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Academic self-efficacy in the acquisition of key competences in Secondary Education from a gender perspective

Autoeficacia académica en la adquisición de competencias clave en la Educación Secundaria: una perspectiva de género

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Abstract:

Key competences have become the transversal axis of our educational system. After completing Compulsory Secondary Education, students must have acquired an average level in each of the competences. The purpose of the study is to discover the academic self-efficacy of students in Extremadura regarding the acquisition of key competences upon completion of compulsory secondary education by observing the differences that exist based on gender—male, female and non-binary. For this purpose, a quantitative, non-experimental, descriptive-inferential study is presented, with a sample of 1,106 4th (final) year ESO [Compulsory Secondary Education] students from public and state-supported private schools in Extremadura (*N* = 11.10%) to whom the KEYCOMSE questionnaire was applied, which was designed *ad hoc* to meet the research objectives. The results indicate significant differences, with females declaring higher academic self-efficacy in linguistic competence, multilingual competence, digital competence, personal, social and learning to learn competence, and cultural awareness and expression competence. Conversely, the non-binary group presents low levels of academic self-efficacy in relation to the development of key competences as a whole, with the exception of multilingual competence. Finally, it is especially important to point out that obtaining students' views on their academic self-efficacy, observing gender differences, can contribute to identifying the most appropriate teaching-learning strategies for equitable education, thus improving educational quality.

Keywords: Compulsory Secondary Education; self-efficacy; key competences; gender; teenagers; perception; multivariate techniques; cluster analysis.

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Resumen:

Las competencias clave se han convertido en el eje transversal de nuestro sistema educativo. Terminada la Educación Secundaria Obligatoria, el estudiantado debe haber adquirido un nivel promedio en cada una de ellas. El propósito del estudio es conocer la autoeficacia académica del alumnado extremeño con respecto a la adquisición de competencias al finalizar la enseñanza obligatoria observando las diferencias que existen en función del género —mujer, hombre y no binario—. Para ello, se presenta una investigación cuantitativa, no experimental, descriptiva-inferencial cuya muestra es de 1106 estudiantes de 4º de ESO de centros públicos y concertados de Extremadura (*N* = 11,10 %) a los que se les aplicó el cuestionario KEYCOMSE, diseñado *ad hoc* para cumplir los objetivos de investigación. Los resultados indican que existen diferencias significativas, siendo las chicas quienes poseen una autoeficacia académica mayor en la competencia lingüística, competencia plurilingüe, competencia digital, competencia social, personal y de aprender a aprender y competencia en conciencia y expresión cultural. Por otro lado, el grupo no binario presenta niveles de autoeficacia académica bajos en relación con el desarrollo de competencias clave en su conjunto, a excepción de la competencia plurilingüe. Finalmente, resulta de especial relevancia señalar que obtener la visión del estudiantado sobre su autoeficacia académica, observando las diferencias por género, puede contribuir a encontrar las estrategias de enseñanza-aprendizaje más adecuadas para formar desde la equidad mejorando la calidad educativa.

Palabras clave: Educación Secundaria Obligatoria; autoeficacia; competencias clave; género; adolescentes; percepción; técnicas multivariantes; análisis clúster.

1. Introduction

Secondary Education is an essential stage in the comprehensive development of any citizen since, once successfully completed, the necessary basic knowledge and competences are acquired for both continuing higher education and early integration into the labour market (Vega-Díaz, 2024). Ensuring that young people fulfil these pedagogical objectives at the end of their compulsory education is a priority for the various OECD member countries, which in 2003 initiated the Definition and Selection of Competences Project (DeSeCo), which defines competence as a combination of knowledge, skills and attitudes that can be operationalised through learning outcomes (García-Llorente *et al.*, 2020).

According to the European Union (2019), key competences are the set of skills and abilities that are aimed at the holistic development of the individual and should guide learning from the earliest stages of formal education and throughout life. These competences are defined as: linguistic competence, multilingual competence, mathematical competence and competence in science, technology and engineering, digital competence, personal, social and learning to learn competence, civic competence, entrepreneurial competence, and cultural awareness and expression competence (European Rec, 2018). Acquiring an average level of all of them by the end of Compulsory Secondary Education (OECD, 2005) provides students, in the social sphere, with the necessary instruments to become democratic citizens capable of living together in plural societies in a climate of inclusion and, in the economic and labour sphere, with the basic tools necessary to access a qualified and continuously changing labour market (Karatepe and Cenk, 2023).

This 21st century educational model demands that we observe the evolution of educational achievement through a holistic lens that incorporates diverse perspectives. One very relevant perspective is that of the student regarding his, her or their own learning process, that is, academic self-efficacy (García-Álvarez *et al.*, 2022). General self-efficacy refers to a person's belief or perception of his, her or their own ability to cope with a

situation or challenge in any given environment (Kabir and Sponseller, 2020). However, as Bandura (2012) states, self-efficacy can be conceptualised in specific domains, such as academia. Precisely in this domain, it is particularly important to observe self-efficacy in Compulsory Secondary Education students associated with the acquisition of key competences (Balaguer *et al.*, 2025), in an education system that is committed to developing said competences as a transversal axis for the comprehensive training of its citizens (Álvarez-Martínez-Iglesias *et al.*, 2021). In addition, there are numerous studies that show a strong relationship between self-efficacy, motivation, academic performance and, ultimately, academic success (Delgado *et al.*, 2019; Quílez-Robles *et al.*, 2021; Rosales Ronquillo and Hernández-Jácquez, 2020; Tumino *et al.*, 2020). It is nevertheless true that, in this complex analysis, the variables that influence the relationship between these constructs are numerous and of different types: geographical origin, educational policies, social context, or gender, among others.

In this case, it is of particular interest to analyse how gender conditions both the self-efficacy associated with the acquisition of content and competences (Vega-Díaz, 2024; Arabit-García *et al.*, 2020; Wang and Yu, 2023) and the relationship between self-efficacy, motivation, academic performance and academic goals (Arroyo *et al.*, 2013; Grossmann *et al.*, 2022; Kaur *et al.*, 2022).

If we look at self-efficacy in the development of key competences at the different stages of formal education, according to gender, numerous studies reveal significant differences in mathematical competence and competence in science, technology and engineering. Stearns *et al.* (2019) show that females have lower self-efficacy in the field of science and technology, thus placing less value and interest in professions in this area. Similarly, Espinoza and Taut (2020) state that males show significant differences in relation to females when measuring confidence in their abilities leading to the development of mathematical competence.

Civic competence and cultural awareness and expression competence also show significant differences. Males consider that they have a greater ability to develop and put into practice skills related to civic competence, while females rate more positively their ability to cope with tasks, activities or learning situations associated with cultural awareness and expression competence (Meroño *et al.*, 2018).

Finally, with regard to personal, social and learning to learn competence, gender differences are observed in specific skills that, on the whole, lead to the acquisition of the competence: personal skills that influence self-efficacy and academic performance, social skills put into practice in the educational environment, and the ability to acquire instruments and tools that enable them to learn to learn are perceived differently depending on whether they are rated by males or females (Belmonte-Lillo and Parodi, 2017; González-Moreno and Molero Jurado, 2022; Pérez-Marmol *et al.*, 2023).

2. Methodology

2.1. Objectives

The objective of this study is to test how gender acts as a moderating variable in the assessment of academic self-efficacy regarding the acquisition of key competences by students in Extremadura upon completion of Compulsory Secondary Education. Based on this objective, two hypotheses are postulated:

1. The existence of significant differences when assessing academic self-efficacy regarding the acquisition of each of the key competences according to gender—male, female and non-binary.
2. Gender as a conditioning variable in academic self-efficacy regarding the holistic acquisition of all key competences.

2.2. Research design and participants

The present study shows data from a quantitative, non-experimental, descriptive and inferential study (McMillan and Schumacher, 2005). The participating sample consisted of 1,106 students in the 4th and final year of Compulsory Secondary Education in the Spanish autonomous region of Extremadura, by which time they should have acquired an average level in the eight key competences established by current legislation on education (Organic Law on Education, 2006; Organic Law Amending the Organic Law on Education (LOMLOE), 2020). The schools were chosen by convenience from the total number of schools in the region. Fourteen schools were selected, all of which are publicly funded. The sample represents 11.10% of students enrolled in the 4th year of Compulsory Secondary Education in Extremadura during the academic year 2023/2024; the population universe amounts to 9,960 students according to official data from the Ministry of Education, Science and Vocational Training of the Regional Government of Extremadura, with a representative sample.

In relation to socio-demographic variables, the average age was 16 and gender was distributed as follows: 52.53 % were male (n = 581), 46.47 % were female (n = 514) and 0.99 % identified as non-binary (n = 11).

2.3. Instruments

In order to measure the academic self-efficacy of the students under study, the KEYCOMSE—Key Competences in Secondary Education—questionnaire was designed based on scientific research criteria. The initial design of the items was based on an in-depth literature review of instruments with similar characteristics (Álvarez-Martínez-Iglesias *et al.*, 2021; Bielba *et al.*, 2015; Meroño *et al.*, 2017), which were used as a source of ideas to create a questionnaire of our own that would be useful for assessing students' academic self-efficacy in relation to their acquisition of key competences, and for observing possible improvements that could lead to an increase in educational quality in this type of education (Abarzúa-Ceballos *et al.*, 2024).

The structure consists of a total of 57 items grouped according to each of the eight competences: linguistic competence (LC) 7 items, multilingual competence (MC) 7 items, mathematical competence and competence in science, technology and engineering (CSTEM) 9 items, digital competence (DC) 5 items, civic competence (CC) 6 items, entrepreneurial competence (EC) 5 items, competence in cultural awareness and expression (CCAE) 6 items, and personal, social and learning to learn competence (PSLLC) 12 items. The latter competence, due to the variety of nuances in the skills it encompasses, requires a larger number of items to facilitate the identification of the level of academic self-efficacy. Moreover, the scale selected is a Likert-type scale, with five response options to measure the degree of capability from "not at all capable" to "fully capable".

Subsequently, a double validation was performed using the expert judgement technique (Galicia-Alarcón *et al.*, 2017), with the participation of teachers from the Didactics and School Organisation and MIDE (Research Methods and Assessment in Education) departments, and teachers of Secondary Education in Extremadura; a pilot test was implemented with students with similar socio-demographic characteristics. This procedure corroborated the appropriateness of the wording, as well as the precise time required to answer the questions posed.

Furthermore, its reliability was determined by analysing the internal consistency using Cronbach's alpha coefficient (González-Alonso and Pazmiño-Santacruz, 2015), the statistical value of which was α = 0.942; thus showing a high level of internal consistency meaning that the KEYCOMSE questionnaire is a reliable and valid instrument.

2.4. Data collection and Analysis Procedure

The KEYCOMSE questionnaire was administered in paper format to students in schools who agreed to participate in the study. An informative letter was previously sent to the

management teams to request participation in the study, explain the purpose of the research, state the confidentiality of the data, and obtain the informed consent of the participants.

The association between students' gender and their levels in the different key competences was analysed using a progressive statistical approach. Chi-square tests of independence were applied to identify significant associations between categorical variables. Subsequently, a multivariate analysis of variance (MANOVA) was used to jointly analyse the overall differences in competences, once the assumptions of normality, multicollinearity and homogeneity of covariances had been verified. Although the test of between-subject effects was conducted to explore competence-specific differences, these results were omitted for reasons of article length, with the interpretation focusing on the overall multivariate statistics. In order to explore relational patterns in a visual and multidimensional way, a multiple correspondence analysis (MCA) was carried out, which allowed us to graphically represent the associations between competence levels and gender categories. Finally, a cluster analysis was conducted on the factor coordinates extracted from the MCA in order to identify homogeneous groups and statistically validate the visually detected profiles.

The competences assessed were transformed into categorical variables with three competence levels: high, medium and low, to facilitate statistical analyses. Data processing and analysis were carried out using IBM SPSS, version 28.

3. Results

The significant association between each competence and gender was assessed using the Chi-square test. Table 1 shows the Chi-square value and the *p*-value for each of the competences with the gender variable.

Table 1. Chi-square value, degrees of freedom and asymptotic significance

	Pearson's Chi-square value	*df*	Asymptotic significance (bilateral)
Linguistic	27.168	4	<0.001
Multilingual	13.959	4	0.007
Mathematical	2.451	4	0.653
Digital	6.812	2	0.033
Social	24.656	4	<0.001
Civic	6.183	4	0.186
Entrepreneurial	5.751	4	0.219
Cultural expression	12.492	4	0.014

Source: Compiled by authors

Table 1 shows that five competences show a *p*-value of less than 0.05. Therefore, a significant association was found between gender and linguistic, multilingual, digital, social and cultural expression competences. This indicates that the distribution of responses differs remarkably from that expected if these variables were independent and suggests that the level of competence is related to the gender of the students. The data show that there is a significant association between gender and these competences. However, mathematical, civic and entrepreneurial competences do not show a significant association with gender.

The Chi-square value is interpreted as a measure of the discrepancy between the data observed and the data that would be expected if no relationship existed, that is, under the null hypothesis of independence. For example, a value of 27.188 for linguistic competence indicates that there is a notable difference between the observed frequencies of the competence and the frequencies that would be expected if there were no relationship between gender and competence. The higher the Chi-square value, the greater the discrepancy.

Table 2 shows the expected frequencies for each level of each competence according to gender. Most of the cells show an expected value greater than 5 and, moreover, none have an expected frequency less than 1, which leads us to conclude that the assumptions of the Chi-square test are met.

Table 2. Expected frequencies for each level of each competence

Gender	**Competence level**			
	Linguistic			
	Baja	Media	Alta	Total
Female	187.0	230.0	164.0	581.0
Male	151.3	239.0	190.7	581.0
NB*	2.9	4.5	3.6	11.0
	Multilingual			
	Baja	Media	Alta	Total
Female	150.1	209.6	154.3	514.0
Male	169.7	236.9	174.4	581.0
NB*	3.2	4.5	3.3	11.0
	Mathematical and Scientific			
	Baja	Media	Alta	Total
Female	142.7	174.7	196.6	514.0
Male	161.3	197.5	222.2	581.0
NB*	3.1	3.7	4.2	11.0
	Digital			
	Baja	Media	Alta**	Total
Female	106.4	407.6		514.0
Male	120.3	460.7		581.0
NB*	2.3	8.7		11.0
	Personal, social and learning to learn			
	Baja	Media	Alta	Total
Female	139.4	207.7	166.8	514.0
Male	157.6	234.8	188.6	581.0
NB*	3.0	4.4	3.6	11.0
	Civic			
	Baja	Media	Alta	Total
Female	143.1	166.4	204.5	514.0

Male	161.8	188.1	231.1	581.0
NB*	3.1	3.6	4.4	11.0
	Entrepreneurial			
	Baja	Media	Alta	Total
Female	128.7	163.6	221.7	514.0
Male	145.5	184.9	250.6	581.0
NB*	2.8	3.5	4.7	11.0
	Cultural Awareness and Expression			
	Baja	Media	Alta	Total
Female	126.4	201.2	186.4	514.0
Male	142.9	227.5	210.7	581.0
NB*	2.7	4.3	4.0	11.0

Source: Compiled by authors

*NB: Non-Binary

**When performing the statistical technique, only two categories emerge (low and medium)

Table 3 shows the Cramer's V value as a measure of the strength of association between each of the competences and the gender variable. Yet again, the linguistic, multilingual, digital, social and cultural expression competences show a statistically significant association.

Table 3. Cramer's V value per competence

	Value	**Approximate significance**
Linguistic	0.111	<0.001
Multilingual	0.079	0.007
Mathematical	0.033	0.653
Digital	0.078	0.033
Social	0.106	<0.001
Civic	0.053	0.186
Entrepreneurial	0.051	0.219
Cultural Expression	0.075	0.014

Source: Compiled by authors

Based on the Chi-square test results, we proceeded to explore further using the MANOVA to check whether there is an overall gender effect on the set of competences. This technique is useful when competences are analysed jointly and requires assumptions of normality and homogeneity of covariance matrices to be met. In line with recent studies applying MANOVA to explore gender differences in perceptions of competence (Cheung *et al.*,2024), these assumptions were verified before proceeding with the analysis, thus ensuring the validity of the results.

Previously, for each competence, normality is verified by reviewing the Q-Q plots and no extreme outliers are detected. Furthermore, multicollinearity is checked and no high Pearson correlation coefficients or close to 1 or -1 are detected. Subsequently, Box's M test for equality of covariance matrices is performed and a *p*-value of 0.115 ($p > 0.001$) is determined, suggesting that the homogeneity assumption is satisfied.

Once these assumptions have been verified, the MANOVA is performed. Table 4 presents various overall statistics (Pillai's Trace, Wilks' Lambda, Hotelling's Trace and Roy's Largest Root), which show a *p*-value of less than 0.05 and, therefore, it can be determined that, overall, competences differ significantly across gender groups.

Table 4. Overall MANOVA statistics

	Effect	Value	F	Hypothesis df	Error df	Sig.
Intersection	Pillai's Trace	0.680	291.164	8.000	1096.000	<0.001
	Wilks' Lambda	0.320	291.164	8.000	1096.000	<0.001
	Hotelling's Trace	2.125	291.164	8.000	1096.000	<0.001
	Roy's Largest Root	2.125	291.164	8.000	1096.000	<0.001
Gender	Pillai's Trace	0.065	4.598	16.000	2194.000	<0.001
	Wilks' Lambda	0.936	4.62	16.000	2192.000	<0.001
	Hotelling's Trace	0.068	4,642	16.000	2190.000	<0.001
	Roy's Largest Root	0.054	7.368	8.000	1097.000	<0.001

Source: Compiled by authors

An MCA is then performed to visually show patterns or associations between gender and levels of competence among the simultaneous categories. This enables us to visualise how the categories are grouped and to detect patterns that may not be evident in numerical analyses.

Table 5 shows how the first two dimensions explain 56.086% of the variability.

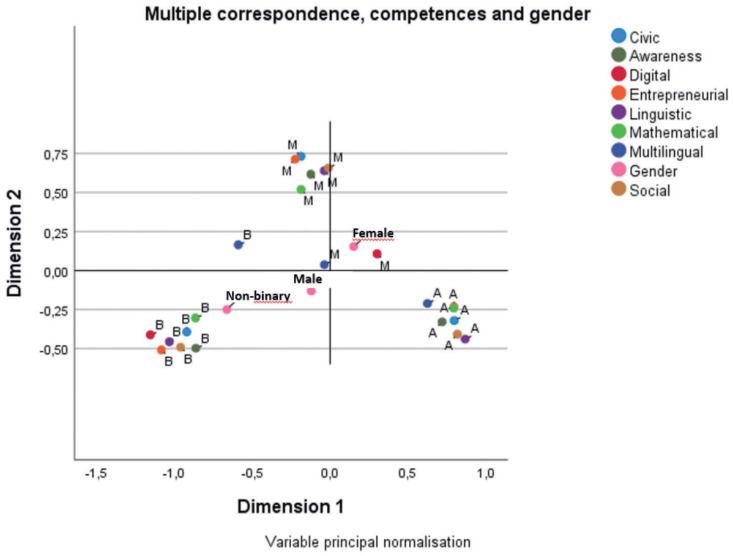
Table 5. MCA explained variance

Dimension	Cronbach's alpha	Variance accounted for		
		Total (eigenvalue)	Inertia	% variance
1	0.939	10.459	0.387	38.736
2	0.817	4.685	0.174	17.35
Total		15.143	0.561	
Mean	0.901	7.572	0.28	28.043

Source: Compiled by authors

In Figure 1, we can simultaneously observe the relationships between competence levels and gender.

FIGURE 1. Multiple Correspondence Analysis between competences and gender



Source: Compiled by authors

The MCA firstly reveals consistent and homogeneous groups according to competence level: the group reporting a high level—third quadrant—does so in the overall set of key competences, suggesting that the development of a high level in one competence may be accompanied by high levels in the others, thus forming a profile of perceived high achievement or high academic self-efficacy in relation to the key competences; the group showing a medium perceived level of competence—first quadrant—does so overall, except for two competences, digital competence and multilingual competence; and finally, the group showing a low perceived level of competence—fourth quadrant—does so overall, except for multilingual competence.

In terms of the relationship between academic self-efficacy and the gender variable, this analysis reveals a clear differentiation in the behaviour of competence levels according to gender. The female variable in the second quadrant, which is very close to the category of medium digital competence, indicates that there is a strong association in the sample between the female gender and 'medium' academic self-efficacy in this competence.

Furthermore, in the fourth quadrant we can observe the low competence level for all competences except multilingual competence, in addition to the non-binary variable, which is very close to the 'low level' variables of the competences, and the male variable, which is further away. This indicates that the academic self-efficacy of non-binary students is associated with a low competence level almost across the board. Similarly, males are also positioned close to a low overall competence level, in contrast to females, who are closer to both the medium competence level and high competence level.

This interpretation complements the inferential Chi-square and ANOVA analyses and offers a graphical and exploratory view of how gender categories are related to the different levels of competences perceived by students in the 4th year of Compulsory Secondary Education in Extremadura. In addition, following recent approaches combining MCA with clustering

techniques (Atkinson, 2024; Hwang *et al.*, 2006; Vrhovac *et al.*, 2024), a cluster analysis was performed on the MCA coordinates. The MCA provides a visual map of general patterns of association, while the cluster analysis explores the quantifiable and significant differences between groups. The results—Table 6—confirmed statistically significant differences in five competences: linguistic, multilingual, digital, personal, social and learning to learn, and cultural awareness and expression, between the male and female groups. This reinforces the differentiated position of females in the MCA, especially their location in the second quadrant. In the case of cultural awareness and expression competence, a significant difference was also found between females and non-binary.

TABLE 6. Cluster analysis—dimensions of key competences—with significant differences in student perception according to gender (in %).

Dimension (clusters)		**Gender**		
% Verticals with χ^2 mark	**Total**	**Female (A)**	**Male (B)**	**Non-binary (C)**
Total	1106	514	581	11
LC				
G. High capability	30.9	35.4 B*	27	27.3
G. Medium capability	46.9	48.4	45.6	45.5
G. Low capability	22.2	16.1	27.4 A	27.3
M.C.				
G. High capability	35.4	41.4 B	30.1	27.3
G. Medium capability	39	34.8	42.5 A	45.5
G. Low capability	25.7	23.7	27.4	27.3
CSTEM				
G. High capability	36.4	33.9	39.0	18.2
G. Medium capability	29.9	31.5	28.1	45.5
G. Low capability	33.8	34.6	32.9	36.4
TC				
G. High capability	58.5	63.2 B	54.6	45.5
G. Medium capability	34.5	31.7	36.8	45.5
G. Low capability	7	5.1	8.6 A	9.1
PSLLC				
G. High capability	50.8	55.1 B	47.3	36.4
G. Medium capability	28	19.3	35.6 A	36.4
G. Low capability	21.2	25.7 B	17.0	27.3
CC				
G. High capability	39.5	39.5	39.8	27.3
G. Medium capability	50.1	50.6	49.4	63.6
G. Low capability	10.4	9.9	10.8	9.1
EC				
G. High capability	41	41,1	41,3	18,2

G. Medium capability	47.7	49.2	46.5	45.5
G. Low capability	11.3	9.7	12.2	36.4
CCAE				
G. High capability	36.8	41.4BC	33.0	18.2
G. Medium capability	20	16.5	22.4 A	54.5AB
G. Low capability	43.2	42	44.6	27.3

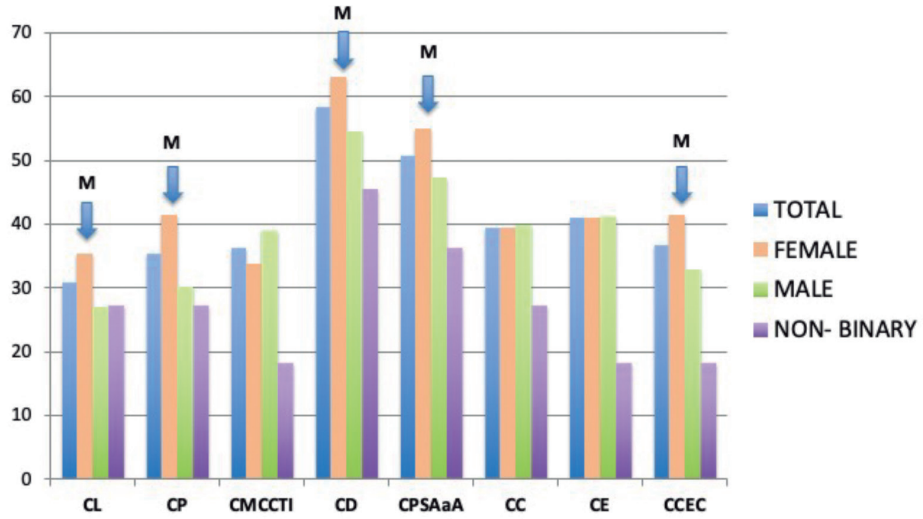
Source: Compiled by authors

*Significant difference at 95 %

The association between non-binary gender and low competence levels was consistently apparent in the MCA, but only reached statistical significance in one specific competence—cultural awareness and expression—after the cluster analysis was performed. This discrepancy may be due to the small size of this category, which limits the statistical power to detect differences in other areas.

These findings reinforce the spatial interpretation of the MCA, indicating that the visual associations detected correspond to actual statistical distances between groups. As a visual complement to this validation, Figure 2 presents a comparison by gender in the high capability groups for each of the key competences, based on the results of the cluster analysis. This representation underlines the prominent position of the female group in certain competences and the low representation of the non-binary category at higher levels.

FIGURE 2. Comparison by gender in "high capability" groups in each of the key competences.



Source: Compiled by authors

4. Discussion and conclusions

The aim of this study was to analyse whether gender acts as a moderating variable when assessing academic self-efficacy in the acquisition of key competences upon completion

of Compulsory Secondary Education, in a sample of 1,106 4th year ESO students in the autonomous region of Extremadura.

The first hypothesis postulated in this study was the existence of significant differences when assessing academic self-efficacy in the acquisition of each of the key competences according to whether students identify as male, female or non-binary. Considering the results obtained, this hypothesis is confirmed, as females have higher academic self-efficacy in the linguistic, multilingual, digital, personal, social and learning to learn, and cultural awareness and expression competences. These data corroborate previous studies that have found females to have higher levels of academic self-efficacy in linguistic skills (Meroño *et al.*, 2018; Pajares, 2003; Pajares Miller and Johnson, 1999). They also show superior performance in skills that lead to the acquisition of personal, social and learning to learn competence (González Moreno and Molero Jurado, 2022), thus highlighting a greater ability to interact with other people and establish social relationships (Betancourth *et al.*, 2017). Similarly, greater empathy and collaboration is observed in different areas of personal, academic and social life (Akelaitis and Lisinskiene, 2018), as is a more competent perception in the skills associated with knowledge construction, that is, learning to learn competence (Gargallo-López *et al.*, 2023). Likewise, Corpas-Reina *et al.* (2015), in a study carried out with students in the sixth year of Primary Education, report that females are more competent in the skills they possess leading to the acquisition of cultural and artistic competence—currently known as competence in cultural awareness and expression—compared to the lower scores of males.

Moreover, with respect to mathematical competence and competence in science, technology and engineering, the results of this study show that males consider themselves more competent in the skills leading to the acquisition of this ability—without any significant differences. Stearns *et al.* (2019) highlight that males show greater self-efficacy and confidence regarding the possibility of developing skills and abilities related to scientific-technological disciplines. In a similar fashion, Zamora-Araya *et al.* (2022) report that males have higher perceived competence in their mathematical skills compared to females.

With regard to the second hypothesis, it can be stated that gender does indeed act as a moderating variable in academic self-efficacy regarding the holistic acquisition of all key competences. The results obtained in the MCA indicate a strong relationship between competences and competence level—high, medium, low—as well as between competence level and gender, with females rating their academic self-efficacy higher upon acquiring the full set of competences. In the case of males, the average level of overall self-efficacy is lower and, in the non-binary group, there is a clear correlation between identifying as such and a low level of overall self-efficacy, with the exception of multilingual competence. This repeated association of the non-binary group with low levels of academic self-efficacy in key competences suggests the need to further explore how non-normative gender identities construct their self-assessment within the education system.

However, given the extensive scientific literature relating academic self-efficacy to motivation, academic performance and, ultimately, academic success, we should note that self-reports, although valuable tools for obtaining information, may not accurately reflect students' actual competence. The line of research could be extended to include practical performance assessments, direct observations or standardised tests that measure actual levels of competence.

Furthermore, the study has other limitations. Having had access to a sample of young people in their 4th and final year of Compulsory Secondary Education, who declare themselves to be non-binary in a study whose key variable is gender is of great interest, as it provides very valuable information on a specific group in the field of education. Nevertheless, the small sample size was considered a limitation of this study, as the sample weighting is insufficient when applying inferential and multivariate statistical techniques, which may

interfere with its generalisability. Similarly, despite using convenience sampling, a sample of scientific interest was obtained; however, caution should be exercised regarding the strict generalisability of the results.

Another limitation detected is the scarcity of scientific evidence on the assessment of the level of self-efficacy of all key competences as a whole, and its correlation with gender. It would be advisable to continue with this line of research in order to strengthen the hypothesis; extending the sample size to different geographical areas would also allow us to observe any potential variations in the weighting of the non-binary group.

Finally, the importance of academic self-efficacy for students in these educational stages should be emphasised, since when students believe in their abilities they tend to deal with their academic obligations in a positive way, avoiding procrastination (Yupanqui *et al.*, 2023) and increasing the likelihood of academic success (Chen *et al.*, 2024A; Nabunya *et al.*, 2022). Their academic behaviour is also motivated by their perception of their own abilities (Chen *et al.*, 2024A; Malpica-Chavarria and Garzón-Umerenkova, 2024). It is of particular relevance to continue researching the relationships between the gender factor and academic self-efficacy, since it could enable a valuable transfer of knowledge to the teaching profession, offering highly useful information for designing appropriate teaching-learning strategies for equitable education, thus improving the quality of the education system.

This would help teachers in their continuous development regarding classroom management and addressing the growing and changing educational needs of students, with a view to reducing educational inequality and promoting equal opportunities in education (García-Herrero *et al.*, 2024). Moreover, they would be provided with resources to foster a democratic and egalitarian education, free from gender distinction, that prepares students to exercise citizenship and serves as a means to ensure the foundations for freedom of choice in the future (Miralles-Cardona, 2025).

Author Contributions

Lara Montero de Espinosa Ramos. Investigation, project administration, resources and visualisation.

Amparo Jiménez Vivas. Conceptualisation and project administration.

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All three authors collaborated on the supervision, writing and critical review of the publication.

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References

Abarzúa-Ceballos, L., Ambrós-Pallarés, A. & Ruiz-Bueno, A. (2024). Construcción y validación de un cuestionario sobre prácticas de lectura digital académica para estudiantado universitario de formación inicial de profesorado [Construction and validation of a questionnaire on academic digital reading practices for undergraduates of initial teacher training]. *Revista de Investigación Educativa*, *42*(1), 33-59. https://doi.org/10.6018/rie.548111

Akelaitis, A. V. & Lisinskiene, A. R. (2018). Social Emotional Skills and Prosocial Behaviour among 15-16-year-old Adolescents. *European Journal of Contemporary Education*, *7*(1), 21-28. http://doi.org/10.13187/ejced.2018.1.21

Álvarez-Martínez-Iglesias, J. M., Molina Saorín, J., Miralles-Martínez, P. & Trigueros-Cano, E. J. (2021). Key Competences and the Transfer of Social Knowledge: Perceptions of Secondary School Pupils. *Sustainability*, *13*(4), 2299. https://doi.org/10.3390/su13042299

Arabit-García, J., Prendes-Espinosa, M. P. & Serrano-Sánchez, J. L. (2021). La enseñanza de STEM en Educación Primaria desde una perspectiva de género [STEM education in Primary Education from a gender perspective]. *Revista Fuentes*, *23*(1), 64-76. https://doi.org/10.12795/revistafuentes.2021.v23.i1.12266

Arroyo, I., Burleson, W., Tai, M., Muldner, K. & Woolf, B. P. (2013). Gender differences in the use and benefit of advanced learning technologies for mathematics. *Journal of Educational Psychology*, *105*, 957-969.

Atkinson, W. (2024). Charting fields and spaces quantitatively: from multiple correspondence analysis to categorical principal components analysis. *Quality & Quantity*, *58*(1), 829-848. https://doi.org/10.1007/s11135-023-01669-w

Balaguer, Á., Benítez, E., Serrano, B., & Orejudo Hernández, S. (2025). Competencias Clave en Educación y Autoeficacia General. Validación de la escala COMINT [Key Competences in Education and General Self-Efficacy. Validation of the COMINT scale]. *Revista De Educación*, *1*(407), 137-166. https://doi.org/10.4438/1988-592X-RE-2025-407-654

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of management*, *38*(1), 9-44. https://doi.org/10.1177/0149206311410606.

Belmonte-Lillo, V. M. & Parodi, A. I. (2017). Creatividad y adolescencia: Diferencias según género, curso y nivel cognitivo [Creativity and adolescence: Differences according to gender, grade and cognitive level]. *European Journal o Investigation in Health, Psychology and Education*, *7*(3) 177-188. https//doi.org/10.30552/EJIHPE.V7I3.205

Betancourth, S., Zambrano, C., Ceballos, A., Benavides, V. & Villota, N. (2017). Habilidades sociales relacionadas con el proceso de comunicación en una muestra de adolescentes. *Revista Psicoespacios*, *11*(18), 133-148. https://doi.org/10.25057/21452776.898

Bielba-Calvo, M., Martínez-Abad, F., Herrera-García, M. E. & Rodríguez-Conde, M. J. (2015). Diseño de un instrumento de evaluación de competencias informacionales en ESO a través de la selección de indicadores clave [Design of an instrument for evaluating information literacy skills in secondary education through the selection of key indicators]. *Education in the Knowledge Society (*EKS), *16*(3), 124-143. https://doi.org/10.14201/eks2015163124143

Chen, P., Yang, D., Lavonen, J., Metwally, A. H. S. & Tang, X. (2024A). How do students of different self-efficacy regulate learning in collaborative design activities? An epistemic network analysis approach. *Frontiers in Psychology*, *14*, article 1398729. https://doi.org/10.3389/fpsyg.2024.1398729

Chen, Y., Li, C., Cao, L. & Liu, S. (2024B). The effects of self-efficacy, academic stress, and learning behaviors on self-regulated learning in blended learning among middle school students. *Educational Technology*, *29*(18), 24087-24110. https://doi.org/10.1007/s10639-024-12821-w

Cheung, KKC., Pun, J. & Hao, Y. (2024). The Use of MANOVA in Analyzing the Effects of Gender on Perceived Difficulties in Speaking and Writing in a Hong Kong EMI University. In: Curle S.M., Pun J., (eds.). *Researching English Medium Instruction: Quantitative Methods for Students and Researchers* (pp. 207-226). Cambridge University Press. https://doi.org/10.1017/9781009425407.017

Corpas-Reina, C., Gutiérrez-Arenas, M. P. & Ramírez-García, A. (2015). Competencia cultural y artística, autopercepción del alumnado de sexto de primaria. En AIDIPE (ed.), *Investigar con y para la sociedad* (vol. 2, pp. 715-729). Bubok. http://hdl.handle.net/10396/14466

Delgado, B., Martínez, M. C., Rodríguez, J. & Escortell, R. (2019). Academic self-efficacy and emotional intelligence as factors associated with the academic success of university students [La autoeficacia académica y la inteligencia emocional como factores asociados al éxito académico de los estudiantes universitarios]. *Revista GPT*, 35, 1-15. http://hdl.handle.net/10045/94947

Espinoza, A. M. & Taut, S. (2020). Gender and psychological variables as key factors in mathematics learning: a study of seventh graders in Chile. *Int. J. Educ. Res*, *103*, 101611. http://doi.org/10.1016/j.ijer.2020.101611

Galicia-Alarcón, L. A; Balderrama-Trápaga, J. A. & Edel-Navarro, R. (2017). Validez de contenido por juicio de expertos: propuesta de una herramienta virtual. *Apertura*, *9*(2), 42-53. http://doi.org/10.18381/Ap.v9n2.993

García-Álvarez, D., Cobo-Rendón, R. & Hernández-Lalinde, J. D. (2022). Validez, fiabilidad e invarianza factorial de las escalas de autoeficacia general y autoeficacia académica en estudiantes universitarios [Validity, reliability and factorial invariance of the general self-efficacy and academic self-efficacy scales in university students]. *Retos*, *46*, 1093-1104. https://doi.org/10.47197/retos.v46.94281

García-Herrero, M., Rodríguez-Conde, M. J. & Martínez-Abad, F. (2024). Factores de calidad docente asociados a la equidad educativa: Formación del profesorado y estrategias docentes [Factors of teaching quality associated with educational equity: Teacher training and teaching strategies]. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *27*(1), article 1. https://doi.org/10.6018/reifop.595181

García-Llorente, H. J., Martínez-Abad, F. & Rodríguez-Conde, M. J. (2020). Assessment of Observed and Self-Perceived Information Literacy in Compulsory Secondary Education Students From a Spanish Region With a High Performance in PISA [Evaluación de la alfabetización informacional observada y autopercibida en estudiantes de educación secundaria obligatoria de una región española con alto rendimiento en PISA]. *Revista Electrónica Educare*, *24*(1), 1-17. https://doi.org/10.15359/ree.24-1.2

Gargallo-López, B., Almerich-Cerveró, G., García-García, F.J., López-Francés, I. & Sahuquillo-Mateo, P.M. (2023). Perfiles de estudiantes universitarios en la competencia aprender a aprender y su relación con el rendimiento académico [University student profiles in the learning to learn competence and their relationship with academic achievement]. *Revista Española de Pedagogía*, 81(286). https://revistas.unir.net/index.php/rep/article/view/74

González-Alonso, J. A & Pazmiño-Santacruz, M. R. (2015). Cálculo e interpretación del Alfa de Cronbach para el caso de validación de la consistencia interna de un cuestionario, con dos posibles escalas tipo Likert.*Revista Publicando*, *2*, 62-77 https://revistapublicando.org/revista/index.php/crv/article/view/22/pdf_11

González-Moreno, A. & Molero-Jurado, M. del M. (2022). Diferencias de sexo en habilidades sociales y creatividad en adolescentes: una revisión sistemática [Sex differences in social skills and creativity in adolescents: a systematic review]. *Revista Fuentes*, *24*(1), 116-126. https://doi.org/10.12795/revistafuentes.2022.17471

Grossmann, N., Hofferber, N., Wilde, M. *et al* (2022). Students' motivation in biology lessons—can student autonomy reduce the gender gap?. *Eur J Psychol Educ 38*, 409–434. https://doi.org/10.1007/s10212-022-00604-1

Hwang, J. H., Park, J. S., & Lim, J. S. (2006). Application of multiple correspondence analysis and clustering techniques to customer segmentation. *Expert Systems with Applications*, *31*(2), 300–313. https://doi.org/10.1016/j.eswa.2005.10.027

Kabir R. S. & Sponseller A. C. (2020). Interacting With Competence: A Validation Study of the Self-Efficacy in Intercultural Communication Scale-Short Form. *Frontiers in Psychology*, *11*, 2086. https://doi.org/10.3389/fpsyg.2020.02086

Karatepe, R., & Cenk, A. (2023). An examination of high school students' key competences skills. *Dokuz Eylül Üniversitesi Buca Egitim Fakültesi Dergisi*, *56*, 649-681. https://dergipark.org.tr/en/download/article-file/2873683

Kaur, T., McLoughlin, E. & Grimes, P. (2022) Mathematics and science across the transition from primary to secondary school: a systematic literature review. *International Journal of STEM Education, 9*, 1-23. https://doi.org/10.1186/s40594-022-00328-0

Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. Boletín Oficial del Estado, 340, de 30 de diciembre de 2020, 122868-122953. https://www.boe.es/boe/dias/2020/12/30/pdfs/BOE-A-2020-17264.pdf

Ley Orgánica 2/2006, de 3 de mayo, de Educación. Boletín Oficial del Estado, núm. 106, de 5 de mayo de 2006. https://www.boe.es/boe/dias/2020/12/30/pdfs/BOE-A-2020-17264.pdf

Malpica-Chavarria, E. A. & Garzón-Umerenkova, A. (2024). Frecuencia y motivos para procrastinar: impacto del curso, género, autorregulación y autoeficacia [Frequency and reasons for procrastinating: impact of the course, gender, self-regulation and self-efficacy]. *Revista Fuentes*, *26*(2), 171-184. https://doi.org/10.12795/revistafuentes.2024.23502

McMillan, J. H. & Schumacher, S. (2005). *Investigación educativa,* (5ªed.) Pearson.

Meroño, L., Calderón, A., Arias-Estero, J.L. & Méndez-Giménez, A. (2017). Cuestionario del Aprendizaje Percibido basado en Competencias para el Alumnado de Educación Primaria (#ICOMPri1) [Questionnaire on Perceived Learning based on Competencies for Primary Education Students (#ICOMPri1)], *Cultura y Educación*, *29*(2), 279-323. https://doi.org/10.1080/11356405.2017.1318470

Meroño, L., Calderón, A., Rieckman, M., Méndez-Giménez, A. & Arias-Estero, J. L. (2018). Relación entre el aprendizaje competencial percibido y aprendizaje medido en TIMSS 2015: Comparación de alumnado español y alemán. *Revista de Educación. 379*, 9-31. https://doi.org/10.4438/1988-592X-RE-2017-379-365

Miralles-Cardona, C. (2025). Teaching gender equality in teacher education: incorporation of gender-responsive pedagogy in pre-service programmes. *Frontiers in Education*, 10. https://doi.org/10.3389/feduc.2025.1570115

Nabunya P., Byansi W., Damulira C. & Ssewamala F. M. (2022). Self-efficacy, academic performance and school transition among orphaned adolescents in southern Uganda. *Children and Youth Services Review*, *143*, 106707. https://doi.org/10.1016/j.childyouth.2022.106707

OCDE (2005). *La definición y selección de competencias clave. Resumen Ejecutivo*. http://deseco.ch/bfs/deseco/en/index/03/02.parsys.78532.downloadList.94248.

Pajares, F., Miller, M. D. & Johnson, M. J. (1999). Gender differences in writing self-beliefs of elementary school students. *Journal of Educational Psychology*, *91*, 50-61. https://doi.org/10.1037/0022-0663.91.1.50

Pérez-Mármol, M., Castro-Sánchez, M., Chacón-Cuberos, R. & Gamarra Vengoechea, M. A. (2023). Inteligencia emocional en Educación Secundaria: relación con los factores sociales y académicos [Emotional intelligence in Secondary Education: relationship with social and academic factors]. *Revista Fuentes*, *25*(2), 126-137. https://doi.org/10.12795/revistafuentes.2023.20909

Quílez-Robres, A., Moyano, N. & Cortés-Pascual, A. (2021). Motivational, Emotional, and Social Factors Explain Academic Achievement in Children Aged 6–12 Years: A Meta-Analysis. *Education Sciences*, *11*(9), 513. https://doi.org/10.3390/educsci11090513

Rosales-Ronquillo, C. A. & Hernández-Jácquez, L. F. (2020). Autoeficacia académica y su relación con el rendimiento académico en estudiantes de nutrición [Academic self-efficacy and its relationship with academic performance in nutrition students]. *Revista Electrónica Educare*, *24*(3), 139-155. http://dx.doi.org/10.15359/ree.24-3.7

Stearns, E., Bottia, M. C., Giersch, J., Mickelson, R. A., Moller, S., Jha, N. & Dancy, M. (2019). Do Relative Advantages in STEM Grades Explain the Gender Gap in Selection of a STEM Major in College? A Multimethod. *American Educational Research Journal*, *57*(1), 218-257. https://doi.org/10.3102/0002831219853533

Tumino, M. C., Quinde, J.M., Casali, L. N. & Valega, M. R. (2020). Autoeficacia en estudiantes universitarios: el rol del empoderamiento académico [Self-efficacy in university students: the role of academic empowerment]. *IJERI: International Journal of Educational Research and Innovation*, *14*, 211-224. https://doi.org/10.46661/ijeri.4618.

Vega-Díaz, M. (2024). Motivación y rendimiento académico en las distintas asignaturas de secundaria: factores influyentes [Motivation and academic performance in different secondary school subjects: influencing factors]. *Cuestiones Pedagógicas. Revista De Ciencias De La Educación*, *1*(33), 263-284. https://doi.org/10.12795/CP.2024.i33.v1.14

Unión Europea (2018). Council Recommendation of 22 May 2018, on key competences for lifelong learning. Official Journal of the Unión Europea, C 189, 4.6.2018, 1-13. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&from=EN

Unión Europea (2019). *Key competences for Lifelong Learning*. European Commission: Directorate-General for Education Publications Office. https://data.europa.eu/doi/10.2766/569540.

Vrhovac, V., Orošnjak, M., Ristić, K., Sremčev, N., Jocanović, M., Spajić, J. & Brkljač, N. (2024). Unsupervised Modelling of E-Customers' Profiles: Multiple Correspondence Analysis with Hierarchical Clustering of Principal Components and Machine Learning Classifiers. *Mathematics*, *12*(23), 3794. https://doi.org/10.3390/math12233794

Wang, L. & Yu, Z. (2023). Gender-Moderated Effects of Academic Self-Concept on Achievement, Motivation, Performance, and Self-Efficacy: A systematic review. *Frontiers in Psychology*, *14*, article 1136141. https://doi.org/10.3389/fpsyg.2023.1136141

Yupanqui-Lorenzo, D. E., Olivera-Carhuaz, E.S., Pulido-Capurro, V. & Reynaga Alponte, A. A. (2023). Efecto de la autoeficacia y eutrés en la procrastinación: un análisis multigrupo [Effect of Self-Efficacy and Eustress on Procrastination: A Multigroup Analysis]. *Revista Fuentes*, 48-58. https://doi.org/10.12795/revistafuentes.2023.21318

Zamora-Araya, J. A., Montero-Rojas, E., Smith-Castro, V., Moreira-Mora, T. E., Zamora-Calvo, P., Quintero-Arias, C. & Matarrita-Muñoz, S. (2022). Gender, self-efficacy and performance in a mathematics test: The moderating role of the educational center [Género, autoeficacia y rendimiento en una prueba de matemática: El papel moderador del centro educativo]. *Uniciencia*, *36*(1), p. 1-17.

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