

## Article

# Future Mathematics Teachers' Perceptions towards Inclusion in Secondary Education: University of Granada

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**Abstract:** Designing and implementing inclusive practices is considered one of the basic actions for the construction of inclusive education. Actions depend largely on teachers' attitudes, which can be modified by the training they receive. This study analyzes 73 future mathematics teachers' perceptions of the diversity training received in the Master in Compulsory Secondary Education and Post-Secondary, Vocational Training and Language Teaching (MAES), as well as their attitudes towards diversity at the University of Granada (Spain). The participants' ages ranged from 22 to 50 years ( $M = 27.12$ ,  $SD = 6.45$ ); 47.9% were cisgender women and 52.1% were cisgender men. This research was a non-experimental, descriptive, and multivariate study, developed under the assumption of the quantitative methodological paradigm. The result revealed that attention to diversity should play an important role in the teachers' future teaching practice. Nevertheless, they were dissatisfied with the initial training received, considered themselves not qualified enough to face diversity in their classrooms, and they had an ambivalent attitude toward attention to diversity. However, attitudes and educational levels were more favorable in the case of women, older participants, and among those who had had contact with people with SNES. It is concluded that it is appropriate to continue to influence the attitudes in relation to this issue, since pedagogical training on the factors that condition the teaching–learning process in terms of attention to diversity provides greater effectiveness in this field.

**Keywords:** student; training; inclusive education; special educational needs; perception; graduate



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## 1. Introduction

The variety of concepts that comprise education and a constant search for improvements in the educational system have led to reforms in most countries, and to the incorporation of the educational concepts of quality and equity [1,2], thus, it is one of the great educational challenges of the 21st century to improve the education quality received by students with different abilities and interests.

The inclusive school is the educational approach currently accepted in most countries to attend to students with special educational needs as human beings with the same rights as their peers. There are many terms that are currently used when talking about attention to diversity: inclusion, diversity, equity, attention to educational needs, disability, etc. Thinking about inclusive education means assuming the challenge of quality, unique, equitable, and equal education for all students. At the same time, it means establishing new professional, curricular, organizational, and structural practices that are adapted to the students' characteristics. For this reason, this study is based on an inclusive paradigm, which is why we speak of attention to diversity and specifically of attention to pupils with specific needs for educational support.

In the secondary education context, inclusive education is difficult to implement [3,4]. The teacher is the key agent for the construction of a quality inclusive school [5], since it

is not possible to make progress in changing the institutional model without working on the representations of the teaching staff, the most powerful tool for change being from the teaching staff and with the teaching staff [6].

The Spanish education system is divided into several levels. The preschool level is designed for children up to 6 years (non-compulsory). Primary education (compulsory) is formed by six academic years between the ages of 6 and 12. Secondary education is from the age of 12 to 16 (the last compulsory stage), and it can be followed by vocational training or pre-university level education. Continuous training is mainly supported through teachers' centers, which are managed by the education administration to support its pedagogical work [7].

Teachers' attitudes are a determining factor for inclusive policies' success [4,8]. A literature review shows that most teachers are in favor of inclusion. However, they are indecisive about how to participate in that process when they have to attend to it, and they have difficulties in attending to the diversity in their classroom. The results of studies by Avramidis and Norwich [9], Pegalajar-Palomino and Colmenero-Ruiz [6], Caurcel et al. [10], and Rojo-Ramos et al. [7] reflect that teachers have positive attitudes towards inclusion, although they consider it more appropriate that students with specific needs for educational support (SNES) continue to receive support in the special education classroom with a special education teacher. In this sense, authors such as Rojo-Ramos et al. [7] consider it necessary to review the curriculum and make adjustments to avoid inequalities.

Addressing diversity in mathematics is not a simple task. Mathematics teaching is a challenge for teachers in the secondary and post-secondary levels due to three reasons: the difficulties that mathematics has always represented for students throughout time, the fact that its teaching has always been focused on conceptual elements, as well as the competence developed by the students in mathematical processes [10–17].

The initial training of secondary school teachers is an interesting topic in European countries. At University of Granada (UGR), the initial training for the compulsory secondary education stage has involved developing the Master in Compulsory Secondary Education and Post-Secondary, Vocational Training and Language Teaching (MAES) [18]. This Master's program is developed and implemented with individual and collective teaching methodologies focused on the diversity of students and promoting the development of learning environments based on equity. Recent research has shown that initial training on attention to diversity determines the success of the inclusive education approach [3,5,19,20]. This Master's program improves the attitudes and confidence of future teachers, reduces their concerns about inclusion, and helps to improve their skills and self-reflection on their own abilities to pay attention to diversity [21].

In this sense, some authors [2,22] highlight how prospective teachers perceive the importance of secondary education teachers being trained in curricular aspects as well as in affective and relational skills. These studies also reveal their dissatisfaction with the time allocated to their didactic training, the theory and practice of connection and coordination among teachers.

Studies by Forlin and Chambers [21], Sharma et al. [23], Da Silva [24], and Smets et al. [25] show that students' attitudes toward attention to diversity become more favorable as they progress through their training. In contrast, a study by Triviño-Amigo et al. [26] reveals that teachers were not adequately prepared to respond to diversity in their initial training. This study highlights the importance of collaboration between specialist teachers and classroom teachers to promote the successful development of students with SNES.

Other studies [27–29] show a lack of training of secondary education professionals, especially in terms of their attention to students with low participation, demotivation towards studying [30], antisocial and unhealthy behaviors, or bullying. Smets et al. [25] and Sandoval-Mena [31] found formative deficiencies in the identification of learning difficulties, teachers' responsibilities, and cooperation among them. These deficiencies in attention to diversity can lead to feelings of disorientation, vulnerability, incapacity, disinterest, and even rejection [32–34].

Along with specific training, some studies show that contact with people with disabilities or disorders increases positive attitudes toward them [25,29,35]. Thus, direct contact and information are the bases for building and changing beliefs and behaviors [36].

A literature review shows the direct relationship between attention to diversity and the socio-demographic elements of students and future professionals. The studies by Alghazo and Naggar [37] observed fewer positive qualities in terms of the attention to diversity paid by men, while Batsiou et al. [38] noted more favorable attitudes. Opdal et al. [39] found that women were more likely to develop inclusive practices. These results are contrary to those of Hodge et al. [40], Kudláèk et al. [41], Parasuram [36] and Flores, and Villardón [20], who find no significant differences according to gender. Studies focus mainly on defining the knowledge and competencies required of mathematics teachers at any level to cope with teaching the discipline [42], without explicitly addressing knowledge related to educational inclusion and special education needs.

This research reveals the lack of studies on how to address the training of mathematics teachers to work with students with special educational needs [43]. Furthermore, traditional mathematics learning environments are not designed for students with SNES [42], creating barriers for learning [44] and defining students only by their deficiencies [43]. It should not be forgotten that some key elements required for the teaching–learning process to be inclusive and promote attention to diversity must be considered [45,46]. These key elements include, for example, considering differences learning opportunities, fostering a good working environment among peers where dialogue and communication predominate, attending to multiple types of intelligence including ICT, encouraging active participation, or making the appropriate adaptations to students who need it. Additionally, other key elements can be working cooperatively by using dynamic methodologies, assessing and removing barriers to participation and learning, taking care of language and promoting its inclusive use, using learning support resources (qualified staff and accessible resources), and ultimately promoting universal accessibility by complying with the principles of Universal Design for Learning (UDL).

This study analyzes prospective mathematics teachers' perceptions of the diversity training received in the MAES, as well as their attitudes toward diversity. In this sense, the research questions that allow us to specify the study objectives and hypotheses are: How do students of the MAES specialization in mathematics perceive the training they received on attention to diversity? What attitudes do the students have toward diversity? Do the perceptions and attitudes of students of the MAES specialization in mathematics differ in terms of the training they received on attention to diversity according to the variables studied?

The study objectives are (a) to describe the students' perceptions of the level of training provided by the MAES to prepare them to respond to the educational needs of students in the classroom; (b) to analyze the students' perceptions of their teacher training on attention to diversity; (c) to know the students' attitudes toward diversity; (d) to define differences according to socio-demographic variables and those related to the participants: age, sex, gender, the presence of SNES, typology, contact with people with SNES, the frequency of such contact, and the quality of such contact. By empirical judgment, the following hypotheses are put forward:

**H1:** *Students perceive their level of training on responding to the educational needs of students in the classroom as improvable.*

**H2:** *Students perceive their teaching training related to attention to diversity as unsatisfactory.*

**H3:** *Students have adequate attitudes toward diversity.*

**H4:** *Students' perceptions are influenced by sex/gender (these characteristics being referred to as interchangeable from hereon due to the fact that they matched in all participants in the sample), age, whether they have SNES, whether they are in contact with people with SNES, and the frequency and quality of this contact.*

## 2. Materials and Methods

### 2.1. Design

This study consisted of [47] a transversal design because the data were collected at a unique time after the ending of the generic module of the MAES. It was non-experimental, since the data were simply collected and then interpreted, and we studied the phenomena as they occurred naturally without intervening so as not to distort the data. The research used a descriptive strategy based on the survey technique, since it was intended to explore the attitudes and training received through MAES, in order to know the real situation and be able to improve it. This study was developed under the quantitative paradigm. This choice was made based on the study objectives, which aim to describe the participants' attitudes towards diversity.

### 2.2. Participants

The study population consisted of 88 students from the MAES of the University of Granada, specializing in Mathematics. As inclusion criteria, the participants must have been enrolled in the "Educational processes and contexts" module, they must have wanted to take part in the study and have signed the informed consent, and they must have fully completed the questionnaire. The exclusion criterion was the presence of serious sensory-perceptual or motor SNES that prevented them from completing the questionnaire by themselves. A non-probabilistic sampling of convenience was used.

Finally, 73 participants, who answered the online questionnaire, took part in this research. Hence, the sample obtained was representative, presenting a confidence level of 95% and a margin of error of less than 4.8%. This value is slightly below the lowest error limit usually used in educational research (5%). None of the participants had serious sensory-perceptual or motor SNES that prevented them from completing the questionnaire by themselves.

The participants' ages ranged from 22 to 50 years ( $M = 27.12$ ,  $SD = 6.45$ ); 49.3% ( $N = 36$ ) of them were between 22 to 24 years. The sample was mostly sex-balanced, and the biological sex of the participants matched their gender identity. Table 1 displays the socio-demographic, academic, and relational data on the sample of participants.

### 2.3. Instrument

To assess the development and attitudes of the future teachers in the mathematics specialization concerning attention to diversity, we administered the validated questionnaire "Questionnaire for preservice Secondary Education teachers on perceptions about attention to diversity" by Colmenero-Ruiz and Pegalajar-Palomino [48]. The questionnaire consisted of 43 items with a Likert-type response scale ranging from 1 (strongly agree) to 4 (strongly disagree). The point values for each item ranged from 1 to 4. The results were interpreted by considering values below 2.5 as agreement or more favorable and values above 2.5 as disagreement or less favorable. The scale was composed of five factors:

1. "Elements conditioning the process of attention to diversity in the classroom" (17 items) described the present elements in the teaching and learning process that the teacher must consider in order to develop a high-quality process for paying attention to diversity in the classroom.
2. "Curricular and organizational response to diversity in the classroom" (8 items) analyzed the teachers' level of training on facing students' educational needs in the classroom.
3. "Pedagogical training for diversity" (9 items) evaluated the training received on special education in the MAES program.
4. "Educational teaching practice in attention to diversity" (5 items) analyzed how the training received enabled the future teachers to respond to the interests and concerns detected in students with SNES.

5. “Pedagogical perception of the student with SNES” (4 items) explored the future mathematics teachers’ attitudes toward attention to diversity and their responses to educational needs such as receiving attention in the classroom in general.

**Table 1.** Socio-demographic, academic, and relational data of participants.

Variables	N (%)	
Age	G1: 22–24 years	36 (49.3)
	G2: 25–27 years	17 (23.3)
	G3: Over 28 years	20 (27.4)
Sex	Women	35 (47.9)
	Men	38 (52.1)
	Others	0 (0)
Gender	Female	35 (47.9)
	Male	38 (52.1)
	Other	0 (0)
Presence of SNES	No	41 (56.2)
	Yes	32 (43.3)
Typology	Behavioral	16 (50.0)
	Visual	9 (28.1)
	Emotional	3 (9.4)
	Mental	2 (6.3)
Contact with persons with SNES	No	29 (33.7)
	Yes	44 (66.3)
Frequency of contact	Almost never	3 (6.8)
	Rarely	16 (36.4)
	Often	19 (43.2)
	Very often	6 (43.2)
Quality of contact	Very negative	0 (0)
	Negative	1 (2.3)
	Neutral	13 (29.5)
	Positive	21 (47.7)

The instrument presented good psychometric properties, with a Cronbach’s Alpha of 0.92 for the global scale, ranging from 0.81 to 0.96 for the dimensions [48], and a of 0.85 for the study participants, ranging from 0.71 to 0.91 for the dimensions. Good reliability values were indispensable for the use of these results [49]. In our study, values above 0.70 were obtained in all dimensions, in line with similar studies [7,50].

Moreover, a personal register of socio-demographic data was used to determine items such as sex (male, female, or other); gender (feminine, masculine, or other); age; the presence of any type of SNES in the participant; contact with persons with SNES; the frequency (almost never, rarely, often, very often) and quality of contact (very negative, negative, neutral, positive, or very positive).

#### 2.4. Procedure

Firstly, the approval of the University of Granada Ethics Committee on Human Research (Spain) was obtained for the study, with a favorable report being received (no.1942/CEIH/2021). Second, the research was approved by the MAES coordinator.

In the last lesson on the course “Educational processes and contexts”, participants were informed of the voluntary nature of the questionnaire, its anonymity, and data exclusivity, as well as the aims of the study. The procedure for accessing the online Google Forms questionnaire was explained, and the participants had the opportunity to ask questions. Instructions were then read aloud, and they were also available in the questionnaire. Each participant was given the informed consent form on paper to sign, and an access link



was handed out with a single-use numerical password. The participants then had an hour to voluntarily complete the questionnaire. In addition, the participants' anonymity was guaranteed by removing the internet protocol (IP) before downloading the data from Google Forms. The study researchers were not part of the teaching staff who taught the compulsory subject of mathematics.

### 2.5. Data Analysis

The data were analyzed using the SPSS statistical program, version 28.0, calculating measures of central tendency (median) and dispersion (interquartile range), as well as frequencies (percentages). To verify the data normality and variance homoscedasticity, a graphic representation of the data was constructed using a histogram with a normality curve and the Kolmogorov–Smirnov ( $n > 50$ ) and Shapiro–Wilk (groups  $n < 50$ ) normality tests, and since the values were less than 0.05, the non-parametric statistics were chosen. For the dichotomous variables of sex, gender, the presence of SNES, and contact with people with SNES, the Mann–Whitney U-test was used, and for the rest of the variables of diverse values, the Kruskal–Wallis test was used. An analysis of the effect size estimation was conducted by calculating Cohen's  $d$  (small:  $0.20 < d < 0.30$ ; medium:  $0.30 < d < 0.80$ ; and large:  $d > 0.80$ ) and the Eta-squared values (small:  $0.01 < \eta^2 < 0.05$ ; medium:  $0.06 < \eta^2 < 0.13$ ; and large:  $\eta^2 > 0.14$ ).

To exhaustively analyze the MAES students' evaluations of attention to diversity, the mean scores and standard deviations obtained in each of the items of the different factors that make up the questionnaire were examined.

## 3. Results

### 3.1. Conditioning Elements of the Process of Paying Attention to Diversity in the Classroom

Looking at the median and interquartile range values in Table 2, it can be seen that the participants were in full agreement with the elements of the teaching–learning process that teachers should consider to provide quality attention to diversity. They agreed more strongly that it was the school's duty to attend to all students (item 1) and that attention to diversity should play an important role in their future teaching practice (item 2). Similarly, they considered paying attention to diversity all teachers' responsibility (item 10). In order for it to be of high quality, it requires the motivation and professional interest of each teacher (item 31), together with collaborative work (item 16) and coordination (item 32) among all professionals in the educational center. It is also important to have an adequate teacher–student ratio (item 30), sufficient and appropriate human and material resources (item 29), and specific initial training (item 28).

Even with values still above the mean, a lower degree of agreement was found in the responses to the item that posited that the most effective way to cater for diversity is the combination of schooling modalities for students with SNES between the support classroom and the regular classroom (item 14), that the support of the schools' management is a priority (item 9), and that greater importance should be associated with attention to diversity in the MAES curriculum (item 20).

All the independent variables analyzed were shown to discriminate between responses, except for those to "frequency" and "quality" of contact ( $p > 0.05$ ). In terms of sex/gender, statistically significant differences were observed in 4 of the 17 items analyzed (Table 3). The women agreed more than the males that a quality process of paying attention to diversity requires the coordination of teachers (item 32:  $U = 507.50, p = 0.036$ ) and specific initial training on attention to diversity [item 28:  $U = 405.00, p = 0.001$ ], with medium and large effect sizes, respectively. They also considered the combination of schooling modalities for students with educational needs between the support classroom and the regular classroom as very effective to a greater extent than men, with a moderate effect size [item 14:  $U = 487.00, p = 0.034$ ]. They were also more concerned about students experiencing inclusion in the classroom [item 13:  $U = 507.50, p = 0.036$ ], with a medium size effect.

**Table 2.** Measurements of trend and dispersion of the conditioning elements of the process of paying attention to diversity in the classroom.

ITEM	Me	IQR	%			
			1	2	3	4
1. It is a school duty to take care of all pupils.	1.00	0.00	89.0	11.0	0	0
2. Attention to diversity must play an important role in my future teaching practice.	1.00	0.00	79.5	19.2	1.4	0
4. Attention to diversity in the classroom enriches the entire educational community.	1.00	1.00	61.6	32.9	4.1	1.4
6. The family's attitude influences the quality of education of students with SNES.	1.00	1.00	69.9	28.8	1.4	0
8. I consider the work of the Guidance Department to be fundamental in the response to the educational needs of students.	1.00	1.00	65.8	31.5	1.4	1.4
9. In the attention to diversity, the school's management support is a priority.	2.00	1.00	41.1	49.3	8.2	1.4
10. Attention to students with SNES is the all teachers' responsibility.	1.00	1.00	71.2	24.7	4.1	0
11. Attention to diversity can be carried out in each and every one of the areas in Secondary Curriculum.	1.00	1.00	64.4	24.7	11.0	0
13. As a teacher, my concern is that students achieve inclusion in the classroom.	1.00	1.00	65.8	30.1	4.1	4.1
14. The most effective way to deal with diversity is to combine the schooling of students with SNES between the regular classroom and the support classroom.	2.00	1.00	20.5	45.2	332.9	1.4
16. In order to provide better attention to diversity, it is necessary to work collaboratively among all the professionals in the educational center.	1.00	1.00	74.0	23.3	2.7	2.7
20. Greater importance should be given to attention to diversity in the curriculum of the Master's degree I am studying.	2.00	1.00	46.6	47.9	2.7	2.7
28. A quality process of attention to diversity requires: Initial training on attention to diversity.	1.00	1.00	65.8	31.5	1.4	1.4
29. A quality process of attention to diversity requires: Sufficient and appropriate (human and material) resources.	1.00	1.00	65.8	31.5	2.7	0
30. A quality process of attention to diversity requires: Adequate teacher-student ratio.	1.00	1.00	71.2	21.9	6.8	0
31. A quality process of attention to diversity requires: Motivation or professional interest of the teacher.	1.00	.00	87.7	8.2	4.1	0
32. A quality process of attention to diversity requires: Coordination among teachers.	1.00	.00	78.1	21.9	0	0

Note. Me = median; IQR = interquartile range.

**Table 3.** Significant differences in the conditioning elements of the process of paying attention to diversity in the classroom according to sex/gender.

Dependent Variables	Man/Male			Woman/Female			U	d
	Me	IQR	MR	Me	IQR	MR		
13. As a teacher, my concern is that students achieve inclusion in the classroom.	1.00	1.00	41.14	1.00	.00	32.50	507.50 *	0.54
14. The most effective way to deal with diversity is to combine the schooling of students with SNES between the regular classroom and the support classroom.	2.00	1.00	41.68	2.00	2.00	31.95	487.00 *	0.54
28. A quality process of attention to diversity requires: initial training on attention to diversity.	2.00	1.00	43.84	1.00	.00	29.57	405.00 **	0.86
32. A quality process of attention to diversity requires: co-ordination among teachers.	1.00	1.00	40.53	1.00	.00	33.17	531.00 *	0.52

Note. Me = median; IQR = interquartile range; MR = means rank; U = Mann–Whitney U-test; d = Cohen's d; \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

In terms of age, the Kruskal–Wallis test found that only one of the twelve items, item 11, was discriminant ( $H(2) = 6.687$ ;  $p = 0.035$ ,  $\eta^2 = 0.09$ ), with the older participants ( $Me_{G3} = 1.50$ ,  $IQR_{G3} = 1.00$ ,  $MR_{G3} = 32.30$  vs.  $Me_{G2} = 1.00$ ,  $IQR_{G2} = 0.00$ ,  $MR_{G2} = 31.91$ ) being those who agreed less that attention to diversity could be paid in each and every one of the areas that make up the secondary education curriculum.

Participants with SNES were the most in favor of the idea that attention to diversity in the classroom enriches the whole educational community (item 4:  $U = 430.50, p = 0.003$ ;  $Me_{Yes} = 1.00, IQR_{Yes} = 0.00, MR_{Yes} = 29.95$  vs.  $Me_{No} = 2.00; IQR_{No} = 1.00, MR_{No} = 42.50$ ).

The participants who had had contact with people with SNES (Table 4) agreed more, with a medium effect size, that paying attention to students with SNES should be the responsibility of all teachers (item 10:  $U = 431.50, p = 0.003$ ), highlighting the importance of the work of the Guidance Department and its fundamental role in the response to students' needs (item 8:  $U = 490.50, p = 0.044$ ). They are also the group that most strongly considered that paying attention to students with SNES requires sufficient and appropriate human and material resources in order for it to be of high quality, with a medium size effect (item 29:  $U = 478.50, p = 0.030$ ), and that attention to diversity could be paid in each and every one of the areas in the secondary education curriculum (item 11:  $U = 478.50, p = 0.038$ ).

**Table 4.** Significant differences in the conditioning elements of the process of paying attention to diversity in the classroom depending on the frequency and quality of contact with people with SNES.

Dependent Variables	No			Yes			U	d
	M	SD	MR	M	SD	MR		
8. I consider the work of the Guidance Department to be fundamental in the response to the educational needs of students.	1.00	1.00	42.09			33.65	490.50 *	0.49
10. Attention to students with SNES is the all teachers' responsibility.	1.00	1.00	44.12	1.00	.00	32.31	431.50 **	0.70
11. Attention to diversity can be carried out in each and every one of the areas in Secondary Curriculum.	1.00	1.00	42.38	1.00	1.00	33.65	482.00 *	0.55
29. A quality process of attention to diversity requires: Sufficient and appropriate (human and material) resources.	1.00	1.00	42.50	1.00	1.00	33.38	478.50 *	0.49

Note.  $Me$  = median;  $IQR$  = interquartile range;  $MR$  = means rank;  $U$  = Mann–Whitney U-test,  $d$  = Cohen's  $d$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ .

### 3.2. Curricular and Organizational Response to Diversity in the Classroom

With regard to the level of training attained by the participants to fulfill the educational needs of students in the classroom (Table 5), the participants stated that they had received adequate training on attention to diversity in terms of grouping students (item 35) and methodological strategies (item 36).

**Table 5.** Measurements of trend and dispersion in the curricular and organizational responses to diversity in the classroom.

ITEM	Me	IQR	%			
			1	2	3	4
33. I consider that my training in diversity is adequate with respect to: organization the space, organization of the school, etc.	3.00	1.00	12.3	24.7	47.9	15.1
34. I consider that my training on attention to diversity is adequate with respect to: time organization.	3.00	1.00	13.7	23.3	50.7	12.3
35. I consider that my training in teaching attention to diversity is adequate in relation to: grouping of students.	2.00	1.00	12.3	39.7	28.4	9.6
36. I consider that my training in teaching for diversity is adequate in relation to: methodological strategies	2.00	1.00	16.4	38.4	34.2	11.0
37. I consider that my training on attention to diversity is adequate in relation to: measures and programs for attention to diversity.	3.00	1.00	9.6	26.0	47.9	16.4
38. I consider that my training in teaching for diversity is adequate in relation to: selection and adaptation of objectives, competences and contents.	3.00	1.00	15.1	27.4	45.2	12.3
39. I consider my training in teaching for diversity to be adequate in respect of: selection, design and practice of activities and tasks.	3.00	1.00	6.8	34.2	41.1	17.8
40. I consider my training in diversity to be adequate in relation to: evaluation of the teaching and learning process.	3.00	1.00	6.8	27.4	47.9	17.8

Note.  $Me$  = median;  $IQR$  = interquartile range.



However, they considered that their training could be improved, as revealed by the responses to the items regarding the evaluation of the teaching and learning process (item 40), measures for and programs on promoting attention to diversity (item 37), the selection, design, and practice of activities and tasks (item 39), space organization (item 33), and time (item 34).

There were no statistically significant differences among the variables age, presence of SNES, contact, quality of contact. There were significant ( $p < 0.05$ ) differences between the answers given by the participants according to sex/gender and frequency of contact: the men disagreed more, with a medium effect size, that the training received was adequate with respect to the grouping of students (item 35:  $U = 473.00$ ,  $p = 0.024$ ,  $d = 0.53$ ;  $Me_M = 3.00$ ,  $IQR_M = 1.00$ ,  $MR_M = 42.05$  vs.  $Me_W = 2.00$ ,  $IQR_W = 1.00$ ,  $MR_W = 31.51$ ).

The frequency of contact was found to be discriminant in three of the eight items (Table 6), with participants with “almost no” contact and those with “very frequent” contact being the highest in disagreement, with a large effect size, about the training offered regarding student groupings (item Kruskal–Wallis test 35:  $H(3) = 8.866$ ;  $p = 0.031$ ) and the organization of space (item 33:  $H(3) = 8.444$ ;  $p = 0.038$ ) and time (item 34:  $H(3) = 9.111$ ;  $p = 0.028$ ).

**Table 6.** Significant differences in the curricular and organizational responses to diversity in classroom according to frequency of contact with people with SNES.

Dependent Variables	Almost Null ( $n = 3$ )		Infrequent ( $n = 16$ )		Frequently ( $n = 19$ )		Very Frequent ( $n = 6$ )		$H$	$\eta^2$
	$Me$ (IQR)	$MR$	$Me$ (IQR)	$MR$	$Me$ (IQR)	$MR$	$Me$ (IQR)	$MR$		
33. I consider that my training in diversity is adequate with respect to: space organization, school organization, etc.	4.00(0.00)	26.50	3.00(1.00)	19.67	3.00(1.00)	24.05	3.50(2.00)	21.78	3.203 *	0.19
34. I consider that my training on attention to diversity is adequate with respect to: time organization.	4.00(0.00)	19.75	3.00(1.00)	23.50	3.00(1.00)	22.69	3.00(1.00)	21.33	3.254 *	0.20
35. I consider that my training in teaching attention to diversity is adequate in respect of: grouping of students.	4.00(0.00)	21.75	2.00(1.00)	19.33	3.00(1.00)	22.69	3.00(1.00)	21.33	4.310 *	0.24

Note.  $Me$  = median;  $IQR$  = interquartile range;  $MR$  = means rank;  $H$  = Kruskal–Wallis test;  $\eta^2$  = eta-squared; \*  $p < 0.05$ .

### 3.3. Teacher Training towards Diversity

In Table 7, the median values reveal the dissatisfaction of the participants regarding their teacher diversity training. The participants only agreed with three items, stating that the training received in the MAES has helped them to increase their interest in training in this field (item 43), to develop a greater awareness of diversity (item 42), and to strengthen their professional choice to teach (item 41).

On the other hand, they expressed their disagreement with the items that posited that adequate and sufficient knowledge on attention to diversity could be required (item 17), on basic aspects of the field of special education (item 22), on the resources and services provided by the educational system (item 25), on the characteristics of students with educational needs (item 23), on the identification of educational needs in students (item 26), and on legislation related to attention to diversity (item 24).

A differential analysis revealed that the responses of the participants differed according to sex/gender, presence of SNES, contact and frequency of contact ( $p < 0.05$ ). In contrast, neither age nor quality of contact were discriminated between responses.

There were statistically significant differences only according to the variable sex/gender in item 41, with women being more likely to agree, with a large effect size, with the statement that the Master’s degree had helped them to strengthen their professional choice to

teach ( $U = 471.00, p = 0.018, d = 1.35; Me_W = 2.00, IQR_W = 1.00, MR_W = 31.46$  vs.  $Me_M = 2.00, IQR_M = 1.00, MR_M = 42.11$ ).

The participants without SNES (Table 8) were the ones who disagreed the most in terms of the knowledge on attention to diversity (item 17:  $U = 411.50, p = 0.003$ ), on the basic aspects of the field of special education (item 22:  $U = 488.50, p = 0.047$ ) acquired in the Master’s Degree, and in on legislation (item 24:  $U = 400.00, p = 0.003$ ).

**Table 7.** Measurements of trend and dispersion of teacher training towards diversity.

ITEM	Me	IQR	%			
			1	2	3	4
17. In Master’s Degree I am studying about attention to diversity.	3.00	1.00	4.1	19.2	46.6	30.1
22. After taking the generic module of Master’s Degree, I consider that I have adequate knowledge of: basic aspects of the field of Special Education.	3.00	2.00	2.7	23.3	43.8	30.1
23. After taking the generic module of the Master’s degree, I consider that I have adequate knowledge about: characteristics of students with educational needs.	3.00	2.00	4.1	28.8	41.1	26.0
24. After studying the generic module of the Master’s degree, I consider that I have an adequate knowledge of: legislation on attention to diversity.	3.00	1.00	12.3	32.9	32.9	21.9
25. After taking the generic module of the Master’s degree, I consider that I have and adequate knowledge of: resources and services provided by the educational system	3.00	1.50	5.5	23.3	46.6	24.7
26. After completing the generic module of Master’s degree, I consider that I have an adequate knowledge of: identification of educational needs in students.	3.00	1.00	4.1	35.6	37.0	23.3
41. This Master’s degree has helped me to strengthen my professional choice towards teaching.	2.00	1.00	26.0	53.4	16.4	4.1
42. This Master’s degree has helped me to become more aware of the need to pay attention to diversity.	2.00	1.00	41.1	38.4	17.8	2.7
43. This Master’s degree has helped me to increase my interest in further training in the area of attention to diversity.	2.00	1.00	41.1	38.4	19.2	1.4

Note. Me = median; IQR = interquartile range.

**Table 8.** Significant differences in teacher training on diversity according to whether or not the participant had SNES.

Dependent Variables	No			Yes			U	d
	Me	IQR	MR	Me	IQR	MR		
17. In the Master’s Degree I am studying; I have acquired sufficient knowledge about attention to diversity	3.00	1.00	42.96	3.00	1.00	29.36	411.50 **	0.63
22. After taking the generic module of the Master’s Degree, I consider that I have adequate knowledge of: basic aspects of the field of Special Education.	3.00	1.00	41.09	3.00	1.00	31.77	488.50 *	0.41
24. After studying the generic module of the Master’s Degree, I consider that I have an adequate knowledge of: legislation on attention to diversity.	3.00	1.00	43.24	2.00	2.00	29.00	400.00 **	0.77

Note. Me = median; IQR = interquartile range; MR = means rank; U = Mann–Whitney U-test; d = Cohen’s d; \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

The participants who had had previous contact with people with SENS (Table 9) agreed more, with a medium and large effect size, with the fact that knowledge about paying attention to diversity could be acquired in the MAES (item 17:  $U = 491.00, p = 0.038$ ), that it has helped them to have greater sensitivity towards attention to diversity (item 42:  $U = 382.00, p = 0.002$ ) and to increase their interest in further training in this field (item 43:  $U = 469.00, p = 0.041$ ).

**Table 9.** Significant differences in teachers' training on diversity according to contact.

Dependent Variables	No		Yes		U	d
	Me(IQR)	MR	Me(IQR)	MR		
17. In this Master's degree I am studying, I have acquired enough knowledge about attention to diversity.	3.00 (1.00)	41.73	3.00 (1.00)	32.14	491.00 *	0.48
42. This Master's degree has helped me to become more aware of the importance of attention to diversity.	2.00 (2.00)	45.83		31.18	382.00 **	0.91
43. This Master's Degree has helped me to increase my interest in further training in the field of attention to diversity.	2.00 (2.00)	42.83	1.00 (1.00)	33.16	469.00 **	0.73

Note. *M* = median; *IQR* = interquartile range; *MR* = means rank; *U* = Mann–Whitney U-test; *d* = Cohen's *d*; \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

As for the frequency of contact, statistically significant differences were only found for item 42, with a large effect size [ $H(3) = 9.767$ ;  $p = 0.021$ ;  $\eta^2 = 0.19$ ], with the participants who had had frequent ( $Me = 1.00$ ,  $IQR = 1.00$ ,  $MR = 19.16$ ) and infrequent ( $Me = 1.00$ ,  $IQR = 1.00$ ,  $MR = 20.56$ ) contact being the ones who indicated most that the Master's degree had helped them to become more aware of the need for attention to diversity.

### 3.4. Educational Teaching Practice in the Field of Attention to Diversity

In terms of how the training on responding to the interests and concerns detected in students with SNES was received (Table 10, the participants agreed that a quality process of paying attention to diversity requires previous experience on the part of the teacher with students with SNES (item 27).

**Table 10.** Measurements of trend and dispersion for the formative teaching practice on attention to diversity.

ITEM	Me	IQR	%			
			1	2	3	4
12. The education system offers the appropriate services and resources to meet the needs of students.	3.00	0.00	2.7	19.2	54.8	23.3
18. The activities or practical examples developed in the classes have improved my knowledge about attention to diversity.	3.00	1.00	8.2	38.4	39.7	13.7
19. I consider myself sufficiently qualified to face the challenge of diversity in my classroom.	3.00	1.00	4.1	15.1	43.8	37.0
21. The knowledge acquired about attention to diversity will allow me to respond to situations that may arise with students with SNES.	3.00	1.00	2.7	39.7	42.5	15.1
27. A quality process of attention to diversity requires: previous experience with students with SNES.	2.00	1.00	30.1	53.4	15.1	1.4

Note. *Me* = median; *IQR* = interquartile range.

On the other hand, they stated that they were not sufficiently qualified to face the challenge of diversity in the classroom (item 19), and disagreed that the educational system offers adequate services and resources to meet the educational needs of students in schools (item 12), that the knowledge acquired about paying attention to diversity allowed them to respond to situations that may arise among students with SNES (item 21), and that the development of activities and practical examples had improved their knowledge of this field of study (item 18).

The differential analyses carried out indicated that the evaluations of the educational teaching practice obtained in terms of attention to diversity were confirmed independently

of sex/gender, age, whether or not they had a SNES, and contact; the frequency and quality of the contact were shown to be of little importance, as statistically significant differences were only found in item 27 ( $p < 0.05$ ). Thus, participants with frequent contact ( $Me = 1.50$ ,  $IQR = 1.00$ ,  $MR = 19.97$ ), compared to those with little contact ( $Me = 2.00$ ,  $IQR = 1.00$ ,  $MR = 27.95$ ), agreed more strongly that paying quality attention to diversity requires previous experience with students with educational needs [ $H(3) = 9.625$ ;  $p = 0.022$ ;  $\eta^2 = 0.23$ ].

When the quality of contact was neutral ( $Me = 2.00$ ,  $IQR = 1.00$ ,  $MR = 25.52$ ), it was observed that participants were less likely to agree that quality attention to diversity requires previous experience with students with educational needs (item 27) compared to those for whom the quality of contact was positive ( $Me = 1.00$ ,  $IQR = 1.00$ ,  $MR = 13.88$ ) ( $H(3) = 10.550$ ;  $p = 0.014$ ;  $\eta^2 = 0.22$ ).

### 3.5. Teachers' Perceptions of SNES Pupils

The participants showed ambivalent attitudes towards attention to diversity and responses to educational needs in the classroom in general (Table 11). On the one hand, they agreed that students with special educational support needs require numerous curriculum modifications (item 15), arguing that their care involves additional work for teachers (item 7). On the other hand, they disagreed in terms of considering special education centers the best form of schooling for pupils with special needs (item 5) and in terms of defining adequate attention to diversity in secondary education as utopic (item 3).

**Table 11.** Measurements of trend and dispersion of teachers' perceptions of students with SNES.

ITEM	Me	IQR	%			
			1	2	3	4
3. Achieving adequate attention to diversity in Secondary Education is utopian.	3.00		12.3	34.2	37.0	16.4
5. Students with Specific Needs of Educational Support (SNES) would be better served in specific Special Education centers.	3.00		1.4	26.0	39.7	32.9
7. Working with students with SNES is an additional workload for the teachers.	2.00		20.5	53.4	19.2	6.8
15. Students with SNES require numerous modifications to the Curriculum.	2.00		8.2	45.2	37.0	9.6

Note. *Me* = median; *IQR* = interquartile range.

There were no significant differences between the answers given by the participants according to sex/gender, age presence of SNES, contact, and frequency. The variable quality of contact was shown to be of little significance, with statistically significant differences occurring in only one item ( $p < 0.05$ ).

When quality of contact was neutral ( $Me = 2.00$ ,  $IQR = 2.00$ ,  $MR = 19.21$ ), the participants were more likely to agree that receiving adequate attention to diversity in secondary education was utopic than those for whom quality of contact was positive ( $Me = 4.00$ ,  $IQR = 1.00$ ,  $MR = 25.00$ ) (item 3:  $H(3) = 9.802$ ;  $p = 0.020$ ;  $\eta^2 = 0.08$ ).

## 4. Discussion

Teachers are essential in guaranteeing that attention to the diversity of students in a classroom is paid [3]. This highlights the importance and reasons for the interest in this study on the perception of future mathematics teachers of the training they received on paying attention to diversity and their attitudes towards educational inclusion.

The results affirm on a general level that the participants' perceptions of attention to diversity were favorable. The results are in accordance with the studies carried out by Rojo-Ramos et al. in 2020 [7] and 2021 [51]. The participants agreed less with the questions related to the training on responding to the interests and concerns detected in students with SNES in the MAES program.

On a general level, participants have experienced difficulties with adapting their practice to the diversity in their classroom [25,52,53]. However, in this study, the participants

demonstrated, in general, good will toward the development of the process of paying attention to diversity so that students with SNES can experience full inclusion.

The inclusion of students with SNES in the current educational system is an urgent challenge that continues to provoke multiple questions and encounter various difficulties [54–56]. In this sense, the participants specializing in mathematics argued that paying attention to diversity implies additional work for the teacher, and that this should be the responsibility of both the integration support teacher and the tutor. For this, it is necessary, as indicated by Rojo-Ramos et al. [7], to provide the necessary educational facilities and create the most appropriate conditions for the participation and progress of the entire educational community. If the objective is to achieve quality inclusion, the process of paying attention to diversity must be oriented toward all students with the aim of promoting the full development of each student without discerning their individual characteristics, focusing on identifying and removing barriers in the teaching and learning process [48,57]. Quality inclusion will be possible when teachers receive adequate training on the particularities of students with SNES and on the most effective models for attending to all students in the classroom [35,58]. Most of the participants agreed that, as future teachers, to develop a quality process of paying attention to diversity in the classroom, the educational center must care for all students. In every teaching practice, paying attention to diversity is essential, although participants are aware that it may be idealistic to pay adequate attention to diversity in secondary education. Although participants considered that it is very difficult to put into practice the strategies for paying attention to diversity proposed in the current educational laws, they considered that developing a high-quality process of paying attention to diversity enriches the entire educational community [6,27,29]. Moreover, the students' attitude to diversity was very positive.

In addition to the above, the participants agreed with the need for the determination of a series of conditioning aspects for the process of paying attention to diversity in the classroom, such as the involvement and coordination of all teachers, the motivation and professional interest of each teacher, collaborative work, an adequate teacher–student ratio, sufficient and appropriate human and material resources, and, of course, specific initial training.

From this point of view, the MAES is considered a training opportunity for in-classroom training practice directed at the acquisition of specific didactic and psychopedagogical areas of knowledge and oriented toward improving the quality of the attention paid to diversity [8,10,23,59].

However, as indicated by Forlin and Chambers [21], Sharma et al. [23], and Da Silva [24], the teacher, before his daily practice in the classroom, already has prejudices, beliefs, and ideas that may hinder this process. This aspect is noteworthy, since, as stated by Hernández and Carrasco [59] and Reoyo et al. [22], it is vitally important for teachers to be trained in curricular aspects as well as in affective and relational skills.

Furthermore, participants considered the training received on the teaching and learning evaluation process measures for and programs on promoting attention to diversity; the selection, design, and practice of activities and tasks, and the organization of space and time was not entirely adequate, results that coincide with those of other studies [5,9,19,29,58,59]. These findings demonstrate the lack of knowledge among the participants about the concept of paying attention to diversity, the strategies and resources for integration and inclusion, methodological competences, and learning community environments.

Despite this, the participants expressed their agreement with the fact that they acquired knowledge about inclusive education during their initial training process [7,51], indicating that through the MAES they not only acquired enough knowledge about paying attention to diversity, but also that the activities or practical examples they developed in class improved their knowledge about paying attention to diversity. This fact leads to as these participants being highlighted as fundamental factors for success in the teaching and learning process of students with SNES [4]. In this sense, the intention of the MAES is to provide the



mathematics trainee teachers with the necessary knowledge and skills for a student to be able to learn in the classroom.

In this sense, although the purpose of the MAES is aimed at increasing the training and awareness of future teachers in terms of attention to diversity, this does not mean that there was an increase in the participants' interest in this area. Some study findings, such as those of Reyes [60] or Mintos et al. [61], highlight, that teaching is a key element in educational transformation. In addition, these studies determined that better preparation and better professional development among teachers, with respect to paying attention to diversity, are required to enable them to overcome the daily challenges they will deal in their classrooms [3,4,58]. Inclusion, beyond integrating students into the system, implies a modification of the educational context and of the specific training of teachers so that they can meet the needs of students [7]. Previous studies [62–65] have warned about the little attention that has been paid to the initial training of teachers to prepare them to be competent, attentive, and sensitive professionals through an inclusive model of education. For this reason, it is essential, among many other endeavors, to promote and implement policies for developing and improving teachers' working conditions according to new social and cultural contexts [58].

In addition to the above, the participants stated that taking the generic module "Educational processes and contexts" allowed them to gain knowledge about students' needs, the resources and services provided, legislation, as well as basic aspects of this field of study. These positive perceptions are contradicted by the results of research by Avramidis and Norwich [9], Sharma et al. [23], Carpenter and Cai [66], Flores and Villardón [20], and Caurcel et al. [10], which conclude that there was a lack of demand for initial training among future secondary education teachers in relation to the issues raised.

Moreover, better training and knowledge on the elements that condition the teaching-learning process for paying quality attention to diversity provides better pedagogical training on paying attention to diversity. This study showed that the content of the MAES and the training acquired from it are closely related to the knowledge acquired on responding to diversity in the classroom. It follows that the MAES program contains elements that are encouraging, including the provision of training on paying higher quality attention to diversity.

For these reasons, it is essential to know how future teachers perceive these aspects after being trained on them by the MAES. It cannot be forgotten that, as indicated in the introduction, mathematics has always represented difficulties to students over time, since its teaching has always been focused on conceptual elements, as well as on the competence developed by students in mathematical processes, which goes against the implementation of learning environments based on all students equality. Authors such as Hettiarachchi and Das [67] highlight how teachers who have received specific training in special education are more competent at working with students with special needs.

Although the MAES content and the training acquired from it are closely related to the knowledge acquired on responding to diversity in classrooms, most of the participants considered their training on diversity very important for their future, but they did not perceive the knowledge acquired as contributory to the improvement of their capacity as teachers or to their sensitivity to diversity, results that partially coincide with similar studies [21,46,68,69].

Regarding the socio-demographic variables that influenced the perceptions of the participants, it should be highlighted that the female students showed more favorable attitudes and more knowledge on inclusive education than male students, results that coincide with other studies [18,66,70].

The participants who had had experiences with people with functional diversity had more positive attitudes and perceptions than those who had not had experiences with people with functional diversity. It is very important for future teachers to have positive attitudes towards and perceptions of inclusive education, and even to have experiences with people with functional diversity. The participants who had had contact with people



with disabilities or disorders not only showed greater agreement with the conditioning elements of the process of paying attention to diversity in the classroom, but also valued more positively the training received in the MAES. As revealed by several studies [36,71–73], contact with people with disabilities increases positive attitudes towards these people.

This study focused on the valuation of the participants' abilities, their degree of personal involvement with disabled people, and the general rating they make of disabled people. Thus, it would have been of great interest for participants to meet people with disabilities either through field practices, volunteering, or during the practicum.

## 5. Conclusions

The aim of this study was to analyze the perceptions of the MAES mathematics students about the initial training they received on paying attention to diversity, as well as to know their attitudes towards educational inclusion.

Regarding the first objective, the participants stated that they had received adequate training on paying attention to diversity with respect to the grouping of students and methodological strategies. However, they considered that the training received in the MAES could be improved, confirming Hypothesis 1 about the evaluation of the teaching and learning process, measures for and programs on promoting attention to diversity, the selection, design, and practice of activities and tasks, and the organization of space and time. The participants indicated the need for specific initial training, since, from their point of view, attention to diversity should be addressed to all students and should play an important role in their future teaching practice. It is concluded that the elements of the teaching–learning process that the teacher should consider to pay quality attention to diversity are sufficient and appropriate human and material resources, shared responsibility, collaborative and coordinated work among the teaching staff, motivation and professional interest, and the teacher–student ratio.

Regarding the second objective, the participants considered that a quality process of paying attention to diversity requires previous experience on the part of the teacher with students with SNES, thus indicating that they were not sufficiently trained, confirming Hypothesis 2 on facing the challenge of diversity in the classroom. It was determined that the educational system does not offer adequate services and resources to meet the educational needs of school students. They also considered that the knowledge acquired about attention to diversity in the MAES will not allow them to respond to situations that may arise among students with SNES, since the development of activities and practical examples did not improve their knowledge about attention to diversity.

Regarding the third objective, the students showed ambivalent attitudes toward attention to diversity, which does not confirm Hypothesis 3. The participants stated that it is possible to pay adequate attention to diversity in secondary education. The participants determined that students with SNES require numerous modifications in the curriculum, but that their schooling should not be carried out in special education centers but in regular centers.

Finally, Hypothesis 4 was not confirmed. In general, the female participants were more concerned about the students' inclusion in classroom; they considered that the Master's degree helped them to strengthen their professional choice to teach. The younger participants pointed out that attention to diversity could be paid in every one of the areas that make up the secondary education curriculum; they also argued that paying attention to diversity meant added work for the teacher. The participants who had a disability and/or disorder considered that paying attention to diversity in the classroom enriches the entire educational community. The participants who had had contact with functionally different people stated that attention to SNES students is the responsibility of all teachers, and indicated that the knowledge about attention to diversity acquired in the Master's program had helped them to have greater sensitivity towards paying attention to diversity.

To conclude, the MAES was conceived as a new training opportunity for future secondary education teachers in the field concerning attention to diversity. Teacher training

(initial and permanent) should be oriented toward improving the educational attention that mathematics teachers provide to students with SNES. Consequently, it is likely that when the participants develop their tasks as secondary teachers, they will be in favor of inclusive education if they have received training through a specific formation based on practical examples. For this to be possible, educational administrations should promote the improvement of processes and update teaching, providing solutions for the needs and concerns of teachers to guarantee inclusion in school [14,58].

As a prospective research project, it would be enriching if, based on the participants' perceptions of attention to diversity, proposals for the improvement of initial training could be established. These improvement proposals should be aimed at deeply understanding the difficulties that different students may experience within mathematics, as well as at making adaptations to accessibility of the curriculum that can be implemented in classrooms. This would undoubtedly be supported by a qualitative study using detailed interviews and focus groups.

In the same way, in future studies, it would be interesting to carry out a quasi-experimental study with pre and post measurements to see the evolution of perceptions. It would also be useful to carry out a longitudinal study of these participants, once they are working in educational centers, to analyze if these perceptions, in the long term, have been modified. It would also be enriching to evaluate the perceptions of teachers who are already working in schools and to make comparisons between the groups (the MAES students and active teachers).

This study has a direct implication for society. The main impact of the study shall be discerned once the perceptions of attention to diversity of future teachers are known. Once the needs have been identified, an intervention program could be developed to promote inclusive schools. This program would be directed at university students and secondary education teachers. The limitations of this study are related to its design. It is a cross-sectional study, as it represents the sample selected at that time. Perhaps it would be interesting to perform longitudinal studies to determine in what sense the perceptions and attitudes of mathematics teachers in training evolve once they begin their work as teachers. Moreover, this is a descriptive study, and cause-effect relationships cannot be established. The relationships typical of any Likert-type survey research also cannot be established, even when a standardized and validated instrument is used in the context of the research.

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