

# Mathematics Teachers' Attitudes towards Inclusive Education\*

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## Abstract

*The success of inclusive practices in educational settings significantly depends on teachers' attitudes. This study addresses the attitudes of mathematics teachers toward inclusive education in Turkish lower secondary schools, filling a gap in existing literature. It examines the determinants shaping these attitudes, providing insights for tailored interventions to support mathematics teachers in promoting inclusivity. Through questionnaire data collected from 262 mathematics instructors, the study reveals a slightly negative overall attitude trend, influenced by factors such as age, prior experience with children, training in inclusive education, and personal connections. Younger teachers, those with experience teaching students with SEN, and those with inclusive education training exhibit more favourable attitudes. Surprisingly, having a family member with SEN also significantly impacts attitudes, highlighting the importance of personal connections. These results underline the need for targeted interventions and professional development to foster inclusive mindsets among mathematics teachers, thereby creating equitable learning environments for all students.*


**Keywords:** Attitudes, inclusive education, mathematics teachers

## Matematik Öğretmenlerinin Kaynařtırma Eğitime Yönelik Tutumları

### Öz

*Eğitim ortamlarında kaynařtırma uygulamalarının etkinlięi, öğretmenlerin tutumlarıyla yakından ilişkilidir. Bu çalışma, Türk ortaokullarındaki matematik öğretmenlerinin kaynařtırma eğitime yönelik tutumlarını incelemektedir. Matematik öğretmenlerinin tutumlarını belirleyen faktörlere odaklanarak, bu öğretmenlerin kaynařtırmayı destekleme konusunda nasıl özel müdahalelerle yönlendirilebileceęi hakkında bilgi sağlar. Çalışma, 262 matematik öğretmeninden toplanan anket verilerine dayanarak, genel olarak hafif negatif bir tutum eğilimi tespit etmiştir. Yaş, önceki özel eğitim deneyimi, kaynařtırma eğitimi alma ve kişisel ilişkiler gibi faktörlerin bu tutumları etkiledięi görülmüştür. Genç öğretmenler, özel eğitim ihtiyacı olan öğrencilerle deneyimli olanlar ve kaynařtırma eğitimi almıř olanlar daha*

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*olumlu tutumlar sergilemektedir. Ayrıca, özel eğitim ihtiyacı olan bir aile üyesine sahip olmanın da tutumlar üzerinde önemli bir etkisi olduğu, bu kişisel ilişkilerin önemini vurgulamaktadır. Bu bulgular, matematik öğretmenlerinin kaynaştırıcı düşünce tarzlarını teşvik etmek için hedefe yönelik müdahalelerin ve mesleki gelişim çalışmalarının önemini ortaya koymaktadır. Böylece, tüm öğrenciler için adil öğrenme ortamları oluşturulabilir.*

**Anahtar Kelimeler:** *Tutumlar, kaynaştırma eğitimi, matematik öğretmenleri*

## Introduction

Inclusive education has emerged as a pivotal concept in contemporary pedagogy, drawing substantial attention from researchers globally. At its core, inclusive education seeks to provide equitable learning opportunities by integrating children with special educational needs (SEN) into classrooms alongside their typically developing peers (Br et al., 2021). The success of inclusive education hinges upon various factors (e.g., school infrastructure, administrative support, and parental involvement), with teacher competencies playing a central role. Scholars underscore the critical importance of teachers' competencies, which encompass attitudes, curriculum adaptation, resource utilisation, parental involvement, and multidisciplinary collaboration (Rajendran et al., 2020). Furthermore, the dynamic nature of inclusive education necessitates flexible and diverse methods for documenting and evaluating its outcomes, addressing the methodological and ethical challenges inherent in the field (Erten & Savage, 2012).

Over the past two decades, inclusive education has garnered growing attention within the educational landscape. Researchers have explored diverse facets of inclusive education, ranging from teachers' attitudes towards it (de Boer et al., 2011) to the learning experiences of children with SEN (Arianti et al., 2022). Integral to inclusive education is not only the physical integration of students but also the provision of necessary support and resources to facilitate effective learning alongside their peers (Arianti et al., 2022). Moreover, inclusive education transcends mere classroom presence, striving to cultivate supportive and inclusive school environments that value diversity and promote the well-being of all students (Xue et al., 2023). Viewed as a pathway to social equity and lifelong learning, inclusive education embodies values of fairness, ethics, democracy, and social justice (Imaniah & Fitria, 2018). Its fundamental objective is to deliver quality education to every student, irrespective of their backgrounds or abilities (Manzano-García & Fernández, 2016). Despite its potential, challenges persist, including teachers' misconceptions about inclusive education (Sanagi, 2016) and the need for continuous professional development to enhance teachers' competencies in delivering inclusive education (Sysoieva et al., 2021). Addressing teachers' attitudes and fostering supportive school climates are essential endeavours for realising the vision of inclusive education.

In Türkiye, inclusive education has garnered increasing attention and significance over the years. The nation has endeavoured to promote inclusive practices in education, aiming to provide equal opportunities for all students, including those with diverse needs (Diken et al., 2016; Karal, 2021; Sakız & Woods, 2014). Several studies have clarified the legal framework underpinning inclusive education in Türkiye, emphasising regulations and laws that advocate for inclusive practices (Diken et al., 2016; Yazıcıoğlu, 2020). However, despite these efforts, challenges persist, signalling the need for further enhancements in the system (Kuzu-Demir et al., 2022; Uygur et al., 2020). Research on inclusive education in Türkiye has explored teacher attitudes, training, and practices, emphasising the critical role of positive teacher perceptions towards inclusion and the significance of training and self-efficacy (Aktan, 2021; Özokçu, 2018; Yakut, 2021). Efforts to develop teacher training programs and assistance for students with SEN have been underlined as pivotal steps towards advancing inclusive education in Türkiye (Ersan et al., 2020; Öztürk, 2019).

Within the scope of support education services, there are studies conducted with teachers that directly affect teachers' views. These studies emphasise the significance of teacher training and preparation in shaping positive attitudes towards inclusion (Khalid & Othman, 2022; Leonard & Smyth, 2020; Zainalabidin & Ma'rof, 2021). Research indicates that education and training in SEN and inclusion play a crucial role in influencing teachers' perceptions and behaviours towards inclusive education (Singh et al., 2020). Furthermore, the positive attitudes of teachers are deemed essential for the successful implementation of inclusive education policies (Jury et al., 2021).

### **Inclusive Education and Mathematics**

In the realm of mathematics education, the concept of inclusion holds profound significance, yet it has often been overshadowed by other educational priorities. Mathematics, with its structured framework of ideas, methods, and reasoning, forms a crucial foundation for understanding various disciplines and problem-solving. The educational aim within mathematics is to cultivate a robust knowledge base, fostering the ability to model and resolve complex issues while elucidating fundamental mathematical principles (National Council of Teachers of Mathematics [NCTM], 2014). The significance of inclusive practices in mathematics education lies in creating a learning environment that caters to the diverse needs of all students, ensuring equitable access to mathematical education. Prediger and Buró (2021) highlight the importance of inclusive teaching practices in secondary mathematics classrooms, emphasising the job-ability framework that outlines the typical situational demands teachers face when teaching mathematics inclusively. This framework stresses the necessity of explicit definitions and a conceptual framework to guide teachers in implementing inclusive practices effectively.

Moreover, Roos (2023) explores students' perspectives on inclusion in mathematics education, underlining the reliance of inclusion on pedagogical practices

in mathematics classrooms. This underscores the crucial role of teachers in establishing an inclusive learning environment that supports the diverse needs of all students. Additionally, Emül, Gulkilik, and Kaplan (2022) investigate how preservice middle school mathematics teachers perceive and achieve mathematical understanding through teaching practices, underscoring the importance of practices that enable students to construct meaning in mathematics lessons. Inclusive practices in mathematics also entail incorporating real-life examples, problem-solving tasks, and cognitive challenges to enhance students' mathematical abilities (Durandt, 2021). By integrating diverse teaching methods and technologies, such as manipulative materials and digital tools, teachers can facilitate a teaching and learning process that respects and includes differences, promoting inclusive mathematical literacy (Silva, 2023). While the term 'inclusion' frequently surfaces in mathematics education discourse and literature, studies on inclusive education in mathematics often tend to indirectly address the concept, rather than delving into its explicit definition and significance (Roos, 2019). Although there is a growing focus on inclusive education in mathematics, existing research primarily touches upon related aspects such as equity and participation yet fails to provide a broad examination of inclusion in the context of mathematics education (Darragh & Valoyes-Chávez, 2019; Jaremus et al., 2020).

The dearth of a cohesive theoretical framework for inclusive education in mathematics further exacerbates this oversight (Vodičková, Mitaříková, & Slavičková, 2023). Consequently, while the ideological underpinnings of inclusive education are frequently expressed, the effective application of inclusive practices in mathematics classrooms remains elusive. Without a clear operationalization of inclusion, its efficacy within educational settings becomes questionable, potentially hindering its meaningful integration into mathematics pedagogy. In essence, the concept of inclusion within mathematics education warrants closer scrutiny and integration. By bridging the gap between theoretical discourse and practical application, inclusion practices within mathematics can be better understood and implemented. This endeavour not only enriches the educational experience but also promotes equitable and participatory learning environments within mathematics classrooms. Hence, it becomes essential to examine the attitudes of mathematics teachers towards inclusive education to ensure the effective integration of inclusive methods and create an environment that accommodates students with SEN.

### **Teachers' Attitudes towards Inclusive Education**

Teachers' attitudes are important in fostering the successful implementation of inclusive education. Consistent positive attitudes among teachers towards inclusive education have been linked with increased support for the inclusion of children with SEN into mainstream classrooms, thereby resulting in enhanced educational outcomes for all (Desombre et al., 2021; Hassanein et al., 2021). Also, teachers' concerns and perceptions closely align with their attitudes, shaping their support and

implementation of inclusive practices within the classroom (Jury et al., 2023). Creating an inclusive learning atmosphere is facilitated by teachers who hold favourable views on inclusion, as they are more proficient in handling instructional materials and curricula tailored to students with special requirements, thereby establishing a classroom environment that is more supportive and accommodating (Larosa et al., 2022). These attitudes are not only essential for the continuation of inclusive practices but also have practical implications for the quality of education provided to all students (Gidlund, 2018), significantly influencing students' social participation and academic performance in inclusive settings (Hussien & Al-Qaryouti, 2014). The interconnectedness of teachers' knowledge, beliefs, and self-efficacy with attitudes towards inclusive education influences their approach to teaching students with diverse needs (Abdullah et al., 2022), and these attitudes serve as critical predictors of self-efficacy for inclusive practices (Alnahdi & Schwab, 2021). Moreover, research indicates that teachers' attitudes are shaped by various factors (Bodhi et al., 2021). The change in teachers' attitudes is quite challenging, as indicated in the literature. Studies have shown that teachers face challenges in adjusting their attitudes towards special needs education (Rashid & Wong, 2022) and inclusive education (Larosa et al., 2022). These challenges often stem from factors like lack of confidence, training, and awareness (Souheyla, 2022; Tadesse, 2020). Positive teacher attitudes are essential for successful educational transformations (Chen et al., 2023). Training and support have been identified as factors that can enhance teachers' attitudes (Tadesse, 2020). Addressing teachers' attitudes is fundamental for effective educational reform and student success.

### **Factors Influencing Teachers' Attitudes**

Understanding the factors that shape teachers' attitudes towards inclusive education is crucial for fostering positive changes in educational practices (Saloviita, 2018). Savolainen et al. (2012) emphasised that teachers' attitudes are shaped by complex social relationships rather than isolated variables. This highlights the need to explore factors such as age, gender, training, types of SEN, and prior experience with children with SEN to gain deeper insights into these attitudes.

Age is a significant factor influencing teachers' attitudes. Research indicates that younger teachers generally express more positive attitudes towards inclusive education compared to their older colleagues. This difference is often attributed to recent training and greater openness to innovative approaches among younger teachers (Alnahdi & Schwab, 2021; Khalid & Othman, 2022). Conversely, older teachers may have established beliefs and practices that make them more resistant to change (Ibrahim et al., 2013; Gal et al., 2010). Gender also plays a role in shaping attitudes towards inclusive education. Studies have found that female teachers typically express more positive attitudes towards inclusive practices than male teachers (Alnahdi & Schwab, 2021; Sharma et al., 2014). However, some research

indicates that male teachers can also hold positive views towards inclusion (Dapudong, 2014), suggesting that gender-related attitudes may be context-specific.

The importance of training in shaping teachers' attitudes towards inclusive education is well-documented. Comprehensive training programs that focus on inclusion and diversity are effective in improving teachers' attitudes and their readiness to implement inclusive practices (de Boer et al., 2011; Khalid & Othman, 2022; Lacruz-Pérez et al., 2021). However, some studies suggest that training alone may not be sufficient, emphasising the need for ongoing professional development (Orakci et al., 2016; Monsen et al., 2014). Prior experience with students with SEN significantly influences teachers' attitudes. While some studies indicate that personal connections with individuals with SEN do not necessarily correlate with more positive attitudes (Alquraini, 2012; Rakap et al., 2015), these experiences can provide unique insights and foster empathy, enhancing teachers' understanding and approach to inclusive practices (Tsibidaki et al., 2020).

Teachers' attitudes towards inclusive education are also affected by the nature and severity of students' disabilities. Positive attitudes are more prevalent towards students with mild disabilities, while negative perceptions often arise with behavioural and emotional difficulties (de Boer et al., 2011; Schwab, 2019). This variability underscores the need for targeted interventions and support to address diverse needs within inclusive settings (Kauffman et al., 2018; McCarthy, 2019). In summary, teachers' attitudes towards inclusive education are shaped by a complex interplay of factors including age, gender, training, prior experience, and the nature of disabilities. Understanding these factors can help educational stakeholders design targeted interventions and professional development programs to promote inclusive practices and create supportive learning environments for all students.

### **Research Aims and Questions**

This literature review has highlighted teachers' attitudes towards inclusive education, yet a significant gap remains regarding the attitudes of mathematics teachers specifically. While existing studies have explored teachers' perceptions of inclusive education, it is crucial to recognize that mathematics teachers may hold unique perspectives due to the specific nature of their subject and the differences in their training programs at the university level, which often involve distinct curricula compared to teachers of other subjects. Therefore, the current study aims to explore the attitudes of mathematics educators towards inclusive education in their instructional settings and to identify the factors influencing these attitudes within mathematics classrooms.

By focusing specifically on mathematics teachers, this research seeks to provide a more nuanced understanding of the challenges and opportunities they encounter in promoting inclusive practices within their subject area. The importance of this research lies in its potential to fill a critical gap in the literature by offering insights

that are directly relevant to mathematics education. Practically, the findings can inform the development of targeted professional development programs and instructional strategies that better support mathematics teachers in implementing inclusive education. This, in turn, can lead to more effective and equitable learning environments for all students, particularly those with special educational needs.

To achieve these objectives, the current study aims to investigate the following research questions:

1. What are the attitudes of mathematics teachers towards inclusive education in their schools?
2. How do different factors shape mathematics teachers' attitudes towards inclusive education?

## Method

### Research Design

This study employs a cross-sectional survey design to explore the attitudes of mathematics teachers towards inclusive education in Turkish lower secondary schools. This design was selected for its effectiveness in capturing the current state of attitudes and identifying influencing factors at a single point in time, thus providing a comprehensive snapshot of prevailing conditions and correlations. The cross-sectional survey design allows the collection of data from a large number of participants simultaneously, making it suitable for identifying patterns and correlations without requiring a long-term commitment from participants. This approach is particularly valuable in educational research where capturing the current state of attitudes can provide important insights for policy and practice.

By employing a cross-sectional survey design, this study aims to efficiently gather data from a diverse sample of mathematics teachers. This design enables the identification of relationships between variables, such as demographic factors and attitudes towards inclusive education, within a relatively short period. It also facilitates the examination of differences and similarities across various subgroups within the sample, providing a nuanced understanding of the factors that shape teachers' perspectives on inclusive education. This approach lays a valuable foundation for developing targeted interventions and professional development programs aimed at fostering more inclusive attitudes among teachers.

### Data Collection Process

Convenience sampling was employed to select participants, involving the recruitment of individuals readily accessible and willing to take part in the study. Mathematics teachers from lower secondary schools across different regions in Türkiye were approached to participate voluntarily, facilitating the recruitment process by targeting

those interested and available for involvement in the study. The data collection process for this study involved both face-to-face and online distribution methods to accommodate the preferences of the mathematics teachers. Initially, the researcher contacted selected schools to inform the teachers about the research and to offer the questionnaires involved in the project. The best way to reach teachers was through school contact details provided on school websites. Face-to-face distribution was preferred because it enabled the researcher to explain the research in detail and clarify any questions or concerns from the participants. However, some teachers preferred not to meet in person and requested to receive the questionnaire by email. Therefore, the questionnaire was also transmitted electronically, and data was gathered online using a web-based survey tool (Google Forms).

While 76 teachers participated in the online questionnaire, 196 teachers completed the printed version of the questionnaire. The online survey method was particularly advantageous during the coronavirus pandemic, as it allowed for quicker and broader distribution, reaching participants in different geographic locations more conveniently. Online surveys offer numerous benefits, including ease of use, confidentiality, anonymity, and enhanced participation levels due to the comfort and freedom they provide to respondents (Nayak & Narayan, 2019).

## **Participants**

Participants were recruited from mathematics teachers working in lower secondary schools in Türkiye, responsible for teaching students aged 11 to 14 years. The questionnaires were circulated to 300 mathematics teachers in lower secondary schools in Türkiye, with a total of 272 (84%) completing it. However, data from only 262 participants were used in the study, as 10 responses from the online questionnaire were invalid due to repeated selections of the same option or leaving every item blank.

A total of 262 mathematics teachers voluntarily participated in the current study. Out of these participants, 160 (61.1%) were identified as female, whereas 102 (38.9%) were identified as male. Most participants fell within the age bracket of 27 to 31 years, representing 35.9% of the total, with ages spanning from 23 to 57 years. Among the 262 participants, it was found that 157 (59.9%) individuals had undergone some form of training regarding inclusive education, reflecting their training background. Additionally, the majority of teachers (227, 86.6%) stated that they did not have friends with SEN, while 35 (13.4%) reported having such friends. Moreover, 40 (15.3%) participants disclosed having a family member with SEN, while 222 (84.7%) did not have such familial connections. Subsequently, teachers were reported about their familiarity with instructing students with various types of SEN. As depicted in Figure 1, roughly 34% to 46% of respondents had experience teaching students with various special needs or challenges.



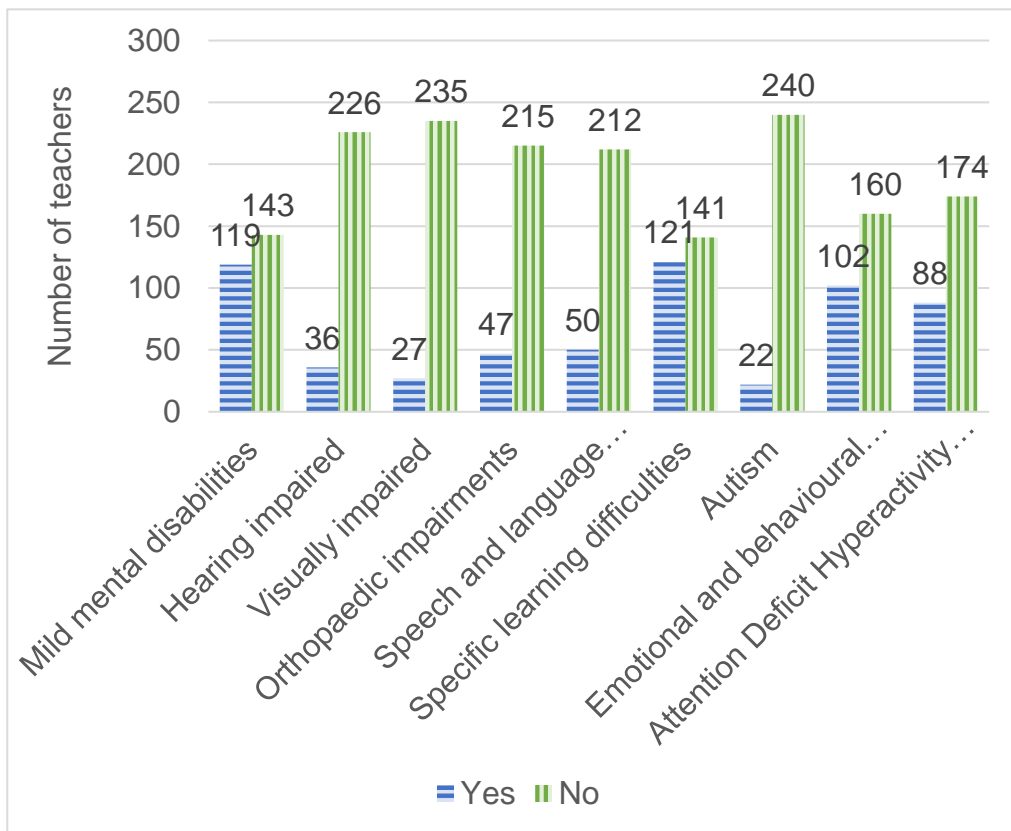


Figure 1. Teachers’ experience with students having specific SEN (N = 262)

**Instruments**

Data collection for the current study involved the use of two questionnaires. The initial questionnaire aimed to collect demographic information. To evaluate mathematics teachers' attitudes, a revised edition of the Opinion Relative to Integration of Students with Disabilities (ORI) scale was incorporated into the questionnaire (Antonak and Larrivee 1995). The ORI scale has been widely employed in prior research to investigate teachers' attitudes towards inclusive education (for example, Alshehri, 2023; Rakap, Cig, and Parlak-Rakap 2017).

The ORI scale's validity and reliability have been extensively evaluated in previous studies. Antonak and Larrivee (1995) conducted the initial psychometric analysis and revision of the scale, confirming its reliability with a Cronbach's alpha coefficient of 0.88. This high coefficient indicates a strong internal consistency of the scale, making it a reliable tool for measuring attitudes towards inclusive education. In the current study, the reliability of the ORI scale was reassessed to ensure its suitability for the sample of mathematics teachers in Turkish lower secondary schools. Cronbach's alpha was recalculated for the collected data, resulting in a coefficient of 0.89, which is consistent with the original findings and indicates a satisfactory level of internal consistency. This reliability measure confirms that the ORI scale is a stable and dependable instrument for this research context. To further ensure the validity of the instrument, content validity was considered by reviewing the scale items to ensure they comprehensively covered the domain of attitudes towards inclusive education. Additionally, the construct validity of the scale was supported by its widespread use in similar studies, which have consistently demonstrated its effectiveness in capturing teachers' attitudes.

The questionnaire comprises 40 statements, utilising a five-point Likert scale. Negative items were reverse-scored to standardise responses (from - to + and + to -), and the 40 responses were then summed to calculate total scores, falling within the range of 0 to 160. Higher scores reflect more positive attitudes towards inclusive education (Alanazi, 2012). This scoring method not only helps identify participants with more favourable attitudes but also aids in pinpointing general disparities in opinions on inclusion among diverse demographic groups. By employing this scoring system, the current study assessed the overall attitudes of mathematics teachers while simultaneously investigating the influence of demographic characteristics on these attitudes.

### **Data Analysis**

The data analysis process was meticulously structured to ensure a comprehensive understanding of the attitudes of mathematics teachers towards inclusive education and the factors influencing these attitudes. The analysis involved several steps, utilising both descriptive and inferential statistical methods. Initially, the collected data underwent a thorough cleaning process to ensure accuracy and reliability. Invalid responses, such as those with repeated selections of the same option or those leaving every item blank, were removed. This resulted in a final dataset of 262 valid responses from mathematics teachers. Descriptive statistics were employed to summarise the demographic characteristics of the participants and the general trends in their attitudes towards inclusive education. Frequencies, percentages, means, and standard deviations were calculated for various demographic variables such as gender, age, prior experience with students with special educational needs (SEN), and training in inclusive education. This provided a detailed overview of the sample's composition and the general distribution of attitudes within the group.

Inferential statistical tests were conducted using the Statistical Package for the Social Sciences (SPSS) version 29.0.2 to examine the relationships between demographic factors and teachers' attitudes towards inclusive education. These analyses included independent samples t-tests and one-way analysis of variance (ANOVA). The independent samples t-test was used to compare the attitudes of male and female teachers and to assess whether there were statistically significant differences in attitudes towards inclusive education based on gender. Additionally, a t-test compared the attitudes of teachers with and without prior experience teaching students with SEN, determining if previous experience with SEN influenced teachers' attitudes.

A one-way ANOVA was conducted to investigate potential age-related differences in attitudes towards inclusive education. This analysis compared the attitudes across different age groups to identify significant variations. ANOVA was also used to compare the attitudes of teachers who had received training in inclusive education with those who had not, evaluating the impact of training on teachers' attitudes. For significant ANOVA results, post hoc comparisons were conducted using the Tukey Honestly Significant Difference (HSD) test to further explore differences between specific groups. This detailed analysis approach ensured that the study comprehensively examined the factors influencing mathematics teachers' attitudes towards inclusive education, providing valuable insights for targeted interventions and professional development programs.

### **Ethical Considerations**

The study obtained ethical approval from the Ethics Committee of the UCL Institute of Education. The methodology involved conducting a survey targeting mathematics teachers in Türkiye. Participants were given consent forms and detailed information sheets prior to their participation in the study. The documents were carefully prepared to guarantee that participants possessed a thorough comprehension of the study's aims and the types of questions they would be presented with. To achieve this, the information sheets included a clear and concise description of the study's purpose, the significance of the research, and the specific objectives being investigated. Additionally, the consent forms outlined the nature of participation, emphasising the voluntary aspect and the confidentiality of the responses. Participants were informed about the types of questions they would encounter, ensuring that there were no surprises or discomfort during the survey process. Furthermore, the documents included contact information for the researchers, allowing participants to seek clarification or ask any questions regarding the study. This transparent communication aimed to build trust and ensure that participants felt comfortable and well-informed before providing their consent. Throughout the survey administration process, respondents were granted the flexibility to skip any questions they felt uncomfortable answering, further emphasising the ethical commitment to voluntary and informed participation.

## Results

In the initial stage of data analysis, quantitative methods were used to scrutinise the data obtained from the filled-out questionnaires. This process entailed performing a descriptive statistical analysis utilising the Statistical Package for the Social Sciences version 29.0.2 (SPSS) software, following data cleaning and screening procedures. Afterward, independent sample t-tests and one-way ANOVA were employed to assess how different factors affected the attitudes of mathematics teachers towards inclusive education in Türkiye.

The analysis of the overall mean for mathematics teachers' total scores revealed a mean score of 79.23, indicating a slightly negative attitude towards inclusive education. An independent samples t-test was performed to examine potential variances in mathematics teachers' attitudes with respect to gender. The null hypothesis posited no statistically significant disparities. Results indicated that males (N=102, M=78.82, SD=21.06) exhibited slightly lower mean attitudes compared to females (N=160, M=80.76, SD=19.66), yet this variation was not statistically significant, as evidenced by the t-test (see Table 1). Additionally, Levene's Test for Equality of Variances showed that there were no statistically significant differences detected in variances between the two groups, supporting the use of the 'equal variances assumed' t-test. Consequently, the null hypothesis was accepted, indicating that gender did not significantly affect teachers' attitudes in the current (see Table 1).

Table 1.  
*Independent samples t-test for the difference in the teachers' attitudes based on gender*

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	.438	.509	1.538	260	.125
Equal variances not assumed			1.515	204.368	.131

A one-way ANOVA was employed to investigate potential age-related variances in the attitudes of mathematics teachers. The null hypothesis suggested that age group had no significant impact on mathematics teachers' overall attitude. Nonetheless, the findings, as presented in Table 2, indicated a noteworthy impact of mathematics teachers' age group on their attitudes. Post hoc comparisons conducted with the Tukey Honestly Significant Difference (HSD) test demonstrated that the mean score for the age group 22-26 (M = 88.04, SD = 23.21) was significantly higher than that of age

groups 32-36, 37-41, and 41+. Additionally, there was no statistically significant difference observed between the age group 22-26 and the age group 32-36. These findings suggest that age has a significant influence on mathematics teachers' attitudes, particularly among younger teachers.

Table 2.  
*A one-way ANOVA for the differences in the teachers' overall attitudes based age groups.*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12606.499	4	3151.625	7.218	.000
Within Groups	112213.837	257	436.630		
Total	124820.336	261			

An analysis was conducted to determine if statistically significant differences existed in teachers' attitudes based on their prior experience in teaching students with SEN. The null hypothesis proposed no significant disparities in attitudes between mathematics teachers with and without prior experience teaching students with SEN. An independent samples t-test results indicated that mathematics teachers who had experience teaching students with SEN exhibited significantly higher mean attitudes ( $M=82.49$ ,  $SD=21.60$ ) compared to those without such experience ( $M=64.85$ ,  $SD=16.82$ ), with  $t(128.994)=6.714$ ,  $p=0.000$ . Thus, the null hypothesis was rejected, confirming a significant difference in attitudes between the two groups, as indicated in Table 3. Also, an independent samples t-test was used to compare attitudes based on the type of SEN teachers who had experience teaching. Results revealed significant differences in attitudes towards students with mild mental disabilities ( $t(231.651)=3.727$ ,  $p=0.000$ ), orthopaedic impairments ( $t(260)=2.152$ ,  $p=0.032$ ), and ADHD ( $t(260)=2.276$ ,  $p=0.024$ ). These findings suggest that mathematics teachers' attitudes vary depending on their experience teaching different types of SEN.

Table 3.  
*Independent samples t-test for the difference in the teachers' attitudes based on the experience of teaching students with SEN*

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	6.012	.015	5.894	260	.000

Equal variances not assumed	6.714	128.994	.000
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Furthermore, the study aimed to examine if there were notable differences in mathematics teachers' attitudes depending on their training in inclusive education. The null hypothesis posited no significant alterations between attitudes of mathematics teachers with and without prior training in inclusive education. The results of an independent-samples t-test indicated a noteworthy disparity in the overall attitude scores between mathematics teachers who had received prior training in inclusive education and those who had not. Teachers with prior training exhibited a higher mean attitude score ( $M = 84.22$ ,  $SD = 23.06$ ) compared to those without training ( $M = 69.49$ ,  $SD = 16.46$ ). Additionally, the Levene's Test for Equality of Variances indicated significance, as shown in Table 4, warranting the use of unequal variances in the t-test. These findings indicate the rejection of the null hypothesis and suggest a significant difference in overall attitudes between mathematics teachers with and without prior training in inclusive education.

Table 4.

*Independent samples t-test for the difference in teachers' attitudes based on the training received on inclusive education*

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	8.099	.005	5.651	260	.000
Equal variances not assumed			6.030	258.873	.000

The null hypothesis posited that there would be no statistically significant differences in the attitudes of mathematics teachers who had prior experience with children with SEN compared to those who did not. An independent-samples t-test analysis revealed that mathematics teachers who had a friend with SEN had a slightly higher mean attitude score ( $M = 80.51$ ,  $SD = 20.42$ ) than those who did not ( $M = 77.97$ ,  $SD = 22.11$ ). However, the t-test did not reveal a statistically significant difference between the two groups ( $t(260) = 0.639$ ,  $p = 0.523$ ), indicating that the null hypothesis was accepted. Therefore, there were no noteworthy differences in mathematics teachers' attitudes regarding whether they had an acquaintance with SEN. However, an independent-samples t-test analysis revealed that mathematics teachers who had a family member with SEN had a substantially higher mean attitude score ( $M = 93.53$ ,  $SD = 22.85$ ) compared to those who did not ( $M = 75.57$ ,  $SD = 20.57$ ). The t-test indicated a statistically significant difference between the two

groups ( $t(260) = 4.994$ ,  $p = 0.000$ ), leading to the rejection of the null hypothesis. These findings imply a notable divergence in the overall attitudes of mathematics teachers depending on whether they had a family member with SEN.

A Wald Chi-Square test revealed a statistically significant relationship between the intersection of gender, age, and years of teaching experience and mathematics teachers' attitudes towards inclusive education,  $X^2(1, N = 262) = 7.85$ ,  $p = .005$ . Specifically, Male teachers between the ages of 22 and 26, had less than two years of teaching experience, demonstrated the highest average attitude score ( $M = 115.50$ ,  $SD = 13.00$ ) compared to other groups. These findings underscore the importance of considering the nuanced interplay of demographic variables in shaping mathematics teachers' attitudes towards inclusion.

In conclusion, the current study elucidates various factors influencing mathematics teachers' attitudes towards inclusive education in Turkish lower secondary schools. While gender did not significantly affect attitudes, age emerged as a significant factor, particularly among younger teachers. Additionally, teachers' familiarity with diverse types of SEN significantly impacted their attitudes, with those having prior training in inclusive education exhibiting more positive attitudes. Moreover, having a family member with SEN significantly influenced teachers' attitudes, indicating a personal connection's profound impact. These findings underscore the importance of targeted training programs and assistance for teachers to foster more inclusive attitudes.

### Discussion

The findings of this study offer valuable insights into the attitudes of mathematics teachers toward inclusive education in Turkish lower secondary schools, considering various influencing factors. The overall slightly negative inclination among mathematics teachers toward inclusive education is concerning. This result suggests a critical need for interventions aimed at shifting teachers' mindsets to be more inclusive. This negative inclination could stem from a lack of adequate training or exposure to inclusive practices, echoing the sentiments found in existing literature (de Boer et al., 2011; Desombre et al., 2021; Hassanein et al., 2021). To address this issue, targeted professional development programs focusing on the benefits and strategies of inclusive education could be essential.

Regarding gender differences, the study found no significant effect of gender on mathematics teachers' attitudes. This lack of significant disparity aligns with some studies (Artiles et al., 2011) but contrasts with others that report gender differences in perceptions and approaches to inclusive practices (Savolainen et al., 2012). The variability in these findings suggests that the influence of gender on attitudes toward inclusive education might be context-dependent. For instance, cultural factors or the gender distribution within the teaching profession in specific regions might play a role. In Turkey, where traditional gender roles are still influential, the lack of gender

difference in this study might reflect a broader societal shift towards gender equality in professional attitudes, particularly in education.

Age emerged as a significant variable influencing mathematics teachers' attitudes, with younger teachers displaying more positive attitudes compared to their older colleagues. This generational shift suggests that newer cohorts of teachers might be receiving more comprehensive training in inclusive education or are more open to progressive educational practices. Previous research supports this trend, highlighting age as a determinant of attitudes (Alnahdi & Schwab, 2021; de Boer et al., 2011; Khalid & Othman, 2022). Younger teachers' more favourable attitudes might also be attributed to their recent exposure to inclusive education during their teacher training programs, which often emphasise current educational paradigms and inclusive practices.

The substantial impact of prior experience with students with SEN on teachers' attitudes highlights the importance of direct interaction and practical engagement. Teachers with hands-on experience in teaching students with SEN are likely to develop a deeper understanding and empathy, leading to more favourable attitudes. This finding is consistent with the literature, which underscores the significance of practical experience in shaping teachers' perceptions (Kauffman et al., 2018; McCarthy, 2019; Schwab, 2019). Schools could benefit from creating more opportunities for teachers to gain experience with SEN students through internships, co-teaching models, or special assignments.

Training in inclusive education significantly influenced teachers' attitudes, with those having received training exhibiting more favourable attitudes. This underscores the efficacy of targeted professional development programs. Comprehensive training not only equips teachers with the necessary skills but also positively shifts their attitudes towards inclusion. This finding aligns with existing research emphasising the critical role of professional development in fostering inclusive mindsets (Istiaryah et al., 2019; Schwab et al., 2024). Policymakers and educational institutions should prioritise ongoing professional development and ensure that inclusive education is a core component of teacher training curricula.

An unexpected yet significant finding was the influence of personal connections, particularly family relationships, on teachers' attitudes. While having a friend with SEN did not significantly impact attitudes, having a family member with SEN emerged as a significant factor shaping attitudes. This underscores the importance of considering individual experiences and personal connections when designing interventions and support systems for teachers. The study suggests that personal connections with family members may foster a deeper sense of empathy and understanding toward individuals with SEN, thereby influencing attitudes toward inclusion. This finding adds a novel dimension to existing literature, which has traditionally focused more on professional experiences (Rakap et al., 2017; Valle-Flórez et al., 2022).



In conclusion, integrating the results of this study with existing literature, this research provides a nuanced understanding of the multifaceted nature of variables affecting mathematics teachers' attitudes towards inclusive education. Factors such as age, gender, prior experience with SEN, training, and personal connections play crucial roles. Addressing these factors through targeted interventions can foster more inclusive mindsets among teachers, ultimately contributing to creating supportive and equitable learning environments for all students. Policymakers and educators must consider these insights to develop comprehensive strategies that promote inclusive education.

### **Limitations and Future Research**

While the study offers valuable insights into mathematics teachers' attitudes toward inclusive education, several limitations warrant acknowledgment. The study's reliance on self-reported measures may introduce bias, as participants might provide responses that they believe are socially acceptable. Additionally, narrowing the focus to mathematics teachers restricts the applicability of the findings to other subjects. To enhance future research, longitudinal designs could be employed to explore the long-term impact of interventions and training programs on teachers' attitudes toward inclusion. Moreover, conducting comparative studies across diverse educational contexts and cultural settings could provide valuable insights into the universal factors influencing attitudes toward inclusive education. Furthermore, employing qualitative research methods like focus groups could provide deeper insights into the underlying motivations and experiences that shape teachers' attitudes.

### **Conclusion**

In conclusion, the current study highlights the significance of understanding and addressing the multifaceted factors affecting mathematics teachers' attitudes towards inclusive education. By revealing a slightly negative disposition overall, the research highlights the need for targeted interventions to promote more inclusive mindsets among teachers. The findings emphasise the critical role of age, experience, training, and personal connections in shaping these attitudes, providing valuable insights for designing effective strategies to foster inclusive practices within the Turkish educational context.

Moreover, in shedding light on the intricate interaction between individual and contextual elements, this study enhances our understanding of inclusive education. By recognizing the significance of these factors, teachers and policymakers can develop comprehensive initiatives aimed at cultivating a more inclusive culture within schools. Ultimately, by addressing the identified barriers and leveraging the identified facilitators, stakeholders can work collaboratively to create learning environments that celebrate diversity, accommodate individual needs, and promote the holistic development of all students.

## Research and Publication Ethics Statement

This study was carried out with the approval and under the scrutiny of the Ethics Committee of the UCL Institute of Education (approval reference no: Z6364106, dated 13.03.2018). There is no conflict of interest.

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### Geniřletilmiř zet

đretmenlerin kaynařtırma eđitimine ynelik tutumları, bu eđitimin bařarılı bir řekilde uygulanması iin kritik bir neme sahiptir. Literatürdeki alıřmalar, đretmenlerin kaynařtırma eđitimine ynelik pozitif tutumlarının, zellikle zel eđitim ihtiyaları olan đrencilerin sınıflara entegrasyonunu desteklediđini

göstermektedir (Desombre vd., 2021; Hassanein vd., 2021; Istiarsyah vd., 2019). Ayrıca, öğretmenlerin kaynaştırma eğitimine dair endişeleri ve algıları, sınıf içindeki kaynaştırma uygulamalarını doğrudan etkilemektedir (Jury vd., 2023). Pozitif tutumlar, öğretmenlerin özel gereksinimleri olan öğrenciler için daha etkili öğretim yapmalarına ve böylece daha destekleyici ve kapsayıcı bir sınıf ortamı oluşturmalarına yardımcı olmaktadır (Larosa vd., 2022). Bu tutumlar, kaynaştırma uygulamalarının devamlılığı ve sunulan eğitimin kalitesi için de hayati önem taşımaktadır (Gidlund, 2018). Ayrıca, kaynaştırıcı ortamlar, öğrencilerin sosyal katılımını ve akademik performansını önemli ölçüde artırmaktadır (Hussien & Al-Qaryouti, 2014). Öğretmenlerin kaynaştırma eğitimine yönelik tutumları, eğitim deneyimleri ve aldıkları destek gibi faktörlerden etkilenmektedir (Bodhi vd., 2021). Ayrıca, sosyal destek, öğretmenlerin algılarını ve uygulamalarını şekillendirebilmektedir (Desombre vd., 2021). Bu nedenle, öğretmenlerin tutumlarını hedefleyen profesyonel gelişim programları, kaynaştırma eğitiminin pozitif bir tutumla uygulanmasını sağlamada önemlidir (Desombre vd., 2021; Istiarsyah vd., 2019). Bu tür müdahaleler, eğitim uygulamalarının genel kaynaştırma rolünü ve etkinliğini artırmaktadır.

Matematik eğitimi açısından kaynaştırma büyük önem taşımaktadır, ancak sıklıkla diğer eğitim önceliklerinin gerisinde kalmaktadır. Matematik, çeşitli disiplinleri anlama ve problem çözme becerilerini geliştirmek için temel bir yapı taşıdır. Bu nedenle, kaynaştırma uygulamalarının bu alanda vurgulanması gerekmektedir. Ancak, eğitim sistemindeki önemine rağmen, matematik eğitiminde kaynaştırma genellikle göz ardı edilmektedir. "Kaynaştırma" terimi sıkça kullanılsa da çalışmalar bu kavramı detaylı bir şekilde tanımlamamaktadır. Ayrıca, matematikte kaynaştırma için kapsamlı bir teorik çerçevenin eksikliği, kaynaştırıcı uygulamaların sınıflarda pratikte uygulanmasını zorlaştırmaktadır. Bu nedenle, teorik tartışma ile pratik uygulama arasındaki boşluğun kapatılması, matematik eğitiminde adil ve katılımcı öğrenme ortamlarının oluşturulması için hayati önem taşımaktadır. Matematik öğretmenlerinin kaynaştırmaya yönelik tutumlarının anlaşılması, kaynaştırıcı uygulamaların etkili bir şekilde hayata geçirilmesi ve öğrencilerin çeşitli ihtiyaçlarına yanıt vermek için kritik bir öneme sahiptir (Darragh & Valoyes-Chávez, 2019; Jaremus vd., 2020).

Öğretmenlerin kaynaştırma eğitimine yönelik tutumlarını şekillendiren faktörleri anlamak da son derece önemlidir. Yaş, cinsiyet, eğitim, önceki özel eğitim ihtiyaçları olan çocuklarla deneyim ve özel eğitim ihtiyaçları olan çocukların türleri, öğretmenlerin tutumlarını etkileyen önemli faktörler arasında yer almaktadır (Alnahdi vd., 2019; Saloviita, 2018). Örneğin, genç öğretmenler, deneyim, eğitim ve kaynaştırma uygulamalarına maruz kalma konusundaki farklılıklar nedeniyle genellikle daha pozitif kaynaştırma eğitimi tutumları sergilemektedir (Khalid & Othman, 2022; Lacruz-Pérez vd., 2021). Ayrıca, cinsiyetin öğretmenlerin kaynaştırma eğitimine yönelik tutumları üzerindeki etkisi üzerine yapılan çalışmalar, eğitim ortamlarındaki cinsiyet ile tutumlar arasındaki ilişki hakkında değerli içgörüler

sunmaktadır (Radojlović vd., 2022; Vat vd., 2015). Örneğin, kadın öğretmenlerin genellikle erkek meslektaşlarına kıyasla kaynaştırma eğitimine daha olumlu tutumlar sergilediği bulunmuştur (Alnahdi & Schwab, 2021; Sharma vd., 2014). Ayrıca, önceki özel eğitim ihtiyaçları olan çocuklarla deneyim, özellikle onlarla akrabalık durumu ve öğretmenlerin karşılaştığı özel eğitim ihtiyaçları olan çocukların türü ve ciddiyeti, tutumları etkileyen diğer önemli faktörler arasında yer almaktadır (Alquraini, 2012; Rakap vd., 2017). Kaynaştırma eğitimindeki eğitim seviyesi de öğretmenlerin tutumlarını şekillendiren bir faktördür. Daha fazla eğitim, kaynaştırma eğitime karşı daha olumlu tutumlarla ilişkilendirilmiştir (Khalid & Othman, 2022; Lacruz-Pérez vd., 2021).

Bu çalışma, Türkiye'deki ortaokul matematik öğretmenlerinin kaynaştırma eğitimine yönelik tutumlarını belirlemek amacıyla anket yöntemini kullanmıştır. 262 öğretmenin katılımıyla gerçekleştirilen anket, cinsiyet, yaş, eğitim ve kişisel deneyimler gibi faktörlerin tutumları nasıl etkilediğini ortaya koymuştur. Veriler, çevrimiçi ve yüz yüze yöntemlerle toplanmış ve SPSS ile analiz edilmiştir. Veriler, demografik bilgiler ve öğretmen tutumlarını değerlendiren 40 maddelik ORI ölçeği kullanılarak toplanmıştır. Verilerin analizi, tanımlayıcı istatistikler ve bağımsız örneklem t-testi ile tek yönlü ANOVA kullanılarak yapılmıştır. Çalışma, etik onay alınarak ve katılımcılardan bilgilendirilmiş onam formları toplanarak yürütülmüştür.

Bulgular, matematik öğretmenlerinin kaynaştırma eğitime yönelik hafif negatif bir eğilim sergilediğini ve bu grubun daha kaynaştırıcı zihniyetler geliştirmesi gerektiğini göstermiştir. Cinsiyetin tutumlar üzerinde anlamlı bir etkisi olmamakla birlikte, yaş önemli bir belirleyici olarak öne çıkmış ve daha genç öğretmenlerin daha olumlu tutumlar sergilediği bulunmuştur. Ayrıca, önceki özel eğitim ihtiyaçları olan çocuklarla deneyim, pozitif tutumları etkileyen önemli bir faktör olarak belirlendi ve bu durum, kaynaştırma algılarının şekillenmesinde pratik deneyimin önemini vurgulamaktadır. Ek olarak, özel eğitim ihtiyaçları olan çocukların türü ve ciddiyeti de tutumları şekillendirmiş ve öğretmenlere özel destek ve eğitim ihtiyacını ortaya koymuştur. Kaynaştırma eğitime yönelik önceki eğitim, daha olumlu tutumlar gösteren öğretmenlerin varlığını ortaya koyarak, hedefe yönelik profesyonel gelişim programlarının önemini vurgulamaktadır. Ayrıca, beklenmeyen bir bulgu, kişisel ilişkilerin, özellikle ailede özel eğitim ihtiyacı olan bireylerin bulunmasının, tutumlar üzerindeki önemli etkisi olmuştur. Ailede özel eğitim ihtiyaçları olan birinin bulunması, tutumları olumlu yönde etkileyerek, bireysel deneyimlerin öğretmenler için müdahaleler tasarlanırken dikkate alınması gerektiğini göstermiştir. Sonuç olarak, bu faktörleri ele alarak, politika yapıcılar ve eğitimciler, öğretmenler arasında daha kaynaştırıcı zihniyetler geliştirebilir ve böylece tüm öğrenciler için destekleyici ve adil öğrenme ortamları oluşturulmasına katkıda bulunabilirler.