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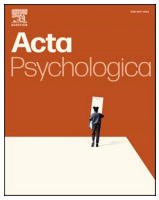

Developing a teacher perception scale for inclusive mathematics education in Turkey

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ABSTRACT

The research aims to develop a scale for assessing primary school teachers' perceptions towards the implementation of inclusive mathematics education. The research employed a scale development study utilising quantitative research methods. The study group comprised 300 teachers working in Ankara, Turkey. Following the experts' opinions and the necessary piloting procedures. The CFA (Confirmatory factor analysis) determined that the fit indices stayed within acceptable limits (CFI = 0.95, TLI = 0.94, SRMR = 0.06, RMSEA = 0.08). In addition, the average variance extracted (AVE) index was calculated as 0.65 for the convergence validity. The reliability of the scale was determined to be quite high. (ω =0.95, CR = 0.95). The result of this study demonstrated that a valid and reliable scale was developed to determine primary school teachers' perceptions of inclusive mathematics education. Furthermore, it facilitated the enhancement of educational policies and teacher development programmes by establishing the primary school teachers' perceptions regarding this approach through the utilisation of this scale.

1. Introduction

Mathematics education can be defined as a process that facilitates the growth of individuals' cognitive and social capabilities (Söderström & Palm, 2024). This process can be examined through an interdisciplinary framework (Zhexembinova et al., 2024), encompassing learning strategies (Vale & Barbosa, 2023), pedagogical approaches (Christiansen & Erixon, 2024), and cognitive processes. The objective of mathematics education is not merely the transfer of mathematical concepts and procedures but also the development of students' analytical thinking (Hidayat et al., 2024), problem-solving (Ndiung & Menggo, 2024), and critical thinking abilities (Suryani et al., 2024). In this context, effective mathematics education has been demonstrated to enhance students' cognitive flexibility (Gökçe & Güner, 2024), thereby facilitating creative solutions to complex problems (Bicer et al., 2024). Moreover, mathematics education is concerned not only with cognitive processes but also with broader issues of the social domain (Hui & Mahmud, 2023). In this regard, individuals who possess mathematical literacy skills (Çakıroğlu et al., 2024) are well-positioned to comprehend and contextualise the economic, scientific and technological challenges they encounter in society. In the present era, there are ongoing studies examining pedagogical approaches and learning styles with the objective of imparting mathematical abilities to individuals and students. Mathematics education is of significant consequence with respect to students' cognitive (Hayun & Hutami, 2024), affective and emotional intelligence domains (Mulyani & Lubis, 2024). In this context, mathematics education is regarded as a multidimensional and dynamic domain of learning that contributes to students' lifelong learning processes (Thwe & Kalman, 2024).

Inclusive education represents an educational philosophy that is designed to ensure that all students have equal access to and participation in the learning process (Büscher & Prediger, 2024). The objective of this approach is to provide differentiated teaching strategies and materials for different ability levels (Prediger & Buró, 2021), learning styles and needs (Joswick et al., 2023), with due consideration of the individual differences of students (Demo et al., 2021). Inclusive educational activities have been shown to enhance student motivation with respect to learning within the course, and this has been demonstrated to positively impact student achievement in lessons. It is particularly noteworthy that students with learning difficulties (Shin et al., 2016) or belonging to disadvantaged groups demonstrate enhanced performance in an inclusive educational environment. In this context, all stakeholders involved in education must work collaboratively to foster an inclusive learning environment. Inclusive education is not solely concerned with the acquisition of academic achievement or cognitive competencies (Mazı, 2024). This approach also encompasses the social, affective

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(Aktaş, 2024) and emotional (Padilla et al., 2024) aspects of students' development. In this regard, it seeks to facilitate students' integration into society and to encourage them to engage with the challenges they encounter in their daily lives critically and reflectively (Büscher & Prediger, 2024). It is not sufficient to implement inclusive education as a sole strategy to enhance the quality of the teaching process. Moreover, it is crucial to ensure that teachers develop professionally and affectively according to this approach.

The perception of teachers about the implementation of inclusive education exerts a decisive and efficacious influence on the quality of the educational process and the academic achievement of their students (Vodičková et al., 2023). The perceptions of teachers concerning the implementation of an inclusive education programme directly influence their pedagogical approaches and the style of interaction with their students (Almalky & Alrabiah, 2024). It can be posited that educators who perceive inclusive education in a favourable light tend to favour differentiated pedagogical strategies, intending to ensure the active incorporation of students with diverse capabilities and needs into the learning process (Scherer, 2019). This approach facilitates a deeper comprehension of mathematical concepts, particularly for students with learning difficulties or special needs, and enhances their academic performance (Mazı, 2025). Furthermore, a positive perception of teachers among students fosters self-confidence and motivation towards mathematics, which in turn enhances the inclusivity of the educational environment (Lindenskov & Lindhardt, 2020). Teachers' embrace of inclusive education approaches and the development of competencies in this regard represent a fundamental element in the success of mathematics education (Moran, 2007).

Inclusive mathematics education represents a comprehensive approach that is designed to ensure that all students, regardless of their learning needs, are able to access learning opportunities on an equal basis. The effective implementation (Forgasz & Cheeseman, 2015) of this approach is dependent upon teachers' perceptions of inclusive mathematics education and their capacity to reflect these perceptions in the classroom environment. It is only through a positive perception of the diversity among their students in terms of ability, language skills, and cultural backgrounds that teachers can facilitate the active participation of these students (Jardinez & Natividad, 2024; Mudhar et al., 2024). In this context, the perceptions that teachers hold regarding inclusive mathematics education play a pivotal role in shaping their pedagogical approaches, the materials they select for use in the classroom, and their interactions with students (Mazı, 2025). Teachers with a positive perception of their role facilitate more interactive and multifaceted lessons, employing a variety of learning techniques, including cooperative learning activities, the use of visual aids and practical work (Ljungblad, 2020). The establishment of an inclusive learning environment has been demonstrated to enhance students' interest in mathematics, bolster their self-confidence and ensure that the course is accessible and meaningful for all students (Civil et al., 2019). In this context, an examination of teachers' perceptions of inclusive mathematics education is crucial for the implementation of practices that promote equality of opportunity in education and facilitate the optimal development of students' abilities. A review of the literature reveals the existence of studies (Fälth & Selenius, 2022; Khan et al., 2017) examining teacher perceptions of inclusive education. Nevertheless, there is a dearth of research in the literature investigating the perception of primary school teachers about inclusive mathematics education. Furthermore, it is noteworthy that teachers' perceptions are generally determined using interview techniques (Magumise & Sefotho, 2018; Mutanga, 2024) or attitude scales (Mishra et al., 2018). The utilisation of psychometrically validated instruments to evaluate teachers' perceptions has been demonstrated to yield more accurate results than traditional methods, such as interviews or general attitude scales. While interviews yield rich qualitative data, they lack the standardisation necessary for large-scale comparisons. Attitude scales, which are designed to measure attitudes rather than perceptions, are unable to capture the distinct anxiety (cognitive activity accompanying concern) and commitment components specific to perception. Consequently, the development of a context-specific perception scale based on theoretical frameworks and subject to expert review and rigorous statistical validation is essential for producing reliable, valid, and actionable data for both research and practice. In this regard, the rationale for examining primary school teachers' perceptions of the implementation of inclusive mathematics education is that other perception scales measure these teachers' general inclusive tendencies or perceptions of special education. However, the development of a scale specific to the mathematics context is important because it has the potential to provide a more comprehensive insight into primary school teachers' perceptions of content, strategy, classroom management, and student profiles in mathematics lessons. The aim of this study is to develop a scale to measure primary school teachers' perceptions of how inclusive mathematics education is implemented. Within this scope, the research question guiding the study is as follows:

RQ. Is the scale of primary school teachers' perceptions towards inclusive mathematics education a valid and reliable scale?

2. Background

Perception can be defined as a process whereby individuals select and arrange the stimuli present in their surrounding environment and then interpret and make sense of them (Ibrahim et al., 2024). It can be posited that the perception process entails the processing of sensory information within the mind (Scott & Liu, 2024). Therefore, it can be stated that both internal and external influences, such as personal experiences, attitudes (Wittmann & Wulf, 2023), beliefs, values (Sagiv et al., 2011) and the cultural background of individuals, have a significant impact on the formation of perception. Perception is the process by which individuals identify objects and events in the physical environment, as well as make sense of the relationships between stimuli (Airlangga et al., 2024). This cognitive process enables individuals to adapt to their physical environment, to obtain information from their surroundings and to generate reactions based on this information (Kenyon & Sen, 2015). The cognitive processing of sensory data may occur consciously or unconsciously (Vogelsang et al., 2024). The concept of perception is examined across numerous academic fields, including social psychology (Crisp et al., 2024), sociology and educational sciences (Sak et al., 2024), as well as within the discipline of cognitive psychology (Spivey, 2023). In studies examining perception in education, it can be stated that these factors determine the attitude (Ho, 2024), expectation and reaction of students towards learning materials (Valova et al., 2024), teaching methods (McKay & Sridharan, 2023) and the physical environment in which education is carried out (Finell et al., 2024). It can be posited that students' perceptions of the material utilised in the course, the content of the course, the instructor and their experiences within the learning process directly influence their motivation (Schweder & Raufelder, 2024), their level of participation in the course and their academic achievement (Shahzad et al., 2024). It is evident that the perceptions of all stakeholders in the education system, from educators to administrators and students, play a significant role in determining the overall effectiveness and efficiency of the educational process (Süzük et al., 2011; Yas et al., 2024). An examination of the role of perception in education reveals it to be an important area of research, with significant implications for the effectiveness of learning processes, optimising classroom interactions and the development of educational

environments. In this context, an investigation of the most recent research on teacher perception in the field of inclusive education reveals that this perception can be defined in terms of three dimensions: Attitude, anxiety (cognitive activity accompanying concern) and commitment (Sam et al., 2015).

The term "attitude" is used to describe a psychological tendency that encompasses emotional, cognitive, and behavioural components, which individuals develop in response to a particular situation (Eagly & Chaiken, 2007). The construct of attitude is comprised of three dimensions: Cognitive, emotional, and behavioural. The cognitive dimension of an attitude can be defined as the beliefs, knowledge, and thoughts of a teacher regarding the subject matter of their attitudes (Di Martino & Zan, 2015). The emotional dimension pertains to the presence or absence of positive or negative sentiments associated with the situation under consideration (Deonna & Teroni, 2015). The final dimension, behavioural, concerns the expression of thoughts, feelings and attitudes in observable actions and behaviours (Svenningsson et al., 2022). The shaping of attitudes through the interrelation between these three dimensions facilitates comprehension of how individuals perceive and assess their surrounding environment, and of their responses, which are in alignment with these perceptions (Charitaki et al., 2024). Anxiety can be defined as an emotional response characterised by feelings of unease and distress experienced by a teacher in response to a specific situation or event (Thynne, 2024). Anxiety can be conceptualised as comprising four distinct dimensions: cognitive, emotional, behavioural and somatic. The cognitive dimension comprises the individual's negative thoughts and beliefs about the situation that elicit feelings of anxiety (Ingram & Kendall, 1987). The emotional dimension encompasses a range of emotions, including fear, distress and tension, that are experienced in response to the situation (Barlow, 2019). The somatic dimension of anxiety can be defined as the impact of general anxiety on the body and health (Carlehed et al., 2017). The final dimension of behavioural responses is characterised by observable behaviours that are associated with feelings of apprehension and distress. These include avoidance, restlessness, and escape behaviours. The integration of these four dimensions facilitates an understanding of how teachers perceive and cope with situations characterised by anxiety (Cenoz et al., 2024). The final dimension of perception is commitment, which is a psychological tendency characterised by determination, loyalty and continuity in the pursuit of a goal, relationship or school affiliation. In this context, the commitment of teachers represents an indispensable prerequisite for establishing a sustainable and efficacious educational environment, particularly regarding practices such as the integration of mathematics education for students with diverse requirements (Sam et al., 2015).

The role of teacher perception in mathematics education is to enhance the efficiency of the learning process, influencing both students' academic achievement and emotional factors (Luo et al., 2024). Teachers' perceptions during the lesson have a direct impact on their choice of teaching methods and the materials they utilise within the classroom (Cirocki & Anam, 2024). Furthermore, these perceptions can facilitate an enhancement in students' attitudes, perceptions and motivation concerning mathematics lessons (Peixoto et al., 2024). It can be reasonably deduced that in this context, teachers' perceptions of their capabilities regarding mathematics teaching have a significant impact on the quality and efficacy of the lesson (Pauli et al., 2024). A positive perception of teachers by their colleagues encourages the implementation of more innovative pedagogical strategies in the teaching and learning of mathematics. Nevertheless, a negative perception of teaching mathematics on the part of the teacher may result in a reduction in the quality of the teaching process. In this regard, the favourable perception of teachers in mathematics education facilitates the implementation of innovative pedagogical methodologies, such as inclusive mathematics education (Mazı, 2024).

3. Method

3.1. Model

The objective of this study is to develop a perception scale for primary school teachers regarding inclusive mathematics education. Following this goal, the research employed a quantitative research methodology to develop the scale. In conclusion, the study concept was defined, and a corpus of pertinent literature was assembled. The initial pool of constructs and items was developed and then subjected to expert feedback, leading to a refinement of the constructs and items. Two applications were carried out to identify potential issues in the items, and the scale tool was validated with a larger sample to ensure consistency and reliability (Mazı & Mazı, 2025).

3.2. Sampling

The first application example involved 250 teachers from primary level schools employed in six different districts (3 central +3 rural districts) in Ankara, Turkey. The second application example encompassed 300 teachers employed in 9 districts (5 central +4 rural districts) that differ from those delineated in the first application. The collection of research data was undertaken using simple random sampling techniques. In an effort to ensure diversity, the opinions of teachers from different districts were obtained. Furthermore, stratification was utilised to balance the number of teachers in both central and rural districts in the second application. Details on participants are presented in Table 1.

3.3. Data collection

Before the research process began, ethical approval for the draft version of the scale was obtained from the ethics committee. The necessary permission was granted by Necmettin Erbakan University on 26/07/2024, decision number 2024/648. After this approval, the first administration of the scale was carried out face-to-face with 250 primary school teachers. Based on the analysis of this initial application, a second administration was conducted with 300 primary school teachers using the final version of the scale.

3.4. Procedure

In accordance with the methodology of this scale development study, the first step involved generating an item pool. This pool was then subjected to content validity analysis, after which the first administration of the scale was carried out. At this stage, the content and construct validity of the scale were examined, and an EFA was conducted accordingly. In the second administration, CFA and convergent validity analyses were performed. Finally, the reliability of the scale was assessed.

3.5. Data analysis

The data analysis phase involved the implementation of various procedures, with the software JASP 0.19.3 being utilised for this purpose (Rogers, 2024). The polychoric correlation was employed within factor analyses in the study. Initially, EFA was employed to verify sample adequacy (KMO $\geq$ 0.70) and Bartlett's Sphericity Test ($p \leq .00$). Subsequently, Mardia coefficient ($p \leq .05$) were implemented to examine

Table 1
Information about participants.

First Application (EFA)					Second Application (CFA)				
Variable		N	F	%	Variable		N	F	%
Gender	Male	250	123	49,2	Gender	Male	300	135	45
	Female		127	50.8		Female		165	55
Age	20–25	250	35	14	Age	20–25	300	48	16
	26–30		42	16.8		26–30		56	18.6
	31–35		51	20.4		31–35		62	20.7
	36–40		59	23.6		36–40		66	22
	40 +		63	25.2		40 +		68	22.7
District	Central	250(6d)	155(3d)	62(d:50)	District	Central	300(9d)	170(5d)	56.7(d:55.5)
	Rural		95(3d)	38(d:50)		Rural		130(4d)	43.3(d:45.5)

multivariate normality. The determination of the number of dimensions was informed by the criterion of parallel analysis. The factor loadings (FL $\geq$ 0.40) and the total variance explained (TVE) by each factor ($\geq$ 50%) were given particular consideration. Subsequently, the CFA model fit was evaluated according to the criteria of $\chi^2/df \leq 3$, CFI $\geq$ 0.90, TLI $\geq$ 0.90, RMSEA $\leq$0.10, and SRMR $\leq$0.08. Furthermore, the convergent validity analysis yielded an AVE $\geq$ 0.50 value for each construct. Moreover, McDonald's omega ($\omega \geq 0.70$) was utilised in the context of reliability analyses. Finally, a CR $\geq$ 0.90 was obtained in Excel for structural reliability (Mazı & Mazı, 2025).

Table 2
EFA.

Item No	Skewness	Kurtosis	FL
14	−0.55	−0.05	0.86
5	−0.75	0.32	0.85
11	−0.70	0.09	0.85
6	−1.06	1.39	0.84
10	−0.90	1.22	0.84
8	−0.78	0.57	0.83
13	−0.58	−0.07	0.83
4	−0.41	0.23	0.80
9	−0.39	−0.15	0.79
16	−0.48	0.01	0.75
15	−0.67	0.65	0.75
7	−0.51	0.03	0.75
2	−0.54	0.40	0.75
3	−0.71	0.69	0.72
1	−0.89	1.10	0.71
12	−0.95	1.29	0.71
KMO and Bartlett's Test of Sphericity		0.95	0.00
Mardia coefficient and FL Threshold		p $\leq$ .05	0.60
TVE		58.84%	

4. Findings

4.1. Content validity

To ensure the content validity of the scale, feedback was obtained from three leading experts (professors) in the field of inclusive education in primary schooling. Following the expert review process, the scale was finalised with 26 items. The content validity index (CVI) was found to be 0.84. The scale has been determined to be suitable on the condition that the CVI is greater than 0.80 (Ayre & Scally, 2014). The scale employed is a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

4.2. Construct validity

4.2.1. EFA

The first administration of the scale was carried out with 250 primary school teachers, after which the data were analysed. As a first step, the suitability of the items for EFA was examined. In this process, 10 items (draft items 1, 2, 3, 7, 8, 9, 16, 21, 22, and 24) were removed from the scale because they did not meet the factor analysis criteria (e.g., normality). The EFA results from the first administration are presented in Table 2.

EFA was performed using the unweighted least squares extraction method. The EFA results indicated a KMO value of 0.95, a Bartlett's Sphericity Test value of 0.00, and a TVE of 58.84%. The minimum FL was determined to be 0.71. Finally, the scree plot illustrating the

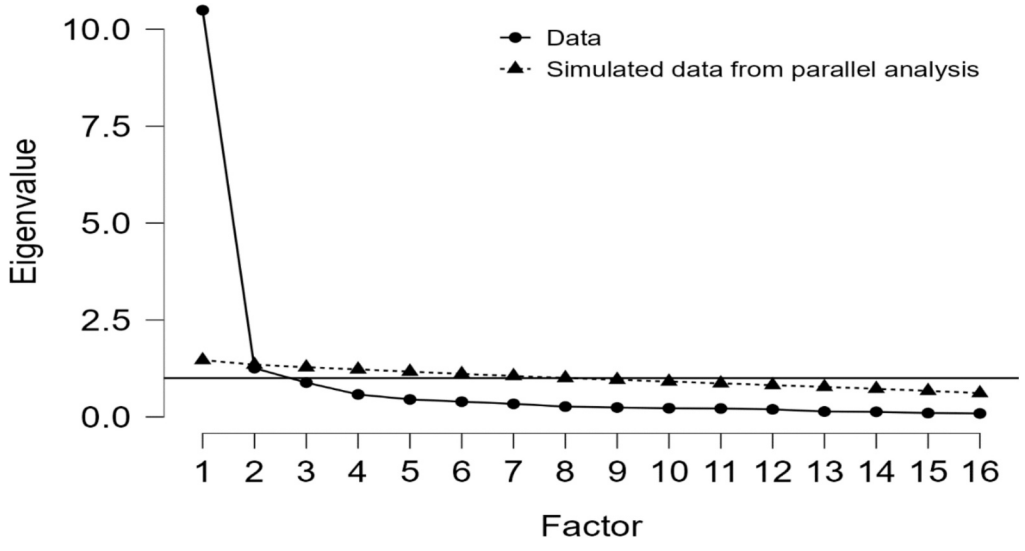

Fig. 1. Scree plot.

dimensional structure of the scale is presented below.

Upon analysis of Fig. 1, it becomes evident that the scale was unidimensional in structure. A detailed analysis of the final version of the perception scale indicated that items 5, 8 and 14 pertain to the anxiety component. It is noteworthy that the items comprising this dimension were formulated reversely. Moreover, items numbered 4, 6, 7 and 11 were associated with the commitment component. The remaining 9 items were related to the attitude dimension of perception. After the completion of the EFA, a CFA procedure followed.

4.2.2. CFA

In this section, the adequacy of the required assumptions was examined prior to conducting the CFA. This assessment showed that the scale met the necessary conditions for CFA. The findings from this analysis are presented in Table 3.

Upon analysis of the goodness of fit indices of the scale in consideration, it becomes evident that the values of the CFI and TLI indices exceeded 0.90. Furthermore, the RMSEA value was determined to be 0.08, while the SRMR value was established to be less than 0.05. The results of the CFA demonstrated that all of the indices of the scale were within the acceptable limits. (Kline, 2016). Furthermore, the resulting path diagram from the CFA is presented in Fig. 2.

The path diagram was created using the JASP software (Rogers, 2024). Furthermore, the number of modifications was kept at a minimal level. Upon examination of the aforementioned indices, it became evident that the scale displayed a considerable degree of validity (Mazı & Mazı, 2025).

Table 3
CFA.

Index	Value	Result (Fit)
χ^2/df	2.86	Acceptable
CFI	0.94	Acceptable
TLI	0.93	Acceptable
SRMR	0.04	Perfect
RMSEA	0.08	Acceptable

4.2.3. Convergence validity

The convergent validity of the scale was assessed using the AVE index. In the first application, the AVE value was calculated as 0.65, which exceeds the generally accepted threshold of 0.50, thereby indicating that the scale demonstrates adequate convergent validity. Furthermore, factor loadings were found to be at an acceptable level (FL $\geq$ 0.70), consistent with the validity criteria proposed by Fornell and Larcker (1981).

4.3. Reliability

The value of a was calculated as ω =0.95, thereby demonstrating the reliability of the scale. Furthermore, the CR value was determined to be 0.95. Upon examination of the aforementioned indices, it became evident that the scale displayed a considerable degree of reliability, as pointed out by Yıldız (2023).

5. Discussion

The present study involves the development of a valid and reliable scale to determine primary school teachers' perceptions of inclusive mathematics education. A review of the literature on perceptions of inclusive education reveals that studies are generally guided by attitudinal research. However, it is important to note that perception encompasses attitude within a broader perspective. Almalky and Alwahbi (2023) directed their attention towards the attitudinal component of perception, adopting a focused approach in their examination of the subject. In a similar vein, Crisol-Moya et al. (2023) evaluated the perceptions of prospective secondary school mathematics teachers in Spain with regard to inclusive education, taking into account their overall attitudes. Furthermore, Colmenero and Palomino's (2015) questionnaire was utilised for this purpose. The majority of research on teachers' perceptions in inclusive mathematics education focuses exclusively on the attitudinal aspect of perception. This underscores the necessity for a scale that encompasses all components of perception to evaluate teachers' perspectives on inclusive mathematics education.

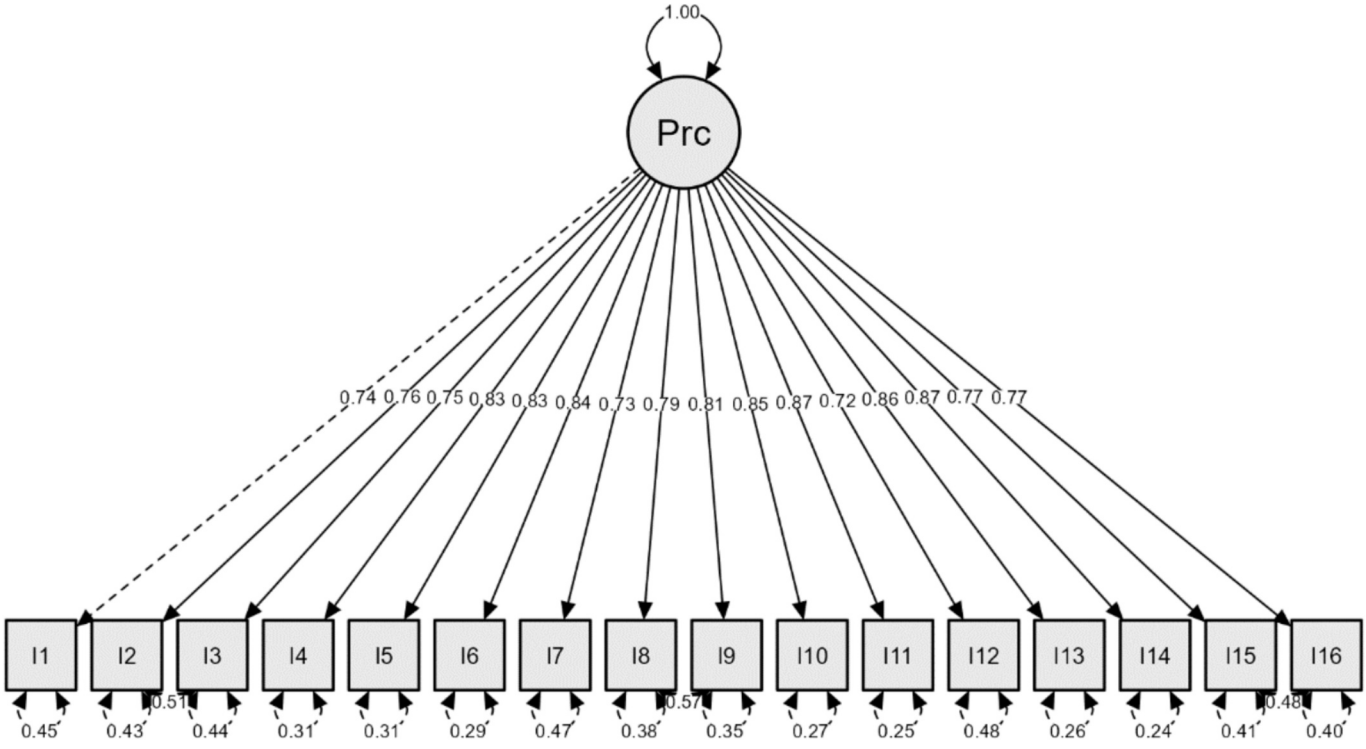

Fig. 2. Path diagram.

Consequently, Sam et al. (2015) identified the components of teachers' perceptions of inclusive education as attitude, concern, and commitment. They further noted that their developed scale encompasses these dimensions. The findings of the present study are in alignment with those of Sam et al. (2015), thus constituting a valuable contribution to the field.

A plethora of studies have been conducted on the subject, and it has been determined that, in lieu of the utilisation of scales, an array of alternative measurement tools have been favoured for ascertaining teachers' perceptions of inclusive education. Aldosari's (2022) study sought to ascertain teachers' perceptions of inclusive education. To this end, she developed and employed an Arabic version of a scale designed to capture views on the inclusion of students with disabilities in the classroom. In a further study, Mfuthwana and Dreyer (2018) elected to ascertain teachers' perceptions of inclusive education through semi-structured interviews and focus group discussions. Meanwhile, Ali et al. (2006) utilised a questionnaire in their survey of teachers' perceptions of inclusive education in Malaysia. Furthermore, Hunter-Johnson et al. (2014) also determined teachers' perceptions of inclusive education via semi-structured interviews in the Bahamas. Moreover, Vodičková et al. (2023) utilised descriptive analysis, a qualitative research method, to examine primary and secondary school teachers' perceptions of inclusive mathematics instruction. Research in this domain has historically relied on interviews or questionnaires as the primary data collection methods. The extant literature indicates that the development of a valid and reliable scale specifically targeting teachers' perceptions of inclusive mathematics education would make a valuable contribution to the field.

A further noteworthy point in the literature is that, during the determination of teachers' perceptions of inclusive education, researchers frequently focus on teachers' views regarding predominantly special-needs students in their classrooms (Aldosari, 2022; Almalky & Alwahbi, 2023; Magyar et al., 2020; Mngo & Mngo, 2018; Page et al., 2019). However, the groups included in inclusive education are not limited to students with disabilities; student populations such as refugees or immigrants have also been incorporated into classroom environments (Mfuthwana & Dreyer, 2018). The scale developed encompasses the measurement of teachers' perceptions concerning the needs of all groups included in inclusive education. In this respect, it is anticipated that the scale will address a significant gap in the extant literature.

Finally, the developed scale was compared to similar studies in the relevant literature to assess its validity and reliability. A review of the extant literature on perception scales (Balaman & Baş, 2023; Kaynak et al., 2023; Uzunboylu & Ozdamli, 2011) reveals that similar procedures have been employed to assess the reliability and validity of such scales. The perception scale developed for inclusive mathematics education is expected to make a valuable contribution to the extant body of literature on the subject.

5.1. Practical implications

The inclusive mathematics education perception scale has been developed for primary school teachers and can serve as an important diagnostic tool for determining teachers' current beliefs, attitudes, and readiness levels regarding inclusive mathematics practices. The results obtained from this scale will provide important outputs for educational institutions to evaluate the effectiveness of inclusive education policies. This will facilitate the identification of areas in which teachers require professional development.

The design and implementation of in-service training programmes have been demonstrated to contribute to the development of primary school teachers' competencies in inclusive education, including the implementation of differentiated instruction and the integration of technology in mathematics teaching. The findings from the research can enable school administrators and policymakers to review inclusive education policies, taking into account the needs of learners. This will ensure the effective planning of resources to be used in education. Furthermore, the developed scale can be utilised to evaluate the effectiveness of inclusive pedagogical approaches throughout the training of prospective classroom teachers and to ascertain the alignment between theoretical knowledge and practice.

5.2. Conclusion

This research has led to the development of a valid and reliable scale for assessing primary school teachers' perceptions of inclusive mathematics education. The scale is structured as a single dimension, labelled ‘perception’. The relationships between the model's components (attitude, anxiety and commitment) and the perception construct were examined in detail. The results indicate that the perception construct in the model corresponds to the perception dimension measured by the scale.

5.3. Suggestions for future studies

The scale has limited applicability for use with primary school teachers, but it could be adapted for use with other levels of education. For instance, it could be used with teachers at the primary, secondary, or high school level, or it could be administered to teachers of other subjects, such as mathematics. Moreover, the scale could be translated and used in other countries, with the understanding that it would have to be adapted to reflect the specific language and educational context of the country where it is used.

5.4. Limitations

This scale development study is inherently bound by methodological constraints characteristic of its design. First, the instrument's items derive exclusively from teacher perceptions within Ankara, Turkey, thereby restricting the validity and applicability of findings to this specific sociocultural milieu. Second, the participant pool's composition limited solely to primary school teachers curtails the scale's generalizability across other instructional tiers (e.g., secondary education). Third, potential measurement distortions merit consideration: respondent inclination towards socially desirable answers (social desirability bias) and investigator subjectivity during item generation/phrasing may compromise metric neutrality. Cumulatively, these limitations circumscribe the universality and transferability of outcomes.

CRediT authorship contribution statement

Ali Mazı: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Ethical approval

The research was approved by the Necmettin Erbakan University Ethics Committee on 26/07/2024, with the decision number 2024/648.

Declaration of competing interest

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

1	I believe that the school supports the principles of inclusive mathematics education.
2	I use teaching materials that reflect different cultures in my maths classes.
3	I ensure that the course materials are also suitable for students from different cultures.
4	I organise group work and discussions to help students with different learning needs to solve mathematical problems in class.
5	I am concerned about taking into account the maths learning needs of students from different cultures.
6	I organise inclusive mathematics education practices in a way that students of different ethnicities and socioeconomic status can understand.
7	I ensure that parents participate in activities related to inclusive maths education organised by the school.
8	I am concerned about implementing the principles of inclusive mathematics education in my school.
9	I believe that all students with different learning needs are given equal opportunities in our school.
10	A positive perception of inclusive mathematics education is found in the school by all stakeholders.
11	I organise mathematics problems in the lesson in a way that enables students to share their own experiences and knowledge.
12	Society supports and encourages inclusive mathematics education practices.
13	In our school, assessment and measurement tools fairly evaluate the achievement of all students with different learning styles and needs.
14	I feel anxious when setting goals in maths that all students can reach.
15	Inclusive mathematics education activities should support the mathematical exploration and creativity of all students.
16	Inclusive mathematics education practices will increase the success of all students in mathematics.

Data availability

Data will be made available on request.

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