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Gender-Differentiated Perceptions of Teaching among Preservice Teachers of Secondary Education

Roberto Sánchez-Cabrero [1,*], Lidia Mañoso-Pacheco [2] and Ana Cristina León-Mejía [3]

[1] Interfacultative Department of Evolutionary Psychology and Education, Autonomous University of Madrid, 28049 Madrid, Spain
[2] Department of Philology and its Didactics, Autonomous University of Madrid, 28049 Madrid, Spain; lidia.mannoso@uam.es
[3] Department of Sociology and Communication, University of Salamanca, 37008 Salamanca, Spain; aleon@usal.es
* Correspondence: roberto.sanchez@uam.es

Abstract: The decision to pursue a career in teaching is usually driven by vocational interests, with the social image of teachers playing a pivotal role in this choice. This study endeavors to explore the influence of gender on the perception of teaching and its impact on the inclination of preservice teachers towards vocational training. The research, based on a sample of 1469 participants, aims to evaluate attributive factors related to the decision to become a secondary school teacher, perceptions of the training received during the master's degree, and gender disparities when recalling their previous teachers. To achieve this, an ad hoc questionnaire was employed. The data obtained were analyzed using *Student's t test*, *Chi-square*, *Somers' D*, and *Chaid Tree*. The results reveal gender differences by age and academic specialization, as well as a more negative evaluation of former high school teachers by female participants compared to their male counterparts. Overall, the study suggests that female students tend to retain more negative memories of secondary school instructors, a phenomenon that could be influenced by the prevailing unfavorable social image of teachers and their perceived struggle to compensate for past educational deficiencies upon embarking on a teaching career. Given that gender proves to be a relevant factor in the work of secondary school teachers, it is strongly recommended that the training of future educators address this issue with utmost diligence and depth. By sensitizing aspiring teachers to the potential challenges related to gender perceptions, teacher preparation programs can better equip them to navigate these complexities in the classroom and foster an inclusive learning environment.

Keywords: preservice teachers; teacher education; secondary education; teaching; gender differences

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1. Introduction

The teaching profession has long been perceived as a career path driven by a profound desire to educate, overcoming potential obstacles and challenges with internal motivation and resilience (Almeida et al. 2021; Palermo and Thomson 2019; Gunersel et al. 2016; Han and Yin 2016; Katz and Shahar 2015). Teaching is often associated with an inner calling or a sense of destiny, making it inconceivable for individuals to pursue any other profession (Sanchez-Cabrero and Pericacho-Gómez 2022). Classical philosophers, such as Savater (1997), have portrayed teaching as a 'noble craft', a gift that enables the dissemination of knowledge and wisdom with transcendence and immortality.

Moreover, teachers are often regarded as 'guides' who can ignite curiosity and inspire positive changes, allowing students to reach their full potential (Fernández-Guayana 2020). However, to fully understand our perception of instructors, the qualities we value in them, and the shortcomings students may perceive, these philosophical reflections must be complemented with objective and current scientific evidence. This is particularly important for aspiring teachers, as traditional pedagogical models are deeply ingrained in their

mindset, and their early professional practices are typically influenced by the teaching approaches they encountered as students (Souto González and García-Monteagud 2016, 2019).

In light of this, Rubio (2023) conducted a qualitative study aimed at exploring the narratives of prospective secondary teachers in Spain at the onset of their master's degree to analyze their conceptions and beliefs regarding the qualities of a proficient teacher. The study revealed that rapport emerged as the fundamental value, followed by pedagogical considerations. However, the potential influence of participants' demographic profiles on their evaluation of past teaching experiences was not assessed in his study.

Representations of teaching are also socially constructed and shared through books, stories, films, and other forms of media, shaping students' perceptions even before they enter the classroom (Chang-Kredl and Colannino 2017). Consequently, these perceptions determine not only educational goals but also the criteria used to classify teachers as 'excellent', 'average', or 'poor' (Dalton 2013). As such, this imagination significantly affects the decision to pursue a teaching career, with gender being a key factor in the career path and discipline specialization. According to Makarova and Herzog's (2015) study, Physical Science and Mathematics are not gender-related in both high school students and teachers. By the same token, Nürnberger et al. (2016) discovered that boys are more likely to be encouraged to pursue math/science-related studies, whereas girls are more likely to be steered towards language-related fields.

Aslan (2015) reported substantial differences in gender metaphors among trainee instructors, with women depicted as 'delicate, sensitive, and in need of attention', while men were described as 'rude, harsh, and insensitive'. It is crucial to note that career decisions are influenced not only by gender but also by professional prospects (Mañoso-Pacheco 2018; Mañoso-Pacheco and Sánchez-Cabrero 2023), potentially leading to the emergence of a 'glass ceiling'. Numerous studies suggest that women, regardless of their competence, have more difficulties in accessing leadership positions within a university (Yagüe-Perales et al. 2021; Gallego-Morón et al. 2020; Gaete-Quezada 2018). Nevertheless, in non-university public institutions like high schools in Spain, where merit-based competitions are better established, such barriers are less pronounced (Díez-Gutiérrez et al. 2009). Fortunately, over time, employment barriers in higher education have been reduced (Belloso et al. 2021), and female professors today have more equitable opportunities for promotion compared to the past, although disparities still persist.

Gender gaps in STEM (Science, Technology, Engineering, and Math) fields are highlighted in several studies, including Makarova et al. (2019), Gecu-Parmaksiz et al. (2021), and OECD (2017). Pelch (2018) suggested that the gender gap in STEM is influenced by differences in anxiety levels between males and females, which, in turn, affect academic performance. Classroom anxiety arises from unpleasant emotions and fears and, regardless of students' abilities, hinders learning (Meyer and Turner 2002). Gender differences in anxiety begin to manifest at the age of nine and continue to increase throughout secondary school (Czerniak and Chiarelott 1985). According to Pelch (2018), gender differences in anxiety are associated with emotional intelligence, which is higher in females (León-Mejía and Miller 2009). However, women's higher emotional intelligence does not shield them from the negative effects of gender stereotypes and biases when confronted with certain subjects.

Gender biases also manifest in seemingly unrelated fields, such as sport and physical education or medicine (Sánchez-Cabrero 2021). For instance, Erden's (2009) study found that preservice teachers associated girls with sedentary traits and poorer physical coordination. Similarly, Preece and Bullingham (2022) discovered gender stereotypes in male and female preservice teachers of sports and physical education. Addressing these issues requires incorporating gender equity courses in educational training (Torrico et al. 2023; López-Torrijo and Mengual-Andrés 2015). Pollock et al. (2021) and Erdamar et al. (2016) emphasized the potential benefits of teacher training courses in physical activity and sport in combatting gender bias, as students exposed to such courses are more likely to create fair learning environments in the classroom and reduce their gender bias. In a different field, Burgos and Josephson (2014) showed that the absence of female role models has a

negative impact on female students' motivation to choose surgery as a specialty, attributing this to sexual harassment and gender discrimination affecting professional identity and specialty choices.

While the relationship between gender, teaching expectations, satisfaction, and perceived teaching quality in preservice teachers is an area that has received less attention in the academic literature compared to studies on experienced teachers, there are still valuable insights to be gained. For instance, Körükcü and Tangülü (2021) found disparities in individual and global senses of social responsibility, with higher levels among female preservice teachers. On the other hand, Kükürt and Çağlar (2021) observed no gender differences in the values of education—that is, which of them are good or desirable—among prospective elementary and preschool teachers. This finding was supported by Rubio (2023), who conducted a study exploring the narratives of prospective secondary teachers in Spain at the onset of their master's degree. The author analyzed their conceptions and beliefs regarding the qualities of a proficient teacher and found that, regardless of gender, rapport emerged as the fundamental value, followed by pedagogical considerations.

Gillooly et al. (2021) explored the role of female positions in the attitudes of Ph.D. students, revealing that male students were less receptive to inclusive curricula, viewing programs with more female academics as 'less academically demanding'. Additionally, Felices-de la Fuente and Chaparro-Sainz (2021) analyzed primary school teachers' perceptions of educational techniques involving technology and digital resources. They found that female students held more favorable opinions of their teachers' resources and methods in the classroom, valuing innovative methodologies, such as information and communication tools, media-based activities, cooperative learning dynamics, and discussion on social issues more than male students. These results align with Cózar-Gutiérrez and Colmenero's (2014) observations that female students had a more positive attitude towards digital resources than male students and spent more time using computers at school (Gómez-Carrasco et al. 2020). However, when Roblizo Colmenero and Gutiérrez (2015) investigated the usage of ICT (Information and Communication Technologies) resources by preservice teachers at the preschool and primary school levels, they found no significant gender disparities.

Regarding the impact of teaching experience, Beijaard's (1995) seminal study demonstrated a distinctly positive influence on the maintenance of a positive image of the teaching profession. The research examined a cohort of teachers, and the majority exhibited a positive trajectory in their professional development, while none displayed negative trends. In a few cases, there was merely stagnation. Subsequent investigations focusing on novice teachers, such as that of Heikonen (2020), further reinforce this assertion. These recent inquiries establish positive correlations between teaching experience and age, with gender also playing a noteworthy mediating role in this association.

Prior research in the literature has provided valuable insights into a plethora of gender-related concerns across various domains, with particular emphasis on the realm of education. These scholarly inquiries have explored the profound influence of gender on critical facets such as career choices, workplace prospects, STEM disciplines, anxiety levels, gender biases in distinct subjects, and the attitudes exhibited by educators, encompassing both preservice and in-service contexts. As a result, all these raised issues shape the meaning, practical implications, contribution to the available knowledge, and purpose of this research, which sets three main objectives considering the relevance of gender to teachers' self-perception of the quality of their training as teachers and their social image as professionals. First, this research aims (1) to explain gender differences among preservice teachers enrolled in the official Master's Degree in Secondary Education Teacher Training in various profile variables (i.e., admission year, academic area, previous teaching experience, and age at obtaining the Master's Degree). Second, it aims (2) to assess how gender influences students' perceptions of their own training. Third, it aims (3) to explore the role of gender in shaping the image of the teaching profession through students' experiences, current situations, and future expectations.

By addressing these objectives and analyzing the relationships with the measured variables, this research aims to elucidate the variance due to gender and rank its relevance.

2. Methods

2.1. Participants

The sample for the study was acquired using cluster sampling from a Spanish official Master's Degree program in Secondary School Teacher Training offered by a private university in Spain through an online platform. Opting for this sampling approach presented several advantages. First, it allowed for the inclusion of participants from diverse geographical regions across Spain, mitigating any location-based bias (Watters and Biernacki 1989). Second, it resulted in a varied sample of aspiring high school teachers with a broad spectrum of academic backgrounds (Boedeker and Henson 2020) and substantial prior experience. This diversity facilitated the inclusion of participants who had made a well-considered and committed decision to pursue a career in secondary school teaching, as opposed to those with temporary or random aspirations (Kuang 2014).

The study sample consisted of 1469 participants, 58.4% female and 41.6% male (858 and 611, respectively), who were students of the Spanish official Master's Degree in Secondary Education Teacher Training, with a mean age of 34.61 years (34.23 for female and 35.13 for male) and a standard deviation of 7.48 (7.34 for female and 7.65 for male). Figure 1 below shows the distribution of the sample by age and gender.

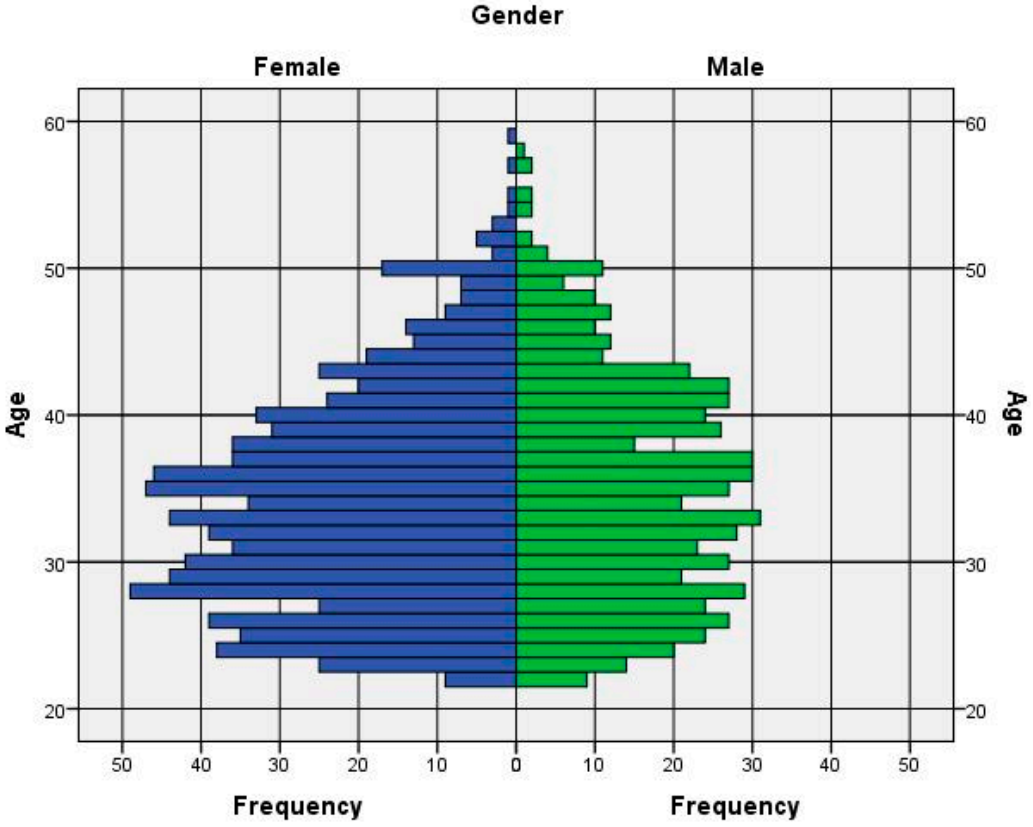

Figure 1. Population pyramid of the sample obtained considering the age and gender of the participants.

The clustered sample was collected over three academic years, from 2018 to 2021, with 383 participants from the 2018–2019 academic year, 427 participants from the 2019–2020 academic year, and 659 from the 2020–2021 academic year. Figure 2 below shows the distribution of the sample by year of enrollment and gender.

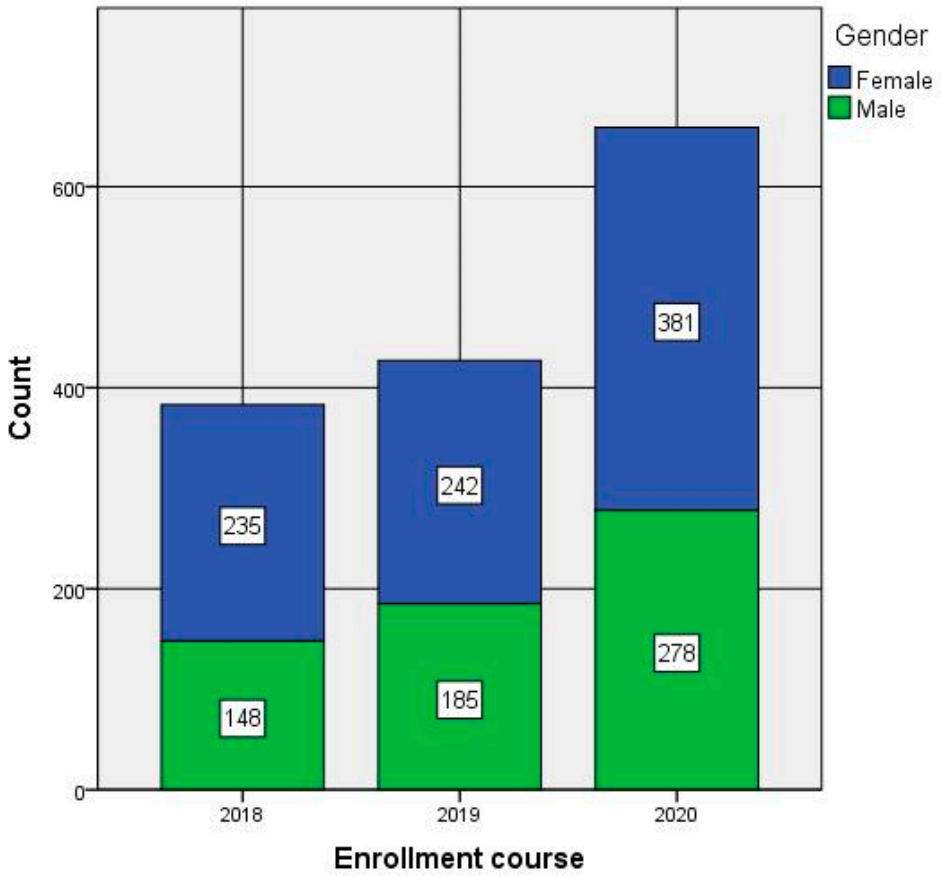

Figure 2. Sample distribution by year of enrollment and gender.

No selection criterion other than being enrolled in the Master's Degree in Secondary Education Teacher Training was applied. Therefore, the profile of the participants is heterogeneous in terms of professional experience, and the participants come from different communities all over Spain. It is worth mentioning that, in Spain, this master's degree is mandatory to obtain a position in state-funded high schools.

Participants are representative of the ten specialties officially recognized in the Master' Degree of Secondary Education Teacher Training (Language and Literature, English as a Foreign Language, Mathematics, Biology and Geology, Physics and Chemistry, Technology, Geography and History, Educational Guidance, Physical Education, and Economics). Figure 3 below, which includes the distribution between genders, shows that Technology is the most frequent (n: 355), and Physical Education (n: 15) is the least frequent.

The data reveal notable variations in gender representation across academic disciplines. Specifically, English as a Foreign Language (84.6%) and Educational Guidance (82.3%) stand out as areas with the highest proportion of female students, whereas Technology (63.7%) and Physical Education (100%) demonstrate the highest percentage of male students. On the other hand, Geography and History show a relatively balanced distribution, with 47.7% female and 52.3% male students, while Mathematics also exhibits a near-even split, with 49.3% female and 50.7% male enrolment.

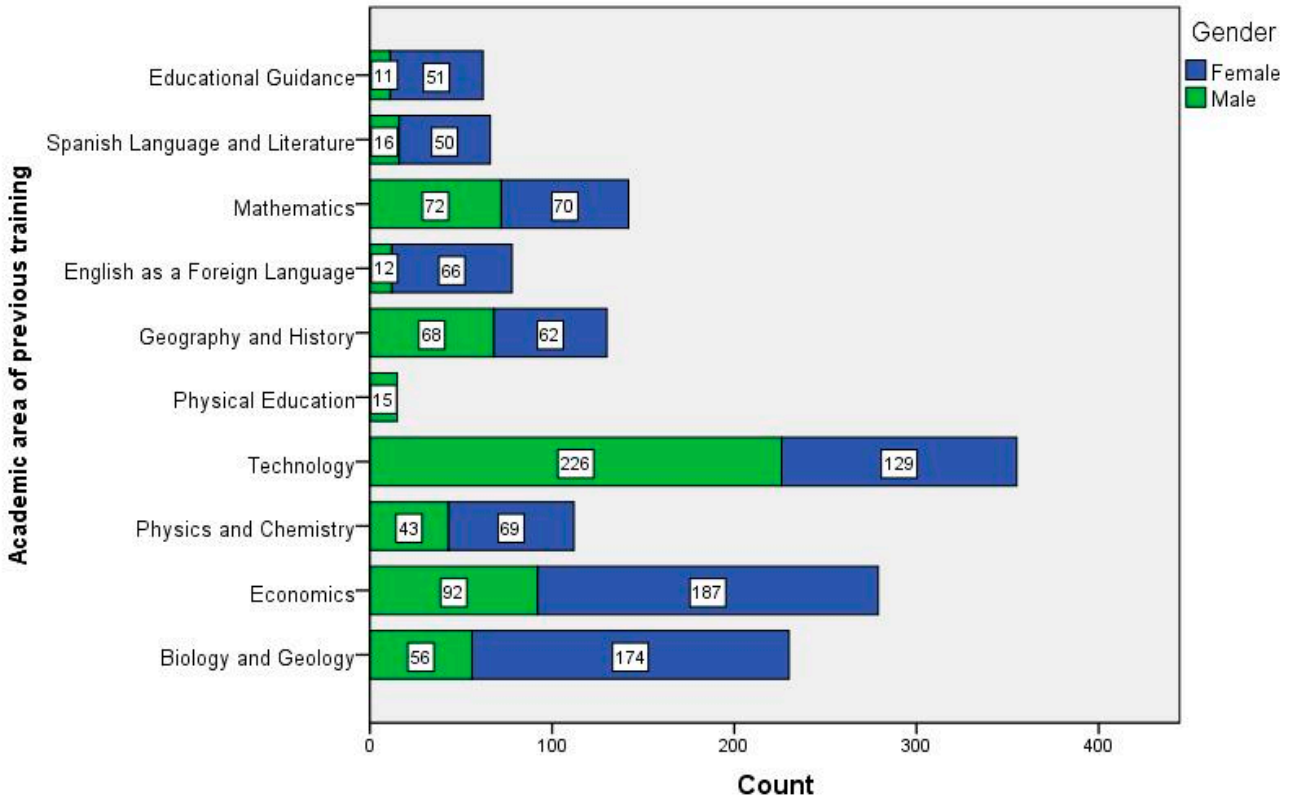

Figure 3. Sample distribution according to enrollment specialty and gender.

2.2. Instruments

An ad hoc computerized questionnaire, designed by the research team specifically to address the research question, was created and hosted on the private server 'https://www.encuestafacil.com' (accessed on 5 September 2018), ensuring participants' accessibility from any Internet-connected electronic device. The research project underwent rigorous assessment by a scientific and ethical commission, which meticulously reviewed and approved the scientific method, ensuring adherence to ethical standards. Additionally, an external committee consisting of five Social Science research experts, independent of the research team, evaluated the questionnaire, yielding an Intraclass Correlation Coefficient (ICC) of 0.75 (Koo and Li 2016).

Prior to participation in the study, all respondents provided written informed consent, in strict accordance with the ethical principles outlined in the Declaration of Helsinki on the ethics of human research (World Medical Association 2013).

The decision to employ an ad hoc questionnaire design is well-founded due to the unique nature of the research. Currently, there are no pre-existing validated instruments that adequately encompass all the attributive factors relevant to the decision-making process of becoming a secondary school teacher, perceptions of the training received in the master's degree, and gender differences in recalling past teachers. To encompass these aspects, it would necessitate using at least three different instruments, leading to significant inconsistencies when evaluating perceptions of the training received in the master's degree among future secondary school teachers in Spain. The distinctiveness of their training, comprising only one course and differing significantly from educational models in neighboring countries, renders other existing instruments unsuitable for this purpose (Ramírez-Granados et al. 2023).

The primary challenge arises from the absence of any instrument tailored to assess the perceptions of the training level of secondary teachers when recalling their past educators—a pivotal aspect of this research. Additionally, this study is guided by specific objectives,

resulting in the exclusion of valuable data from previously validated instruments. Such an approach would necessitate allocating more time to evaluate content that ultimately would not be utilized.

While it is undeniable that employing previously validated instruments could enhance the reliability of the results, it would compromise the study's validity, as those instruments were not designed with our sample and objectives in mind. Moreover, using these instruments could substantially increase the evaluation time, potentially leading to higher experimental attrition rates. Therefore, the decision to opt for an ad hoc questionnaire was made, and its 13 items were made public to enable the future replication of this research.

As mentioned above, the survey questionnaire was administered in the middle of the 2018–2019, 2019–2020, and 2020–2021 academic years of the master's segree, right at the start of the second term, to ensure that all participants were in the middle of the process of becoming a secondary school teacher (Sanchez-Cabrero and Pericacho-Gómez 2022). We used samples from multiple cohorts to reduce potential temporal biases that any specific cohort might have experienced (Kom et al. 1997). Master's thesis supervisors shared the link to the questionnaire with their students, thus helping the authors to gather data. The questionnaire consists of two sections. The first section includes instructions for completing the questionnaire, obtaining informed consent, and ensuring the anonymous use of data for scientific purposes. The second section comprises thirteen questions specifically designed in accordance with the research goals and the latest scientific findings. Each of these questions assesses the variables under study and is presented as a single-response item with a drop-down menu.

The items with the 13 variables evaluated are as follows:

1. Gender (Male/Female): a two-level dichotomous nominal variable.
2. Age: a discrete quantitative criterion.
3. Enrollment course: a three-level nominal attributive variable (2018–2019, 2019–2020, and 2020–2021).
4. Previous academic training: a ten-level nominal variable (Language and Literature, English as a Foreign Language, Mathematics, Biology and Geology, Physics and Chemistry, Technology, Geography and History, Educational Guidance, Physical Education, and Economics).
5. Vocational interest in teaching: a two-level dichotomous variable (Yes/No).
6. Reason for pursuing the Master's Degree in Secondary Education Teacher Education in the short term: a two-level dichotomous variable (Not defined/Short-term employment). It refers to the existence or non-existence of a compelling reason to obtain this degree. For example, the prospect of a future competitive examination for public employment or having a job offer.
7. Previous teaching experience: a four-level ordinal variable (None, Less than one year, More than one year but less than 5, More than 5).
8. Positive recall of their secondary teacher training: a two-level dichotomous variable (Yes/No).
9. Fulfillment of training needs by the Master's Degree in Secondary Education Teacher Training: a three-level ordinal variable (Insufficient, Acceptable, Excellent).
10. Need to expand the initial training of secondary school teachers: a two-level dichotomous variable (Yes/No).
11. Participant's willingness to extend her/his official training to become a secondary school teacher: a two-level dichotomous variable (Yes/No).
12. Personal image of the participant's secondary school teacher: a five-level ordinal variable (Poor, Bad, Indifferent, Good, and Excellent).
13. Image of the secondary school teacher in society: a five-level ordinal variable (Poor, Bad, Indifferent, Good, and Excellent).

Items 1–4 and 7 were utilized to specifically address the first research objective. Items 1, 5, 6, and 9–11 were employed to target the second research objective, and items 1, 8, 12,

and 13 were focused on the third research objective. The collective responses to all items and their interrelationships were utilized to derive the conclusions of this study.

To ensure data integrity, the participants were allowed to participate only once. Upon completing the questionnaire, the IP of their Internet connection was blocked, preventing further participation.

2.3. Design and Procedures

This study encompasses a comprehensive analysis conducted over three academic courses, employing a descriptive, inferential, and correlational design to explore the realities and perceptions of preservice teachers pursuing their Master's Degree, a requirement for formal qualification as secondary school educators. The study evaluates the interactions and associations among various nominal, ordinal, and quantitative variables. Data were collected anonymously from the participants and then subjected to statistical analysis using the IBM SPSS (Statistical Package for the Social Sciences, version 25.0), a computerized statistical tool.

Descriptive statistics such as the arithmetic mean and standard deviation were employed to analyze the quantitative variable *Age*, while frequency distribution was used for the remaining variables. In order to conduct inferential analyses on the quantitative variable *Age*, a normality assessment of the data was conducted using the *Kolmogorov–Smirnov Test (K-S)*. Despite the large sample size of n = 1469, which can make normality tests highly sensitive to even the slightest statistical variations (Arigita-García et al. 2021), the *K-S test* resulted in a value of 0.072, with a significance level above 99%, suggesting that the data's normality cannot be guaranteed. Consequently, non-parametric tests were incorporated into the statistical analysis.

To compare both genders, differences in means were evaluated using the *Independent-Samples t-test*, with *Student's t* as the parametric statistic. Additionally, the *Independent-Samples Mann–Whitney U Test* was used as a complementary non-parametric test.

An examination of contingencies for the remaining nominal and ordinal variables was also undertaken using *Chi-square* for the independence of variables and *Somers' D* to assess the orientation of the association, effect size, and significance. These statistical measures were selected due to their suitability for contingency analysis in the case of *Chi-Square* and, in the case of *Somers' D*, due to their ability to compare two ordinal variables, effectively indicating the orientation of differences (Sánchez-Cabrero et al. 2019). It should be noted that to adequately reflect data tendencies with *Somers' D*, nominal variables were transformed into ordinal values. For example, the variable Gender was recoded as Female = 1 and Male = 2, while dichotomous variables with YES/NO conditions were represented by YES = 1 and NO = 0. The *Chaid Tree* was employed to elucidate the association between gender (response variable) and a set of explanatory variables, facilitating the creation of a data classification framework.

To establish statistical significance, a confidence level of 99 percent (α: 0.01) and 95 percent (α: 0.05) was applied. Bonferroni Correction was utilized for variables with more than two conditions.

In full compliance with the Research Ethics Committee regulation from the Autonomous University of Madrid, the administration of surveys and questionnaires fell outside the scope of the application of Article 1.2. This research adheres to a non-interventional approach, guaranteeing participant anonymity, in accordance with the Spanish Organic Law 3/2018, of December 5th, on Data Protection and Guarantee of Digital Rights.

3. Results

The results are presented below according to the three research objectives, following a descriptive–inferential–classificatory structure. That is, to address each objective, we begin by presenting the descriptive results obtained. Subsequently, the correlational and inferential analyses are shown to determine if the descriptive differences obtained are

significant. Finally, the relevance of the variables involved is ranked based on gender using the *Chaid classification technique*.

Following the first research goal consisting of examining gender differences in the profiles of preservice teachers enrolled in the master's program, Table 1 shows the descriptive statistics that define this profile, showing the gender and age distribution (absolute percentages) according to the course, previous teaching experience, age at which the master's degree is taken, distribution of frequencies, and mean and standard deviation of the age of the participants according to the attributive variables analyzed in the study.

Table 1. Descriptive statistics by gender and age according to course, previous teaching experience, and academic area.

Enrollment course	**%**	**% Females**	**% Males**	**Frequency**	**Mean Age**	**SD**
2018–2019	26.1	27.4	24,2	383	34.56	7.07
2019–2020	29.1	28.2	30,3	427	34.56	7.68
2020–2021	44.9	44.4	45,5	659	34.66	7.59
Previous teaching experience	**%**	**% Females**	**% Males**	**Frequency**	**Mean Age**	**SD**
None	31.9	30.4	33.9	468	33.69	6.85
Less than 1 year	24.8	23.2	27.0	364	34.19	7.01
More than 1 year and less than 5 years	29.5	30.9	27.5	433	34.39	7.95
More than 5 years	13.9	15.5	11.6	204	37.91	7.79
Academic area of previous training	**%**	**% Females**	**% Males**	**Frequency**	**Mean Age**	**SD**
Biology and Geology	15.7	20.3	9.2	230	33.26	7.07
Economics	19.0	21.8	15.1	279	35.93	7.42
Physics and Chemistry	7.6	8.0	7.0	112	32.9	6.18
Technology	24.2	15.0	37.0	355	37.94	6.86
Physical Education	1.0	7.2	2.5	15	27.67	4.22
Geography and History	8.8	7.7	11.1	130	32.65	8.06
English as a Foreign Language	5.3	8.2	2.0	78	30.9	7.32
Mathematics	9.7	5.8	11.8	142	34.08	7.24
Spanish Language and Literature	4.5	5.9	2.6	66	31.73	7.22
Educational Guidance	4.2	20.3	1.8	62	32.31	6.41
STEM Academic area of previous training	**%**	**% Females**	**% Males**	**Frequency**	**Mean Age**	**SD**
Yes	76.1	73.3	80.0	1118	35.48	7.29
No	23.9	26.7	20.0	351	35.81	7.38
TOTAL	**100**	**58.4**	**41.6**	**1469**	**34.61**	**7.48**

Table 1 illustrates the key demographic characteristics of the student participants in this study. The majority of students are female (58.4%) and enrolled during the 2020–2021 academic year (44.9%). Most of them have no prior teaching experience (31.9%), are from the Technology area (24.2% percent), and belong to the STEM field (76.1%). Notably, male students with less prior teaching experience constitute the majority in subjects such as Technology, Geography, History, and Mathematics. Additionally, the average age of participants is 34 years old (X = 34.61; SD = 7.48), and an interesting trend emerges wherein older individuals tend to have more previous teaching experience. Furthermore, an analysis of age and specialty reveals that the youngest participants are inclined towards Physical Education (X = 27.67; SD = 4.22) and English as a Foreign Language (X = 30.9; SD = 7.32), while the oldest participants lean towards Technology (X = 37.94; SD = 6.86).

To assess the statistical significance of the gender differences observed, the authors employed various tests. Specifically, we analyzed the significance and effect size of the *Student's t-test Student* and *Mann–Whitney U Test* for the quantitative variable *Age* and of the *Chi-Square* and *Somers' D* for the nominal and ordinal variables. Table 2 below shows this information.

Table 2. Student's t-tests, *Chi-Square*, and *Somers' D* tests of attributive variables and gender.

Quantitative variables	***t***	***Mean differences***	***Standard error of difference***
Age	−2.263 *	−0.895	0.395
Nominal and ordinal variables	***Chi-square***	***D of Somers***	***Eta***
Academic year	1.99	0.02	0.037
Previous teaching experience	8.69 *	−0.06 *	0.077
Previous academic area of training	185.14 **	0.07 **	0.355
STEM academic area of previous training	8.87 **	0.08 **	0.078

* Correlation significant at the 0.05 level/** Correlation significant at the 0.01 level.

The findings, presented in Table 2, indicate that there are indeed statistically significant gender differences in the age at which participants pursue the master's degree, with male participants being slightly older (M = 35.13; SD = 7.65 years) than their female counterparts (M = 34.23; SD = 7.34 years). The significance of the *t-test* ($\alpha = 0.024$), assuming unequal variances, and the *Mann–Whitney U Test* ($\alpha = 0.026$) indicates substantial differences. Additionally, it is evident that women have slightly but significantly more prior teaching experience, as shown by the significance and direction of *Somers' D*, as observed in Table 1.

Furthermore, there are significant differences in the academic field, both in distinguishing between STEM and non-STEM areas and considering each of the 10 previous degrees. While gender differences in STEM degrees are statistically significant, the effect size is very small. As for the previous academic field by degree, with ten distinct areas as nominal categories, *Somers' D* does not provide conclusive information about the direction of this relationship. Therefore, to determine how master's students are distributed according to gender, taking into account their academic areas, an *Exhaustive Chaid Tree* analysis is conducted, as shown in Figure 4 below.

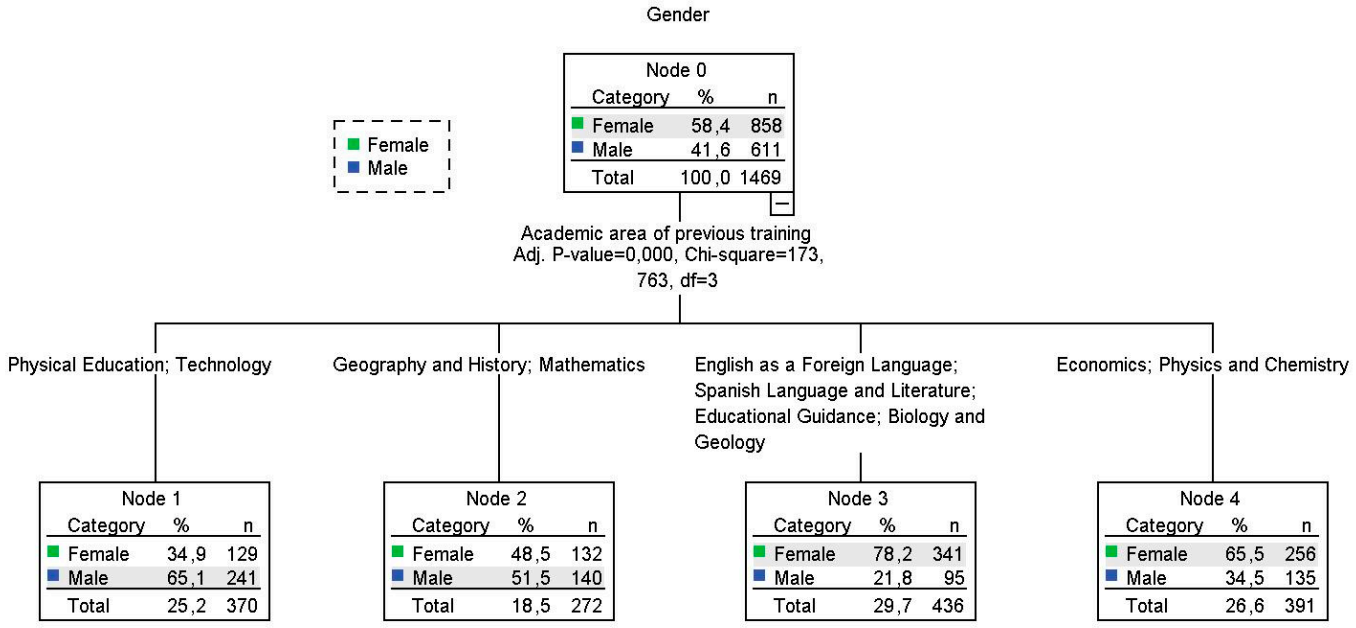

Figure 4. *Chaid tree* of the distribution of academic areas by gender.

Figure 4 portrays the results of the *Chaid Tree* analysis, which classifies the sample into four distinct groups based on their subjects. The first category (n = 436), comprising subjects like Biology and Geology, English as a Foreign Language, Language and Literature, and Educational Guidance, is predominantly female (78.2 percent). The second group (n = 391), consisting of subjects like Economics, Physics, and Chemistry, is also dominated by female students (65.5 percent). Conversely, the third group (n = 370), which includes Technology

and Physical Education subjects, primarily consists of male students (65.1 percent), while the fourth group (n = 272), encompassing Geography, History, and Mathematics subjects, maintains a gender balance (48.5 percent female and 51.5 percent male).

Addressing the second research objective, which examines how gender influences preservice teachers' perceptions of their own training, Table 3 displays the frequency and percentage distribution of responses by gender.

Table 3. Frequency distribution by teacher training and the percentage distribution according to gender.

Teaching as vocational	**Frequency**	**%**	**% Females**	**% Males**
No	212	14.4	14.2	14.7
Yes	1257	85.6	85.8	85.3
Short-term interest in the master's degree	**Frequency**	**%**	**% Females**	**% Males**
Indeterminate (other options, such as vocation)	932	63.4	64.3	62.2
Short-term employment (public servant positions, private employment offers)	537	36.6	35.7	37.8
Assessment of the master's degree meeting all needs	**Frequency**	**%**	**% Females**	**% Males**
Insufficient	27	1.8	2.1	1.5
Acceptable	908	61.8	61.1	62.8
Excellent	534	36.4	36.8	35.7
Need to expand initial training	**Frequency**	**%**	**% Females**	**% Males**
No	863	58.7	56.6	61.7
Yes	606	41.3	43.4	38.3
Participants' willingness to expand training	**Frequency**	**%**	**% Females**	**% Males**
No	870	59.2	58.2	60.7
Yes	599	40.8	41.8	39.3
TOTAL	**1469**	**100.0**	**100.0**	**100.0**

According to Table 3, the predominant profile indicates that most preservice teachers consider teaching a vocation (85.6%) and do not possess a particular short-term interest in pursuing the Master's Degree in Secondary Education Teacher Training (63.4%). Furthermore, a significant majority finds the master's degree training to be adequate (61.8%), leading them to believe that expanding their training is unnecessary (58.7 percent) and, thus, to them not expressing a willingness to do so (59.2 percent).

To determine if the observed gender differences are significant, Table 4 presents the statistical significance of the *Chi-square* tests and *Somers' D*, as well as the effect size of the relationships between different responses to the items related to teacher training according to gender.

Table 4. *Chi-square*, *Somers' D*, effect size, and statistical significance of teacher training by gender.

Nominal and Ordinal Variables	***Chi-Square***	***Somers D***	***Eta***
Teaching as a vocation	0.07	−0.01	0.007
Short-term interest in the master's degree	0.71	0.02	0.022
Master degree's capacity to address formative needs	1.07	−0.01	0.027
Evaluation of the need for additional training	3.77	−0.05	0.051
Willingness to continue his or her studies	0.97	−0.03	0.026

* Correlation significant at the 0.05 level/** Correlation significant at the 0.01 level.

The findings of the *Chi-square* and *Somers' D* analyses presented in Table 5 indicate that the participant's gender does not have a significant impact on any of the different responses to the items related to teacher training.

Table 5. Distribution of frequencies and percentages according to the variables related to the image of the teacher and the recollection of their past as high school students by gender.

Positive memories of teachers when s/he was a high school student	**Frequency**	**%**	**% Females**	**% Males**
No	468	31.9	35.3	27.0
Yes	1001	68.1	64.7	73.0
Personal image of the secondary school teacher	**Frequency**	**%**	**% Females**	**% Males**
Very bad	1	0.1	0	0.2
Bad	41	2.8	2.4	3.3
Indifferent	82	5.6	5.9	5.1
Good	1134	77.2	76.7	77.9
Excellent	211	14.4	14.9	13.6
Image of the secondary school teacher in society	**Frequency**	**%**	**% Females**	**% Males**
Lousy	26	1.8	1.9	1.6
Bad	377	25.7	27.7	22.7
Indifferent	475	32.3	29.6	36.2
Good	585	39.8	40.4	39.0
Excellent	6	0.4	0.3	0.5
TOTAL	**1469**	**100.0**	**100.0**	**100.0**

As for the third research objective, showing the role of gender in the image reflected in the teaching profession through the students' own experiences, their current situation, and their expectations for the future, Table 6 presents the frequency distribution of the sample in relation to the various responses to items concerning the teacher's image and the recollection of their past experiences as high school students. Additionally, it displays the percentage distribution based on the gender of the participants across the different response options.

Table 6. *Chi-square*, *Somers' D*, effect size, and statistical significance regarding teacher image and gender.

Nominal and Ordinal Variables	***Chi-Square***	***Somers' D***	***Eta***
Memories of teachers when he/she was a secondary school student	11.35 **	0.09 **	0.088
Personal image of the secondary school teacher	3.27	−0.02	0.047
Image of the secondary school teacher in society	8.7	0.03	0.077

* Correlation significant at the 0.05 level/** Correlation significant at the 0.01 level.

Table 5 further highlights the dominant responses concerning the participants' memory of secondary school teacher training and their perception of the teacher's image. A significant majority (68.1%) recall a positive experience during their time as secondary school students. Moreover, most participants perceive the image of educators as predominantly positive, both in their own perception (77.2%) and in society's (39.8%). However, it should be noted that the future secondary school teacher's perception of their own image as an educator is much better than the perception they believe society has of them.

To assess the significance of gender differences, Table 6 presents the results of the association analysis using *Chi-square* and *Somers' D test*. It helps determine if the observed gender variations are statistically significant.

The statistical analyses conducted with Chi-square and Somers' D tests reveal gender-related differences in recalling teachers from high school, with females demonstrating a significantly poorer recall, as indicated by Somers' D.

Lastly, a Chaid Tree was utilized to explain the variance attributed to gender, based on the relationships established with all the measured variables, ranked by relevance. This included the 12 variables evaluated in the sample of 1469 participants, and the results are displayed in Figure 5 below.

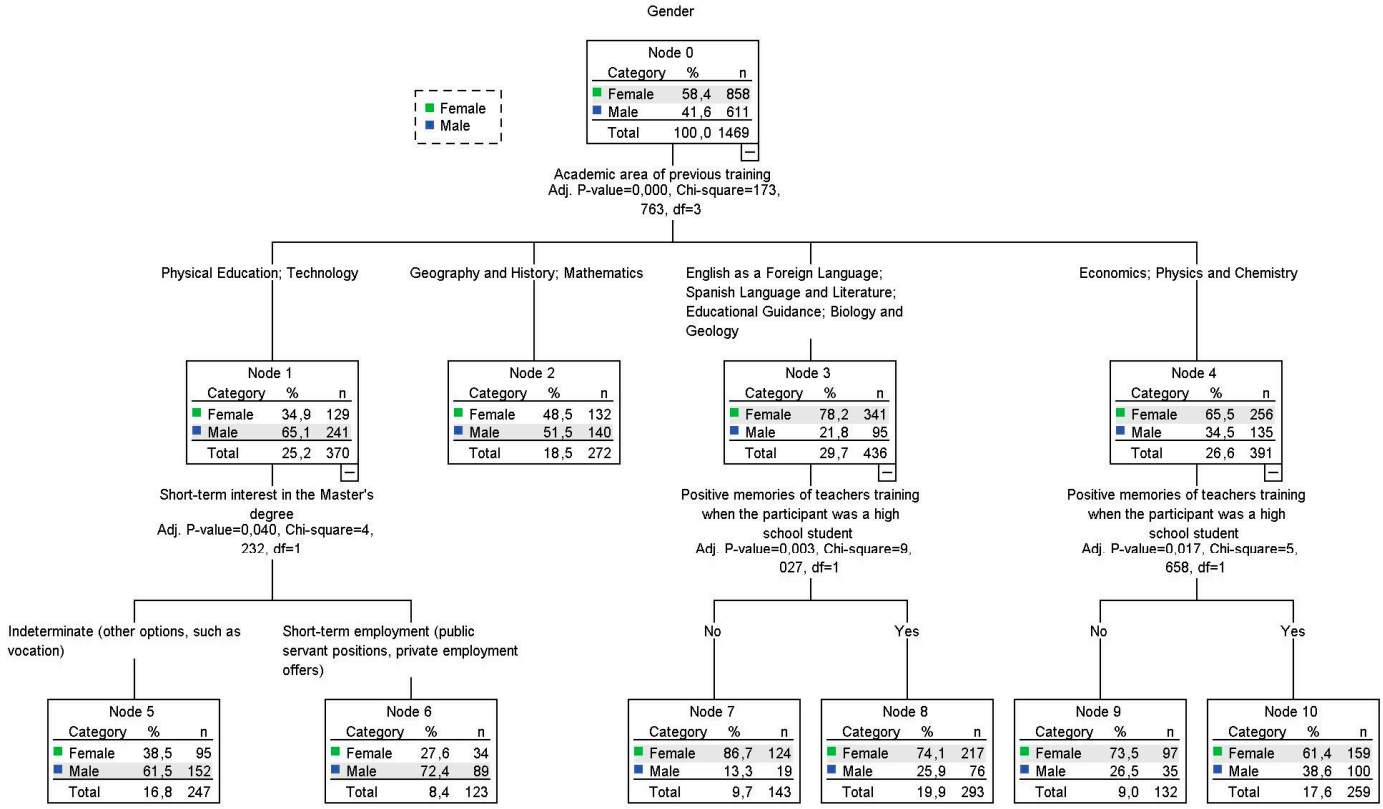

Figure 5. Chaid tree of the distribution of the total variance by gender.

The outcomes of the Chaid Tree analysis showcased in Figure 5 demonstrate adequate predictive values considering the model's risk (Risk Estimate = 0.334; Risk Standard Error = 0.012). The Chaid Tree accurately predicts 66.6% of the total cases (69.6% for females and 62.4% for males). The academic area, as depicted in the four groups, emerges as the primary explanatory factor for the observed variance, followed by participants' recollections of their teachers during their time as secondary school students, which will be further discussed in subsequent sections.

4. Discussion

Regarding the first research objective, the findings suggest that age and gender appear to play pivotal roles in the decision-making process of individuals pursuing a career in teaching. Specifically, females tend to make this choice at a younger age compared to their male counterparts. This trend is consistent with the Education Indicators Report of the Ministry of Education and Vocational Training (MEFP, Ministerio de Educación y Formación Profesional 2020). It is reasonable to posit that female preservice teachers' heightened sense of social responsibility, as observed by Körükcü and Tangülü (2021), may account for their earlier entry into the teaching profession. Another contributing factor could be the absence of a 'glass ceiling' in state-funded secondary schools in Spain, as opposed to the private sector and other occupations. The presence of a glass ceiling in private sectors may compel women in STEM companies to consider opportunities in the public sector. This phenomenon could also align with women's inclination towards service-oriented or people-oriented vocations, which might be influenced by socialization factors and gender stereotypes (Schmader 2023).

In terms of the participants' educational training, our Chaid Tree analyses revealed that there are some gender disparities in STEM disciplines among preservice teachers that we may consider. In line with previous studies by Makarova and Herzog (2015), Makarova et al. (2019), Gillooly et al. (2021), Gecu-Parmaksiz et al. (2021), and Schmader (2023), the results of this research suggest that gender differences when choosing a career seem to persist despite efforts to eliminate barriers and inequalities. According to Fox-Turnbull et al. (2022), girls and women still need to receive messages that encourage them to choose and stay in STEM-related fields, as well as those that dispel any misconceptions about their abilities or the skills required in certain fields that might deter them from pursuing STEM-related career paths. This study provides additional evidence that teaching is still perceived as a predominantly female profession, even among women who have pursued a career in science. In this investigation, the significantly higher number of female preservice teachers coming from STEM fields compared to men suggests that women perceive public education positions as a more suitable professional role, even though they may be less well paid than positions in private companies, resulting in a gender asymmetric self-selection of teaching candidates. As Saltiel (2023) pointed out, being a woman with high ability in a STEM domain does not necessarily result in high self-efficacy, which may influence women to consider different professional paths.

Addressing the second objective, the authors may conclude that there were no discernible disparities in the evaluation of secondary school initial teacher training. Consequently, it can be inferred that gender does not significantly influence preservice teachers' perceptions of their own training, a finding corroborated by Menon and Athanasoula-Reppa (2011), Mena et al. (2023), and Rubio (2023).

Regarding the third objective of our study, female participants exhibited more negative recollections of their high school teachers. This noteworthy discovery can be partially attributed to the gender differences in adolescent experiences prevalent in contemporary Western societies (Block 1973; Calvo-García 2018; Vincent-Ruz and Schunn 2018). The process of transitioning into adulthood varies between genders due to the interplay of biological and social factors (Lenroot and Giedd 2010), resulting in gender-specific societal expectations. These expectations foster gender-biased values and roles, which significantly impact teenagers' psychological well-being (Kashima et al. 1995; Yarnell et al. 2019). The journey towards adulthood and self-affirmation for women, particularly during adolescence, is believed to be notably intricate and challenging (Gowen et al. 2004; Calvo-García 2018; Vincent-Ruz and Schunn 2018). As a consequence, gender differences in life satisfaction may emerge, with the educational environment, specifically schools, playing a paramount role in shaping these differences (Marquez 2023). This could offer some insight into why females may seek greater support and understanding from their primary social references, such as teachers, and subsequently exhibit a more critical evaluation of them, as observed in this study. Additionally, other factors, including the limited female representation in secondary school curricular content and the involvement of the teaching staff responsible for implementing this curriculum, warrant consideration.

Pollock et al. (2021) and Erdamar et al. (2016) assert that fostering inclusive classroom environments, free from gender stereotypes, requires instructors to act as agents of change by confronting their own preconceptions. Institutions should promote the incorporation of courses that advocate for gender equality to facilitate this process. It is crucial to acknowledge that many instructors may lack the necessary skills to establish more equitable teaching environments and adopt appropriate classroom practices (Erden 2009; FitzGerald et al. 2019; Pollock et al. 2021; Verdugo-Castro et al. 2022; Yang and Bers 2023). Particularly relevant to our study are the conclusions of the systematic review conducted by Verdugo-Castro et al. (2022). This review emphasizes the importance of considering influences not only from family and peers but also from the educational environment and culture itself. By doing so, we can create an environment where both men and women make study choices based on their goals rather than being negatively affected by gender gaps.

According to the research conducted by Gillooly et al. (2021), a stronger female presence in academics and increased topic diversity in higher education courses can play crucial roles in improving educational attitudes. Having a more significant representation of women in academia can serve as powerful role models for students, inspiring and encouraging more young women to pursue higher education and academic careers. It can break down gender stereotypes and challenge societal perceptions that certain fields are more suitable for one gender over the other. Furthermore, enhancing topic diversity in higher education courses can contribute to a more inclusive and enriching learning experience for all students. It can expose them to a wide range of perspectives, ideas, and approaches, fostering critical thinking, creativity, and problem-solving skills, leading to a more inclusive and supportive learning environment that benefits all students, regardless of their gender or background.

Regarding gender differences in evaluating previous educational experiences, this study provides some support for the idea that a more negative view of training might be associated with the emotional factor discovered by Pelch (2018). It suggests that emotional aspects, such as anxiety, could play a role in shaping individuals' perceptions of their educational experiences. However, this finding was specific to the STEM field. Thus, further research is necessary to determine whether gender differences in anxiety could have broader implications for educational phenomena beyond STEM disciplines. Understanding the potential impact of anxiety on educational experiences in various fields could shed light on the underlying factors influencing students' perceptions of and attitudes towards their learning journeys. Moreover, examining the intersectionality of gender with other demographic factors, such as race, socioeconomic status, and cultural background, can offer valuable insights into the complexities of educational experiences. Identifying potential patterns and disparities within different student populations may help design targeted interventions and support systems for addressing specific challenges.

Finally, concerning gender variance, the study's results reveal that the academic area has the most substantial impact, followed by the recollection of secondary school teacher experiences. These findings are consistent with several recent studies underscoring how gender often shapes academic decisions and significantly influences students' future career paths (Navarro and Casero 2012; Rodríguez Méndez et al. 2016; Vázquez Romero and Blanco 2018; Belloso et al. 2021; Verdugo-Castro et al. 2022). This finding emphasizes the importance of addressing gender disparities and biases in educational processes to foster more equitable and inclusive learning environments. As highlighted by Felices-de la Fuente and Chaparro-Sainz (2021), future improvements in the educational landscape should involve a comprehensive examination of gender inequalities at every stage of the educational journey.

The impact of gender on academic choices can affect students' aspirations, opportunities, and eventual employment outcomes. By understanding how gender dynamics intersect with educational experiences, policymakers, educators, and institutions can implement targeted strategies for dismantling barriers and promoting equal access to educational opportunities for all students.

5. Conclusions

Understanding and addressing gender disparities in education is crucial for creating a more inclusive, equitable, and empowering learning environment. By striving to eliminate gender biases and foster an educational landscape that is free from discrimination, we can better prepare students to achieve their full potential and contribute to a more just and diverse society.

The findings of the present study highlight the continued relevance of gender roles in today's educational environment. Gender roles not only influence learners, but they also shape their life choices, career aspirations, and perceptions of the social world they inhabit. The educational realm is deeply impacted by gender differentiation, affecting the societal image of teachers and students' aspirations to become educators. Understanding

this gendered worldview requires considering various psychological, educational, and societal factors, as gender may significantly influence other fundamental life decisions.

The results of this research not only provide critical insights into the dynamics within the education field but also call for greater commitment to equity from instructors in the classroom. Building upon the findings mentioned earlier, future research could explore whether gender differences observed among preservice teachers become less pronounced over time as they finally become teachers. Additionally, delving into the specific elements influencing female students' attribution of a more negative social image to their teachers would require a more focused assessment in future studies. Analyzing preservice teachers' evaluative language about their previous educational experiences through a discursive examination could also shed light on gender inequalities in educational discourse.

However, it is essential to acknowledge the limitations of this research. The most significant limitation lies in the evaluation instrument, as a previously validated instrument was not available due to the complexity of the research questions and the asymmetry of the topics addressed. While this limitation poses challenges, it also underscores the importance of developing more suitable instruments that consider the multifaceted nature of gender-related research.

In conclusion, the findings underscore the enduring impact of gender roles on education and professional choices. By addressing gender biases and fostering an inclusive educational space, we could empower all students to thrive and succeed, irrespective of their gender or background.

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Institutional Review Board Statement: According to the regulations of the Research Ethics Committee of the Autonomous University of Madrid, the anonymized questionnaires, as activities which do not fall within the scope of European Union law, are not within the application scope of Research Ethics Committee (Article 2.3), since this is a non-experimental study that guarantees the anonymity of the participants and has prior informed written consent, following Organic Law 7/2021, of May 27th, on the Protection of Data and Guarantee of Digital Rights (Jefatura del Estado Ley Orgánica 7/2021, de 26 de Mayo, de Protección de Datos Personales Tratados Para Fines de Prevención, Detección, Investigación y Enjuiciamiento de Infracciones Penales y de Ejecución de Sanciones Penales, 2021).

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