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Research Article

Analysis of theses conducted with mathematics teachers on education of gifted students in Türkiye[1]

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Abstract

Mathematical giftedness refers to an individual's capacity to easily generalize mathematical knowledge, develop original solution strategies, and interpret the world through a mathematical perspective. The role of teachers is a decisive factor in enabling mathematically gifted students to maximize their potential. Besides, studies on research trends, which are considered the most effective way of defining a field, have gained particular importance in today's academic landscape. Accordingly, the purpose of this research is to analyze graduate theses indexed in the National Thesis Center of the Council of Higher Education (NTCCHE) that were conducted with mathematics teachers on education of gifted students under eight categories: year, type, paradigm (approach), model, sample type, sample size, data collection tool, and research topic. In this study, a qualitative research approach was adopted, and thematic content analysis (meta-synthesis). The study included theses published between 2009 and 2024. Accordingly, this research was carried out on 17 theses conducted with mathematics teachers in the field of gifted education. The data were collected through document analysis. The findings indicate that the studies were predominantly conducted at the master's level, employing qualitative and descriptive methods, with a teacher-centered focus and small-scale samples. The theses mainly concentrated on the development of programs, activities, and scales, while student-centered topics were found to be more limited. While this emphasis strengthens the practical orientation of the field, it also highlights the need for greater attention to student-focused dimensions such as creativity, problem-solving, and self-regulation.

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Introduction

Giftedness is defined as an individual's cognitive, creative, and motivational capacity being above the average level (Beumann et al., 2025). Today, this concept is increasingly addressed in relation to more specific domains. Particularly with Gardner's (1993) theory of multiple intelligences, it has been acknowledged that individuals may demonstrate giftedness in distinct areas—such as music, bodily-kinesthetic skills, verbal abilities, or mathematical competencies (VanTassel-Baska, 2005). This perspective has supported the development of the domain-specific conception of giftedness and has emphasized that individuals should be evaluated not only based on their general intelligence levels but also on their advanced competencies in particular disciplines (Mora et al., 2024). In this context, mathematical giftedness stands out as one of the most prominent examples of domain-specific giftedness approaches (Samnia-Hammod & Paz-Baruch, 2024).

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Mathematical giftedness refers to an individual's capacity to easily generalize mathematical knowledge, develop original solution strategies, and interpret the world through a mathematical perspective (Beumann et al., 2025; Erdoğan & Gül, 2023). Krutetskii (1976) defined mathematical giftedness as the ability to grasp mathematical relationships, make generalizations, and create original methods of solution. In this context, mathematically gifted students exhibit advanced cognitive skills such as spontaneous problem solving, high-level mathematical reasoning, abstraction, and the ability to ascribe deep meaning to mathematical concepts (Erdogan & Gul, 2022; Leikin, 2021). These students not only acquire ready-made knowledge quickly but also stand out with their capacity to produce original and creative solutions (Smedsrud et al., 2022). Therefore, a close relationship exists between mathematical creativity and giftedness, and these characteristics should be identified at an early age and systematically nurtured.

Today, mathematics education programs are generally structured based on the achievements of typically developing students, which prevents mathematically gifted students from realizing their full cognitive potential (Lv et al., 2024). These students often complete classroom activities quickly and are left without meaningful tasks, which may lead to boredom, loss of motivation, and even academic underachievement (Özdemir & Işıksal-Bostan, 2025). Moreover, the lack of differentiated learning environments that foster their intrinsic motivation and desire to learn may result in stagnation of development at an early stage. In this respect, in line with the principle of equity in education, differentiated content and instructional methods emerge as an inevitable necessity for gifted students (Beumann et al., 2025; Tortop, 2014).

The role of teachers is a decisive factor in enabling mathematically gifted students to maximize their potential (Michalak, 2022). Mathematics teachers play a central role in recognizing, guiding, and supporting these students' abilities (Karp, 2010). Teachers act not only as transmitters of knowledge but also as mentors who observe and foster the cognitive, emotional, and social development of these students (Özdemir & Işıksal-Bostan, 2025). Particularly in the implementation of differentiated instructional strategies, teachers' pedagogical flexibility and sensitivity to student needs come to the forefront (Beumann et al., 2025). This highlights the necessity for teachers to possess adequate knowledge and skills regarding gifted students and their educational needs (Lv et al., 2024).

In the global competition among countries, the education of gifted students plays a critical role; however, research shows that teachers often lack sufficient knowledge and skills in this area. It is particularly emphasized that undergraduate programs do not provide the necessary foundation on gifted education, leaving teachers inadequately prepared to meet students' needs (Karp, 2017; Michalak, 2022; Uzunboylu et al., 2022). Teachers' perceptions and opinions significantly shape educational environments, and various studies have investigated their views regarding gifted students and their needs (Jawabreh et al., 2022; Michalak, 2022; Park & Oliver, 2009; Yazgan-Sağ, 2024). Nevertheless, the limited number of such studies is noteworthy. Yet, mathematics teachers play a key role in identifying, nurturing, and sustaining the abilities of mathematically gifted students.

Studies on research trends, which are considered the most effective way of defining a field, have gained particular importance in today's academic landscape, where scientific knowledge is expanding exponentially. Research trend analyses can not only provide insight into the current and past status of a discipline but also serve as a tool for forecasting future directions. For researchers, being aware of current research trends in their fields can offer valuable guidance in advancing their academic careers. Furthermore, analyzing graduate theses provides a deeper understanding of the scope and prevalence of a particular topic and reveals the overall outlook of the field. Considering that such findings may influence and guide future research from different perspectives, it is crucial to examine theses conducted with mathematics teachers in the field of gifted education in depth. With such an analysis, this study aims to provide a foundation for future research, expand the knowledge base of the field, and encourage the development of original studies. Accordingly, the purpose of this research is to analyze graduate theses indexed in the National Thesis Center of the Council of Higher Education (NTCCHE) that were conducted with mathematics teachers on education of gifted students under eight categories: year, type, paradigm (approach), model, sample type, sample size, data collection tool, and research topic.

Method

Research Model

In this study, a qualitative research approach was adopted, and thematic content analysis (meta-synthesis), which is one of the types of content analysis, was employed. Thematic content analysis involves organizing studies according to specific themes or templates, synthesizing and interpreting the data, and comparing similarities and differences among the results. The primary aim of this method is to evaluate the existing research in the literature from a holistic perspective and to provide researchers with high-quality information directly from the source (Çalık & Sözbilir, 2014).

Documents

In this study, criterion sampling, one of the purposive sampling methods, was employed. This method aims to select information sources with specific characteristics and to examine only those cases that meet predetermined criteria (Patton, 2002). In this way, data most relevant and comparable to the aim of the study were obtained. For the formation of the sample, the following criteria were applied: theses were limited by the keywords "gifted," "talented," "special talent," "mathematics education," "mathematically gifted," and "giftedness in mathematics." In the literature, it is observed that theses in this field have been conducted since 2009. As the uploading process of theses from 2025 is still ongoing, the study included theses published between 2009 and 2024. Accordingly, this research was carried out on 17 theses conducted with mathematics teachers in the field of gifted education and indexed in the NTCCHE (Appendix 1).

Data Collection and Analysis

The data were collected through document analysis. The study was conducted based on Forster's (1995) five-step document analysis process: (1) accessing the documents, (2) checking originality, (3) coding and categorizing, (4) analyzing the data, and (5) utilizing the data. Within this framework, the originality of the theses accessed through keyword searches in the NTCCHE was verified. In the third stage, the analyses were carried out within the framework of thematic analysis, which is one of the content analysis approaches. Thematic analysis is a method that enables the systematic examination of selected studies in line with a specific purpose across different variables and allows for the descriptive evaluation of the data obtained (Çalık & Sözbilir, 2014). In this study, since the theses were intended to be examined under eight themes—year, type, paradigm, model, sample type, sample size, data collection tool, and topic—the thematic analysis method was employed. The data were categorized using a Research Review Form, converted into numerical expressions, and presented in tabular form.

Process Validity and Reliability

In this study, both internal and external validity criteria were taken into consideration. To ensure internal validity, the member-checking method was employed. Through this method, the researchers reviewed whether the collected data were systematically categorized and whether any duplications existed (Cohen et al., 2000). Thus, accuracy and consistency were maintained during the data analysis process. Regarding external validity, special attention was paid to developing original and meaningful themes during the analysis, ensuring that the categories were created in alignment with the purpose of the study. For reliability, the formula proposed by Miles and Huberman (1994) was applied. The calculation indicated a 92% agreement rate. Disagreements among coders were resolved through discussion and consensus. According to Miles and Huberman (1994), an inter-coder reliability above 70% is considered acceptable. In this context, the reliability of the research process was ensured.

Results

This section presents the findings based on the analysis of theses conducted with mathematics teachers in the field of gifted education under eight themes: year, type, paradigm, model, sample type, sample size, data collection tool, and research topic.

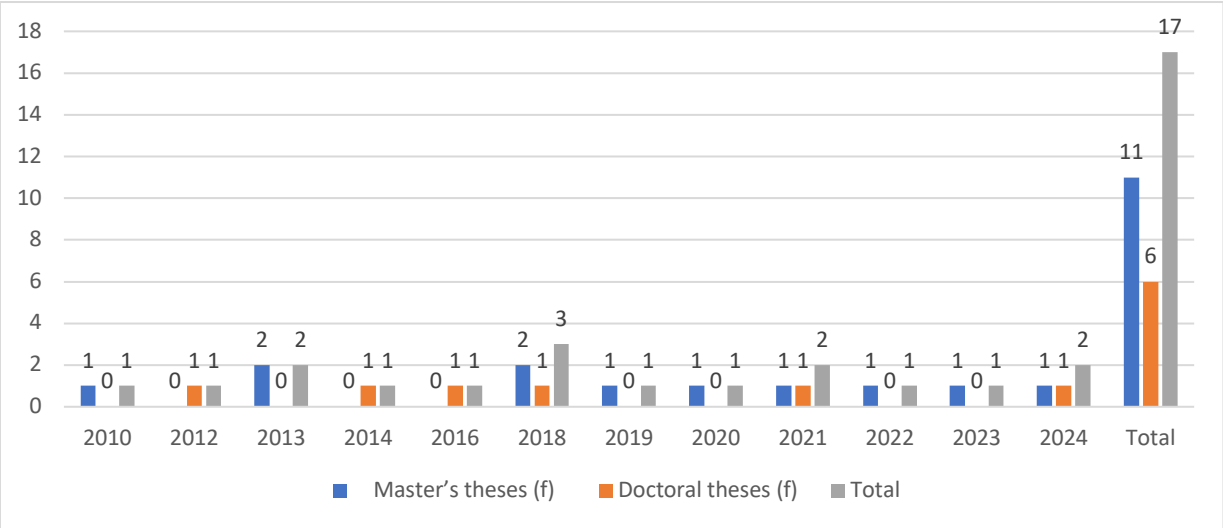

Figure 1. Distribution of master's and doctoral theses by year

When examining the distribution of the 17 theses analyzed in the study by year, it was observed that the highest concentration was in 2018 (16.7%). This was followed by the years 2013, 2020, 2023, and 2024, each of which accounted for 11.1% of the total theses. In contrast, the distribution was more limited in other years, with only one thesis produced in 2010, 2012, 2014, 2016, 2019, 2021, and 2022, corresponding to 5.6% each. Furthermore, it was found that master's theses outnumbered doctoral dissertations (11 master's vs. 6 doctoral), suggesting that research in this field has predominantly been initiated at the graduate level but has continued with a limited number of advanced studies.

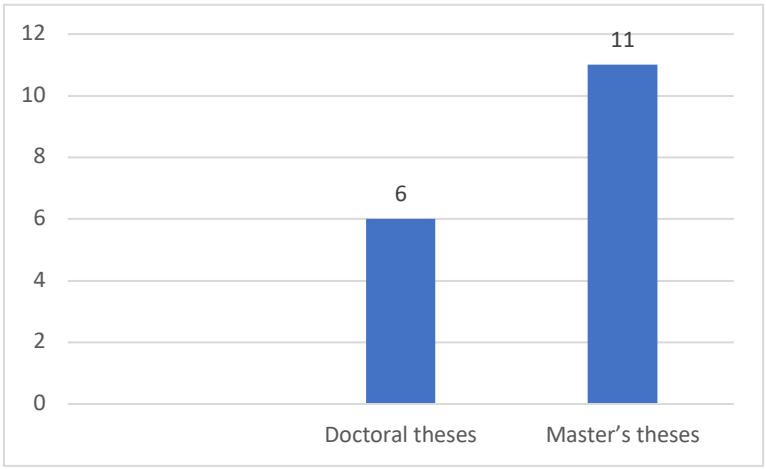

Figure 2. Distribution of theses by type

Of the 17 theses examined within the scope of the study, 11 were at the master's level (64.7%) and 6 at the doctoral level (35.3%). This finding indicates that research conducted with mathematics teachers in the field of gifted education has largely concentrated at the master's level. While the greater academic interest at this level demonstrates that the topic attracts attention at the graduate stage, the limited number of doctoral studies reveals that the field remains open to further in-depth investigation.

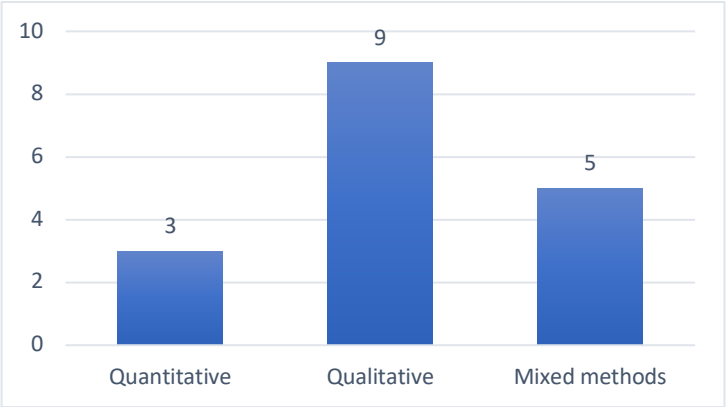

Figure 3. Research paradigms used in the theses

According to the research findings, of the 17 theses examined, 9 employed a qualitative approach (52.9%), 5 adopted a mixed-methods design (29.4%), and 3 utilized a quantitative approach (17.6%). This distribution indicates that qualitative research paradigms are more commonly preferred in theses focusing on mathematically gifted students and mathematics teachers. The use of mixed methods to a certain extent also reflects an interest in studies that integrate both quantitative and qualitative data. On the other hand, quantitative approaches appear to be less frequently employed, suggesting that researchers tend to focus more on obtaining in-depth descriptive and interpretive data.

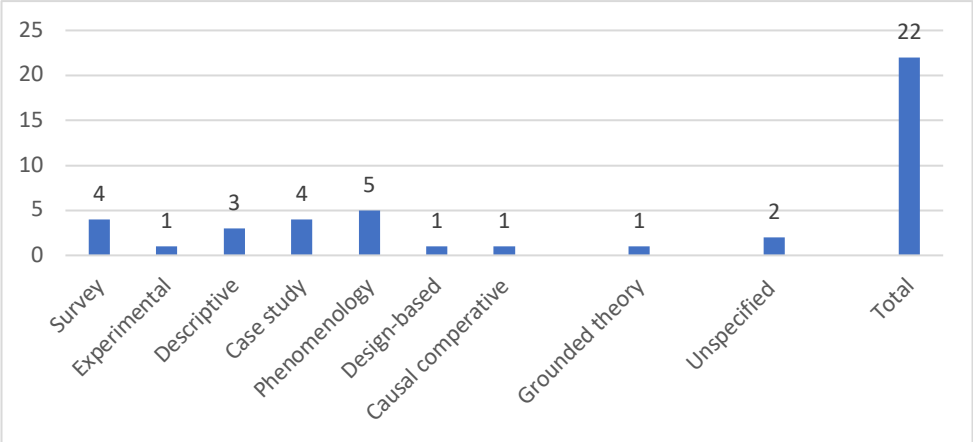

Figure 4. Frequencies of research models used in the theses

In the 17 theses examined, a total of 22 research models were employed, as some theses utilized more than one model. The most frequently used model was phenomenology (22.7%), followed by survey and case study designs, each with 18.2%. The descriptive method accounted for 13.6%, while design-based research, experimental, causal-comparative, and grounded theory models were each used at a rate of 4.5%. In addition, two theses (9.1%) did not specify the research model employed. This distribution suggests that researchers predominantly favored qualitative designs aimed at understanding and interpretation. The use of multiple models within the same study also indicates an attempt to adopt a multidimensional approach to the field.

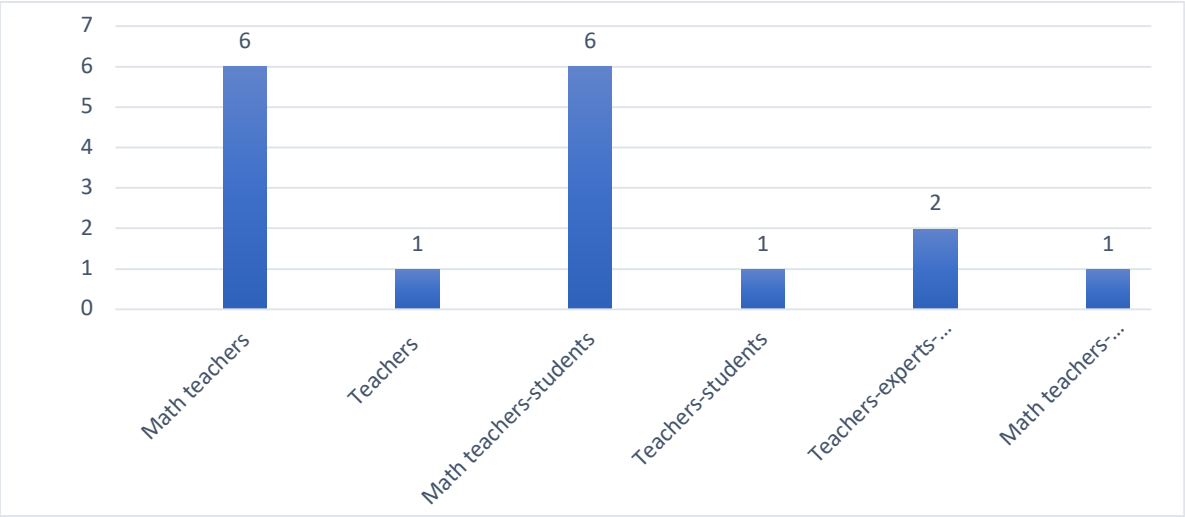

Figure 5. Sample types used in the theses

An analysis of the sample types used in the theses examined revealed that the most frequently employed samples were mathematics teachers alone and mathematics teacher–student combinations (each f = 6; 35.3%). This finding indicates that research has predominantly centered on mathematics teachers, drawing directly on their experiences. In addition, two theses (11.8%) included mixed samples of teachers, experts, and students, while three other sample types—mixed teachers, teacher–student, and teacher–student–parent—were each represented only once (5.9% each). This distribution demonstrates that studies were largely teacher-oriented, with students generally included alongside teachers, whereas the participation of experts and parents remained very limited.

Table 1. Distribution of sample sizes in the theses

Sample sizes	Master's these (f)	Doctoral theses (f)	Total	%
1-10	2	-	2	11.8
11-30	5	3	8	47.1
31-130	1	2	3	17.6
131-300	2	1	3	17.6
301+	1	-	1	5.9
Total	11	6	17	100

An analysis of the distribution of theses by sample size revealed that the most common range was 11–30 participants (47.1%). This was followed by the ranges of 31–130 participants (17.6%) and 131–300 participants (17.6%). Small-scale samples (1–10 participants) accounted for 11.8%, while only one thesis (5.9%) was conducted with more than 300 participants. This finding suggests that the theses generally preferred medium-scale samples, which are suitable particularly for in-depth qualitative analyses. Studies involving large-scale samples, on the other hand, were very limited.

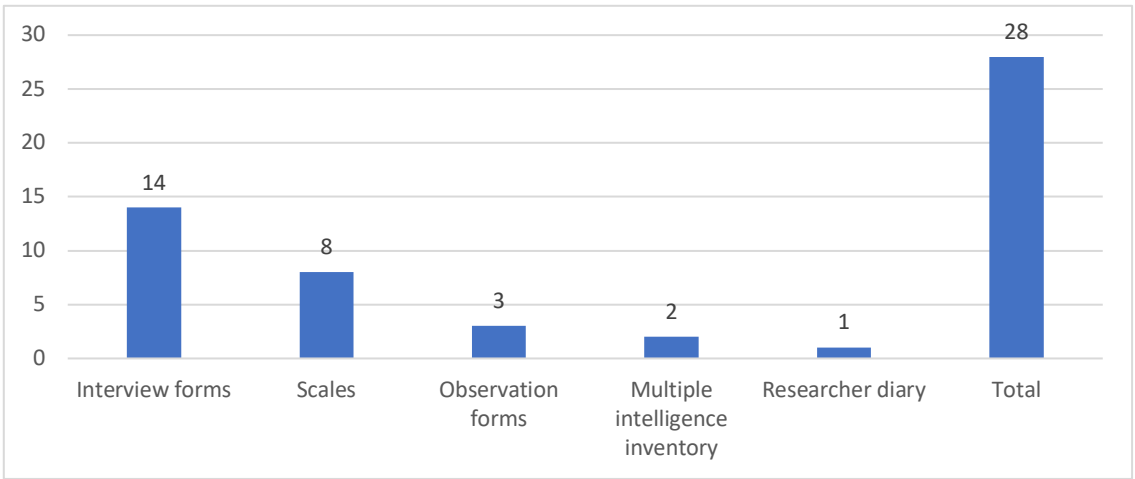

Figure 6. Data collection tools used in the theses

In the theses examined, a total of 28 data collection tools were employed. Half of these (14 tools; 50%) were interview forms, indicating that the studies largely relied on the collection of qualitative data. Scales ranked second (28.6%), suggesting that in some cases quantitative data were used to complement the findings. Observation forms (10.7%), multiple intelligences inventories (7.1%), and researcher diaries (3.6%) were employed to a more limited extent. This distribution demonstrates that researchers predominantly favored semi-structured and open-ended methods, selecting tools that could directly capture participants' experiences.

Table 2. Distribution of research topics in theses on gifted education and mathematics teachers

Research topics in theses	**f**	**%**
Development and evaluation of activities, programs, and scales for gifted students	7	41.2
Examination of mathematics teachers' attitudes, self-efficacy, needs, and challenges regarding the education of gifted students	4	23.5
Analysis of the mathematics curriculum in terms of giftedness	3	17.6
Investigation of perceptions of gifted students in relation to gender, professional experience, and teaching field variables	1	5.9
Challenges faced by mathematics teachers in Science and Art Centers during the teaching and learning process	1	5.9
Theory building on the mathematical creativity of gifted students		5.9
Total	17	100

The 17 theses examined focused on different themes in terms of research topics. The findings show that a significant proportion of the studies concentrated on the development of activities, programs, and scales (f=7; 41.2%). This highlights the importance attached to designing and improving methods and materials used in the mathematics education of gifted individuals. It can be suggested that researchers particularly leaned toward program design and evaluation to strengthen the practical dimension of the field. The second most frequent theme involved examining mathematics teachers' attitudes, self-efficacy, needs, and challenges regarding the education of gifted students (f=4; 23.5%). This proportion underscores the critical role of teachers in the educational process and demonstrates that their perspectives provide valuable input for research.

The third theme was the investigation of mathematics curricula in terms of giftedness from the perspectives of teachers and students (f=3; 17.6%), indicating that researchers questioned the adequacy of curricula for gifted learners. In contrast, three other research topics appeared in a more limited number of studies. These included (i) examining teachers' perceptions of gifted students in relation to variables such as gender, professional experience, and teaching field (f=1; 5.9%); (ii) analyzing challenges faced by mathematics teachers working in BILSEMs during the teaching–learning process (f=1; 5.9%); and (iii) constructing a theory of gifted students' mathematical creativity (f=1; 5.9%).

Discussion

In this study, theses prepared between 2010 and 2024 on gifted students in relation to mathematics teachers were examined under eight themes. The findings provide noteworthy insights into the trends in the field, both in terms of their development in Türkiye and their similarities and divergences with the international literature. The analysis of theses conducted between 2010 and 2024 on gifted students in relation to mathematics teachers revealed a fluctuating distribution rather than a consistent increase over time. Although 2018 stands out as a peak year, the general trend does not indicate a linear growth but rather periodic intensifications of interest in the topic. This pattern suggests that research on gifted education conducted with mathematics teachers in Türkiye has developed in a somewhat sporadic manner, possibly reflecting differences in institutional focus or individual researcher interest, rather than indicating a consistent nationwide research trajectory. This finding aligns with Gürlen et al. (2018), who noted that while studies on giftedness have expanded in Türkiye, the progress has been uneven and context-dependent, reflecting the emerging nature of the field. Similarly, Bilgiç and Baloğlu (2023) emphasized that research on mathematical giftedness tends to progress in waves, corresponding to short-term policy emphasis and available funding rather than continuous growth.

When the types of theses were examined, master's theses were found to outnumber doctoral dissertations (11 vs. 6). This pattern indicates that although graduate students demonstrate increasing interest in gifted education conducted with mathematics teachers, the limited number of advanced doctoral studies suggests that the field is still developing and has not yet matured into a sustained research tradition. As Çavuş-Erdem (2023) also emphasized, the scarcity of in-depth doctoral research highlights the need for further conceptual and methodological depth in future studies.

From the perspective of research approaches, the predominance of qualitative methods was also reported in previous works by Kardeş et al. (2018) and Ayvacı and Bebek (2019). This tendency reflects researchers' focus on obtaining in-depth insights into teachers' experiences and perceptions regarding gifted education. However, it should also be noted that, as the number of mathematics teachers actively involved in the education of gifted students in Türkiye is limited, qualitative approaches were naturally preferred due to the small and context-specific nature of the sample. This methodological choice allowed researchers to explore the topic in greater depth despite sample size constraints. At the same time, the presence of mixed-methods research parallels the findings of İnan and Mert-Uyangör (2022), who employed mixed designs in their studies.

In terms of research models, the prominence of phenomenology, survey, and case study designs is noteworthy. This finding is also frequently highlighted in the international literature. For instance, Leikin (2021) emphasized the necessity of phenomenological approaches in order to understand both the domain-specific and domain-general characteristics of mathematical giftedness. However, the limited number of experimental and design-based studies indicates a need for more innovative and practice-oriented research.

Regarding sample types, the analysis focused on the participant groups reported within the theses, not on the sample of the present study. The results revealed that mathematics teachers and teacher–student combinations were the most frequently used sample types across the theses analyzed. This finding shows that previous researchers in the field have tended to collect data primarily from teachers, emphasizing their central role in gifted education practices. This tendency aligns with the emphasis of Michalak (2022) and Jawabreh et al. (2022), who pointed out that teachers' perspectives play a decisive role in shaping instructional environments for gifted students. Nevertheless, the limited representation of parents and experts suggests that, as Beumann et al. (2025) argue, future studies could benefit from incorporating more diverse stakeholders to ensure a multidimensional understanding of gifted education. It should also be clarified that the current study itself employed a criterion sampling strategy, analyzing theses indexed in the Council of Higher Education (YÖK) database that were specifically conducted with mathematics teachers on gifted education. Therefore, this finding pertains to the sample types used within those theses, rather than the sample of this research.

In terms of sample size, the most frequent range was found to be 11–30 participants. This distribution reflects a methodological tendency in qualitative research to conduct in-depth analyses with small to medium-sized groups. Considering that the existing literature on gifted education conducted with mathematics teachers in Türkiye is predominantly qualitative, the prevalence of such sample sizes is an expected outcome rather than a limitation. As Smedsrud et al. (2022) emphasized, however, large-scale survey studies can provide valuable comparative insights that complement qualitative findings. Therefore, while the dominance of narrow samples aligns with the qualitative tradition of the field, expanding future research to include broader participant groups could enhance the generalizability and cross-contextual understanding of gifted education practices.

With regard to data collection tools, the dominance of interview forms is directly related to the qualitative orientation of the field. The partial use of scales indicates an increasing interest in the development of assessment instruments. This trend parallels the study of Samnia-Hammod and Paz-Baruch (2024), who examined self-regulation skills in mathematically gifted students by combining scales with qualitative data.

Finally, when research topics are considered, it is evident that the majority of theses focused on the development of activities, programs, and scales. This finding is consistent with national studies (Çavuş-Erdem, 2023; İnan & Mert-Uyangör, 2022) that emphasize the need for material and program development in gifted education. Studies addressing teachers' attitudes, competencies, and challenges ranked second, aligning with the literature that underscores the critical role of teachers (Leikin, 2021; Bilgiç & Baloğlu, 2023). In contrast, the limited number of studies on student creativity

and issues within the science and art center context confirms the research gaps highlighted in the international literature (Beumann et al., 2025; Samnia-Hammod & Paz-Baruch, 2024), thereby reflecting similar shortcomings in the Türkiye context.

Conclusion

In this study, graduate theses conducted with mathematics teachers on education of gifted students were systematically examined under eight categories: year, type, paradigm, model, sample type, sample size, data collection tools, and research topics. In this study, graduate theses conducted with mathematics teachers on the education of gifted students were systematically analyzed under eight categories: year, type, paradigm, model, sample type, sample size, data collection tools, and research topics. The findings revealed that research in Türkiye on this topic has followed a fluctuating pattern over time, showing periodic concentrations of academic interest rather than a steady upward trend. The majority of the studies were conducted at the master's level, predominantly adopting qualitative approaches. Phenomenology, case study, and survey designs were the most frequently employed research models. In terms of participants, mathematics teachers and teacher–student groups constituted the dominant sample types, often involving small- to medium-scale participant numbers. Interviews emerged as the primary data collection tool, consistent with the qualitative orientation of the field. In terms of research focus, program, activity, and scale development studies were most common, followed by investigations addressing teachers' attitudes, competencies, and instructional challenges. These findings collectively suggest that research on gifted education conducted with mathematics teachers in Türkiye remains largely teacher-centered, descriptive, and practice-oriented.

Limitations and Recommendations

This research is limited to theses conducted between 2010 and 2024 that are accessible in the NTCCHE and specifically focused on gifted education in relation to mathematics teachers. Therefore, international theses or studies available in different databases were not included in the analysis. In addition, the thematic content analysis employed in the study was carried out solely within the framework of eight predetermined themes (year, type, paradigm, model, sample type, sample size, data collection tools, and research topic), without directly addressing the substantive findings or effectiveness levels of the theses. Another limitation was the lack of clarity or absence of information regarding certain research models or sample characteristics in some theses, which posed challenges during the analysis process.

Considering these limitations, several recommendations can be made to strengthen future contributions to the field. First, increasing the number of doctoral-level studies would help build a deeper body of knowledge in gifted education. While qualitative and descriptive approaches dominate the field, there is a clear need for more experimental, mixed-method, and design-based studies. In terms of sampling, the strong emphasis on teachers highlights the importance of expanding research to include multiple stakeholders, such as students, parents, and experts. The predominance of small-scale studies suggests that future research should involve larger participant groups to enhance generalizability. Regarding data collection, the heavy reliance on interview forms indicates the need to diversify measurement tools through the development and use of scales and other assessment instruments. Finally, while the focus on program and activity development strengthens the applied dimension of the field, there remains a pressing need for more research on student-centered themes such as creativity, problem-solving, and self-regulation.

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