, diary, interview, social product rubric	1	1.7	STEM activity, STEM self efficacy scale, metaphor form	1	1.7
STEM activity, disaster education, interview	1	1.7	STEM activity, STEM tastic adventures, mobile application, interview, observation	1	1.7
STEM activity, Drama, SPS scale, Torrance creativity test	1	1.7	STEM activity, STEM trainer education evaluation survey, assessment test, interview, observation, rubrics	1	1.7
STEM activity, early childhood creativity scale, interview, observations, reflective diaries, PSS scale	1	1.7	STEM activity, Torrance creativity test	1	1.7
STEM activity, ecological footprint awareness scale	1	1.7	STEM awareness scale, attitudes toward science teaching scale	1	1.7
STEM activity, environment scale, interview, observation, SPS scale	1	1.7	STEM view, 21st skills teaching scale	1	1.7
STEM activity, evaluation of critical thinking through the philosophical inquiry scale, SPS scale	1	1.7	STEM+A activity, suitability survey	1	1.7
Total:			**f=59, %=100.0**		

Table 8 shows that the scientific process skills scale (10.2%) is the most frequently used data collection tool in theses on STEM+STEAM in early childhood education. According to the table, data collection tools in theses on STEM+STEAM include scales, tests, interviews, and observation tools, in addition to STEM+STEAM applications.

Conclusion

This research examined postgraduate theses on STEM+STEAM topics published in the field of early childhood education in Turkey in terms of bibliography, subject, and methodology. According to the findings of the research, it was determined that a large proportion of theses on STEM+STEAM in the field of early childhood education were master's theses. Other studies analyzing postgraduate theses on STEM in Turkey have also found that the majority of theses written are master's theses (e.g., Balca, 2022; Tetik, 2021). When examined by the year of publication, the highest number of theses were published in 2019, followed by 2024. This result suggests that there was an increase in STEM+STEAM-themed theses in early childhood education in 2019. Similarly, Tetik (2021) and Demir (2022) stated that most studies on STEM were conducted in 2019. When the universities where the theses were published were examined, it was found that the most theses on STEM+STEAM were published at Bahceşehir University, Gazi University, and Yıldız Technical University. It was found that theses on STEM+STEAM included scientific process skills, problem

solving, and creativity themes. This result is parallel to the results of the study by Erol & Erol (2022). From this result, it can be said that skill-based topics are given more space in theses on STEM+STEAM.

In theses regarding STEM+STEAM in early childhood education, a quasi-experimental design is predominantly utilized. Another study examining STEM-related theses also showed that the experimental method is frequently used in theses (Tetik, 2021). This may be related to obtaining measurable evidence in line with the nature of the research. When the sampling method was examined, it was found that convenience sampling and purposive sampling methods were frequently used. Other studies examining graduate theses on STEM also concluded that appropriate sampling methods were frequently used in theses (e.g., Genç, 2022). When examined in terms of the sample group, children constituted the largest sample group in the theses analyzed. Other studies examining graduate theses on STEM topics have found that students frequently constitute the sample group in the theses (e.g., Ata Aktürk & Demircan, 2017; Balca, 2022). Teachers follow next. In some theses, the sample group consists of both children and teachers. Very few theses included children, teachers, and families together as the sample group. It was found that STEM+STEAM-based activities were frequently used as data collection tools in the theses, along with scales, interview forms, and observation forms. Similarly, other studies conducting content analysis have emphasized that scales and interview forms are frequently used in STEM studies (e.g., Demir, 2022; Tetik, 2021).

In future research, building on the results of this study, more comprehensive research on the STEM or STEAM approach can be conducted to effectively implement the STEM or STEAM approach in early childhood education. Future research should include studies on new types of the STEAM approach, such as STEAM-C, diversifying research methods, considering socioeconomically advantaged and disadvantaged child groups as research groups, enriching data collection tools, and incorporating alternative assessment tools. This is expected to enrich research on the STEM+STEAM approach in early childhood education.

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Appendix 1: List of Theses Analyzed in the Study

Abanoz, T. (2020). STEM yaklaşımına uygun fen etkinliklerinin okul öncesi dönem çocuklarının bilimsel süreç becerilerine etkisinin incelenmesi. Dokora Tezi. Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü.

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Tüfekçi, C. (2024). Okul öncesi öğretmenlerinin STEM temelli afet eğitimi uygulamalarına yönelik görüş ve deneyimleri. Yüksek Lisans Tezi. Eskişehir Osmangazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Eskişehir.

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Ünal, M. (2019). 4-6 yaş okul öncesi çocuklarına etkinlik temelli STEM eğitiminin bilimsel süreç becerilerine etkisinin incelenmesi. Bolu Abant İzzet Baysal Üniversitesi, Eğitim Bilimleri Enstitüsü, Bolu.

Ünlü, A. B. (2021). Okul öncesi eğitim kurumuna devam eden 5 yaş grubu çocuklara uygulanan STEM eğitim programının ekolojik ayak izi farkındalığına etkisi. Yüksek Lisans Tezi. Aksaray Üniversitesi, Sosyal Bilimler Enstitüsü, Aksaray.

Üret, A. (2019). STEM eğitiminin anaokuluna devam eden 5 yaş çocuklarının yaratıcılık düzeylerine etkisi. Yüksek Lisans Tezi. Yıldız Teknik Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Uyulan, V. (2024). Erken çocukluk döneminde STEM etkinlikleri ile öğrencilerin bilimsel süreç becerilerinin ve eleştirel düşünme becerilerinin geliştirilmesi. Yüksek Lisans Tezi. Süleyman Demirel Üniversitesi, Eğitim Bilimleri Enstitüsü, Isparta.

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Yıldız, S. (2023). Okul Öncesi Öğrencilerine Yönelik Web 2.0 Araçlarıyla Zenginleştirilmiş STEAM Etkinliklerinin Geliştirilmesi ve Etkisinin Değerlendirilmesi. Doktora tezi. Fırat Üniversitesi, Eğitim Bilimleri Enstitüsü, Elazığ

Yılmaz, G. (2023). Okul öncesi eğitimde STEM yaklaşımının kullanımı: Oyun temelli mühendislik tasarım uygulamaları. Doktora Tezi. Bursa Uludağ Üniversitesi, Eğitim Bilimleri Enstitüsü, Bursa.