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Editorial

The framework of professional teaching competencies or the importance of emotional competence training for teachers.

Recently, we have been introduced to the Final Report with the Proposal for the Framework of Professional Teaching Competencies, developed by the Teacher Training Working Group of the Ministry of Education and Vocational Training (MEFPD). It is true that, overall, the report has been well received as it outlines the fundamental guidelines for teaching practice and, therefore, for the training of future teachers, regardless of the educational level in which they are involved.

However, it has also received some criticism, as it has not sufficiently emphasized the development of critical and creative education. Some have even equated it to a mere handbook, without delving into significant aspects of contemporary education (Permanent Commission, “For a New Educational Policy. Seville Forum,” 2024), such as “understanding education in its complexity; integrating and applying knowledge in diverse contexts; teaching competencies based on diversity and inclusion; ethical and political commitment to human rights; democracy and the common good; or the ability to tackle complex situations with consolidated and innovative methodologies.”

Of the eleven competencies proposed in the aforementioned report, Competency 4 focuses on the holistic development and well-being of both students and teachers. This competency is further broken down into two descriptors, which “determine the professional identity of teachers”: on one hand, student well-being, prevention, and action regarding student health; and on the other hand, teacher well-being, prevention, and action regarding teacher health.

In this editorial, we focus on the second descriptor, referring to teacher well-being. In the four levels outlined in this descriptor, the need for teachers to engage in actions that improve their emotional health is emphasized. These actions include understanding, planning, implementing, evaluating, improving, and transferring practices that enhance emotional well-being, in addition to promoting initiatives with the primary objective of preventing and detecting elements that threaten their personal well-being. Despite this, and interestingly, one of the criticisms the document received from the Permanent Commission “For a New Educational Policy. Seville Forum” (2024) is the call for greater training in socio-emotional skills and empathy, as advocated by UNESCO.

Scientific literature has revealed that teachers possess a personal resource, which can be trained and developed, and which significantly influences their emotional and professional well-being. This is reflected in increased commitment and enthusiasm for their work (engagement), greater occupational commitment—especially relevant for novice teachers—and fewer symptoms of burnout. We are referring to emotional competencies, which should be the focus of attention for those responsible for training future teachers.

EMOTIONAL COMPETENCIES OF TEACHERS

Numerous publications have highlighted that teachers with higher emotional skills exhibit fewer symptoms of burnout and higher levels of work engagement (Pena & Extremera, 2012). In other words, teachers who can accurately perceive and express their emotions, as well as those of others; who understand the reasons behind their feelings or are capable of empathizing with others; and who regulate their emotions and those of others by generating positive emotions like joy, while not being overwhelmed by negative emotions such as fear, anger, or sadness, show greater vigor, dedication, and absorption in their daily work. These three characteristics define work engagement.

In this regard, Extremera et al. (2019) jointly examined the role of a personal resource—such as emotional ability—and a work-related resource—such as support from colleagues and the management team—in explaining teachers' level of work engagement. Their results suggest that when teachers perceive insufficient support from colleagues or management teams, emotional competencies become increasingly necessary to maintain work engagement. Thus, it is evident that emotional competencies are especially crucial in professional contexts where teachers perceive lower support from colleagues or management, as these competencies allow teachers to maintain a positive, active, and persistent attitude in the classroom.

Now, is the relationship between emotional competencies and work engagement a direct one, or is it mediated by some other variable? In this sense, Mérida-López et al. (2020) concluded that teachers with high emotional abilities cope with daily challenges at school in a more effective manner, showing greater resilience and employing less pessimistic strategies. They focus on the positive aspects of situations when solving problems, which results in higher energy, dedication, and enthusiasm for their work. Therefore, this resilient coping explains the relationship between these two variables.

If we consider another concept, occupational commitment—defined as the desire to work in a specific profession—we observe its inverse relationship with the intention to leave the profession. According to Mérida-López et al. (2023), as

in the case of emotional competencies and engagement mentioned earlier, these authors emphasize that resilient coping mediates and explains the relationship between emotional intelligence and teachers' occupational commitment. Their research results confirm the hypothesis that novice teachers with higher emotional perception, understanding, and regulation competencies are more likely to use "cognitive and behavioral coping strategies to face adversity, focusing on achieving goals and personal growth," leading to higher occupational commitment.

Furthermore, teachers with higher emotional skills reported lower symptoms associated with burnout syndrome; that is, lower levels of emotional exhaustion and depersonalization, along with a higher degree of personal accomplishment. Mérida-López and Extremera (2016, 2017) conducted a systematic review of studies addressing this issue among teacher samples, confirming the negative relationship between emotional competencies and burnout, particularly among secondary education teachers, compared to other educational levels. However, the authors point out the scarcity of research in early childhood and university education, emphasizing the need for more studies to confirm this hypothesis.

From all of the above, we can conclude the importance of training and guidance in emotional competencies for future teachers. To this end, universities offer different programs, including their own qualifications and summer extension courses. Autonomous communities can provide teacher training through teacher resource centers (CPR) or similar institutions. Additionally, there are numerous scientific and popular journals specializing in teacher training. Furthermore, there are many published programs on emotional competency training.

In our view, the most effective actions are structural ones—those that do not depend on the initiative of a particular person but, in some way, "force" those involved to implement them. This highlights the need to incorporate courses that focus on socio-emotional competencies into teacher training curricula (Porrás et al., 2020). In this regard, the National University of Distance Education (UNED) has incorporated the course "Emotional and Social Learning" into the curriculum of the Bachelor's Degree in Early Childhood Education. This is a basic training course, worth 6 ECTS, placed in the second year of the degree, under the subject "Childhood, Health, and Nutrition" and within the professional module "Socio-Affective Development."

As noted in the course's basic bibliography (Hernández et al., 2024), the competencies that students are expected to achieve align with those outlined in the current legislative text, the Organic Law of Education 3/2020 (LOMLOE, 2020), and its curricular specification through Royal Decree 95/2022 of February 1, 2022.

In this course, through synchronous sessions between the teaching team and students, continuous assessment tests (CAT), non-graded training activities—such as emotional support sessions through storytelling—and self-assessments, the goal

is for students to achieve learning outcomes such as interpreting socio- emotional development in diverse educational contexts as healthy behavior; distinguishing socio-emotional learning theories in the family and school; recognizing different types of emotions applied to childhood; identifying socio- emotional competencies in children based on the analysis of socio-educational situations and their benefits for well-being and health; understanding educational intervention programs and specific resources for emotional and social learning as a factor in preventing emotional deprivation and well-being for both children and teachers; creating teaching materials for socio-emotional learning in early childhood education; and identifying socio-emotional training needs for early childhood education professionals.

The importance that students have placed on this course is reflected in satisfaction survey results, ranking it as the second most highly rated course in the degree program, just behind an elective. This is just one example of the importance of incorporating solid emotional training into the curricula for future teachers.

CONCLUSIÓN

The journal *Educación XX1* has not been indifferent to this topic or the interest it has generated among researchers. In fact, Mérida-López et al. (2022) addressed the issue, concluding that emotional competencies of teachers constitute an essential personal resource with positive consequences for both the personal and professional well-being of teachers. These authors published the findings of a novel study in which they simultaneously examined the relationships between contextual factors (demands and work resources) and personal factors (emotional competencies) with work engagement and teachers' work attitudes. The objective of their research was to analyze the "relationships between antecedents (demands and work resources) and consequences of teacher engagement (work attitudes), as well as the potential moderating effect of emotional intelligence." They concluded that, in the face of the daily work demands imposed by students, parents, colleagues, management teams, tasks, etc., those teachers with sufficient emotional skills will demonstrate higher levels of enthusiasm for their work.

Therefore, as a conclusion, we could affirm with Porras et al. (2020) that the passage of time does not improve the acquisition of emotional interpersonal skills such as empathy. All the research cited highlights the importance of intentionally training teachers in the ability to empathize, regulate emotions in interpersonal relationships, and accurately perceive others' emotions, as this brings invaluable work-related benefits.

For this reason, educational administrations—whether national, regional, or provincial—cannot remain indifferent to the promotion of intentional and systematic

teacher training in emotional skills, allocating the necessary material, financial, and human resources. At the same time, they must strengthen working conditions that enhance engagement and occupational commitment while minimizing teacher burnout (e.g., improving student-teacher ratios, increasing salaries, providing more personal support in the classroom, reducing administrative tasks, etc.).

As Mérida-López et al. (2020, p.73) state, “teacher training programs focused on creating positive learning environments could include modules that train teachers to identify daily conflicts and setbacks, help them recognize negative emotions and how they affect their performance and the classroom climate, and ultimately teach them effective ways to regulate the emotions caused by these adversities. This would help them feel more confident in implementing regulatory and resilient strategies in their daily professional practice, strengthening their perception that their work is challenging and stimulating, and thus increasing their levels of teaching enthusiasm.”

Mario Pena Garrido
Educación XX1 Director

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Studies

Conceptual learning in pre-service teacher groups through a Text Mining intervention

Aprendizaje conceptual en grupos de profesorado en formación mediante una intervención basada en Minería de Textos

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RESUMEN

Concept acquisition is a critical aspect in the education of teachers yet is especially challenging in group contexts in which traditional teaching strategies often fail to convey complex notions effectively. This study investigates the potential of text mining (TM) based learning analytics as a teaching tool to enhance conceptual learning in pre-service teachers. To do so, it analyses how the learning of complex and abstract educational concepts was affected by a TM-based learning analytics intervention, in comparison with traditional teaching strategies, including the elaboration of an individual project, and the attendance of a master class. Quasi-experimental pre- and post-tests were thus

administered to three non-equivalent groups (A, B, and C, respectively) of a total of 81 master's students enrolled in a distance education teacher training programme at a Spanish university, and token corpora were analysed using TM techniques in collected definitions of abstract educational concepts (1017 pre-test and 1133 post-test tokens from Group A; 1127 pre-test and 1111 post-test tokens from Group B; and 1101 pre-test and 1173 post-test tokens from Group C). It was found that the TM-based learning analytics intervention significantly enhanced the students' keyword selection in submitted definitions ($t_{\text{Yuen}} = -6.37, p < .001, \delta_R^{AKP} = -1.03, IC_{95\%} = -2.10, -.74$) and the association of relevant terms (with post-test Jaccard values ranging from .217 to .917) compared to the other teaching approaches. This study therefore offers empirical evidence that TM-based learning analytics can be an effective pedagogical tool that promotes an enhanced learning of abstract concepts in the education of teachers. The results underscore the value of TM-based educational technology in optimizing conceptual learning and resource efficiency in higher education settings.

Palabras clave: textual analysis, content analysis, concept formation, social learning, visual learning, educational technology, higher education, teacher education

ABSTRACT

La adquisición de conceptos es un aspecto fundamental en la formación del profesorado, pero sigue siendo un reto, especialmente en contextos grupales en los que las estrategias de enseñanza tradicionales a menudo no logran transmitir las nociones complejas de forma eficaz. En este estudio se examina el potencial de la analítica del aprendizaje basada en minería de textos (MT) como herramienta didáctica para mejorar el aprendizaje conceptual del profesorado en formación. El objetivo fue analizar el efecto de la analítica del aprendizaje basada en MT en la adquisición de conceptos educativos complejos y abstractos, en comparación con otras estrategias de enseñanza tradicionales, como la elaboración de proyectos individuales o asistir a clases magistrales. Se llevó a cabo un estudio cuasiexperimental pre y posttest con 81 estudiantes de máster de un programa de formación a distancia en una universidad española. El estudio se centró en analizar los corpus textuales relacionados con la definición de conceptos educativos no tangibles de tres grupos no equivalentes (Grupos A, B y C, respectivamente). Mediante técnicas de MT, se analizaron 1017 tokens pretest y 1133 posttest del Grupo A, 1127 tokens pretest y 1111 posttest del Grupo B, y 1101 tokens pretest y 1173 posttest del Grupo C. Los resultados revelaron que la analítica de aprendizaje basada en MT mejoró significativamente la adquisición de conceptos de los estudiantes en cuanto a la selección de palabras clave ($t_{\text{Yuen}} = -6.37, p < .001, \delta_R^{AKP} = -1.03, IC_{95\%} = -2.10, -.74$) y la asociación de términos relevantes (valores de Jaccard posttest de .217 a .917) en sus definiciones, comparado con otros enfoques de enseñanza. Este estudio ofrece pruebas empíricas de que la analítica del aprendizaje basada en MT es una herramienta pedagógica eficaz, que contribuye a mejorar el aprendizaje de conceptos abstractos en la formación del profesorado. Los resultados subrayan el valor de la tecnología educativa basada en MT para optimizar el

aprendizaje conceptual y la eficiencia de los recursos en entornos grupales de educación superior.

Keywords: análisis de texto, análisis de contenido, formación del concepto, aprendizaje social, aprendizaje visual, tecnología de la educación, enseñanza superior, formación de profesores

INTRODUCTION

Concept acquisition occurs as learners actively categorize and label information, connecting keywords and related ideas in cohesive mental models. Conceptualization exercises, such as sorting tasks and identifying attributes, can reinforce this process by encouraging learners to define and refine their understanding (Bruner et al. 1956) as the basis for developing further knowledge and skills and achieving meaningful learning. Following a long tradition of research on this subject, and particularly in the wake of the COVID-19 pandemic (Gaglo et al., 2022), an increasing number of studies have investigated how applications of educational technology can have a role in enhancing concept acquisition. Indeed, data analytics and artificial intelligence resources such as virtual agents, natural language processing, pattern recognition, data mining and data visualization tools have provided new means and opportunities for technology-enhanced learning in higher education. In particular, text mining (TM) is a data mining technique that leverages quantitative content analysis to help visualize concepts and better understand them (Inada, 2018), and has opened the door to a new research line.

This study evaluates the potential of TM-based learning analytics as a teaching tool to enhance the acquisition of abstract educational concepts, by comparing results of its application with those of other teaching strategies, precisely the elaboration of an individual project, and the attendance of a conventional master class, in three non-equivalents groups of pre-service student teachers. Following a literature review, in order to test the hypothesis that TM-based learning analytics indeed had the potential to be an effective tool, two specific research questions were formulated before applying the strategies and collecting the data. Implications for educational practice were then extrapolated from the findings, and considered in the context of the limitations of the study and emerging research.

Literature review

Since the last century, the contributions of Bruner et al. (1956) have led to an expansion in the scope of studies of concept acquisition and improvements to

their accuracy. Teacher educators have taken interest in this field, with a view to supporting learning processes, enhancing transfer value, and helping pre-service teachers learn about the consistency of educational materials and procedures and how to respond adaptively to different educational scenarios, considering that, without adequate conceptual knowledge, teachers may lack guidance and a clear awareness of what teaching means and involves. Specialized journals have continued to publish studies on the subject (Azadi et al., 2018; Freeman, 2018; Turner, 1975), with a particular focus on abstract educational concepts in teacher education, such as critical thinking, school culture, and curriculum design. Such fundamental yet abstract concepts can be detached from physical reality and are qualitatively different from concrete concepts that are more connected to perceptual and motor experience (Borghi et al., 2019; Gagné, 1985). This means that abstract concepts are particularly difficult to acquire and to relate to practical applications, and their teaching remains a demanding challenge. Although the current study focuses on student teachers in particular, the existing body of knowledge on how concepts are learned in higher education in general is especially relevant, and implications may well extend beyond the immediate context of teacher education.

Concept acquisition in higher education

Engaging students as active participants in their learning process has been shown to stimulate cognitive aspects such as attention, memory, and comprehension (Hernández-de-Menéndez et al., 2019; Nguyen et al., 2021). Furthermore, recent studies have evidenced improvements in the concept acquisition on the integration of active techniques into the learning process, such as flipped classes (Atkinson et al., 2020), asynchronous online discussions (Breivik, 2020), the gamification of lessons (Kortemeyer et al., 2019), and virtual reality simulations (Liao, 2022).

Active learning has been shown to promote concept acquisition if applied as an integral part of the overall strategic planning of teaching activities, and game-based learning has been observed to yield good results (Casanoves et al., 2022), while pre-training videos and real-time cues have, on the other hand, have been shown to have limited effects on conceptual learning (Tsai et al., 2022). Moreover, timed reading, video enactments and writing assignments have been seen to be helpful in certain studies (Guerrettaz et al., 2020; Reynolds et al., 2020), and making students explore, contrast and compare different meanings has appeared to particularly useful in enhancing the potential of writing activities (Wittek, 2018).

Active learning seems to be more effective the more it engages students and is adapted to their specific learning needs, for example, by setting learning goals according to appropriate difficulty levels. Furthermore, the agile creation of reading-

only materials such as digital fanzines (Redondo López, 2021) and the provision of specific feedback from lecturers (Gao & Lloyd, 2020) have been observed to contribute to concept acquisition in university courses, especially when tactile and kinesthetics inputs complement visual information in virtual learning environments (Magana et al., 2019).

However, beyond the design of tasks and materials, some research appears to not fully incorporate the theories of comprehensive learning in the vein of Ausubel et al. (1968) and Novak (1977). For instance, student participation in creative exercises and the use of concept maps has been shown to not have a significant impact on students' abilities in explaining concepts (Ye et al., 2020), likely due to a lack of in-depth contextualization around the subject matter, which has been shown to improve the effectiveness of interventions in other studies (Cortes et al., 2019). Contextualization refers to the conditions in which a concept makes sense rather than merely considering its practical function and is particularly relevant for acquiring abstract concepts that entail no physical functionality.

Accordingly, based on previous evidence, concept acquisition seems to be modulated not only by active or passive learning, but also by the arrangement of materials in task designs, the monitoring of student progress, and the contextualization of concepts. In this general context, TM-based learning analytics may have the potential to be a worthy ally in enhancing concept acquisition.

TM-based learning analytics for concept acquisition

Exchanges between peers have been observed on several occasions to facilitate concept acquisition, mostly when students are organized into small groups (Atkinson et al., 2020; Rodriguez & Potvin, 2021). Interactive systems and peer teaching and assessment have also been widely identified as helpful for concept acquisition (Babaahmadi et al., 2021; Koong et al., 2021), particularly in peer-reviewing of writing assignments focused on developing content knowledge (Finkenstaedt-Quinn et al., 2021). This suggests that group discussions can complement individual analytical descriptions of a concept and both can contribute to positive results (Reyes-Santías et al., 2021; Volkwyn et al., 2020).

Thus far, we have considered that elements such as writing and discussion tasks, lecturers' feedback and visual information supplements can all help concept acquisition. These are, in fact, elements that TM-based learning analytics can offer, although evidence of the effectiveness of its application is currently scarce. Papers published on the applications of TM have concerned, for example, the assessment of learning outcomes after a certain educational intervention (Kong et al., 2021), or the automation of the annotation and categorization of exam queries according to concepts to be assessed (Begusic et al., 2018). Furthermore,

studies that have directly addressed conceptual learning with the application of TM have looked at concept acquisition in relation to exam repositories (Pintar et al., 2018), semantic relationships between concepts (Shwartz, 2021) and the identification of students' conceptions and misconceptions (De Lin et al., 2021; Taga et al., 2018) by asking students for written definitions and then applying TM to those definitions.

Surprisingly, although educationalists have applied TM-based learning analytics to understand student concept acquisition, identify learning styles (Aguilar et al., 2022) and analyse outcomes of discussion threads (Hernández-Lara et al., 2021; Pillutla et al., 2020), it has rarely been evaluated as a didactic tool relevant to the design of teaching tasks regarding concept acquisition. Until now, research has mainly been focused on know-how regarding TM as a university teaching evaluation tool. Therefore, in this paper, we aim to present one of the first empirical studies to give evidence on the use of TM-based learning analytics as a teaching tool for promoting the acquisition of abstract educational concepts by student teachers, and applying some of the above discussed learning aspects, including the joint analysis of definitions by peers, and the visual representation of results. The motivation for the research includes a consideration that TM-based learning analytics may potentially offer new mechanisms for providing targeted instruction and data-driven feedback, allowing teachers to more effectively address misconceptions and gaps in concept acquisition. The current study therefore contributes to efforts to optimize classroom management and the use of resources in fostering concept acquisition, through the application of TM-based learning analytics. Overall, this study paves the way for innovative pedagogical strategies that leverage technology to improve teaching and learning outcomes, particularly in teacher education.

Research questions derived from the literature review

Our literature review, as detailed above, led to the hypothesis that TM-based learning analytics can be an effective teaching tool that facilitates the acquisition of abstract concepts. To test this hypothesis in relation to student teachers, we decided to compare TM-based learning analytics to two other teaching strategies, namely asking students to complete individual project work, and to attend a conventional master class. Furthermore, to guide the evaluation of TM-based learning analytics as a teaching tool, we decided to answer two specific research questions (RQs), aimed at collecting evidence on the students' selection of keywords and on associations made between relevant terms in the definition of a concept.

- RQ1: How does TM-based learning analytics promote keyword selection in student teachers compared to other teaching strategies?

- RQ2: How does TM-based learning analytics promote associations between keywords compared to other teaching strategies?

METHODS

This study compares effects on the acquisition of abstract educational concepts relating to the application of three teaching strategies: TM-based learning analytics; the carrying out of individual project work; and the attendance of a conventional master class. The construct of concept acquisition was operationalized using two key indicators relating to the definition of concepts: keyword selection, and the association of relevant terms.

Study design and participants

Quasi-experimental pre- and post-tests were administered to three non-equivalent groups (A, B, and C), composed of a total of 81 students (62.96% female) following a teacher training master's programme at a Spanish university. Group A consisted of 26 students (65.38% female) with a mean age of 32.65 years (standard deviation or SD=5.78), Group B consisted of 28 students (64.29% female) with a mean age of 32.50 years (SD=6.43), and Group C consisted of 27 students (59.26% female) with a mean age of 32.19 years (SD=6.43). All were following the programme through distance education and used the Blackboard platform for online learning.

Learning environment

As a theoretical framework for the online learning interventions, the Data-Driven Decision-Making model (Khong et al., 2023) was selected. This model outlines a cyclical process in which data are systematically collected, analysed, interpreted and thus transformed into information and, ultimately, into actionable knowledge that can be used to guide and inform educational practice and strategy. It can therefore provide valuable insights into the learning strengths and weaknesses of students and offer guidance for structuring more effective teaching strategies.

In the current study, the teaching strategies were administered by the researchers acting as instructors, and were carried out simultaneously for the three separate groups of students. The researchers therefore set up an environment on the Blackboard platform so that students could define concepts with a 280-character limit, considering that the optimal structure for understanding a concept consists

of assembling and relating a set of fundamental propositions, in accordance with the learning theories of Bruner et al. (1956) and Greco & Piaget (1959), which agree that students who have a comprehensive overview of a concept are better prepared to understand its details, constituent elements and applications. The definitions allowed us to collect evidence on and analyse the students' overview or general representation of each concept.

Procedure and teaching strategies

At first, the students of each group had to define a concept and submit their definitions in an individual assignment on the Blackboard platform. They had 15 minutes to complete the task. These first definitions provided the pre-test data. Then, each group carried out the work corresponding to each of the three teaching strategies. Finally, the students submitted a new definition of the concept based on learning derived from the teaching strategies to which they were exposed. These final submissions provided post-test data to compare with the pre-test data, in order to evaluate the effects of the teaching strategies on concept acquisition.

Group A

The students of Group A were asked to define the concept of “inclusive education”. Their submissions were collected, pre-processed and analysed using TM in the software KH Coder 3 to obtain term frequency and two co-occurrence networks. The first network included modularity analysis to detect clusters of words, and the second included betweenness centrality to reveal the influence of each word over the flow of information. The network graphs incorporated words with frequencies (f_o) > 4, and the distances between them were measured using the Jaccard coefficient (J_c). Figure 1 illustrates the co-occurrence networks that the students were then shown.

Based on the networks, students identified which keywords appeared most often in their definitions and which were missing. For example, they had emphasized more the “needs” of “students” in schools than “looking for” their “capabilities” or providing “responses” to their special educational needs. Moreover, although they thought about “capabilities” and “difficulties” and therefore connected many other words to these terms, they did not consider “reducing” difficulties, either as a keyword (e.g., reduce, overcome, eliminate) or in connection with other terms (e.g., capabilities, barriers, needs).

Using TM learning analytics as both a visual and verbal complement, the instructor tried to make students aware of their misconceptions by comparing relevant connections between terms, and incorporating new ideas into the class’s general notion of inclusive education. Subsequently, students had another 15 minutes to reformulate their first definitions and submit them once again to the Blackboard platform.

Group B

The students in Group B were asked to define the concept of an “open and flexible curriculum”. They carried out an individual project in which they examined the curricular documents of a real school, and elaborated proposals to make the school’s curriculum more open and flexible. This exercise took them a couple of weeks, and, afterwards, they briefly discussed their progress with classmates during class time. The instructor then reviewed the projects and gave examples of suggested proposals, and subsequently gave the students 15 more minutes to reformulate their definitions of the concept.

Group C

The students of Group C were asked to define the concept of “meaningful curricular adaptation”. After completing and submitting their definitions, they received an expositive master class on the concept, and, at the end of the lecture, they had 15 minutes to reformulate and resubmit their definitions to the Blackboard platform.

Collecting and processing the analytical sample

All the data was collected during regular class hours. The procedure respected participant rights to informed consent, personal data protection, confidentiality, and non-discrimination, and the participants did not receive any compensation.

The researchers downloaded the concept definitions in text format directly from the Blackboard platform, and performed manual pre-processing of the text. This involved the correction of typos or misspellings, the changing of acronyms to their expanded meanings, and the removal of double spaces, special characters, and inclusive language expressions. The cleaned text constituted the dataset for the analysis without including any stop words. The resulting corpora consisted of an analytical sample for Group A of 1017 pre-test and 1133 post-test tokens, for Group B of 1127 pre-test and 1111 post-test tokens, and for Group C of 1101 pre-test and 1173 post-test tokens.

A set of 10 keywords and 10 associations between terms relevant to each concept were identified as priority elements to be included in the definitions. These keywords supported the evaluation of students' comprehensive understanding of the concepts, while the associations served to compare the relationship patterns of terms with word co-occurrences in the pre- and post-tests regarding each group. Appendices 1 and 2 present the criteria used to evaluate the definitions of the concepts.

The test statistic of Yuen's test of robust paired samples on trimmed means for dependent samples was calculated to obtain an effect size, with associated 95% confidence intervals (CI) around the estimates. Yuen's paired sample trimmed mean test is one of the most robust methods for comparing paired samples with non-normal distributions to obtain more robust results than traditional non-parametric tests. Values of $\xi = .10, .30$, and $.50$ were thus taken to correspond respectively to small, medium, and large effect sizes.

All analyses were carried out with "ggstatsplot" package, an extension of the "ggplot2" package, for R.

RESULTS

RQ1: Keyword selection

Table 1 shows the results corresponding to RQ1, while Figure 2 contains box plots representing the pre- and post-tests for each group (A, B and C). The results show that the only significant within-subjects difference was observed in Group A

of the students exposed to TM-based learning analytics as the teaching strategy, while a marginal statistical significance was observed in Group B. Group A therefore saw a larger pre- to post-test effect from TM-based learning analytics ($t_{\text{Yuen}} = -6.37$, $p < .001$, $\delta_R^{AKP} = -1.03$, $IC_{95\%} = -2.10, -.74$) compared to the effect from the individual project task ($t_{\text{Yuen}} = -1.78$, $p = .09$, $\delta_R^{AKP} = -.50$, $IC_{95\%} = -.86, -.10$).

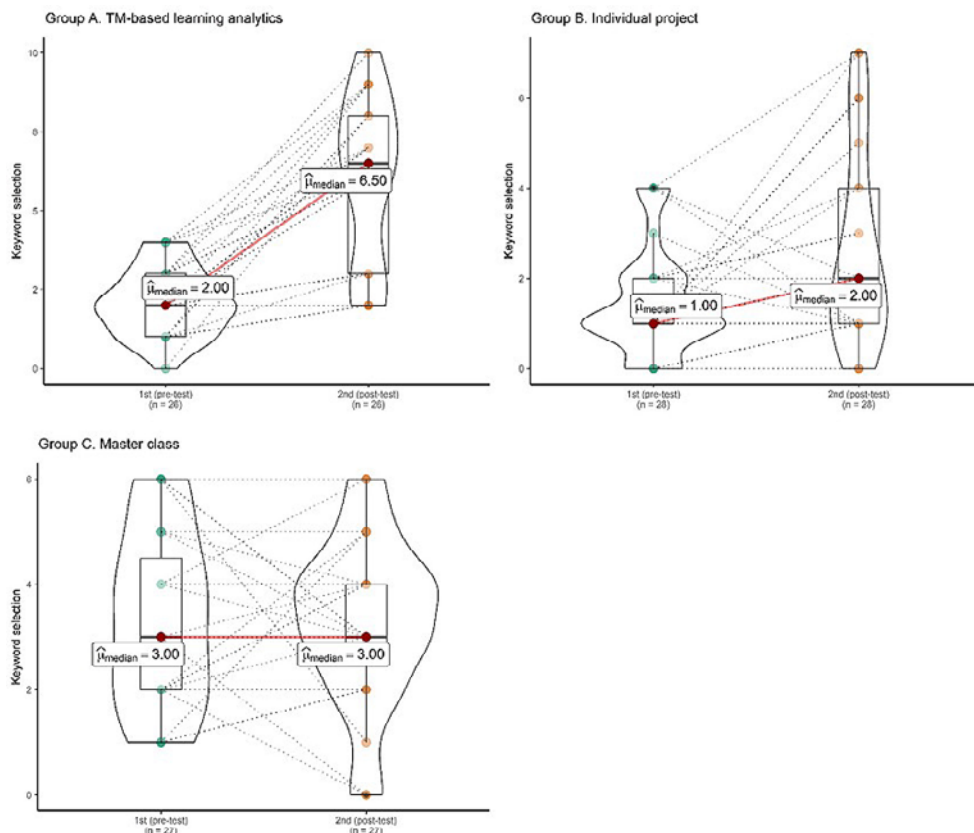
Table 1

Results of pre-test and post-test differences in keyword selection for each group

Group	V_{Wilcoxon}	$p\text{-value}$	$r_{\text{biserial}}^{\text{rank}}$	$IC_{95\%}$	t_{Yuen}	$p\text{-valor}$	δ_R^{AKP}	$IC_{95\%}$
A	NA	NA	NA	NA	-6.37	<.001	-1.03	(-2.10, -.74)
B	.01	.01	-.61	(-.83, -.24)	-1.78	.09	-.50	(-.86, -.10)
C	59.50	.88	.05	(-.37, .45)	-.15	.88	-.03	(-.52, .25)

Note 1. V_{Wilcoxon} = Wilcoxon test statistic; $p\text{-valor}$ = probability value indicating the significance level; $r_{\text{biserial}}^{\text{rank}}$ = estimated rank-biserial correlation; $IC_{95\%}$ = 95% confidence interval; t_{Yuen} = Yuen's t-test statistic; δ_R^{AKP} = robust effect size measure; NA = not applicable.

Note 2. For Group A, it was not possible to calculate the Wilcoxon test, since the variables do not meet two of the required basic assumptions: the symmetric distribution of variables with a level of measurement of interval or ratio, and the symmetric distribution of rang differences (Pardo & San Martín, 2010).

Figure 2*Pre- and post-tests box plots for each group***RQ2: Association of terms**

For Group A, the Jaccard index for word associations in the pre-test ranged from .000 to .375 (see Table 2). After the session in which students were made aware of their misconceptions using the TM-based visual plot provided by instructor, the post-test Jaccard values increased to a range of .217 to .917, revealing statistically significant differences between the pre-test and the post-test in seven of the top ten words associations (1 to 7 all with p_j and $p_t < .05$) (see Table 2). For certain associations, the Jaccard index increased substantially from pre-test to post-test after applying the TM-based teaching strategy, such as in the case of term associations 2 and 5 (i.e., *accessible – contexts*, and *removing – barriers*, respectively).

Table 2*Top 10 term associations by group*

Group	Jc tests	Pre-test	f_x	f_y	p_e	p_b	Post-test	f_h	f_z	p_j	p_t	$J_c \Delta$
A	Term association 1	.000	1	4	.473	.645	.609*	23	14	.037	.028	.609
	Term association 2	.000	1	2	.462	.628	.917***	12	11	<.001	<.001	.917
	Term association 3	.111	8	2	.499	.065	.692***	13	9	<.001	<.001	.581
	Term association 4	.187	3	16	.122	.107	.667**	13	17	.002	<.001	.480
	Term association 5	.000 ^a	0	1	1.000	1.000	.783**	18	23	.007	.007	.783
	Term association 6	.333	5	3	.028	.078	1.000***	12	12	<.001	<.001	.667
	Term association 7	.333	3	5	.028	.078	.588**	15	12	.007	.007	.255
	Term association 8	.200	5	25	.476	.190	.417	11	23	.746	.806	.217
	Term association 9	.142	1	7	.086	.034	.583	23	15	.337	.401	.441
	Term association 10	.117	3	16	.855	.108	.421	10	17	.179	.200	.304
B	Term association 1	.375*	4	7	.011	.018	.750***	10	11	<.001	<.001	.375
	Term association 2	1.000*	1	1	.005	.012	1.000***	5	5	<.001	<.001	.000
	Term association 3	.555	18	24	.642	.685	.538	21	19	.837	.884	-.017
	Term association 4	.000	8	1	.462	.590	1.000***	5	5	<.001	<.001	1.000
	Term association 5	.055	1	18	.425	.708	.273	7	21	.427	.467	.218
	Term association 6	.250	3	7	.054	.075	.273***	8	11	<.001	<.001	.023
	Term association 7	.000	3	8	.268	.342	.444	8	5	.005	.659	.444
	Term association 8	.000 ^a	0	7	1.000	1.000	.000	1	11	.412	.636	.000
	Term association 9	.000 ^a	1	0	1.000	1.000	.454**	5	11	.002	.002	.454
	Term association 10	.000 ^a	0	1	1.000	1.000	NA	0	0	NA	NA	NA
C	Term association 1	.440	21	15	.543	.595	.565	20	16	.268	.326	.125
	Term association 2	.440	21	15	.543	.585	.480	21	16	.670	.708	.040
	Term association 3	.348	21	10	.825	.842	.348	21	10	.826	.822	.000
	Term association 4	.190	21	4	.142	.263	.227	21	6	.707	.715	.037
	Term association 5	.208	21	8	.233	.240	.261	21	8	.835	.887	.053
	Term association 6	.000 ^a	21	0	1.000	1.000	.000 ^a	21	0	1.000	1.000	.000
	Term association 7	.136	21	4	.921	.980	.095	21	2	.402	.538	-.041
	Term association 8	.095	21	2	.402	.549	.095	21	2	.402	.526	.000
	Term association 9	.048	21	1	.472	.658	.048	21	1	.473	.650	.000
	Term association 10	.055	15	4	.204	.231	.111	16	4	.678	.735	.056

Note 1. Jc tests = Jaccard tests; Pre-test = baseline measurement before application of the teaching strategy; f_x = frequency of the first keyword selection in the pre-test for each association; f_y = frequency of the second keyword selection in the pre-test for each association; f_h = frequency of the first keyword selection in the post-test for each association; f_z = frequency of the second keyword selection in the post-test for each association; p_e = exact p -value (pre-test); p_b : bootstrapped p -value (pretest); p_j = exact p -value (post-test); p_t = p -value with bootstrapping (post-test); * $p < .05$, ** $p < .01$, *** $p < .001$ with bootstrap and exact methods.

Note 2. Appendix 2 shows the term associations for each group.

Note 3. ^a one input vector contained only zeroes.

The students in Group B who carried out individual projects established two significant associations in the pre-test (term associations 1 [attention – individualized] and 2 [equality - opportunities], with p_e and $p_b < .05$, respectively). After the teacher conceptualized, reviewed the projects and suggested proposals, post-test conceptualization results showed up to five significant associations (term associations 1, 2, 4, 6, and 9, all with p_j and $p_i < .05$; see Appendix 2 for the term associations). Group B, with the individual project as a teaching strategy, produced pre- to post-test Jaccard coefficient differences less favourable than Group A, but nonetheless produced an evident improvement ($t_{yuen} = -1.78$, $p = .09$, $\delta_R^{AKP} = -.50$, $IC_{95\%} = -.86, -.10$) (see Table 1 and Figure 2).

Group C, who attended an expositive master class, did not produce significant differences between the pre- and post-tests ($t_{yuen} = -.15$, $p = .88$, $\delta_R^{AKP} = -.03$, $IC_{95\%} = -.52, .25$). nor did they significantly make relevant associations.

DISCUSSION

The present study provides empirical evidence on the use of TM-based learning analytics as a pedagogical tool, compared to individual project work and attendance of a master class, for facilitating the acquisition of abstract educational concepts, specifically within the university context and in relation to student teachers. Previous research has suggested that active learning involving writing and discussions (Breivik, 2020), detailed feedback (Gao & Lloyd, 2020) and visual information (Magana et al., 2019) can facilitate concept acquisition in university courses, especially when applied in small groups (Atkinson et al., 2020; Rodriguez & Potvin, 2021). Furthermore, it has suggested that the technique of TM can be used to make the assessment of student learning outcomes more efficient (Kong et al., 2021). However, until now, there has been a lack of evidence on the effects of TM techniques used as a teaching strategy for conceptual learning at the higher education level. In this study, TM-based learning analytics supported students in selecting keywords and identifying missing aspects in the definition of an abstract concept, and helped them establish more relevant associations between terms.

Consistent with the findings of this study, previous studies at elementary school level have examined the effects of the Sobek topic modelling tool on scientific concept assessments. These studies found that students using TM-based tools performed significantly better on exams (Costa et al., 2017; Reategui et al., 2019). Similarly, research with 54 high school students showed that those using TM-based tools in essay writing incorporated a greater number of relevant concepts into their work (Erkens et al., 2016). These findings are in line with our own, reinforcing

the view that TM-based learning analytics can be a valuable tool for enhancing conceptual understanding and retention.

Implications for educational practice

It is no coincidence that TM-based learning analytics can be a powerful ally for university students to acquire abstract concepts, given that the field of neuroscience has evidenced visual attention and its relation to information processing for several decades (Hutmacher, 2019; Kanwisher & Wojciulik, 2000). Indeed, the relevant literature has emphasized that aspects such as colour contrasts and intensity, among others, can stimulate visual attention, and lead to benefits in terms of working memory performance (Itti & Koch, 2001). In fact, in the present study, TM-based visual representations were made to present words in different colours, sizes and contrasts, because we knew that, in the classroom, students tend to have problems maintaining attention, especially when sessions are too long (Ghanizadeh et al., 2024). According to the theories of comprehensive learning that are sometimes ignored in research, we know that the quality of the performance of a task, such as defining a concept, depends on a combination of sensory attention and access to prior knowledge records in memory (i.e., executive control) (Nobre & Kastner, 2014).

Although we have seen that TM-based learning analytics help students select keywords and establish relevant associations between terms in an overview of a concept, this does not necessarily guarantee that students will effectively manipulate and handle those conceptions later. It only implies that they acquired the basic notions to the extent of considering their most critical parts, and thus obtaining a general idea of them. We know from seminal works in the literature of the field (Bruner et al., 1956) that having a thorough general idea contributes to successful concept acquisition, but in no case does it guarantee the correct use of concepts in other more complex activities. Some studies have shown how peer review, for instance, did not always promote improvements in higher-order reasoning skills following concept acquisition (Turner et al., 2018).

Just as other tasks are deliberately aimed at developing higher-order thinking (e.g., asynchronous online discussions) (Jeong & Chiu, 2020), there is currently a lack of evidence of any effects of the use of TM-based learning analytics on this type of learning. Therefore, we cannot yet design reliable tasks incorporating TM-based learning analytics for purposes such as longer-term assessments taking a concept as a criterion or comparing it with other concepts. For now, we know that TM-based learning analytics can certainly be used as a teaching resource at the beginning of a course to help students acquire fundamental abstract concepts. Subsequently, it would be necessary to design other different assignments to learn

how to develop these concepts in certain given contexts (Cortes et al., 2019). For example, in the case of Group A in our study, we would need to teach the students to practically assess whether a certain school or teaching strategy was inclusive through other activities such as assembling a rubric.

One of the benefits of TM as a tool is that it generates a detailed description of a group's level of acquisition of a given concept, and presents a more precise and generalized explanation for the whole class, detailing missing aspects and misconceptions in definitions of the concept. With the use of TM, lecturers can save time and avoid a situation in which students arrive one by one at resolving doubts about the concept, or, worse, have unresolved doubts and do not achieve desired learning outcomes regarding a subject due to a lack of understanding of fundamental notions.

Nevertheless, TM-based learning analytics involves procedures that certainly not all university instructors will be familiar with, and therefore adequate training programmes will need to be developed presenting TM as a teaching tool, for lecturers to conduct those procedures successfully. Moreover, such training is relevant at this time in which higher education institutions are increasingly investing in educational technology, and their teaching staff need to know how to get the most out of it in order to make investments profitable. All in all, our findings support the investment of resources in TM-based learning analytics as a tool for university teaching and not just for assessment, as has been more common according to the studies we have reviewed (e.g., Begusic et al., 2018; Hernández-Lara et al., 2021).

Limitations and emerging research

Although the present study provides evidence of the potential of TM-based learning analytics as a teaching tool for concept acquisition at the university level, the design of the study has limitations that impact both the internal and external validity of the results. One specific limitation is the lack of a formal validation process in the design and implementation of the teaching strategy before its execution. A formal validation process should consider aspects such as feasibility, acceptability, and validity, and potentially provide preliminary evidence of the teaching strategy's impact. An expert panel might have further contributed by discussing aspects such as the content being studied, various teaching strategies, the intervention duration and frequency, and administrator criteria, among others. Future studies should include a teaching strategy protocol and prior validation process to ensure the consistency of the findings. Additionally, they should also consider experimental designs with a TM-based intervention control and homogeneous measures between groups (e.g., by analysing the same concept).

Another limitation of the study is its limited statistical power to detect significant differences between conditions, due to the small sample sizes. Additionally, these limited sample sizes may have introduced bias, restricting the generalizability of our results. Therefore, future studies with larger sample trials are needed to confirm these preliminary findings.

Furthermore, while we know that acquiring a concept overview facilitates the meaningful learning of that concept by promoting fundamental inclusiveness in Ausubel's terms, our study does not provide information about the further development of the concept that the students defined. It is likely that TM facilitates only the acquisition of a general overview of an abstract concept, and other teaching strategies are necessary to learn how to develop its contents and apply it successfully in professional practice. More research is needed to further explore how the benefits of TM extend to the acquisition of abstract concepts in groups of undergraduate students, particularly in teacher education.

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APPENDICES

The token words in Appendices 1 and 2 came from student data contained in the submitted definitions. The researchers examined the texts considering multiple synonyms and word combinations to obtain the following tables that made it possible to evaluate the data. The parts of speech identified are indicated at the end of both appendices.

Appendix 1

The top 10 keywords for each group

Group A's keywords	Group B's keywords	Group C's keywords
"Participación" ^{N,V}	"Individual" or "Personal" ^{AQ,AV,N,V}	"Necesidad" or "Limitación" ^N
"Accesibilidad" ^{AQ}	"Equidad" ^N	"Objetivo" ^N
"Equidad" ^N	"Adaptación" ^{N,V}	"Contenido" ^N
"Aceptación" ^V	"Ordinario" or "Común" ^{AQ}	"Competencia" ^N
"Barrera" or "Dificultad" ^N	"General" or "Básico" ^{AQ}	"Evaluación" [N, V]
"Derecho" ^N	"Autonomía" ^{AQ,N}	"Tiempo" ^N
"Capacidad" or "Potencial" ^N	"Docente" or "Profesor" ^{AQ,N}	"Centro" or "Aula" ^N
"Sociedad" ^{AQ, N}	"Formación" or "Cualificación" ^{AQ,N}	"Material" or "Recurso" ^N
"Aprendizaje" ^{N,V}	"Equipo" or "Grupo" ^N	"Mínimo" ^{AQ}
"Necesidad" or "Limitación" ^{N,V}	"Material" or "Recurso" ^N	"Individual" ^{AQ,AV,N}

Note. AQ = adjective, AV = adverb, N = noun, V = verb.

Appendix 2a

Associations between blocks of terms in Group A

Jc tests	Block of terms #1	Block of terms #2
Term association 1	"Barrera" or "Dificultad" ^N	"Participación" ^{N,V}
Term association 2	"Accesibilidad" ^{AQ}	"Contexto" ^N
Term association 3	"Igualdad" ^{AQ,N}	"Oportunidad" ^N
Term association 4	"Aceptación" ^V	"Necesidad" or "Limitación" ^{N,V}
Term association 5	"Suprimir" or "Eliminar" ^{N,V}	"Barrera" or "Dificultad" ^N
Term association 6	"Derecho" ^N	"Garantizar" or "Asegurar" ^V
Term association 7	"Desarrollar" ^{N,V}	"Capacidad" or "Potencial" ^N
Term association 8	"Sociedad" ^{AQ, N}	"Educación" ^{AQ,N}
Term association 9	"Barrera" or "Dificultad" ^N	"Aprendizaje" ^{N,V}
Term association 10	"Atender" or "Superar" ^{N,V}	"Necesidad" or "Limitación" ^{N,V}

Note. AQ = adjective, AV = adverb, N = noun, V = verb.

Appendix 2b*Associations between blocks of terms in Group B*

Jc tests	Block of terms #1	Block of terms #2
Term association 1	“Atención” or “Enseñanza” ^N	“Individual” or “Personal” ^{AQ,N}
Term association 2	“Igualdad” ^N	“Oportunidad” ^N
Term association 3	“Concretar” or “Adaptar” ^{AQ,N,V}	“Currículum” or “Métodos” ^{AQ,N}
Term association 4	“Centro” or “Escuela” ^N	“Ordinario” or “Común” ^{AQ}
Term association 5	“General” or “Básico” ^{AQ}	“Concretar” or “Adaptar” ^{AQ,N,V}
Term association 6	“Autonomía” ^{AQ,N}	“Docente” or “Profesor” ^{AQ,N}
Term association 7	“Autonomía” ^{AQ,N}	“Centro” or “Escuela” ^N
Term association 8	“Formación” or “Cualificación” ^{AQ,N}	“Docente” or “Profesor” ^{AQ,N}
Term association 9	“Equipo” or “Grupo” ^N	“Docente” or “Profesor” ^{AQ,N}
Term association 10	“Disponibilidad” ^N	“Material” or “Recurso” ^N

Note. AQ = adjective, AV = adverb, N = noun, V = verb.

Appendix 2c

Asociaciones entre bloques de términos para el Grupo C

Jc tests	Block of terms #1	Block of terms #2
Term association 1	"Necesidad" or "Limitación" ^N	"Individual" ^{AQ,AV,V}
Term association 2	"Adaptar" or "Ajustar" ^{N,V}	"Objetivo" ^N
Term association 3	"Adaptar" or "Ajustar" ^{N,V}	"Contenido" ^N
Term association 4	"Adaptar" or "Ajustar" ^{N,V}	"Competencia" ^N
Term association 5	"Adaptar" or "Ajustar" ^{N,V}	"Evaluación" ^{N,V}
Term association 6	"Adaptar" or "Ajustar" ^{N,V}	"Tiempo" ^N
Term association 7	"Adaptar" or "Ajustar" ^{N,V}	"Centro, Aula" ^N
Term association 8	"Adaptar" or "Ajustar" ^{N,V}	"Material" or "Recurso" ^N
Term association 9	"Adaptar" or "Ajustar" ^{N,V}	"Mínimo" ^{AQ}
Term association 10	"Individual" ^{AQ,AV,V}	"Aprendizaje" ^{N,V}


Note. AQ = adjective, AV = adverb, N = noun, V = verb.

Influence of problematic video games use and technological access on academic performance: characterization of adolescent profiles

Influencia del uso problemático de videojuegos y el acceso tecnológico en el rendimiento académico: caracterización de perfiles adolescentes

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ABSTRACT

In the current context, where technology has become omnipresent in the student's daily life, it is essential to understand how the digital divide and Problematic Video Game Use (PVU) can influence their academic performance (AP). This research aims to examine the relationship between access to technological resources (mobile phone, computer, Internet access, daily Internet connection time, and problematic video games use) and AP. To do this, a sample of 1,448 students from Extremadura was selected, of which 51.1% were women and 48.9% were men, with an average age of 14.5 years ($SD = 1.57$). A sociodemographic questionnaire was used with the grade record from the previous course recorded in the Rayuela Platform. In addition, the Video Game Related Experiences Questionnaire (CERV in Spanish) was used. The results obtained in the 5 groups categorized through a two-stage cluster indicate that more than five hours of connection have a negative impact on the general AP, but when there is a connection between 1 and 3 hours, with access problems to devices and/or digital resources, a worse AP is obtained, being more significant in Mathematics. In conclusion, a double digital divide opens up regarding the control of connectivity time, and regarding the lack of access to digital resources in the family environment, which significantly limits the academic success of this ad hoc student profile.

Keywords: ICT, problematic use of video games, adolescents, academic performance, cluster, Spain

RESUMEN

En el contexto actual, donde la tecnología se ha vuelto omnipresente en la vida cotidiana del alumnado, resulta fundamental comprender cómo la brecha digital y el Uso Problemático de Videojuegos (UPV) pueden influir en su rendimiento académico (RA). La presente investigación tiene como objetivo examinar la relación entre el acceso a los recursos tecnológicos (móvil, ordenador, acceso a Internet, tiempo de conexión diario a Internet y uso problemático de videojuegos) y el RA. Para ello, se seleccionó una muestra de 1448 estudiantes de Extremadura, de los que el 51.1% eran mujeres y un 48.9% hombres, con una edad media de 14.5 años ($DT = 1.57$). Se empleó un cuestionario sociodemográfico junto con el registro de calificaciones del curso anterior consignado en la Plataforma Rayuela. Además, se utilizó el Cuestionario de Experiencias Relacionadas con los Videojuegos (CERV). Los resultados obtenidos en los 5 grupos categorizados mediante un clúster bietápico indican que más de cinco horas de conexión inciden negativamente en el RA general, pero cuando existe una conexión entre 1 y 3 horas, con problemas de acceso a los dispositivos y/o recursos digitales, se obtiene un peor RA, siendo más significativo en Matemáticas. En conclusión, se abre una doble brecha digital respecto al control del tiempo de conectividad, y respecto a la falta de acceso a los recursos digitales en el entorno familiar, lo que limita sensiblemente el éxito escolar de este perfil de estudiante ad hoc.

Palabras clave: TIC, uso problemático de videojuegos, adolescentes, rendimiento académico, clúster, España

INTRODUCTION

Access to Information and Communication Technologies (ICT), number of hours of use, and Problematic Video Games Use (PVU)

Currently, technology plays an increasingly important role in our lives. If we consult the report 'El uso de las tecnologías por los menores en España' (2022) by the National Observatory of Technology and Society, 98% of children between 10 and 15 years old have been using the Internet regularly since the 2020 pandemic. However, during the last two years, there has been an increase in computer use in this same age group, reaching 95%. Another interesting fact is that seven out of ten children have a mobile phone, but it is mostly used by women (72%).

Therefore, ICTs have brought about significant changes in the way we relate, communicate and entertain ourselves (Bozzola et al., 2022). Similarly, the Spanish Survey on ICT Equipment and Use reveals that the use of computers (95.2%), mobile phones (68.7%), and the Internet (93.9%) among minors is very widespread (Instituto Nacional de Estadística [INE], 2022). In turn, the use of video games among young people has experienced a notable increase in recent years, as highlighted by Díaz et al. (2023).

However, following the same authors, it is necessary to understand how an intensive use can lead to significant problems (Díaz et al., 2023). In this paper, Problematic Video Game Use, with its acronym 'PVU', refers to a pattern of maladaptive behaviour associated with the excessive and uncontrolled use of video games. It involves a loss of control over time spent playing, interference with daily activities, impairment in social, academic or occupational functioning, and symptoms of dependence (Griffiths, 2018). Nevertheless, there is also scientific evidence that the use of video games can have a positive effect on well-being, which can have positive effects on academic profiles (Halbrook et al., 2019). To assess this construct, Chamarro et al. (2014) developed the Video Game Related Experiences Questionnaire (CERV in Spanish). Thus, the World Health Organisation (World Health Organisation [WHO], 2018) has recognised this phenomenon by including 'Gaming Disorder' in its International Classification of Diseases (ICD-11). This disorder encompasses both online and offline gaming, highlighting the importance of addressing the negative effects of PVU on people's health and well-being. All of this raises a relevant question at the adolescent education stage: *Are there differences in PVU depending on whether students own a mobile phone, or computer, have access to the Internet at home, and finally, are they influenced by how many hours they 'go online' daily?*

In this direction, studies published in Spain by González et al. (2021) reveal that access to ICTs can exceed six hours a day, being an average of five hours a day. These authors show that the most widely used device is the mobile phone, where

a high number of hours of use could impact the health of young people. On the other hand, Shinetsetseg et al. (2022) indicate that problematic internet and mobile phone use is directly associated with public health problems, such as the use of tobacco, alcohol, cannabis or other drugs, low AP, poor family relationships, and intensive computer use.

Regarding video games, Gómez-Gonzalvo et al. (2020) showed that there are around 15.8 million video game players in Spain, with 75.94% playing weekly. According to their study, a moderate daily time is recommended to prevent PVU which can affect different areas of life. These data show that the abuse of new technologies is growing due to the notorious use of video games among young people (Díaz et al., 2023). Regarding this issue, young people's preferred means of accessing video games have been changing over time. A decade ago, computers and video game consoles were the most widely used media (Gómez-Gonzalvo et al., 2020); meanwhile, a study by US consultancy The NDP Group (2023) indicates that mobile devices are the most prevalent medium among teenagers today, even more so than computers and consoles. This research concludes that 65% of children prefer to play games on mobile phones, compared to 23% who choose computers and 12% who prefer consoles. Such findings reflect the increasing use of and access to mobile phones among the adolescent population. In this regard, researchers argue that access to mobile phones significantly influences video game use among children and adolescents (The NDP Group, 2023), thus encouraging problematic use which can include psychosocial and behavioural symptoms (Chamarro et al., 2014; Joshi et al., 2023).

Therefore, easy and frequent access to ICT, such as mobile phones (Yu & Cho, 2016) and computers (Rehbein et al., 2010), may encourage excessive and unhealthy use of video games (Griffiths, 2018; Machimbarrena et al., 2023); particularly, since the expansion of device functions, the availability of online games and access to other attractive entertainment products, aspects already highlighted by Ruiz-Palmero et al. (2016). Thus, the constant availability of devices increases the likelihood of PVU patterns (Griffiths, 2018), where more online time spent may be associated with a higher risk of developing PVU in adolescents (González et al., 2021; Mora-Salgueiro et al., 2022).

Distinctive profiles in Compulsory Secondary Education (ESO) and Baccalaureate students according to technological access

We cannot ignore the fact that access to digital resources is a fundamental issue for adolescents to avoid social exclusion (Fundación Foessa, 2022). The Organisation for Economic Co-operation and Development (OECD) warned in early 2000 that such access to ICTs, particularly the Internet and computers, could lead

to a digital divide among the new generations (OECD, 2002). These predictions have been confirmed in our country twenty years later, where digital disconnection is considered a new 21st century alphabetism, highlighting Internet access and access to at least one computer as a fundamental condition for not falling behind the rest of the community (Fundación Foessa, 2022). According to the OECD report 'Empowering Young Children in the Digital Age' the digital divide among children can be addressed from an early age (OECD, 2023).

This digital divide can be addressed by 3 types: 1. The first digital divide refers to inequalities in access to digital technologies. 2.- The second digital divide refers to the competencies for the use of digital technologies by minors. 3.- Finally, a third social divide, which is emerging, relates to differences in off-line returns to the use of digital technologies between individuals, despite similar access and usage patterns. The main idea is that digital technologies make it easier to connect and thus make better use of social capital. However, this third digital divide is less relevant in the context of minors because of the compensation of their participation in the education system, which minimises this risk. Alderete and Formichella indicated in 2016 that unequal access to technologies affects AP, with higher achievement among students who use ICT. However, García-Martín and Cantón-Mayo, three years later, in 2019, commented on the complexity of such a relationship, because it will depend on the training received and the way it is used. This debate highlights the uncertainty as to whether greater access to ICT and more time spent using the Internet among secondary school students necessarily translates into an improvement in AP (Giménez-Gualdo et al., 2014).

Access to ICTs, number of Internet hours connexion and UPV in AP

Access to ICTs and their relationship with adolescent AP is a relevant issue in today's digitalised society. Previous studies, such as the one by Martínez-Garrido in 2018, pointed out this close relationship in our country. The new proposals for the integration of ICT in the educational context require reflection and analysis of their consequences on the academic progress of Secondary and Bachelor students (García-Martín & Cantón-Mayo, 2019). The OECD (2023) highlights the importance of empowering adolescents in this challenge of digital evolution, considering that ICT use modulates academic success, especially about the frequency of use as a work resource.

In this direction, the concern becomes evident, not only at a strictly psycho-educational level, but also at a social level, because academic success conditions the individual development of the adolescent, where the connection to the digital world (number of hours of Internet access 'sensu stricto') can support AP, but at the same time, can constitute a threat to it (García-Gil et al., 2022). Technological

resources, such as video games, continue to receive attention due to their impact on entertainment, business, and gamification-based educational methodologies (Roa et al., 2021). However, the frequent use of technological devices by adolescents can lead to problematic use, disrupting their daily routines and academic agenda (Sánchez & Benítez, 2022a). It has also been linked to lower AP, mental health difficulties (García-Gil et al., 2023), and aggressive behaviour (Bushman, 2016). Other studies show how moderate video game use can bring benefits to students, improving their concentration, improvements in cognitive states, visual attention, spatial skills and perception, ability to take initiative, as well as executive functions (Blair, 2017).

The present study

The present study takes the first digital divide as a reference, choosing the variables highlighted by the OECD (2002, 2023) and FOESSA (2022): having a computer, having access to the Internet at home, and daily Internet connection time, which previous research claims as necessary for future studies (Zhang et al., 2018). In turn, due to the wide reach of mobile phones in our country, the condition of having or not having a mobile phone is added as a complementary variable to those already proposed. In addition to these highly relevant variables, the authors of this research also wanted to analyse another condition of current interest: Problematic Video Game Use (PVU).

Aims and hypotheses of the study

O.1.— To examine whether there are differences in PVU depending on whether students have a mobile phone, computer, Internet access at home, and the number of hours they spend connected to the Internet daily. -H1: Students who own a mobile phone are more likely to have a higher PVU than those who do not have access to a mobile phone. -H2: Pupils who own a computer are more likely to have higher PVU than those who do not have access to a computer. H3: Students who have access to the Internet at home are likely to have higher PVU scores than those who do not. -H4: Students who spend more time online each day are likely to have higher PVU than those who spend less time online.

O.2.— To assess the presence of correlations between the dimensions of the Video Game Related Experiences Questionnaire (QERV; CERV in Spanish) and AP. H1. There will be a negative and significant correlation between the *psychological dependence* and *avoidance dimension* of the CERV and the AP. H2. There will be a

negative and significant correlation between the negative consequences dimension of the CERV and the AP.

O.3.— To explore using a two-stage cluster whether there are distinctive profiles among Secondary and Bachelor students, based on their PVU and their access or not to a computer, a mobile phone, the Internet at home, and the number of hours of daily connection to the Internet. - H1: There will be different profiles among students depending on the variables set out in aim two.

O.4.—To analyse the relationship between the profiles obtained in aim two and the AP in Mathematics and Language. - H1: There will be significant differences in Mathematics AP depending on the profile obtained in O.2. H2. There will be significant differences in Language and Literature AP depending on the profile obtained in O.2.

METHOD

Participants

A sample of 1448 compulsory secondary education (ESO in Spanish) and bachelor students (high school; Bachillerato in Spanish) was selected, including 740 females (51.10%) and 708 males (48.90%), with an average age of 14.5 years ($SD = 1.57$), from 8 schools in the provinces of Cáceres and Badajoz (Extremadura; Spain). We used non-probabilistic purposive sampling for the selection of participants. 51.8% of the students were located in rural environments, while the remaining 48.2% were located in urban environments. 53.7% of the selected students came from public schools, while 46.3% came from a state-subsidised school; 22% belonged to 1st ESO, 21.8% to 2nd ESO, 20% to 3rd ESO, 21.9% to 4th ESO and 14% to high school. The students surveyed answered satisfactorily all the questions.

Instruments

Firstly, an ad hoc questionnaire was drafted to collect data related to participants' Internet access. This questionnaire included specific questions that provided key information regarding: whether they had a mobile phone 'Do you have a mobile phone?', a computer at home 'Do you have a computer or laptop at home?', whether they had Internet access at home 'Do you have Internet access at home?', with a binary answer (yes/no), and how many hours they spent online each day 'How much time do you spend online?' with the response options: *Less than 1 hour*, *Between 1 and 3 hours*, *Between 3 and 5 hours*, and *More than 5 hours*.

To measure AP, the average grade obtained in the compulsory areas of Mathematics and Language and Literature in the 2018-2019 academic year was taken. These grades were indicated by the students themselves in the Rayuela Platform through the anonymous questionnaire, in accordance with previous studies (Fajardo-Bullón et al., 2017; García-Martín & Cantón-Mayo, 2019). Confidentiality and anonymity were ensured, in full compliance with current data protection and children's rights regulations, which would not have been possible if the data had been provided by the educational centres. This variable has been used in several studies as a representative and valid measure of AP (Fajardo-Bullón et al., 2017; García-Martín & Cantón-Mayo, 2019; Martínez-Garrido, 2018). In addition, the PISA report, which is based on the assessment of three subjects in Compulsory Secondary Education (ESO): Mathematics, Language and Literature, and Science, was used as a reference for the selection of the subjects to be assessed. In our study, Mathematics and Language and Literature were specifically chosen because of their compulsory presence in all the ESO and Bachillerato grades analysed. This choice was made in order to avoid external variables, such as the weight of the subject in the Baccalaureate Assessment for University Entrance (EBAU) or each student's choice of pathway.

The Video Game Related Experiences Questionnaire (CERV in Spanish) (Chamarro et al., 2014) measures the PVU. It is composed of 17 questions with four response options on a Likert scale from 1 (almost never) to 4 (almost always). It presents two factors: the first one is called 'psychological dependence and avoidance'. It consists of 8 items assessing the following constructs: worry, denial, avoidance, and desire to gamble ($\alpha=.841$). The second factor is called 'negative consequences'. It consists of 9 items assessing the following constructs: increased tolerance, reduced activities, and negative effects ($\alpha=.768$), with good overall scale reliability ($\alpha=.89$). The results of the questionnaire were satisfactory, demonstrating good overall reliability in this study ($\alpha=.89$).

Procedure

First of all, a request was made to the Provincial Delegation of Education of the Regional Government of Extremadura in the provinces of Cáceres and Badajoz in order to collect the number of schools and students enrolled in ESO and Bachillerato (Bachelor in English). Eight schools were randomly selected from the total list of existing schools. The 8 schools agreed to participate in the study. Once the centre had been selected and allowed to be present at their facilities, the questionnaires were handed out in paper format to all the pupils in each of the 8 selected centres. If there was more than one group per year (e.g. a, b and c), one was chosen at random. Beforehand, parents and students were asked for

permission and informed about the aims of the research. They were assured of the privacy of the data collected and their exclusive use in the context of the research. The questionnaires were collected in person, depending on the time available at each school, and lasted approximately 10-15 minutes. During the completion of the questionnaires, at least one researcher was present to answer any questions together with a teacher from the school. The questionnaires were collected in 2018 with a criterion of voluntariness and confidentiality following the ethical principles of the American Psychological Association (APA, 2017).

Statistical analysis

This study developed a descriptive, correlational, cross-sectional design. Because the study variable was quantitative, continuous, and met the requirements of normality (Kolmogorov-Smirnov $> .05$) and homoscedasticity (Levene $> .05$), parametric tests were performed. Furthermore, these tests were applied in accordance with the Central Limit Theorem (CLT), which suggests their use in large samples, as in this case with 1448 adolescents (Pek et al., 2018). To analyse the first, second and third hypotheses of aim one, the student's t-test for independent samples was used. Subsequently, to study differences in PVU as a function of daily Internet connection time, a robust one-factor ANOVA was implemented. This technique was applied for hypothesis 4 of aim one, using Welch's method, which is suitable for working with heterogeneous variances. Post hoc multiple comparisons were performed using the Games Howell procedure.

Secondly, for hypothesis 1 of aim two, a two-stage clustering was used. This analysis offers an automated methodology to determine the optimal number of clusters, including both categorical and continuous variables (Rubio-Hurtado & Vilà-Baños, 2017). Categorical variables were included in the cluster such as 'having or not having a mobile phone', 'having or not having Internet at home', 'having or not having a computer (laptop or fixed) at home' and 'daily Internet connection time', from less than 1 per day to more than 5 hours per day. PVU was incorporated as a continuous quantitative variable. The model obtained satisfies the principles of independence and normality for the continuous variable, as well as for categorical qualitative variables that have a multinomial distribution. Even if these assumptions were not met in principle there are no problems because as Rubio-Hurtado and Vilà-Baños (2017, p.20) "Internal empirical checks indicate that this procedure is quite robust, even when these conditions are not met". The log-likelihood measure was applied to assess the distance between clusters, and the Bayesian Schwartz criterion (BIC) was used to identify the number of clusters. To avoid ordering effects, a random assignment of cases was performed. The results showed a satisfactory model consisting of 5 clusters.

Finally, for the analysis of Hypothesis 1 of aim three, a one-factor cluster ANOVA on AR was performed.

RESULTS

The descriptive statistics of the sample are shown below (see Table 1) and the statistical analyses previously described are carried out for each of the hypotheses of the study.

Table 1

Frequency of Internet use and access to technological resources among adolescents

		<i>n</i>	%
Having a mobile phone	Yes	1414	97.7 %
	No	34	2.3 %
Having a computer at home	Yes	1362	94.1 %
	No	86	5.9 %
Internet access at home	Yes	1408	97.2 %
	No	40	2.8 %
Internet connection time	Less than 1 hour	166	11.5 %
	Between 1 and 3h.	552	38.3 %
	Between 3 and 5h.	393	27.3 %
	More than 5 hours	331	23 %

The first study hypothesis explored PVU scores in relation to having ($M = 24.86$) or not having a mobile phone ($M = 25.08$). The results of Student's t-test for independent samples showed no significant difference in UPV according to mobile phone ownership or not ($t_{1445} = -0.170$, $p = 0.865$, $d = 0.224$).

Likewise, the results showed no significant differences ($t_{1445} = 1.39$, $p = 0.165$; $d = 0.219$) between those who had Internet at home and those who did not.

Finally, the results on having a computer at home and its influence on PVU showed that there is no significant difference in PVU ($t_{1444} = 0.204$, $p = 0.838$, $d = 0.02$).

However, the results of the study indicate that daily time spent on the Internet had a significant effect on PVU. Welch's robust one-factor ANOVA showed statistically significant differences in PVU as a function of Internet connection time

($F_{3,578} = 6.367, p < .001, \eta^2 = 0.015$). Post hoc multiple comparisons were performed using the Games Howell procedure (see Table 2).

Table 2

Comparison of PVU average values according to Daily Internet Connection Time

	<i>M</i>	<i>DT</i>	<i>Comparación</i>	<i>DM</i>	<i>p</i>	<i>IC 95%</i>
<i>G1</i>	23.21	7.08	G1-G2	-1.47	0.088	[-3.09, 0.14]
<i>G2</i>	24.68	7.03	G1-G3	-1.38	0.179	[-3.13, 0.37]
<i>G3</i>	24.59	7.87	G1-G4	-3.19	< .001**	[-5.1, -1.28]
<i>G4</i>	26.40	9	G2-G3	0.1	0.997	[-1.18, 1.38]
			G2-G4	-1.72	0.017*	[-3.21, -0.22]
			G3-G4	-1.81	0.023*	[-3.45, -0.18]

Note. G1=Less than 1 hour; G2= Between 1 and 3h. G3= Between 3 and 5h. G4=More than 5 hours. *M* = Mean, *SD* = Standard Deviation, *MD* = Mean Difference, *p* = p-value adjusted by Games Howell, **p* < .05, ***p* < .01.

Statistically significant differences were observed between those who logged on for less than 1 hour and those who logged on for more than 5 hours; between those who logged on for 1-3 hours and those who logged on for more than 5 hours; and between those who logged on for 3-5 hours and those who logged on for more than 5 hours. Those who logged on for more than 5 hours had a higher PVU score compared to the other 3 groups.

For the second aim, a correlational analysis was carried out using Pearson's correlation (because the assumption of normality in the data is met), between the students' AP in each of the studied subjects (Language and Mathematics) and both dimensions of the CERV. An inverse and significant relationship was found between psychological dependence and avoidance and AP in both, the Spanish Language and Literature (with a bilateral significance level of .01 and $r = -0.115$) and Mathematics (with a bilateral significance level of .01 and $r = -.078$). Likewise, in the negative consequences dimension, $r = -.159$ was obtained in the case of Spanish Language and Literature and $r = -.109$ in Mathematics, both with a bilateral significance level of .01.

For the third aim, a two-stage clustering was performed. The model obtained from five clusters is satisfactory/good, with a cluster goodness of fit value of .6 out of 1. To corroborate these findings, a modified version of the test was carried out, in which the subjects were rearranged in the matrix, and the results were equally satisfactory (Rubio-Hurtado & Vilà-Baños, 2017). In this model, the weight of the variables is varied: the data collected in the two-stage cluster point to Internet

connection time as the most influential in the formation of clusters 1 out of 1 ($\chi_{12} = 3809.47$, $p < .001$), followed by having a computer at home ($\chi_4 = 915.94$, $p < .001$) with a predictor of .8 out of 1, having access to the Internet ($\chi_4 = 330.48$, $p < .001$) with an influence of .6 out of 1, having a mobile phone ($\chi_4 = 282.26$, $p < .001$) with a significance of .4 out of 1, and finally, the PVU with an influence of .2 out of 1. The characteristics of each of the 5 groups of students obtained are described below:

Cluster 1: In this group of 511 adolescents (35.5%), all individuals own a mobile phone, a computer, have access to the Internet at home, and go online between 1 and 3 hours per day. The average UPV in this group is 24.72. This grouping will be referred to as '*Adolescents with Digital Resources with Medium connection and Moderate use of Video Games*'.

Cluster 2: This group is made up of 129 teenagers (9%), all of whom have a mobile phone, computer, Internet connection at home and connect to the Internet less than 1 hour a day. The average in PVU in this group is 23.36. This cluster will be called '*Adolescents with Digital Resources, Low Connection and Moderate use of Video Games*'.

Cluster 3: This cluster consists of 141 adolescents (9.8%). 78.7% have a mobile phone, 44% have a computer, 75.2% have Internet access at home and connect to the Internet between 1 and 3 hours per day. The average PVU in this group is 24.72. This cluster will be called '*Adolescents with Less digital resources with Medium connection and Moderate use of Video Games*'.

Cluster 4: This group includes 362 adolescents (25.1%), with digital resources such as mobile phone, computer and Internet connection at home, using the Internet between 3 and 5 hours per day. The PVU in this cluster is moderate with an average of 24.54. This cluster will be referred to as '*Adolescents with Digital Resources and High Connection, and Moderate use of Video Games*'.

Cluster 5: This group consists of 297 adolescents (20.6%). The students have a mobile phone, computer, Internet access at home, and connect to the Internet for more than 5 hours a day. The average PVU in this group is 26.29. This cluster will be called '*Adolescents with Digital Resources and Maximum connection, as well as High use of Video Games*'.

The following table 3 shows the analysis comparing the means of AP in Mathematics for the different clusters obtained. In addition, Table 4 compares the means of the AP in Language between the same clusters mentioned above.

Table 3

Comparison of AP Mathematics means between the different types of clusters

	<i>M</i>	<i>DT</i>	<i>Comparación</i>	<i>DM</i>	<i>p</i>	<i>IC 95%</i>
1	6.97	2.05	1-2	-0.16	0.932	[-0.72, 0.39]
2	7.13	1.98	1-3	1.39	< .001**	[0.85, 1.92]
3	5.58	2.27	1-4	0.16	0.785	[-0.22, 0.55]
4	6.81	1.98	1-5	0.68	< .001**	[0.27, 1.09]
5	6.30	2.09	2-3	1.55	< .001**	[0.87, 2.24]
			2-4	0.32	0.545	[-0.25, 0.90]
			2-5	0.84	< .001**	[0.25, 1.44]
			3-4	-1.23	< .001**	[-1.79, -0.67]
			3-5	-0.71	.007**	[-0.13, -1.28]
			4-5	0.52	< .011**	[0.08, 0.96]

Note. *M*=Mean, *SD*= Standard deviation, *DM*=Mean difference, *p*=p-value adjusted by Games Howell, **p*<.05, ***p*<.01.

Table 4

Comparison of means of AP in Language between the different cluster types

	<i>M</i>	<i>DT</i>	<i>Comparación</i>	<i>DM</i>	<i>p</i>	<i>IC 95%</i>
1	7.14	1.84	1-2	-0.24	.687	[-0.75, 0.26]
2	7.38	1.80	1-3	1.13	< .001**	[0.64, 1.62]
3	6.01	2.07	1-4	0.15	.795	[-0.21, 0.50]
4	6.99	1.82	1-5	0.77	< .001**	[0.39, 1.15]
5	6.37	1.98	2-3	1.37	< .001**	[0.75, 2]
			2-4	0.39	.263	[-0.14, 0.92]
			2-5	1.01	< .001**	[0.47, 1.56]
			3-4	-0.98	< .001**	[-1.5, -0.47]
			3-5	-0.36	.336	[-0.89, 0.17]
			4-5	0.62	< .001**	[0.22, 1.03]

Note. *M*=Mean, *SD*= Standard deviation, *DM*=Mean difference, *p*=p-value adjusted by Games Howell, **p*<.05, ***p*<.01.

To produce the figures, the mean scores obtained in the analysis were presented. In addition, a post hoc analysis was used to identify categories with no significant differences between their mean scores. These categories were represented in the figures by the inclusion of circles grouping them together. Figure 1 shows the means of AR in Mathematics as a function of cluster, while Figure 2 shows the means of AR in Language as a function of cluster.

Figure 1

Mathematics AP as a function of Cluster

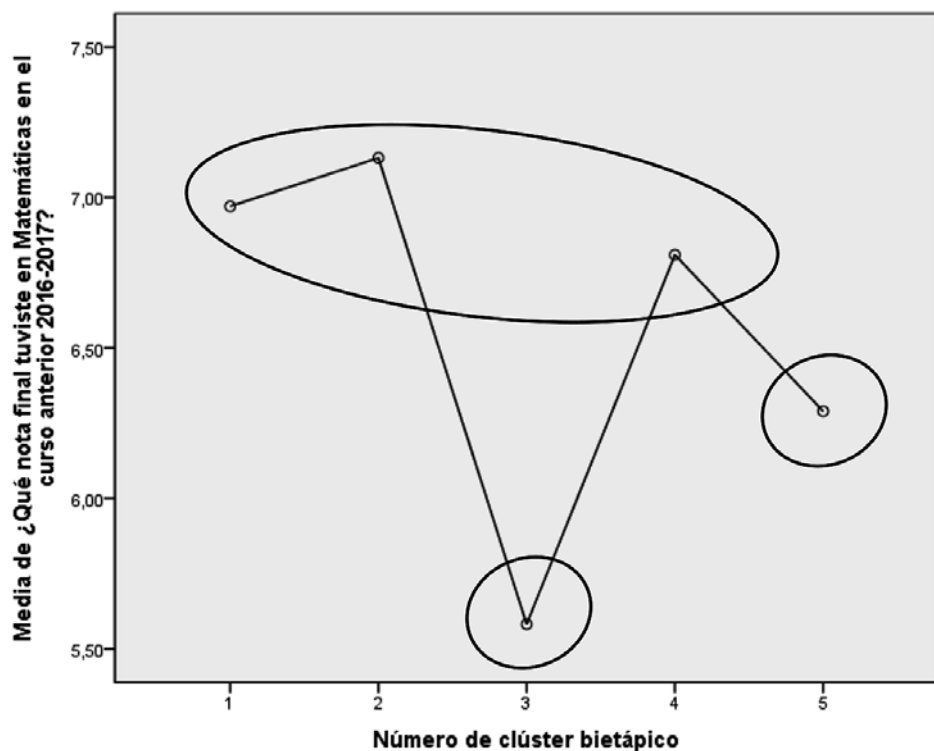
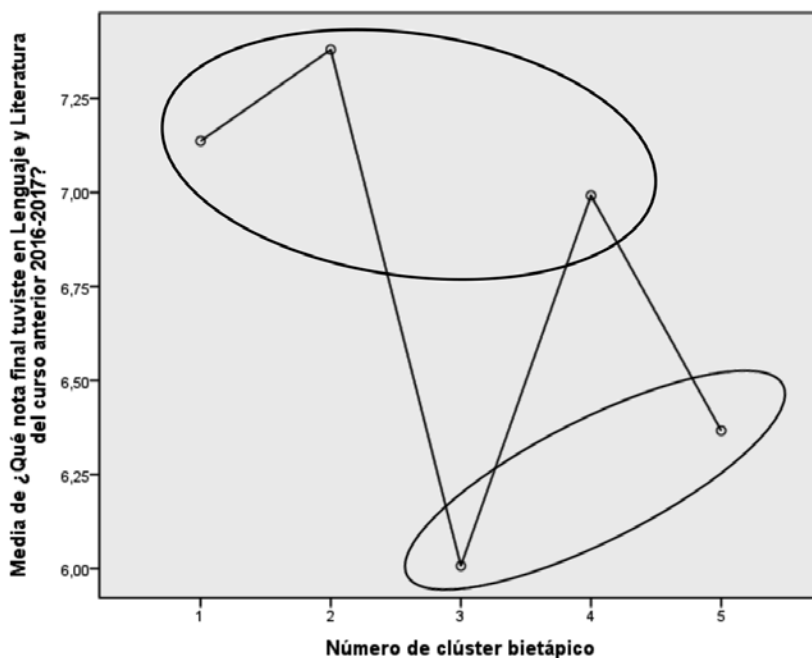


Figure 2

Average Language AP as a function of Cluster



DISCUSSION AND CONCLUSIONS

The aims of the research were: (1) to examine the differences in problematic video game use according to access to computers, mobile phones, as well as Internet access and daily connection time; (2) to evaluate the presence of correlations between the dimensions of the CERV and AP; (3) to explore the existence of possible adolescent profiles according to access to digital resources, connection time and problematic video game use, and (4) to analyse the relationship between the profiles obtained and AP in Mathematics and Language.

Based on the results, no significant differences were found in the PVU score in relation to ownership of a mobile phone and access to a computer at home. Thus, the first two hypotheses of the first aim are rejected (H1: Pupils who own a mobile phone are likely to have higher PVU than those who do not have access to a mobile phone, and H2: Pupils who own a computer are likely to have higher PVU than those who do not have access to a computer). Therefore, it seems that, although there has

been an increase in adolescent screen use in recent decades (Thomas et al., 2020), problematic video game use will not be affected by having a mobile phone and/or computer available. Similarly, the results of the present study showed no significant differences in PVU scores in relation to Internet access at home (H3: Students who have Internet access at home are likely to have higher PVU scores than those who do not). However, the fourth hypothesis was confirmed (H4: Students who spend more time connected to the Internet daily are likely to have higher PVU than those who spend less time connected to the Internet). Based on the obtained results, it seems that it is the time spent online for more than 5 hours that most significantly affects the PVU. These results agree with previous studies by Mora-Salgueiro et al. (2022) who also found a positive relationship between Internet connection time and the risk of developing PVU in adolescents. In this direction, research such as Ruiz-Palmero et al. (2016) suggests that excessive use of online games or entertainment apps on mobile phones may be associated with problematic mobile phone use. This would be relevant to focus studies not so much on access to resources (mobile, computer, Internet) but on their proper use and control of their connection times. Therefore, it would be advisable to pay attention to the second digital divide proposed by the OECD (2023), by teaching skills to adolescents that allow them to control their connection time, prevent the problematic use of video games and the difficulties associated with this use in areas such as mental health and emotional well-being (Fajardo-Bullon et al., 2019; García-Gil et al., 2022).

Concerning the second aim, the existence of an inverse correlation between both scales, the CERV and the AP in Spanish Language and Literature, as well as the AP in Mathematics, was corroborated. These results agree with Herrera et al. (2019), who indicate the existence of different characteristics of the video game that could make it more or less harmful for the adolescent depending on the time of use.

Regarding the third aim, five types of student clusters were identified. The variable with the greatest weight is the number of hours of Internet connection, followed by having a computer and Internet access at home, with PVU being the variable with the least weight in the classification. Therefore, it seems that, although access to resources is essential, the number of hours spent on the Internet per day carries the most weight when category students. In the same way as the OECD (2023), we find a group that could be related to the first digital divide among the clusters. The so-called '*Adolescents with fewer digital resources, with medium connection and moderate use of video games*' (cluster 3) are particularly characterised by having fewer digital resources than the rest. In turn, we obtain another group that could be related to the second digital divide, the group called '*Teenagers with Resources, with Maximum connection and High use of Video Games*' (cluster 5) which is characterised by those who misuse the Internet with

an excessive number of hours of connection and high scores in PVU. In this regard, the model is adequate allowing us to confirm the study hypothesis (H1: There will be different profiles among students depending on their PVU, their access or not to a computer, a mobile phone, the Internet at home and the number of hours of daily connection to the Internet). This classification of adolescents allows us to understand the significance of looking at the studied variables in a grouped way. It is vital to highlight the weight of the number of hours of daily Internet connection as a key variable when classifying students. In previous studies, this variable has already been considered relevant for the well-being of Spanish children, especially when the threshold of 5 hours of connection per day is exceeded (Fajardo-Bullon et al., 2019). However, it had not yet been analysed jointly in a cluster with problematic video game use. In this way, thanks to the analysis carried out, we will be able to preventively attend to groups of students who may have difficulties depending on the presence of the variables studied, paying special attention to the number of hours online per day.

Finally, with regard to objective four, the two hypotheses put forward (H1: There are significant differences in Mathematics AP according to the profile obtained in O.3. There are significant differences in Language AP as a function of the profile obtained in O.3.) According to the graphs in this study, Cluster 3 '*Teenagers with fewer digital resources, with medium connection and moderate use of video games*' and Cluster 5 '*Teenagers with digital resources, with maximum connection and high use of video games*' are the ones with the worst scores in Mathematics and Language AP compared to the rest. The results show that adolescents either with fewer digital resources or with a high Internet connection (more than 5 hours) are the most disadvantaged in AP. However, clusters with moderate Internet use obtain better scores in AP. These results coincide with those obtained in the study by López-Agudo and Mancenaro-Gutiérrez (2020), which show the positive effect of moderate ICT use on Mathematics AP, and other previous studies that indicate that the video games use, does not in itself imply a decrease in AP at school, although it may affect adolescents' attention (Drummond & Sauer, 2015).

On the other hand, clusters 1, 2, and 4 have similar AP scores in both subjects, Language and Literature and Mathematics. Cluster 2, however, with Internet connections of less than one hour, has higher AP scores (although not statistically significant). If we conduct an analysis by subject, Mathematics shows higher results in the clusters of adolescents who have access to digital resources, moderate scores in the use of video games and, above all, moderate daily Internet connection time. This is followed by lower scores for those clusters with resources and an Internet connection of more than 5 hours, and finally, in a differentiated way, for the group with less access to digital resources. These results could be useful to understand why, when digital resources are used in schools with moderate time connection

and video games use and accessible digital resources, Mathematics scores may improve, or, conversely, may suffer if their connection time is excessive (García-Martín & Cantón-Mayo, 2019; Islam et al., 2020; Martínez-Garrido, 2018). Regarding the subject of language, again, groups of adolescents who have access to digital resources, moderate scores in the use of video games, and mostly a moderate amount of time spent online obtain better scores. Thus, the educational approach focused on digital competence and the use of technologies can have benefits in terms of connectedness, as long as a balance and moderate use of resources is maintained (Blair, 2017). However, in contrast to Mathematics (see Figures 1 and 2), both, the cluster with fewer resources and the cluster with an excess of connection obtained similar, but lower, scores compared to the other groups. Some studies suggest that adolescents' daily Internet use is not so much focused on academic activities as on more recreational and social use (Álvarez-de-Sotomayor et al., 2022). In this sense, previous studies show how the lack of access to resources can generate a psychosocial impact on minors that can have effects on AP in Language and Mathematics (García-Gil et al., 2022). Likewise, higher scores in the PVU or in the number of hours connected to the Internet may be influencing adolescent adjustment, affecting their AP and psychosocial development (García-Gil et al., 2023; Moge & Romano, 2020).

Analysing the results, it seems that not having digital resources or having them, but not having the skills to control the excessive number of hours of connection and the PVU, may be fundamental determining factors in guaranteeing a child's good academic development. In the first case concerning access to resources, the TALIS report (2018) showed how insufficient access to the internet and the scarcity or inadequacy of digital technology for play and learning (e.g. computers, tablets, smartboards) hinder the provision of a quality environment for development, well-being and learning in school. This has recently been supported by OECD studies (2023) and furthermore in Spain by the FOESSA Foundation report (Fundación Foessa, 2022).

In the second case, related to the number of connection hours and PVU, it seems essential to have adequate digital skills that can limit the number of hours of connection. This information is in relation to previous studies that show a significant deterioration in children's development after 5 hours of daily Internet use (Fajardo-Bullon et al., 2019) or the impact that problematic video game use can have on children's mental health (González et al., 2016). In reference to AP, excessive daily Internet use, highlighting its non-academic use, will have a negative impact on their weekly learning time and AP (Gómez-Gonzalvo et al., 2020; Zhang et al., 2018) as well as on their mental health (Sánchez & Benítez, 2022b), which may in turn influence the child's AP (García-Gil et al., 2022).

Finally, it is important to highlight some limitations of the present study. The self-report method was used to collect information, which may be associated with social desirability bias. However, the sample size used in the research helped to mitigate this potential bias (Kraushaar & Novak, 2010). Another limitation is that the data collection is from 2019 and circumstances may have changed in recent years. Future research proposes to update these results after the Covid-19 pandemic to determine whether they are maintained or changed. In addition, it seems necessary to research in detail the type of video games that students use to extend the results (López-Agudo & Mancenaro-Gutiérrez, 2020). In turn, it would be interesting to make a series of psychoeducational recommendations both for the educational centres themselves and to train families, in these new digital needs of their adolescent children (Sánchez & Benítez, 2022a), as well as to carry out gender-differentiated studies.

Finally, this paper shows the significance of joint attention to relevant variables such as access to digital resources, problematic video game use and daily Internet connection. It also tries to show how these variables can correctly classify students in ESO and Bachillerato and thus determine their joint impact on Language and Mathematics AP. The study shows how access to resources is important for academic performance, which is why educational policies should focus on universal access to technologies for equal opportunities. In turn, in an increasingly digitalised environment, it is essential that such education policies address the second digital divide (OECD, 2023), which focuses on the adequate training and education of children in digital skills. Therefore, it is not only a question of access to digital resources, but also of the user's ability to at least control their daily connection time and manage content. In this sense, it should be ensured that the adolescent never equals or exceeds 5 hours of daily Internet connection, regardless of the devices used during the day.

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The critical thinking strategies university students use when dealing with Fake News produced by Artificial Intelligence

Universitarios frente a las Fake News generadas por Inteligencia Artificial: estrategias asociadas al pensamiento crítico que adoptan

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ABSTRACT

The arrival of Artificial Intelligence (AI) in the digital arena has increased the amount of fake news (FN) circulating on social networks (SNs), where young people are at particular risk of being deceived and manipulated. The study objectives were: 1) to analyse the critical-thinking strategies that university students (N=543) activate when dealing with FN; 2) to determine how much education and training they have been given for detecting FN; and 3) to describe the educational content that they believe to be most important for identifying FN. The methodology was empirical and non-experimental. The study was descriptive, exploratory, and comparative. A validated questionnaire ($\alpha=0.895$) with 56 items was used to ascertain how much education they had received for detecting FN and to identify the critical-thinking strategies (cognitive, personal-attitudinal, logical-argumentative, communicative-expressive, and ethical) they activated when dealing with FN. The results indicated that 76.6% reported having little or no education in this regard. The majority understood what FN with the aim of manipulation was, although around 40% reported not being aware of having received any. They did not habitually test the information they received against reliable sources nor check where it came from or who wrote it. Nonetheless, they did detect clickbait. The strategies they used did not always ensure that they determined the truth of the news stories they received, making them more vulnerable. They called for specific education and described the training content they would prioritize to understand how FN is created and to critically analyse its form and content, avoiding being manipulated. Finally, it is important to consider the role of generative AI in altering “evidence”, limiting the audience’s ability to determine the truth of any information they receive, potentially leading to widespread scepticism.

Palabras clave: fake news, artificial intelligence, critical thinking, social networks, university students

RESUMEN

La irrupción de la Inteligencia Artificial (IA) en la esfera digital está incrementando las Fake News (FN) que circulan en las redes sociales (RRSS), donde especialmente los jóvenes corren el riesgo de ser víctimas de engaños y manipulación. Los objetivos de esta investigación son: 1) analizar las estrategias activadas por universitarios (N=543) frente a las FN, relacionadas con las dimensiones del pensamiento crítico; 2) determinar su nivel de formación recibido para detectar FN; y 3) delimitar los contenidos formativos que consideran prioritarios para discriminarlas. La metodología es empírica, no experimental de tipo descriptivo, con carácter exploratorio y comparativo. Se utilizó un cuestionario de opinión validado ($\alpha=0.895$), integrado por 56 ítems para conocer el nivel de formación recibido para detectar FN; e identificar qué estrategias del pensamiento crítico (cognitiva, personal-actitudinal, lógico-argumentativa, expresivo-comunicativa y ética) activan frente a ellas. Los resultados evidencian que un 76.7% declara tener poca o ninguna formación al respecto. La mayoría sabe qué son las FN con el fin de manipular, aunque un aproximado 40% declara no ser

consciente de recibirlas. Habitualmente no contrastan la información recibida con fuentes fiables ni comprueban su fuente y autoría. Sin embargo, detectan el abuso del clickbait. Las estrategias que emplean no siempre garantizan discernir la veracidad de las noticias que reciben, incrementando su vulnerabilidad. Reclaman una formación específica y enuncian los contenidos prioritarios para conocer cómo se construyen las FN y analizar críticamente su contenido y forma, evitando el riesgo de manipulación. Finalmente, cabe reflexionar sobre el papel de la IA generativa para modificar “evidencias”, limitando la capacidad de la audiencia para discriminar la veracidad de la información recibida, e incluso, abocando a un escepticismo generalizado.

Palabras clave: *fake news*, inteligencia artificial, pensamiento crítico, redes sociales, universitarios

INTRODUCTION

The post-truth era is characterized by an emphasis on the prevalence of subjectivity and the irrelevance of the truth in the face of so-called ‘facts’ (Villena, 2019). According to Waisbord (2018), we are seeing a new order in communication, with a battle to convince audiences using social networks (SNs): governments orchestrate propaganda campaigns, elites and corporations compete to dominate news coverage without demonstrating facts, only seeking followers. Audiovisual rhetoric is prioritized—techniques for transmitting the most effective, aesthetic, visual, and persuasive messaging possible (Sülflow et al., 2019). Audiovisual messages are created and spread on SNs, trying to convince or move the audience to feel something to achieve a desired effect, making the truth somewhat irrelevant. The young audience, spending so much time on SNs (Lozano-Blasco et al., 2023), often encounter fabricated information dressed up as news-like stories that serve political, economic, or ideological interests (Hernández, 2020).

The object of such Fake News (FN) is to manipulate public opinion, to change its ideas about a given situation, and legitimize a point of view (Aleinikov et al., 2019), which may even harm democratic stability (Chambers et al., 2021). This phenomenon of manipulation contributes to increasing the audience’s vulnerability, which is amplified by the reach of SNs and the development of Artificial Intelligence (AI) (Gómez de Ágreda et al., 2021; López et al., 2022). The algorithms behind these SNs examine users’ interests to feed them tailored information or advertising (Swart, 2021), adapting to their requirements at the risk of isolating them in bubbles. That may lead to users not seeing other content and becoming radicalized, reinforcing the ideas and arguments they share with similar users (Wolfowicz et al., 2023). The creators of FN do not want their information analysed or their sources checked, but rather seek instant, impulsive, visceral responses, using provocative imagery to trigger emotional responses (Acosta, 2021). In this way, they capture young

people's attention through emotion, affecting their beliefs and seeking their help in spreading false news stories.

Hence, the spread of FN is closely related to deficits in processing conflict and the public's ability to analyse information. Britt et al. (2019) and Batailler et al. (2022) noted four factors that promoted the viral spread of FN: those who receive it not being motivated to analyse the information before they spread it; reduced critical-thinking skills for analysing it; prioritizing the emotional over the cognitive channel; and the information received matching prior beliefs (the more consistent it is, the easier it is to accept). Faced with this situation, it is worth asking whether university students are affected by these factors, and how they deal with the FN they see on the SNs they spend so much time on. More specifically, the objective of the present study is to analyse the strategies related to critical-thinking skills that university students use when dealing with fake news.

CRITICAL THINKING VS. AI-BOOSTED FAKE NEWS

The emergence of generative AI has triggered ethical debates about its use in computing and communication, which is affecting the entire process of news production (Otero, 2022). This technology also has an impact on the strategies people activate to gain knowledge from information they receive, which requires students to be equipped with the cognitive tools that will allow them to be able to respond to the challenges they face (García-Peñalvo et al., 2024). There is no doubt that AI offers great potential for education, although it also brings with it some challenges, which means there is a need for rigorous analysis involving the entire educational community (Sánchez-Mendiola y Carbajal, 2023). One of the risks of the technology is related to its misuse, if it is put into service of malicious interests to create uncertainty in the face of an avalanche of false information, as Martín and Buitrago (2023) and Ballesteros-Aguayo and Ruiz del Olmo (2024) noted.

The challenge nowadays focuses on detecting FN that is created automatically by increasingly sophisticated systems (Meso et al., 2023). These systems replace the authentic actors of news-events, emulating their voices or writing styles, putting them in fictitious scenes, changing what they say, misleading people and causing a permanent state of disbelief and uncertainty. Given this worrying situation, people—especially young people—need to be given tools and strategies to stimulate critical thinking and train them to countereffect the negative impact of AI associated with the creation and spread of FN. That requires determining whether young people are ready to cope in the age of disinformation, in other words, whether they have intrinsic critical-thinking skills.

Ennis (1985) defined critical thinking as a cognitive process that allowed subjects to rationally explain certain facts, identifying their nature and ethical connotations. When it comes to the news this is about peoples' abilities to identify the nature of news stories and evaluate them from an ethical perspective, checking whether they are true and whether they match up with reality. Paul and Elder (2007) suggested five intrinsic dimensions for critical thinking: cognitive, personal-attitudinal, logical-argumentative, expressive-communicative, and ethical. Young people's critical abilities in the face of fake news—created or spread by AI—involves using various abilities that may fall within these dimensions.

The *cognitive dimension* is associated with subjects' capacity to identify and define FN, to be aware of receiving it, and able to classify it in news stories that may be incomplete, biased, contradictory, distorted, misleading, or out-of-context, according to López-Flamarique and Planillo (2021). It also refers to the ability to identify the interests behind FN, highlighting the areas where it are more prevalent.

The *personal-attitudinal dimension* is related to subjects' reactions to FN stories, whether that is stopping reading them in order to analyse them, checking sources and authors, checking or verifying them against other media or with other people (Castells et al., 2022), expanding information, or ignoring them. It is also related to their capacity to rationalize the motives that often lead them to unthinkingly and reflexively spread FN, without considering the potential impact.

The *logical-argumentative dimension* is associated with the ability to discern the formulas FN adopt: a humorous or satirical tone; without context; sensationalist—clickbait—titles or images (Singh et al., 2023); misleadingly cropped, distorted, or AI-created images (Karen et al., 2023) created to capture attention and manipulate. This dimension is also related to the ability to check the veracity of a news story, identifying the elements that contribute to that, such as whether the news comes from an expert or a well-known organization, is supported by believable testimony, is not controversial, and includes real images or video, as demonstrated during the COVID experience (Del Moral et al., 2021).

The *expressive-communicative dimension* is related to subjects' abilities to detect technical or aesthetic aspects that help to disguise FN, in other words, those aspects that cause doubts about its veracity (Kondamudi, 2023). These include a lack of authors, unreliable sources, no publication date, inclusion of attention-grabbing data or headlines that are unrelated to the actual content, use of offensive or discriminatory tone, spelling and grammar errors, AI-produced images, etc. (Figure 1).

Figure 1*Examples of AI-produced fake news*

Source. Google Images.

Lastly, the *ethical dimension* is linked to the capacity to think about the motivations behind AI-based FN. In other words, determining whether it is about growing an audience, generating controversy, manipulation or influence, making money, causing social alarm (Aboualola et al., 2023), discrediting people or institutions, obscuring other news items, etc. This dimension also refers to the ability to identify those responsible for spreading FN, such as influencers, pseudo-experts, politicians, journalists, and other citizens.

It is essential to determine whether young people—who are most exposed to the digital arena—are sufficiently ready to respond to the challenges of being inundated with FN produced and spread using AI. Do they possess the levels of critical thinking needed to avoid being manipulated? The current study examines their opinions, perceptions, and reactions to FN, identifying the strategies they use to identify, verify, and check it. This will allow us to explore their abilities and identify limitations in their education that will allow the future design of systematic educational interventions for stimulating their critical thinking in the face of this phenomenon.

METHOD

This study was a result of the inter-university project, *SURFake*, in response to the following questions:

- Q1. Do university students feel that they are ready to deal with the avalanche of false information produced by AI that they receive through SNs?

- Q2. Can they identify the traits that define FN?
- Q3. In what settings do they believe that FN are most prevalent?
- Q4. What strategies associated with critical thinking do they deploy when faced with FN?
- Q5. What indicators alert them that information is false?
- Q6. What do they think are the reasons behind the creation of FN and its spread on SNS?
- Q7. Who is responsible for creating and spreading FN?
- Q8. Why would they be pushed to spread news without checking it?
- Q9. What education or training do they think is most important to deal with this?

More specifically, the *hypotheses* derived from the research questions were as follows:

- H1. University students do not feel ready to discriminate the FN they receive via SNS.
- H2. Most students think that FN stories are characterized by being biased or incomplete.
- H3. They believe that FN proliferates in university, politics and in society news.
- H4. They activate various strategies to determine the truth of news they receive on SNS.
- H5. A variety of indicators lead them to doubt the truth of news stories they receive depending on age and gender.
- H6. Young people believe that the main motivation for creating and spreading FN is manipulation of the public.
- H7. The university students believe that influencers are the most responsible for the spread of FN.
- H8. The students spread news stories without checking when they are shocking and when they cause social alarm.

This was an empirical, non-experimental study, which was exploratory, comparative, and survey-based, as described by Cohen et al. (2011). The objectives were: 1) to analyse the strategies university students use when faced with FN, related to critical-thinking dimensions; 2) to determine what level of education or training they had received for detecting FN; and 3) to describe the educational content they would prioritize for identifying FN. This will allow future outlining of possible courses of action to incorporate in educational intervention programs that would strengthen strategies associated with critical thinking when faced with any kind of new information.

Sample

Sampling was non-probabilistic and intentional, following application of a questionnaire that university students completed voluntarily. Table 1 shows the distribution of the subjects considering the different classification variables.

Table 1
Sample distribution

		Frequency	Percentage
University	University of Oviedo	274	50.5
	University of Valencia	269	49.5
Gender	Female	420	77.3
	Male	123	22.7
Age (years)	18-19	174	32.1
	20-21	194	35.8
	22-23	100	18.5
	24-25	45	8.3
	Over 25	29	5.4
Degree	Bachelor's in Social Education	86	15.8
	Bachelor's in Teaching Infant Education	131	24.1
	Bachelor's in Teaching Primary Education	113	20.8
	Bachelor's in Education	154	28.4
	Masters' in Education	59	10.9
TOTAL	543	100.0	

Source. authors' own work.

Instrument

The instrument, designed specifically for this study, included 56 items related to the critical-thinking dimensions defined by Paul and Elder (2007). The aim of the instrument was to identify the *Strategies associated with Critical Thinking (ESPECRI)* that university students activated when dealing with FN. It combined items that had been validated and adapted from other similar studies, although the difference here was the systematization of the questions around the critical-thinking dimensions—the present object of study. In other words, the questions were aimed at understanding the strategies university students adopted when dealing with potential FN received via SNs. The cognitive dimension included items adapted from the study by López-Flamarique and Planillo (2021) on awareness of what FN is and awareness of receiving it. The attitude dimension included similar indicators to those used by Castells et al. (2022) to determine subjects' reactions to FN and their contributions to spreading it. The ethical dimension included similar items to those used by Aboualola et al. (2023) to examine beliefs about those responsible for spreading FN and the reasons for creating it.

The items in the logical-argumentative dimension were based on the studies by Del Moral et al. (2021), Karen et al. (2023), and Singh et al. (2023) linked to understanding subjects' abilities to discern the traits of true news stories and to identify the types of FN they often find. The expressive-communicative dimension included items about testing the veracity of news stories, as in the study by Kondamudi (2023). In addition to the critical-thinking dimensions defined by Paul and Elder (2007), an additional dimension was included, education, to assess how important the university students thought various educational content was for being able to deal with disinformation on SNs and AI. This included an item to record the amount of education they had received in this regard, and another to assess their educational needs based on priority topic areas intrinsic to media literacy for combatting disinformation (Sádaba-Chalezquer y Salaverria-Aliaga, 2023).

The instrument was a self-reported questionnaire, with closed questions and mutually exclusive Likert-type response options (four response options: 1=never, 2=occasionally, 3=often, 4=always) (Table 2).

Table 2*ESPECRI-Fake News instrument*

Dimension	Variables	Category and coding
1. Cognitive (López-Flamarique y Planillo, 2021)	1.1. Are you aware of the fake news you receive?	(1=never, 2=occasionally, 3=often, 4=always)
	1.2. Indicate to what extent the following adjectives define a fake news story	1.2.1. Incomplete 1.2.2. Biased 1.2.3. Contradictory 1.2.4. Distorted 1.2.5. Misleading 1.2.6. Lacking context
	1.3. What areas do you think fake news proliferates most in?	1.3.1. Culture 1.3.2. Health 1.3.3. Environment 1.3.4. Society 1.3.5. Economy 1.3.6. Politics 1.3.7. Sport
2. Attitudinal (Castells et al., 2022)	2.1. How do you usually react when you think you are looking at a fake news story?	2.1.1. I ignore it/I don't read it (indifference) 2.1.2. I read the whole thing (interest) 2.1.3. I check the source or author (confirmation) 2.1.4. I verify the link (verification) 2.1.5. I check with other people (check) 2.1.6. I look for more information online (documentation) 2.1.7. I check with other media (traditional news, official bulletins, specialist websites...) (compare)
	2.2. Indicate the most common reasons one may have for reflexively contributing to spreading fake news without checking it	2.2.1. It might be useful to others (recipes, offers, advice, medicine, etc.) 2.2.2. It aligns with my interests (leisure, economics, etc.) 2.2.3. It worries me 2.2.4. It shocks me 2.2.5. I enjoy it 2.2.6. It agrees with how I think 2.2.7. It reinforces my ideological convictions

Dimension	Variables	Category and coding
3. Ethics (Aboualola et al., 2023)	3.1. Indicate why you think fake news stories are created	3.1.1. To increase an audience/visits/clicks 3.1.2. To create controversy 3.1.3. To manipulate or influence 3.1.4. For economic interests 3.1.5. To create social alarm 3.1.6. To discredit someone or something 3.1.7. To hide other news
	3.2. Indicate who you think is more responsible for spreading fake news	3.2.1. People in general 3.2.2. Influencers 3.2.3. Pseudo-experts 3.2.4. Politicians 3.2.5. Journalists
4. Logical argumentative (Del Moral et al., 2021; Karen et al., 2023; Singh et al., 2023)	4.1. What kinds of fake news do you commonly find on your social media?	4.1.1. Humorous or satirical information 4.1.2. Information lacking context (time or place) 4.1.3. Headlines, images, or subheadings unrelated to the topic (clickbait) 4.1.4. Misleadingly framed information or images 4.1.5. Unconfirmed information designed to mislead or manipulate
	4.2. How important do you think the following elements are for believing a news item	4.2.1. Supported by recognized experts or organizations 4.2.2. Supported by testimonials 4.2.3. Includes real images or video 4.2.4. Is not controversial
5. Expressive-communicative (Kondamudi, 2023)	5. Indicate how much these indicators make you doubt the truth of a news story	5.1. There is no author 5.2. No date of publication 5.3. An unofficial source (blogs, websites, etc.) 5.4. Data that shock, cause alarm, or controversy 5.5. An attention-grabbing headline unrelated to the content 5.6. Use of a discriminatory or offensive tone 5.7. Poorly written, spelling or grammar mistakes

Dimension	Variables	Category and coding
6. Education	6.1. In your opinion, how much education have you been given for detecting fake news?	(1=None, 2=A little, 3=Some, 4=A lot)
	6.2. In the post-truth era, how important are the following educational content for identifying fake news?	6.2.1. Visual literacy (images, framing, etc.) 6.2.2. The process of creating fake news 6.2.3. Guidelines for testing news stories 6.2.4. Recognizing reliable sources 6.2.5. Keys for detecting hidden interests or intentions 6.2.6. Critical analysis: message and form 6.2.7. Identification of strategies for capturing an audience 6.2.8. Media responsibility and social impact (ethical code) 6.2.9. Steps for defending my rights as a user

Source. authors' own work.

The instrument's reliability was assessed via Cronbach's alpha and McDonald's (1999) Omega, with values shown in Table 3. According to O'Dwyer and Bernauer (2013), all values being greater than (or very close to) 0.7 indicates that the instrument overall, and each of its component dimensions, can be considered reliable.

Table 3

Reliability of the instrument: Cronbach's α and McDonald's Ω

	Cronbach alpha	McDonald's omega
1. Cognitive	.752	.754
2. Attitudinal	.764	.736
3. Ethical	.824	.821
4. Logical-argumentative	.711	.677
5. Expressive-communicative	.776	.778
6. Education	.864	.875

Source. authors' own work

Finally, both Cronbach Alpha and McDonald's omega for the instrument overall gave high values ($\alpha=0.895$ and $\Omega=0.917$), indicating good reliability.

Data analysis

Data analysis was based on descriptive statistics related to frequencies, percentages, and means. After confirming that the sample did not meet the criteria for normality via the Kolmogorov-Smirnov test, subsequent testing was non-parametric to determine whether there were statistically significant differences in dichotomous variables (Mann-Whitney U) and those with more categories (Kruskal-Wallis).

Only results that were statistically significant are reported. The effect size was assessed using Cohen's d (d) for the dichotomous variable (gender) and Cohen's f (f) for the other variables (age and amount of education received about detecting FN). The statistical power (SP) was calculated specifically for each case, assuming a level of type I error of .1. The data were interpreted with reference to the values suggested by Cohen (1988). The effect size according to d is small at .20, moderate at .50, and large at .80; the effect size according to f is small at .10, moderate at .25, and large at .40; the statistical power is small at .60, moderate at .70, and large at .80. The analyses were done using the software SPSS v26 and G*Power 3.1.9.7.

RESULTS

The distribution of the university students' responses relating to their level of education for detecting FN was as follows: 52.9% indicated having had little education; 23.8% indicated having had none (showing that three-quarters of the students were unhappy with their readiness to tackle disinformation and other issues arising from misuse of AI); only 2.4% felt that they were well educated, and 21% felt somewhat prepared for the task. These data confirm H1, as the students believed that they were not very well trained or educated for this challenge. This is a key variable, as in subsequent tests between groups, the students' perceived levels of readiness may affect their critical abilities for dealing with FN.

Cognitive dimension

The students associated FN with terms such as lies (20.8%), deception/fraud/cheating (15.2%), manipulation/misrepresentation (12.4%), hoax (9.1%), false/not credible (7.9%), invented/unreal (6.9%), disinformation (5.1%), pseudo-journalism

(3.3%), politics/power (3.3%), and others (15.9%). This indicates that they are aware of and understand the concept and its connotations. Over half (51.4%) demonstrated often being aware of the FN they received on SNs, 8.8% said that they were always aware, whereas 38.7% said they were occasionally aware of it, and 1.1% stated never being aware.

Figure 2
Word cloud



Source. authors' own work.

To determine whether there were statistically significant differences in the levels of awareness of receiving FN, the means were compared by gender. This indicated that women were less aware than men of receiving FN through SNs. As might be expected, the students who felt that they had received more education in this regard indicated greater awareness of receiving FN than those who felt they lacked this training (none: $\bar{x}=2.53$, $SD=.662$; a little: $\bar{x}=2.64$, $SD=.602$; some: $\bar{x}=2.89$, $SD=.657$; a lot: $\bar{x}=3.38$, $SD=.768$; $p<.000$; $f=.253$; $SP=.999$). The effect size for the gender-related difference was small ($d<0.2$), while the effect for education was moderate ($f<0.25$). The statistical power was low ($SP<0.70$) in the first case and high ($SP>0.90$) in the second (Table 4).

Table 4

Descriptive statistics related to the variable awareness of receiving FN

		X	DT	p	d/f	PE
Gender	Female	2.66	.657	.028	.199	.612
	Male	2.79	.618			
Age	18-19	2.67	.666	.146	.103	.581
	20-21	2.68	.628			
	22-23	2.66	.670			
	24-25	2.71	.626			
	>25	2.97	.680			
Education	None	2.53	.662	.000	.253	.999
	A little	2.64	.602			
	Some	2.89	.657			
	A lot	3.38	.768			

Source. authors' own work.

The traits that the respondents felt defined fake news were deception, followed by distorted and out-of-context information (Table 5).

Table 5

Descriptive statistics about the traits defining a fake news story according to gender

Traits	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Incomplete	2.85	.887	2.88	.897	2.70	.833	.034	.207	.644
Biased	2.95	.831	2.97	.837	2.85	.803	.124	.145	.411
Contradictory	3.04	.784	3.05	.793	2.96	.746	.196	.117	.307
Distorted	3.52	.604	3.55	.582	3.42	.668	.064	.203	.624
Deceptive	3.68	.571	3.67	.575	3.68	.566	.941	.017	.105
Out of context	3.29	.730	3.29	.726	3.26	.748	.661	.041	.126

Source. authors' own work.

Comparing the means by gender indicated significant differences in defining FN. Women tended primarily to identify them as incomplete, although the size of the effect of the gender variable was small and the statistical power was low. There was a similar picture for the 22-23 year-old age group (18-19: $\bar{x}=2.64$, $SD=.880$; 20-21: $\bar{x}=2.84$, $SD=.821$; 22-23: $\bar{x}=3.21$, $SD=.880$; 24-25: $\bar{x}=2.82$, $SD=.936$; >25: $\bar{x}=2.86$, $SD=.953$; $p<.000$; $f=.220$; $SP=.997$). This age difference was also seen with FN being defined as *contradictory* (18-19: $\bar{x}=2.94$, $SD=.719$; 20-21: $\bar{x}=2.98$, $SD=.811$; 22-23: $\bar{x}=3.26$, $SD=.747$; 24-25: $\bar{x}=2.91$, $SD=.874$; >25: $\bar{x}=3.34$, $SD=.769$; $p=.002$; $f=.179$; $SP=.964$); and out of context (18-19: $\bar{x}=3.11$, $SD=.774$; 20-21: $\bar{x}=3.34$, $SD=.702$; 22-23: $\bar{x}=3.44$, $SD=.656$; 24-25: $\bar{x}=3.27$, $SD=.780$; >25: $\bar{x}=3.45$, $SD=.632$; $p=.004$; $f=.178$; $SP=.962$).

Over-25s identified FN with bias (18-19: $\bar{x}=2.64$, $SD=.827$; 20-21: $\bar{x}=2.97$, $SD=.751$; 22-23: $\bar{x}=3.28$, $SD=.792$; 24-25: $\bar{x}=3.04$, $SD=.903$; >25: $\bar{x}=3.31$, $SD=.761$; $p<.000$; $f=.291$; $SP=.999$) and with being distorted (18-19: $\bar{x}=3.41$, $SD=.663$; 20-21: $\bar{x}=3.54$, $SD=.568$; 22-23: $\bar{x}=3.61$, $SD=.530$; 24-25: $\bar{x}=3.58$, $SD=.621$; >25: $\bar{x}=3.69$, $SD=.604$; $p=.029$; $f=.142$; $SP=.844$), and while the effects were small or moderate, the statistical power was high. This pattern was repeated throughout the study results; the effect size data was occasionally limited, although always above the minimum value, but thanks to the acceptable error levels and the large sample, high statistical power was obtained. This suggests that the likelihood of correctly identifying a real effect was high, as indicated by Cohen (1988).

In terms of the *settings* where respondents felt that FN proliferate, their responses indicated society and the political arena (Table 6).

Table 6

Descriptive statistics related to settings where students felt that FN abound, with differences by gender

Settings	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Culture	2.64	.789	2.65	.798	2.58	.761	.258	.090	.225
Health	3.04	.762	3.06	.749	2.96	.810	.224	.128	.345
Environment	2.67	.775	2.66	.793	2.69	.705	.692	.040	.125
Society	3.48	.639	3.53	.623	3.31	.671	.001	.344	.954
Economy	3.19	.772	3.21	.779	3.12	.748	.195	.118	.310
Politics	3.62	.626	3.61	.637	3.65	.588	.573	.065	.167
Sport	2.49	.771	2.40	.730	2.78	.832	.000	.492	.999

Source. authors' own work.

There were statistically significant differences between means by gender. Women felt that society news was more affected by FN, while men saw it particularly in sport. Over-25s felt that health news was particularly affected by hoaxes and false stories, unlike the other age groups (18-19: \bar{x} =2.88, SD=.799; 20-21: \bar{x} =3.03, SD=.723; 22-23: \bar{x} =3.22, SD=.760; 24-25: \bar{x} =3.18, SD=.747; > 25: \bar{x} =3.24, SD=.636; p =.003; f =.176; SP =.959). Respondents aged 22-23 identified economic news stories as the least trustworthy (18-19: \bar{x} =3.05, SD=.835; 20-21: \bar{x} =3.20 y SD=.729; 22-23: \bar{x} =3.36, SD=.746; 24-25: \bar{x} =3.33, SD=.769; >25: \bar{x} =3.21, SD=.620; p =.021; f =.149; SP =.878). Effect sizes in relation to gender and age were small, although the statistical power was high.

Personal-attitudinal dimension

The strategies activated in the face of a supposed FN story may affect a subject's behaviour and lead to them becoming a victim of fraud or manipulation (Lozano-Blasco et al., 2023). This is why it is important to understand their *reactions* and analyse how they deal with this challenge in order to determine and shore up their weaknesses. Over a quarter (26.9%) said that they always ignored FN stories, only 23.2% read them and sought more information online, 17.9% compared them with other media, and 14.2% asked other people about them. It is worth noting that 72.9% confessed to never or only occasionally checking sources or authors of news stories they received (Table 7).

Table 7

Descriptive statistics related to reactions to potential FN and differences by gender

Reactions	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Ignore it/don't read it	2.84	.904	2.85	.919	2.80	.862	.520	.056	.150
Read it in full	1.88	.829	1.90	.845	1.85	.771	.830	.061	.160
Check source or author	1.93	.961	1.91	.965	1.98	.931	.331	.074	.185
Verify the link	1.64	.939	1.63	.942	1.64	.931	.772	.011	.102
Ask other people	2.50	.923	2.60	.918	2.16	.866	.000	.477	.988
Seek more information online	2.71	.961	2.73	.972	2.61	.916	.167	.127	.341
Compare with other media	2.46	.999	2.47	.999	2.45	1.000	.838	.020	.106

Source. authors' own work.

There were significant differences between means based on gender and age. Women were more likely to ask other people about the news they received. Over-25s were more likely to check the source or author (18-19: $\bar{x}=1.83$, $SD=.964$; 20-21: $\bar{x}=1.89$, $SD=.948$; 22-23: $\bar{x}=2.03$, $SD=.958$; 24-25: $\bar{x}=1.93$, $SD=.939$; >25 : $\bar{x}=2.48$, $SD=.911$; $p=.005$; $f=.154$; $SP=.896$) and to verify links (18-19: $\bar{x}=1.46$, $SD=.871$; 20-21: $\bar{x}=1.60$, $SD=.895$; 22-23: $\bar{x}=1.72$, $SD=.944$; 24-25: $\bar{x}=1.91$, $SD=1.041$; >25 : $\bar{x}=2.17$, $SD=1.167$; $p<.000$; $f=.194$; $SP=.984$). Effects were small in both cases, although statistical power was high.

In addition, respondents who felt that they were well educated about FN were more likely to check sources and authorship, in contrast to those who said that they had not been educated in this regard (none: $\bar{x}=1.71$, $SD=.920$; a little: $\bar{x}=1.90$, $SD=.944$; some: $\bar{x}=2.20$, $SD=.923$; a lot: $\bar{x}=2.54$, $SD=1.030$; $p<.000$; $f=.198$; $SP=.992$). They were also more likely to check links (none: $\bar{x}=1.45$, $SD=.857$; a little: $\bar{x}=1.57$, $SD=.873$; some: $\bar{x}=1.90$, $SD=1.030$; a lot: $\bar{x}=2.46$, $SD=1.191$; $p<.000$; $f=.217$; $SP=.998$) and compare information with other media (none: $\bar{x}=2.22$, $SD=1.030$; a little: $\bar{x}=2.46$, $SD=.992$; some: $\bar{x}=2.70$, $SD=.902$; a lot: $\bar{x}=2.92$, $SD=1.115$; $p=.001$; $f=.176$; $SP=.971$). The effects regarding education were small, although the statistical power was high.

Respondents were also asked for the most common reasons that would lead them to spread a news story without checking it. This question sought to illuminate the types of behaviour they demonstrated: unthinking or deliberate, immediate or intentional, etc., and to identify the risks involved in that behaviour. Table 8 shows the reasons that they reported for sharing unchecked information. Emotion played a large role, almost always associated with shock (73.5%) or worry (67.7%).

Table 8

Descriptive statistics related to the reasons for spreading unchecked news stories and differences by gender

Reasons	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Others may find it useful	2.59	.781	2.63	.782	2.48	.776	.073	.192	.587
It relates to my interests	2.71	.793	2.73	.786	2.65	.824	.250	.099	.252
It worries me	2.82	.747	2.86	.775	2.67	.624	.007	.254	.793
It shocks me	2.95	.800	2.99	.811	2.83	.749	.030	.200	.615
I enjoyed it	2.50	.949	2.44	.951	2.76	.895	.001	.337	.947
It aligns with how I think	2.42	.936	2.41	.947	2.45	.894	.720	.043	.130
It reinforces my ideological convictions	2.40	.989	2.40	.992	2.42	.981	.887	.020	.106

Source. authors' own work.

Comparing the mean scores for the reasons given for sharing news stories without checking them by gender produced significant differences. Women were more likely to spread news stories—without checking them—as a result of the concern they produced and the impact they had. Men were more likely to spread stories they enjoyed and for entertainment. Comparing by the levels of education about FN they had received, those reporting most education indicated that they did it for fun (none: $\bar{x}=2.33$, $SD=.971$; a little: $\bar{x}=2.50$, $SD=.934$; some: $\bar{x}=2.68$, $SD=.917$; a lot: $\bar{x}=2.77$, $SD=1.092$; $p=.035$; $f=.131$; $SP=.818$). The gender differences in reasons for spreading FN had a small effect and high statistical power, while the differences based on education had a small effect, and high statistical power.

Ethical dimension

Knowing how to discern the *reasons behind the creation of FN* is a skill that involves teasing out what lies underneath a hidden lie and allows subjects to be alert to them. Table 9 shows the respondents' opinions about the reasons behind this type of false information. The vast majority (94.3%) believed that they are mostly created in order to manipulate, and a similar percentage felt that organizations created FN to increase their audience or consumer base.

Table 9

Descriptive statistics related to reasons for creating FN and differences by gender

Reasons	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Gain audience/visits/clicks	3.55	.666	3.58	.626	3.43	.783	.082	.212	.657
Create controversy	3.20	.744	3.25	.727	3.07	.787	.033	.242	.757
Manipulate or influence	3.58	.616	3.64	.580	3.40	.701	.000	.390	.983
Economic interests	3.35	.759	3.39	.754	3.21	.763	.009	.237	.742
Social alarm	3.24	.756	3.32	.747	2.97	.730	.000	.463	.998
Discredit someone/ something	3.27	.739	3.30	.726	3.18	.785	.157	.159	.457
Obscure other news	3.22	.789	3.28	.756	3.02	.861	.003	.330	.939

Source. authors' own work.

On comparing the means, opinions differed significantly by gender and age. Women were more likely to believe that FN was created to cause controversy, manipulate or influence people, make money, cause social panic, or to obscure other news. The effects were small, while the statistical power was moderate or high.

Looking at age, 22-23 and 24-25-year-olds gave higher scores to manipulation (18-19: $\bar{x}=3.37$, $SD=.699$; 20-21: $\bar{x}=3.66$, $SD=.563$; 22-23: $\bar{x}=3.71$, $SD=.498$; 24-25: $\bar{x}=3.71$, $SD=.506$; >25: $\bar{x}=3.69$, $SD=.660$; $p<.000$; $f=.238$; $SP=.999$) and economic interests (18-19: $\bar{x}=3.16$, $SD=.817$; 20-21: $\bar{x}=3.36$, $SD=.744$; 22-23: $\bar{x}=3.56$, $SD=.592$; 24-25: $\bar{x}=3.53$, $SD=.786$; >25: $\bar{x}=3.45$, $SD=.736$; $p<.000$; $f=.200$; $SP=.988$), while the over-25s gave emphasized causing social panic (18-19: $\bar{x}=3.02$, $SD=.768$; 20-21: $\bar{x}=3.31$, $SD=.718$; 22-23: $\bar{x}=3.40$, $SD=.728$; 24-25: $\bar{x}=3.29$, $SD=.787$; >25: $\bar{x}=3.48$, $SD=.738$; $p<.000$; $f=.210$; $SP=.994$) and hiding other news (18-19: $\bar{x}=3.06$, $SD=.781$; 20-21: $\bar{x}=3.24$, $SD=.787$; 22-23: $\bar{x}=3.31$, $SD=.813$; 24-25: $\bar{x}=3.36$, $SD=.743$; >25: $\bar{x}=3.52$, $SD=.688$; $p<.000$; $f=.162$; $SP=.924$). The effects of the age-related differences were small, while the statistical power was high.

The respondents identified journalists as principally responsible for the viral spread of FN, followed by influencers and the general public (Table 10).

Table 10

Descriptive statistics related to who is responsible for the spread of FN and differences by gender

Responsible	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
General public	3.19	.721	3.25	.671	2.98	.846	.003	.374	.976
Influencers	3.23	.736	3.24	.711	3.19	.820	.827	.065	.167
Pseudo-experts	2.78	.832	2.78	.821	2.76	.866	.911	.024	.109
Politicians	3.07	.849	3.08	.848	3.01	.851	.374	.082	.206
Journalists	3.41	.777	3.39	.775	3.45	.785	.298	.077	.192

Source. elaboración propia.

Comparing the means by age and gender indicated significant differences. Women indicated greater responsibility for the general public in the spread of FN. In terms of age, 24-25-year-olds identified journalists (18-19: $\bar{x}=3.28$, $SD=.863$; 20-21: $\bar{x}=3.38$, $SD=.733$; 22-23: $\bar{x}=3.57$, $SD=.728$; 24-25: $\bar{x}=3.58$, $SD=.621$; >25: $\bar{x}=3.52$, $SD=.785$; $p=.009$; $f=.150$; $SP=.879$), followed by politicians (18-19: $\bar{x}=2.91$, $SD=.866$; 20-21: $\bar{x}=3.07$, $SD=.840$; 22-23: $\bar{x}=3.23$, $SD=.839$; 24-25: $\bar{x}=3.31$, $SD=.763$;

>25: $\bar{x}=3.07$, $SD=.842$; $p=.011$; $f=.157$; $SP=.907$) and pseudo-experts (18-19: $\bar{x}=2.60$, $SD=.832$; 20-21: $\bar{x}=2.78$, $SD=.806$; 22-23: $\bar{x}=2.93$, $SD=.879$; 24-25: $\bar{x}=3.00$, $SD=.769$; >25: $\bar{x}=2.93$, $SD=.753$; $p=.006$; $f=.169$; $SP=.945$). The effects for both variables were small, while the statistical power was high.

Logical-argumentative dimension

The ability to identify the type of FN received via SNs is key for these young people to be able to identify it and not fall victim to disinformation (López-Flamarique y Planillo, 2021). They were asked what kind of FN they received most often. Almost three-quarters (73.3%) indicated that it was mostly unproven information created to deceive or manipulate. A similar proportion (70.9%) received clickbait—stories with headlines, images, or subheadings that had little to do with the story to drive visits or grow an audience (Table 11).

Table 11

Descriptive statistics related to the type of FN received and differences by gender

Most common fake news	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Jokes or satire	2.55	.757	2.54	.761	2.60	.737	.297	.080	.200
Out-of-context information	2.68	.750	2.67	.761	2.69	.707	.961	.027	.112
Clickbait (attention grabbing headlines, images or subheadings)	2.93	.844	2.94	.863	2.88	.777	.356	.073	.183
Misleadingly framed information or images	2.66	.790	2.69	.812	2.54	.708	.031	.190	.578
Unconfirmed evidence created to deceive or manipulate	3.00	.798	3.02	.805	2.91	.775	.121	.139	.384

Source. authors' own work.

Comparing the means, there were statistically significant differences by gender, but the effect size and statistical power did not meet the minimum values, meaning they were negligible. In terms of age, over-25s indicated receiving more misleadingly framed images or information (18-19: $\bar{x}=2.48$, $SD=.766$; 20-21: $\bar{x}=2.77$, $SD=.775$; 22-23: $\bar{x}=2.63$, $SD=.861$; 24-25: $\bar{x}=2.76$, $SD=.712$; >25: $\bar{x}=2.86$, $SD=.743$; $p=.004$; $f=.169$; $SP=.944$), as well as unconfirmed information created to mislead or manipulate

(18-19: $\bar{x}=2.83$, $SD=.815$; 20-21: $\bar{x}=3.12$, $SD=.735$; 22-23: $\bar{x}=3.06$, $SD=.827$; 24-25: $\bar{x}=2.89$, $SD=.885$; >25: $\bar{x}=3.17$, $SD=.711$; $p=.004$; $f=.166$; $SP=.937$). The effect of this difference was small, although the statistical power was high.

From an educational perspective and given the flood of FN that inundate SNs—amplified by AI—it is important to identify what elements these young people prioritize that give the information they receive credibility, and so be able to detect the areas they are lacking in in order to redirect their strategies. The majority (84.1%) believed information supported by recognized experts or organizations, while 71.1% were more likely to believe news stories that were accompanied by visual evidence, including real images or videos (Table 12).

Table 12

Descriptive statistics related to elements that students prioritize in giving a news story credibility and differences by gender

Elements of credibility	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Supported by a recognized expert or organization	3.16	.740	3.20	.711	3.05	.825	.120	.194	.595
Supported by testimonies	2.88	.760	2.94	.733	2.69	.817	.002	.329	.938
Includes real images/video	2.93	.800	2.96	.800	2.83	.792	.092	.163	.475
Is not controversial	2.24	.851	2.26	.862	2.17	.813	.335	.107	.276

Source. authors' own work.

Comparing means indicated significant differences by gender and age. Women found news supported by testimonies more believable. Over-25s gave more credibility to news stories backed by recognized experts or organizations (18-19: $\bar{x}=3.09$, $SD=.736$; 20-21: $\bar{x}=3.19$, $SD=.680$; 22-23: $\bar{x}=3.27$, $SD=.827$; 24-25: $\bar{x}=2.98$, $SD=.812$; >25: $\bar{x}=3.34$, $SD=.670$; $p=.031$; $f=.125$; $SP=.740$). The effects in both cases were small, while the statistical power was high.

Expressive-communicative dimension

Being able to identify the truth of a news story needs people to activate certain strategies in order not to be deceived. Students were asked what *elements* they felt were key to checking information and ensuring that it was true. It was clear that poorly written stories with spelling and grammatical errors made them question a

news story *a priori* (88.2), followed by attention-grabbing headlines that had little to do with the actual content (84.7%) (Table 13).

Table 13

Descriptive statistics related to elements that make respondents question the truth of a story, and differences by gender

Questionable elements	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
No author	3.06	.823	3.07	.829	3.00	.806	.316	.086	.214
No date of publication	2.72	.862	2.72	.883	2.73	.785	.806	.012	.102
An unofficial source	3.19	.758	3.23	.756	3.07	.761	.029	.211	.655
Shocking/alariming/ controversial data	2.76	.787	2.78	.791	2.69	.775	.181	.115	.300
Attention-grabbing headline unrelated to the content	3.25	.768	3.28	.761	3.13	.785	.057	.194	.592
Use of a discriminatory or offensive tone	3.23	.818	3.29	.798	3.01	.851	.001	.342	.952
Poorly written, with spelling and grammatical errors	3.48	.758	3.53	.719	3.30	.863	.006	.303	.902

Source. authors' own work.

Comparison of means indicated significant differences by gender and age. Women were more likely to question news stories from unofficial sources, those with a discriminatory tone, and those that were poorly written. In each case, the effect was small. In the first case the statistical power was low, in the other two, it was high. In terms of age, 22-23-year-olds were more suspicious of news stories with a discriminatory or offensive tone (18-19: \bar{x} =3.03, SD=.853; 20-21: \bar{x} =3.27, SD=.841; 22-23: \bar{x} =3.39, SD=.680; 24-25: \bar{x} =3.33, SD=.826; >25: \bar{x} =3.35, SD=.677; p =.004; f =.174; SP =.954). The effect was small, while the statistical power was high.

Education and requirements

The study showed that a concerning 76.7% of the university students had not had any specific education for detecting FN on SNs, most of which are produced by AI. Comparing means by the levels of education they did report and by gender indicated significant differences. Women were more critical about the gaps in their

education than men (women: $\bar{x}=1.97$, $SD=.699$; men: $\bar{x}=2.19$, $SD=.840$; $p=.014$; $d=.299$; $SP=.893$). The effect was small, while the statistical power was high.

The students, aware of their limited education in this regard, were asked how important certain educational content would be in coping with FN. This showed their concern about having guidelines for recognizing reliable sources, and for critically analysing the form and the messaging of the information they received (Table 14).

Table 14

Descriptive statistics related to how important students rated certain educational content, with differences by gender

Educational content	Total		Women		Men		p	d	PE
	\bar{x}	DT	\bar{x}	DT	\bar{x}	DT			
Visual literacy	2.96	.777	3.00	.763	2.83	.813	.040	.219	.682
How Fake News is created	2.92	.708	2.95	.706	2.83	.711	.118	.169	.498
Guidelines for checking news stories	3.11	.788	3.12	.785	3.07	.803	.524	.063	.162
Recognizing reliable sources	3.28	.734	3.33	.703	3.12	.818	.011	.286	.870
Keys to detecting hidden interests and intentions	3.15	.748	3.19	.716	2.99	.842	.024	.267	.827
Critical analysis: form and content	3.17	.770	3.21	.757	3.02	.796	.014	.247	.771
Identifying audience-capture strategies	2.97	.780	3.03	.766	2.75	.788	.001	.359	.966
Media responsibility and social impact	3.07	.774	3.11	.745	2.92	.833	.019	.245	.768
Ways to defend user rights	2.97	.780	3.03	.773	2.77	.772	.001	.337	.947
TOTAL	3.07	.883	3.00	.763	2.83	.813	.040	.216	.671

Source. authors' own work.

The differences between means were significant considering gender, age, and amount of education received for detecting FN. Women ascribed more importance to education in visual literacy, recognizing reliable sources, keys for identifying hidden interests and intentions, guidelines for critical analysis of form and content, audience-capture strategies, user-rights, and media responsibility and social impact. The effects were small and the statistical power was high.

Respondents aged 24-25 gave higher scores to *visual literacy* (18-19: $\bar{x}=2.87$, $SD=.765$; 20-21: $\bar{x}=2.91$, $SD=.770$; 22-23: $\bar{x}=3.11$, $SD=.827$; 24-25: $\bar{x}=3.16$, $SD=.673$; >25 : $\bar{x}=3.00$, $SD=.802$; $p=.042$; $f=.135$; $SP=.806$), *guidelines for checking news stories* (18-19: $\bar{x}=2.99$, $SD=.812$; 20-21: $\bar{x}=3.07$, $SD=.769$; 22-23: $\bar{x}=3.28$, $SD=.780$; 24-25: $\bar{x}=3.33$, $SD=.707$; >25 : $\bar{x}=3.17$, $SD=.805$; $p=.007$; $f=.154$; $SP=.897$), and *keys for detecting hidden interests and intentions* (18-19: $\bar{x}=3.00$, $SD=.783$; 20-21: $\bar{x}=3.11$, $SD=.767$; 22-23: $\bar{x}=3.30$, $SD=.628$; 24-25: $\bar{x}=3.38$, $SD=.684$; >25 : $\bar{x}=3.31$, $SD=.712$; $p=.003$; $f=.178$; $SP=.962$).

Those aged 22-23 gave higher scores to content that helped *uncover the process of constructing FN* (18-19: $\bar{x}=2.80$, $SD=.660$; 20-21: $\bar{x}=2.89$, $SD=.686$; 22-23: $\bar{x}=3.14$, $SD=.766$; 24-25: $\bar{x}=3.04$, $SD=.706$; >25 : $\bar{x}=2.93$, $SD=.799$; $p=.002$; $f=.173$; $SP=.954$), *recognizing reliable sources* (18-19: $\bar{x}=3.18$, $SD=.738$; 20-21: $\bar{x}=3.25$, $SD=.742$; 22-23: $\bar{x}=3.49$, $SD=.674$; 24-25: $\bar{x}=3.44$, $SD=.659$; >25 : $\bar{x}=3.17$, $SD=.848$; $p=.004$; $f=.163$; $SP=.929$), and *examining media responsibility and social impact* (18-19: $\bar{x}=2.90$, $SD=.798$; 20-21: $\bar{x}=3.13$, $SD=.733$; 22-23: $\bar{x}=3.25$, $SD=.730$; 24-25: $\bar{x}=3.00$, $SD=.853$; >25 : $\bar{x}=3.14$, $SD=.743$; $p=.004$; $f=.170$; $SP=.946$). As previously, the effects were small while the statistical power was high.

Examining respondents opinions based on the education they had received about detecting FN, those who felt more qualified ascribed more importance to recognizing reliable sources (none: $\bar{x}=3.08$, $SD=.815$; a little: $\bar{x}=3.23$, $SD=.710$; some: $\bar{x}=3.28$, $SD=.682$; a lot: $\bar{x}=3.37$, $SD=.862$; $p=.002$; $f=.104$; $SP=.637$).

DISCUSSION AND CONCLUSIONS

The first hypotheses was based on the question “Do university students feel that they are ready to deal with the avalanche of false information produced by AI that they receive through SNs?”. It was confirmed, with responses that are cause for concern. Only a quarter of the students indicated having a good level of prior education for dealing with FN, and almost half felt they were unready to do so. The data showed the gaps in their education and their vulnerability, as well as the risk of being at the mercy of manipulation by accepting FN as true and sharing it without thinking. These are valuable findings that open up new educational goals to minimize those gaps and provide students with suitable strategies for the challenges they will face thanks to the emergence of AI and the spread of FN on SNs, as Aboualola et al. (2023) concluded.

A deeper analysis of the data indicated the strategies—linked to the critical-thinking dimensions—that the respondents activated in the face of the FN they received. In the *cognitive dimension*, most of the students gave correct definitions of FN, identifying it with disinformation; manipulation; false information or hoaxes; promoting certain interests, sensationalism and fearmongering; and causing

insecurity and alarm to the general public. The results indicate that they know how to define FN at a theoretical level, but have issues discriminating them based on their educational needs.

After confirming a level of uniformity amongst the respondents in terms of identifying FN as misleading or distorted news stories, the study refuted H2 as the respondents did not identify incomplete or biased news as FN, details that may affect how true information is perceived. This risk is amplified due to the growth of AI tools that make it easy to digitally alter text, images, and videos in order to manipulate the audience, something that makes it harder to tell fact from fiction and predisposes students to systematic doubt, as reported by Ballesteros-Aguayo and Ruiz del Olmo (2024), or to uncritical acceptance.

In contrast, the respondents agreed that FN abound in the social and political spheres—as H3 suggested—in line with the data from Catalina et al. (2019) indicating politics, sport, and the economy as the main areas for FN. In addition, the results indicated that there was a bias related to gender. Women indicated that society news was more affected by FN, perhaps due to their SN consumption, following celebrities and influencers, as reported by Gómez et al. (2020). Men, on the other hand, indicated that there was more FN in sports news, again probably due to the nature of their consumption, as reported by Espinar et al. (2020). Over-25s felt that disinformation and hoaxes were more common in health news, perhaps due to the flood of FN during the COVID-19 pandemic (Román et al., 2020). This indicates that people's experiences of news and their focus of interest may influence their perceptions. No doubt SN algorithms and AI provide people with information based on their profiles, which may confine them to a bubble, as Swart (2021) noted.

Students' abilities for identifying the type of FN they receive and whether they believe a news story are related to the logical-argumentative dimension of critical thinking. Hypothesis H4 was partially confirmed, as the traits that—according to the students—define FN included deception, distortion, and decontextualization. Similarly, they also recognized themselves as victims of clickbait and hoaxes, as Alcalá et al. (2021) and López et al. (2023) reported, leading to uncertainty. Women and over-25s indicated receiving more news stories with false or misleading framing thanks to the involvement of AI.

In addition, the results confirmed the range and variety of criteria that university students used to determine the credibility of a news story based on gender and age, confirming hypothesis H5. Women were more trusting of news supported by testimonials, and older students prioritized information from recognized experts or organizations, followed by news stories containing real images or videos, as Del Moral et al. (2021) noted. However, there are AI applications currently in use that are designed specifically for manipulating photographic “evidence”, threatening

this ability to identify authenticity and possibly even leading to widespread scepticism.

One of the strategies within the personal-attitudinal dimension that the women prioritized was to check news stories with their friends, as Valencia et al. (2022) reported. As one might expect, older respondents demonstrated more critical awareness, underscoring their maturity and thoughtful attitudes, they checked sources and verified links. In contrast the younger respondents' strategies did not allow them to determine the truthfulness of the news they received, predisposing them to being manipulated. In addition, the reactions to FN were consistent with the level of education that subjects reported having received for detecting them. The most educated usually checked sources, verified links, and compared against other media. Nazari et al. (2022) reported something similar after analysing young people's consumption and behaviour in the face of FN, indicating the importance of checking information in order not to be fooled (Bronstein et al., 2021), of not spreading hoaxes, and of confirming sources, as Tandoc et al. (2023) emphasized.

The students strategies for verifying information and ensuring it is true are related to the expressive-communicative dimension of critical thinking. Badly spelled news stories with poor grammar followed by attention-grabbing headlines that have little to do with the actual content were the basic indicators that led respondents to question the veracity of the news they received. These are obvious elements that are visible immediately, however the students did not use the date of publication, often a key factor in manipulating information. Women were more likely to doubt news that did not come from official sources, that had a discriminatory tone, or was badly written. This indicates a need, as Valencia et al. (2022) noted, to focus on these aspects and implement educational plans aimed at younger students to give them the strategies for testing and verifying the information they receive, as Alcalá et al. (2021) noted, and so that they can be cautious when dealing with the challenges posed by AI.

Examining the responses related to the ethical dimension of critical thinking, the respondents understood the reasons driving creation of FN, as they were clear that such stories were designed to manipulate, deceive, and influence, whether for economic or ideological reasons, or even to polarize an audience. This confirmed hypothesis H6. Women demonstrated a more critical spirit, indicating that the creators of FN sought to increase their audiences, influence people, make money, cause social alarm, and hide other news stories, as Gómez et al. (2020) reported. Older respondents noted similar motivations, demonstrating more awareness of the dangers of viral news stories for directing the public gaze in order to hide other news.

In contrast to hypothesis H7, the students placed most blame for creating and spreading FN on journalists, followed by influencers and then the general public. In addition, when they were asked why they would share information without checking it, they indicated unthinking behaviours, driven by immediacy, although some were more prudent and considered in their responses. There reactions were affected by the emotional charge of some news stories, and viral spread was related to their intentions to make their friends aware of news stories, particularly when those stories reflected their beliefs and ideas, as Castells et al. (2022) noted. This confirms hypothesis H8. Women shared information without checking it due to concern and impact, whereas men did so when they enjoyed it, without questioning it ethically.

The study indicates that university students' critical-thinking strategies adopted when dealing with FN are insufficient and should be reinforced in the educational arena. They are aware of the risks but they do not know how to react properly. No doubt, in the post-truth era, there needs to be education and training that prepares them for that. More specifically, their priorities indicate a need for them to have guidelines for identifying reliable sources, analyse form and content, and to have guidance so they can detect the hidden interests and intentions behind FN. This should be based on visual literacy, as Dumitru et al. (2022) and Pérez-Escoda et al. (2022) noted.

The importance that the respondents ascribed to certain educational content may help indicate the key aspects for possible educational interventions so that they do not become victims of disinformation. This should involve recognizing reliable sources, detecting media strategies for capturing an audience, identifying the role of the media and its social repercussions, understanding users' rights and responsibilities, and ways to defend against being misled, assuming responsibility for not being complicit in viral spread, etc. These proposals will doubtless contribute to the development of various strategies associated with the critical-thinking dimensions, which will help prepare students for the sophistication of AI tools and raise their awareness of the risk of being manipulated.

The most notable contribution of this study is that it describes and specifies lines of educational intervention for detecting FN, which is becoming increasingly necessary thanks to the explosion of AI in the digital arena. In addition, the study identified the strategies associated with critical-thinking dimensions that are fundamental for educating the public in an environment where uncertainty rules. That said, it is important to note that this was an analysis linked to a specific university context, which means it would be useful to explore other educational levels in order to identify their educational gaps and intervene appropriately to ensure future generations' critical abilities.

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ANEXO

Table 1

Descriptive statistics on the characteristics of a fake news story by gender, age, and education level

		Incomplete	Biased	Contradictory	Distorted	Misleading	Out of context
Women	\bar{x}	2.88	2.97	3.05	3.55	3.67	3.29
	DT	.897	.837	.793	.582	.575	.726
	R	278.23	276.18	275.34	276.82	270.79	272.44
Men	\bar{x}	2.70	2.85	2.96	3.42	3.68	3.26
	DT	.833	.803	.746	.668	.566	.748
	R	245.89	253.01	255.94	250.80	271.72	265.99
Gender	p	.034	.124	.196	.064	.941	.661
18-19 years	\bar{x}	2.64	2.64	2.94	3.41	3.59	3.11
	DT	.880	.827	.719	.663	.636	.774
	R	238.28	216.39	251.25	247.60	254.15	239.13
20-21 years	\bar{x}	2.84	2.97	2.98	3.54	3.71	3.34
	DT	.821	.751	.811	.568	.547	.702
	R	268.67	274.13	263.78	273.55	279.58	281.01
22-23 years	\bar{x}	3.21	3.28	3.26	3.61	3.76	3.44
	DT	.880	.792	.747	.530	.495	.656
	R	334.59	333.23	312.98	288.95	289.80	301.36
24-25 years	\bar{x}	2.82	3.04	2.91	3.58	3.60	3.27
	DT	.936	.903	.874	.621	.580	.780
	R	268.41	292.51	253.07	287.34	250.97	270.00
Over 25 years	\bar{x}	2.86	3.31	3.34	3.69	3.76	3.45
	DT	.953	.761	.769	.604	.511	.632
	R	277.05	339.17	330.24	316.48	290.28	301.50
Age	p	.000	.000	.002	.029	.073	.004
No educational level	\bar{x}	2.90	3.13	3.02	3.53	3.72	3.36
	DT	.975	.860	.820	.587	.484	.737
	R	284.47	307.85	269.11	271.70	277.33	287.99
Low educational level	\bar{x}	2.85	2.91	3.02	3.53	3.64	3.25
	DT	.854	.816	.775	.602	.608	.742
	R	271.17	262.98	268.76	273.52	266.72	264.53

The critical thinking strategies university students use when dealing with
Fake News produced by Artificial Intelligence

		Incomplete	Biased	Contradictory	Distorted	Misleading	Out of context
Moderate educational level	\bar{x}	2.79	2.82	3.07	3.53	3.70	3.29
	DT	.857	.833	.784	.641	.579	.700
	R	260.78	250.51	277.87	275.78	279.82	270.94
High educational level	\bar{x}	2.77	3.15	3.31	3.31	3.69	3.38
	DT	1.013	.555	.630	.480	.480	.650
	R	264.96	303.88	320.65	208.38	267.00	287.42
Educational level	p	.658	.008	.611	.399	.737	.468

Table 2

Descriptive statistics on the areas where fake news is perceived to be prevalent, by gender, age, and education level

		Culture	Health	Environment	Society	Economy	Politics	Sports
Women	\bar{x}	2.65	3.06	2.66	3.53	3.21	3.61	2.40
	DT	.798	.749	.793	.623	.779	.637	.730
	R	274.79	275.08	269.67	281.73	275.34	269.35	255.35
Men	\bar{x}	2.58	2.96	2.69	3.31	3.12	3.65	2.78
	DT	.761	.810	.705	.671	.748	.588	.832
	R	257.84	256.83	275.61	233.76	255.93	276.74	322.97
Gender	p	.258	.224	.692	.001	.195	.573	.000
18-19 years	\bar{x}	2.57	2.88	2.66	3.43	3.05	3.52	2.54
	DT	.793	.799	.808	.691	.835	.743	.795
	R	259.85	241.93	271.05	262.30	247.82	256.13	279.28
20-21 years	\bar{x}	2.66	3.03	2.60	3.53	3.20	3.68	2.37
	DT	.740	.723	.736	.629	.729	.530	.724
	R	276.72	268.69	257.03	282.19	269.88	280.34	250.70
22-23 years	\bar{x}	2.70	3.22	2.82	3.46	3.36	3.63	2.61
	DT	.870	.760	.730	.626	.746	.597	.777
	R	279.44	305.99	299.58	265.46	304.60	272.50	297.39
24-25 years	\bar{x}	2.64	3.18	2.73	3.58	3.33	3.73	2.51
	DT	.802	.747	.915	.543	.769	.539	.843
	R	273.39	297.36	285.54	288.84	299.33	296.17	271.99
Over 25 years	\bar{x}	2.66	3.24	2.59	3.41	3.21	3.59	2.46
	DT	.769	.636	.682	.568	.620	.628	.744
	R	276.19	308.67	252.38	249.07	267.12	262.88	264.34
Age	p	.791	.003	.161	.462	.021	.257	.094
No educational level	\bar{x}	2.64	3.05	2.64	3.49	3.23	3.58	2.55
	DT	.874	.753	.779	.626	.745	.658	.770
	R	272.19	274.02	264.62	272.87	278.66	265.31	284.31
Low educational level	\bar{x}	2.62	3.03	2.68	3.49	3.15	3.63	2.43
	DT	.771	.784	.781	.658	.795	.618	.739
	R	268.09	270.27	274.34	275.28	264.47	273.29	261.27

The critical thinking strategies university students use when dealing with
Fake News produced by Artificial Intelligence

		Culture	Health	Environment	Society	Economy	Politics	Sports
Moderate educational level	\bar{x}	2.68	3.05	2.63	3.44	3.26	3.63	2.53
	DT	.744	.702	.744	.625	.717	.613	.825
	R	278.79	272.24	264.62	260.05	282.95	274.07	276.93
High educational level	\bar{x}	2.77	3.08	3.15	3.62	3.15	3.69	2.77
	DT	.725	.954	.801	.506	.987	.630	.927
	R	296.88	288.08	358.19	295.69	276.27	291.69	323.08
Educational level	p	.842	.974	.155	.705	.639	.867	.228

Table 3*Descriptive statistics on reactions to potential fake news, by gender, age, and education level*

		I ignore/ do not read it	I read it entirely	I check its source or authorship	I verify the link	I discuss it with others	I search for more information online	I compare it with other media sources
Women	\bar{x}	2.85	1.90	1.91	1.63	2.60	2.73	2.47
	DT	.919	.845	.965	.942	.918	.972	.999
	R	273.21	271.72	267.69	27.09	287.09	275.77	271.71
Men	\bar{x}	2.80	1.85	1.98	1.64	2.16	2.61	2.45
	DT	.862	.771	.931	.931	.866	.916	1.000
	R	263.34	268.50	282.48	274.15	215.15	254.46	268.54
Gender	p	.520	.830	.331	.772	.000	.167	.838
18-19 years	\bar{x}	2.79	1.78	1.83	1.46	2.48	2.66	2.44
	DT	.963	.839	.964	.871	.917	1.017	1.061
	R	265.76	251.29	253.55	241.98	267.71	265.02	266.63
20-21 years	\bar{x}							
	DT	2.88	1.93	1.89	1.60	2.58	2.77	2.51
	R	.902	.808	.948	.895	.897	.895	.951
22-23 years	\bar{x}	277.60	282.69	264.87	268.61	286.28	280.68	279.05
	DT							
	R	2.80	1.99	2.03	1.72	2.51	2.76	2.44
24-25 years	\bar{x}	.910	.870	.958	.944	1.010	.965	1.008
	DT	263.48	289.31	288.71	289.04	272.92	279.14	266.68
	R							
Over 25 years	\bar{x}	2.93	1.78	1.93	1.91	2.33	2.47	2.24
	DT	.751	.765	.939	1.041	.953	.991	1.026
	R	286.32	255.29	273.93	314.17	245.22	231.77	238.61
Age	p							
No educational level	\bar{x}	.789	.842	.911	1.167	.702	.978	.830
	DT	269.79	281.66	360.41	341.26	231.22	284.29	317.86
	R	.857	.153	.005	.000	.236	.320	.226
Low educational level	\bar{x}							
	DT	2.86	1.89	1.71	1.45	2.43	2.64	2.22
	R	.899	.886	.920	.857	.966	1.045	1.030

		I ignore/ do not read it	I read it entirely	I check its source or authorship	I verify the link	I discuss it with others	I search for more information online	I compare it with other media sources
Moderate educational level	\bar{x}	275.52	270.00	235.57	240.15	259.47	261.64	234.12
	DT							
	R	2.80	1.84	1.90	1.57	2.47	2.66	2.46
High educational level	\bar{x}	.923	.777	.944	.873	.904	.943	.992
	DT	265.53	266.78	266.78	265.51	268.01	263.83	271.60
	R							
Educational level	p	2.89	1.93	2.20	1.90	2.65	2.90	2.70

Table 4

Descriptive statistics on the reasons for sharing unverified news, by gender, age, and education level

		It may be useful for others	It relates to my interests	It worries me	It impacts me	It entertains me	It aligns with my way of thinking	It reinforces my ideological convictions
Women	\bar{x}	2.63	2.73	2.86	2.99	2.44	2.41	2.40
	DT	.782	.786	.775	.811	.951	.947	.992
	R	276.99	274.81	279.42	278.25	259.40	269.77	270.51
Men	\bar{x}	2.48	2.65	2.67	2.83	2.76	2.45	2.42
	DT	.776	.824	.624	.749	.895	.894	.981
	R	250.21	257.76	239.62	245.85	311.26	275.28	272.71
Gender	p	.073	.250	.007	.030	.001	.720	.887
18-19 years	\bar{x}	2.59	2.72	2.75	2.94	2.56	2.48	2.39
	DT	.833	.780	.764	.776	.964	.878	.935
	R	270.69	269.90	255.98	267.41	279.11	280.41	268.44
20-21 years	\bar{x}	2.65	2.74	2.87	3.00	2.48	2.37	2.36
	DT	.697	.759	.719	.748	.923	.903	.962
	R	283.28	275.26	281.89	279.80	267.62	263.29	265.61
22-23 years	\bar{x}	2.65	2.77	2.91	2.98	2.45	2.44	2.43
	DT	.833	.897	.753	.876	.999	1.018	1.018
	R	279.37	286.65	287.28	278.88	264.73	275.20	275.85
24-25 years	\bar{x}	2.40	2.62	2.80	2.93	2.64	2.53	2.69
	DT	.837	.747	.786	.809	.933	.991	1.125
	R	235.48	255.96	268.09	268.66	292.68	287.04	312.70
Over 25 years	\bar{x}	2.34	2.48	2.64	2.62	2.31	2.21	2.28
	DT	.670	.785	.731	.942	.891	1.114	1.162
		226.31	227.83	235.41	219.50	242.26	236.12	250.34
Age	p	.127	.346	.195	.313	.594	.497	.354
No educational level	\bar{x}	2.64	2.61	2.77	2.85	2.33	2.32	2.28
	DT	.864	.851	.805	.867	.971	.976	1.038
	R	282.15	254.53	263.12	256.19	246.53	255.64	253.16
Low educational level	\bar{x}	2.59	2.73	2.83	2.98	2.50	2.45	2.43
	DT	.733	.773	.718	.778	.934	.910	.957
	R	270.49	273.16	271.89	277.50	270.63	275.44	275.13

		It may be useful for others	It relates to my interests	It worries me	It impacts me	It entertains me	It aligns with my way of thinking	It reinforces my ideological convictions
Moderate educational level	\bar{x}	2.57	2.80	2.90	3.00	2.68	2.45	2.46
	DT	.787	.755	.731	.753	.917	.932	.979
	R	267.12	289.74	286.77	280.18	299.56	277.42	280.98
High educational level	\bar{x}	2.46	2.69	2.46	2.69	2.77	2.69	2.69
	DT	.967	.947	.877	.947	1.092	1.109	1.251
	R	247.38	264.15	213.19	235.69	313.38	310.96	310.96
Educational level	p	.762	.297	.277	.377	.035	.437	.332

Table 5

Descriptive statistics on the reasons for the creation of fake news, by gender, age, and education level

		Gain audience/ visitors/ clicks	Generate controversy	Manipulate or influence	Economic interests	Social alarm	Discredit the image of someone/ something	Mask other news
Women	\bar{x}	3.58	3.25	3.64	3.39	3.32	3.30	3.28
	DT	.626	.727	.580	.754	.747	.726	.756
	R	276.33	278.08	282.45	279.59	286.85	275.69	280.87
Men	\bar{x}	3.43	3.07	3.40	3.21	2.97	3.18	3.02
	DT	.783	.787	.701	.763	.730	.785	.861
	R	252.51	246.44	231.25	241.17	215.98	254.71	236.76
Gender	p	.082	.033	.000	.009	.000	.157	.003
18-19 years	\bar{x}	3.45	3.08	3.37	3.16	3.02	3.19	3.06
	DT	.709	.808	.699	.817	.768	.763	.781
	R	251.45	250.24	225.86	236.44	229.29	255.83	239.34
20-21 years	\bar{x}	3.58	3.24	3.66	3.36	3.31	3.32	3.24
	DT	.656	.656	.563	.744	.718	.722	.787
	R	279.20	274.03	288.94	272.21	283.20	281.35	275.77
22-23 years	\bar{x}	3.61	3.33	3.71	3.56	3.40	3.29	3.31
	DT	.634	.779	.498	.592	.725	.743	.813
	R	283.78	300.17	296.63	306.88	302.73	274.88	291.42
24-25 years	\bar{x}	3.62	3.18	3.71	3.53	3.29	3.20	3.36
	DT	.614	.806	.506	.786	.787	.786	.743
	R	284.60	269.22	297.27	313.40	282.18	258.43	296.71
Over 25 years	\bar{x}	3.59	3.31	3.69	3.45	3.48	3.48	3.52
	DT	.628	.604	.660	.736	.738	.574	.688
	R	277.66	286.86	302.03	290.10	322.21	308.26	328.10
Age	p	.202	.086	.000	.000	.000	.260	.003
No educational level	\bar{x}	3.67	3.18	3.67	3.46	3.32	3.33	3.27
	DT	.564	.824	.518	.718	.750	.700	.798
	R	294.14	270.83	288.41	291.75	287.08	282.01	282.47
Low educational level	\bar{x}	3.50	3.19	3.54	3.32	3.21	3.25	3.19
	DT	.709	.716	.657	.768	.761	.748	.777
	R	262.97	267.82	264.31	266.38	265.13	267.52	265.29

		Gain audience/ visitors/ clicks	Generate controversy	Manipulate or influence	Economic interests	Social alarm	Discredit the image of someone/ something	Mask other news
Moderate educational level	\bar{x}	3.53	3.26	3.60	3.32	3.26	3.25	3.24
	DT	.655	.717	.606	.768	.753	.771	.813
	R	265.82	282.53	273.89	264.32	276.18	267.96	276.81
High educational level	\bar{x}	3.69	3.23	3.54	3.31	3.08	3.46	3.23
	DT	.630	.832	.660	.855	.760	.660	.832
	R	305.96	283.58	262.27	267.46	237.31	307.00	274.00
Educational level	p	.113	.816	.380	.351	.412	.626	.704

Table 6

Descriptive statistics on those responsible for the viralization of fake news, by gender, age, and education level

		Citizens	Influencers	Pseudo-experts	Politicians	Journalists
Women	\bar{x}	3.25	3.24	2.78	3.08	3.39
	DT	.671	.711	.821	.848	.775
	R	280.87	271.72	271.38	274.02	267.66
Men	\bar{x}	2.98	3.19	2.76	3.01	3.45
	DT	.846	.820	.866	.851	.785
	R	236.75	268.49	269.69	260.53	282.60
Gender	p	.003	.827	.911	.374	.298
18-19 years	\bar{x}	3.15	3.15	2.60	2.91	3.28
	DT	.768	.730	.832	.866	.863
	R	265.62	255.13	241.35	245.12	250.71
20-21 years	\bar{x}	3.19	3.26	2.78	3.07	3.38
	DT	.698	.718	.806	.840	.733
	R	269.55	277.59	271.67	270.69	262.12
22-23 years	\bar{x}	3.30	3.27	2.93	3.23	3.57
	DT	.732	.750	.879	.839	.728
	R	293.68	280.60	299.41	300.04	305.65
24-25 years	\bar{x}	3.27	3.38	3.00	3.31	3.58
	DT	.654	.777	.769	.763	.621
	R	283.06	304.59	309.03	313.94	299.27
Over 25 years	\bar{x}	3.00	3.10	2.93	3.07	3.52
	DT	.598	.772	.753	.842	.785
	R	225.43	246.29	296.81	270.93	298.14
Age	p	.196	.181	.006	.011	.009
No educational level	\bar{x}	3.28	3.19	2.67	3.01	3.44
	DT	.673	.737	.792	.888	.706
	R	288.16	262.48	250.75	262.29	273.77
Low educational level	\bar{x}	3.18	3.20	2.77	3.04	3.36
	DT	.766	.749	.868	.844	.823
	R	271.47	267.50	271.00	266.94	264.57

		Citizens	Influencers	Pseudo-experts	Politicians	Journalists
Moderate educational level	\bar{x}	3.17	3.35	2.94	3.22	3.50
	DT	.651	.652	.744	.784	.707
	R	263.36	293.51	299.45	297.40	287.75
High educational level	\bar{x}	2.85	3.15	2.69	2.92	3.38
	DT	.689	1.068	1.032	1.038	.961
	R	199.08	277.31	264.15	257.38	280.31
Educational level	p	.143	.335	.084	.222	.507

Table 7*Statistics on the types of fake news received, by gender, age, and education level*

		Humorous or satirical tone	Information out of context	Headlines, images, or subtitles unrelated to the subject (<i>clickbait</i>)	Misleading or distorted information/ images	Unverified information created to deceive or manipulate
Women	\bar{x}	2.54	2.67	2.94	2.69	3.02
	DT	.761	.761	.863	.812	.805
	R	267.53	270.84	274.13	278.25	276.24
Men	\bar{x}	2.60	2.69	2.88	2.54	2.91
	DT	.737	.707	.777	.708	.775
	R	283.04	271.57	260.14	245.83	252.81
Gender	p	.297	.961	.356	.031	.121
18-19 years	\bar{x}	2.51	2.56	2.82	2.48	2.83
	DT	.803	.740	.817	.766	.815
	R	263.29	251.38	252.02	239.38	241.15
20-21 years	\bar{x}	2.59	2.73	3.02	2.77	3.12
	DT	.744	.743	.855	.775	.735
	R	278.42	279.72	287.94	294.37	291.97
22-23 years	\bar{x}	2.53	2.78	2.94	2.63	3.06
	DT	.703	.746	.897	.861	.827
	R	268.84	292.36	274.90	265.50	283.08
24-25 years	\bar{x}	2.60	2.78	3.02	2.76	2.89
	DT	.809	.823	.783	.712	.885
	R	284.77	289.24	285.86	287.42	255.54
Over 25 years	\bar{x}	2.48	2.52	2.79	2.86	3.17
	DT	.688	.688	.819	.743	.711
	R	263.05	237.79	244.40	307.22	301.55
Age	p	.823	.079	.139	.004	.009
No educational level	\bar{x}	2.60	2.74	2.93	2.68	3.02
	DT	.785	.805	.868	.820	.815
	R	282.47	284.72	272.80	277.51	277.50
Low educational level	\bar{x}	2.52	2.64	2.92	2.63	2.94
	DT	.714	.739	.853	.772	.800
	R	267.08	263.13	271.22	267.72	260.54

		Humorous or satirical tone	Information out of context	Headlines, images, or subtitles unrelated to the subject (<i>clickbait</i>)	Misleading or distorted information/ images	Unverified information created to deceive or manipulate
Moderate educational level	\bar{x}	2.53	2.70	2.90	2.68	3.11
	DT	.789	.703	.798	.793	.750
	R	267.92	278.95	266.29	276.00	292.14
High educational level	\bar{x}	2.77	2.77	3.23	2.69	3.08
	DT	1.092	.832	.832	.947	.954
	R	312.38	280.65	331.31	276.81	293.65
Educational level	p	.550	.495	.515	.912	.225

Table 8

Descriptive statistics on the elements prioritized to give credibility to a news story, by gender, age, and education level

		Supported by a recognized specialist or entity	Backed by testimonials	Includes real images/videos	Does not generate controversy
Women	\bar{x}	3.20	2.94	2.96	2.26
	DT	.711	.733	.800	.862
	R	276.11	281.05	276.67	274.27
Men	\bar{x}	3.05	2.69	2.83	2.17
	DT	.825	.817	.792	.813
	R	253.25	236.10	251.32	259.65
Gender	p	.120	.002	.092	.335
18-19 years	\bar{x}	3.09	2.89	2.95	2.16
	DT	.736	.749	.766	.824
	R	255.39	273.55	274.27	258.16
20-21 years	\bar{x}	3.19	2.97	2.98	2.35
	DT	.680	.682	.751	.815
	R	274.03	287.95	279.89	291.62
22-23 years	\bar{x}	3.27	2.77	2.97	2.29
	DT	.827	.863	.881	.935
	R	300.22	254.44	281.61	278.05
24-25 years	\bar{x}	2.98	2.84	2.76	2.04
	DT	.812	.796	.908	.852
	R	236.87	261.99	240.99	240.52
Over 25 years	\bar{x}	3.34	2.62	2.62	2.10
	DT	.670	.820	.775	.900
	R	305.97	222.74	211.26	242.41
Age	p	.031	.107	.089	.079
No educational level	\bar{x}	3.16	2.82	2.89	2.20
	DT	.755	.861	.877	.842
	R	271.38	264.31	268.39	266.48
Low educational level	\bar{x}	3.15	2.89	2.93	2.25
	DT	.738	.741	.761	.844
	R	269.02	272.83	271.38	273.62

		Supported by a recognized specialist or entity	Backed by testimonials	Includes real images/videos	Does not generate controversy
Moderate educational level	\bar{x}	3.20	2.89	2.96	2.25
	DT	.694	.670	.791	.850
	R	278.29	273.45	274.89	274.74
High educational level	\bar{x}	3.15	3.08	3.08	2.23
	DT	1.068	.862	.954	1.166
	R	288.81	317.31	296.15	267.08
Educational level	p	.913	.639	.923	.966

Table 9

Descriptive statistics on the elements that make people question the credibility of a news story, by gender, age, and education level

		Non-existent authorship	Publication date omitted	Unofficial source	Social impact/ political controversy data	Shocking headline	Uses discriminatory or offensive tone	Poor writing and/or spelling and grammar errors
Women	\bar{x}	3.07	2.72	3.23	2.78	3.28	3.29	3.53
	DT	.829	.883	.756	.791	.761	.798	.719
	R	274.37	271.84	278.28	275.48	276.83	282.31	279.61
Men	\bar{x}	3.00	2.73	3.07	2.69	3.13	3.01	3.30
	DT	.806	.785	.761	.775	.785	.851	.863
	R	259.29	268.10	245.74	255.47	248.58	231.73	241.13
Gender	p	.316	.806	.029	.181	.057	.001	.006
18-19 years	\bar{x}	.850	.860	.780	.785	.849	.853	.832
	DT	261.05	273.16	277.33	253.93	254.66	236.80	259.43
	R	3.01	2.63	3.13	2.80	3.29	3.27	3.47
20-21 years	\bar{x}	.798	.874	.757	.777	.749	.841	.721
	DT	260.43	255.91	260.63	279.63	279.80	281.75	266.29
	R	3.21	2.91	3.26	2.79	3.31	3.39	3.57
22-23 years	\bar{x}	.795	.805	.747	.795	.692	.680	.685
	DT	300.25	302.43	285.76	279.96	279.33	296.08	287.80
	R	3.11	2.58	3.16	2.62	3.29	3.33	3.56
24-25 years	\bar{x}	.832	.941	.767	.777	.695	.826	.785
	DT	280.58	245.81	265.00	247.50	275.39	292.84	290.56
	R	3.17	2.86	3.21	3.07	3.29	3.38	3.59
Over 25 years	\bar{x}	.889	.789	.675	.799	.713	.677	.733
	DT	295.03	299.10	270.10	330.60	274.79	293.24	293.00
	R	.147	.063	.653	.050	.498	.004	.313
Age	p	3.04	2.76	3.18	2.78	3.29	3.33	3.57
No educational level	\bar{x}	272.57	280.83	270.04	275.33	279.76	288.84	291.77
	DT	3.02	2.68	3.17	2.72	3.21	3.21	3.40
	R	.830	.862	.778	.775	.785	.863	.782

		Non- existent authorship	Publication date omitted	Unofficial source	Social impact/ political controversy data	Shocking headline	Uses discriminatory or offensive tone	Poor writing and/or spelling and grammar errors
Low educational level	\bar{x}	266.00	263.69	269.80	264.78	265.40	27.11	257.43
	DT	3.11	2.76	3.21	2.81	3.28	3.21	3.56
	R	.713	.779	.710	.751	.738	.746	.704
Moderate educational level	\bar{x}	278.15	277.91	273.85	281.31	277.19	263.61	285.88
	DT	3.46	3.00	3.46	2.92	3.31	3.00	3.54
	R	.660	.816	.660	.954	.630	.707	.660
High educational level	\bar{x}	344.85	316.04	323.88	316.88	274.77	22.15	275.88
		.272	.441	.619	.480	.772	.283	.063

Table 10

Descriptive statistics on the importance assigned to specific educational content, by gender, age, and education level

		Visual literacy	Construction process	Contrast guidelines	Reliable sources	Detecting interests	Critical analysis	Strategies for engagement	Responsibility and social impact	Channels for defense
Women	\bar{x}	3.00	2.95	3.12	3.33	3.19	3.21	3.03	3.11	3.03
	DT	.763	.706	.785	.703	.716	.757	.766	.745	.773
	R	277.83	276.07	273.13	279.35	278.49	279.17	282.50	278.80	282.27
Men	\bar{x}	2.83	2.83	3.07	3.12	2.99	3.02	2.75	2.92	2.77
	DT	.813	.711	.803	.818	.842	.796	.788	.833	.772
	R	247.29	253.39	263.60	242.00	244.99	242.64	231.10	243.91	231.87
Gender	p	.040	.118	.524	.011	.024	.014	.001	.019	.001
18-19 years	\bar{x}	2.87	2.80	2.99	3.18	3.00	3.09	2.86	2.90	2.86
	DT	.765	.660	.812	.738	.783	.804	.795	.798	.793
	R	255.98	246.32	249.10	250.38	244.19	257.31	250.59	239.86	251.49
20-21 years	\bar{x}	2.91	2.89	3.07	3.25	3.11	3.19	2.98	3.13	3.01
	DT	.770	.686	.769	.742	.767	.746	.741	.733	.748
	R	260.87	265.70	262.96	264.07	266.96	274.26	273.47	282.81	278.70
22-23 years	\bar{x}	3.11	3.14	3.28	3.49	3.30	3.23	3.10	3.25	3.08
	DT	.827	.766	.780	.674	.628	.763	.798	.730	.787
	R	301.24	315.82	304.98	313.77	298.29	284.01	299.27	305.89	293.67
24-25 years	\bar{x}	3.16	3.04	3.33	3.44	3.38	3.20	2.93	3.00	2.91
	DT	.673	.706	.707	.659	.684	.842	.780	.853	.821
	R	305.93	293.41	313.62	301.87	316.79	281.29	264.18	261.73	262.33
Over 25 years	\bar{x}	3.00	2.93	3.17	3.17	3.31	3.24	3.10	3.14	3.03
	DT	.802	.799	.805	.848	.712	.636	.817	.743	.778
	R	279.74	274.53	282.22	255.05	303.05	279.86	299.36	282.28	281.17
Age	p	.042	.002	.007	.004	.003	.594	.074	.004	.171
No educational level	\bar{x}	2.95	2.88	3.12	3.23	3.19	3.16	2.91	3.10	2.98
	DT	.779	.844	.810	.815	.820	.795	.771	.828	.834
	R	269.64	267.74	275.88	266.64	286.07	270.97	261.63	280.90	273.90
Low educational level	\bar{x}	2.92	2.90	3.05	3.28	3.11	3.14	2.96	3.03	2.94
	DT	.813	.680	.780	.710	.751	.770	.786	.770	.784
	R	265.79	265.88	260.71	269.99	265.71	265.29	270.62	263.60	266.21

		Visual literacy	Construction process	Contrast guidelines	Reliable sources	Detecting interests	Critical analysis	Strategies for engagement	Responsibility and social impact	Channels for defense
Moderate educational level	\bar{x}	3.07	3.00	3.22	3.37	3.18	3.26	3.04	3.13	3.02
	DT	.675	.610	.761	.682	.627	.729	.769	.710	.691
	R	291.61	285.25	292.39	287.12	272.21	289.51	287.57	282.19	279.61
High educational level	\bar{x}	2.92	3.23	3.23	3.08	3.08	3.15	2.92	3.08	3.15
	DT	.760	.599	.927	.862	.954	.899	.862	.862	.899
Educational level	\bar{x}	260.62	333.23	303.88	237.08	269.31	276.77	268.96	279.65	314.23
		.435	.250	.196	.518	.618	.514	.572	.562	.598

The interplay between digital media, shared book reading and sleeping problems in early language development

La interacción entre medios digitales, lectura compartida y problemas para dormir en el desarrollo lingüístico temprano

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ABSTRACT

The main goal of this study was to explore the impact of digital media (screen exposure and video calls) on children's early language development by exploring its interrelationships with shared book reading and children's sleeping problems. The cross-sectional data of 362 families with children aged 30 to 41 months old were collected and a structural equation analysis was used as a multivariate analysis technique to explore the complexity of the relationships among variables of interest. Screen exposure was significantly and negatively related to book reading and marginally and positively related to sleeping problems. The results indicated that screen exposure and video calls were not associated to children's linguistic development; rather book reading was the main predictor. Maternal education was also a key factor on these interrelationships, as children from families in which the mother had a higher education degree spent less time with screens and were more exposed to shared book reading. The findings of this study provide additional insights on the relationship between digital media use and language development in the early years and highlight the importance of raising awareness among parents of the relevance of practices out of screens, such as book reading.

Keywords: language development, screen exposure, shared book reading, sleep quality, video calls

RESUMEN

El objetivo de este estudio fue conocer el impacto de los medios digitales (exposición a pantallas y videollamadas) en el desarrollo lingüístico temprano de los niños explorando sus interrelaciones con la lectura compartida de libros y los problemas para dormir. Para estudiar la complejidad de estas relaciones se analizaron datos transversales recopilados de 362 familias con niños de entre 30 y 41 meses de edad, usando ecuaciones estructurales. Los resultados revelaron que la exposición a pantallas se relacionaba significativamente de forma negativa con la lectura de libros y marginalmente de forma positiva con los problemas para dormir. Sin embargo, ni la exposición a pantallas ni las videollamadas se asociaron con el desarrollo lingüístico de los niños, siendo la lectura de libros el predictor principal. La educación materna también fue un factor clave en estas interrelaciones, ya que los niños de familias en las que la madre tenía un título superior pasaban menos tiempo frente a las pantallas y estaban más expuestos a la lectura compartida de libros. Los hallazgos de este estudio proporcionan información adicional sobre la relación entre el uso de medios digitales y el desarrollo del lenguaje en los primeros años, y resaltan la importancia de concienciar a las familias sobre la relevancia de prácticas fuera de las pantallas, como la lectura de libros.

Palabras clave: desarrollo del lenguaje, exposición a pantallas, lectura compartida de libros, calidad del sueño, videollamadas

INTRODUCTION

The relationship between digital media use in childhood and learning outcomes is likely complex, as there seem to be conflicting results. On the one hand, some research suggests some positive effects of digital skills acquired in early childhood in future school achievement (Hurwitz & Schmitt, 2020). On the other hand, other studies suggest that the time of screen exposure has no effects (Adelantado-Renau et al., 2019; Kumar & Shirley, 2020) or has a moderate negative effect on children's academic performance (Tremblay et al., 2011). This negative effect has been explained by a number of reasons, including a reduction in the time available for academic-related activities such as reading or homework (Nolan et al., 2022; Shin, 2004), and a reduction in cognitive processing abilities, including a decrease in brain connectivity (Horowitz-Kraus & Hutton, 2018) and attention skills (Jourdain et al., 2023; Meri et al., 2023; Santos et al., 2022).

Some research has specifically focused on the relationship between digital media use and language development. The results of a systematic review published in 2017, including studies with children under 14 years old, indicate that television exposure is associated with poor linguistic outcomes (Kostyrka-Allchorne et al., 2017). Another systematic review with meta-analysis that included studies whose participants were aged 4 to 18 years old also showed that the time of television viewing was negatively associated with language, both in children and adolescents (Adelantado-Renau et al., 2019). An even more recent systematic review with meta-analysis, covering studies with children under 12 years old, also provided strong evidence that the quantity of screen time (whether TV or other devices) was negatively related to children's language development, whereas later age at screen use onset was associated to better linguistic skills (Madigan et al., 2020).

There are some hypotheses to the reasons for this negative impact of the digital media on children's linguistic development. During their first years of life, infants and toddlers develop their linguistic skills through interaction with others, mainly their caregivers. Screen time (even when a device, such as TV, is in the background and children are not directly watching it) seems to reduce not only parent-child interactions, but also children's play, which is key for the development of symbolic operations (Anderson & Subrahmanyam, 2017; Madigan et al., 2020). Additionally, there is evidence that infants and toddlers under 3 years have difficulties in learning and translating to their experience the information that is communicated to them via symbolic media, as studies show that screen exposure only has a positive effect on linguistic development when parents interact with their children, "translating" the content provided by screens and providing them opportunities for conversational turn-taking (Alroqi et al., 2023; Deloache et al., 2010). In fact, the results of the

meta-analysis by Madigan et al. (2020) indicate that screen co-viewing is associated with children's better linguistic skills.

Furthermore, there is evidence that screen exposure under three years of age has negative effects on cognitive abilities that have a key role on linguistic development, such as working memory (Zimmerman & Christakis, 2005). For these reasons, several organizations, such as the World Health Organization (WHO) and the American Academy of Pediatrics (AAP), have suggested that screen exposure is not recommended for children under 2 years, and should not exceed 1 hour per day in children aged between 2 and 5 years (AAP, 2016; WHO, 2019), being considered excessive when surpassing 2 hours per day (Bhutani et al., 2024). However, studies in different countries show that the reality is too far from these numbers. For example, a recent study in Saudi Arabia (Alroqi et al., 2023) showed that 95% of the children aged under 2 years and 91% of the children aged between 2 and 3 years exceeded these screen time recommendations, each age group being exposed to screens, on average, 2 and 3 hours a day, respectively. A recent study in Portugal with children aged between 18 and 57 months also showed that children were exposed to screens, on average, 2 hours a day (Rocha et al., 2023). Another study in the United States found similar results, indicating that children under 3 years watched television on average 2.2 hours per day (Zimmerman & Christakis, 2005). A study in Finland (Mustonen et al., 2022), focusing children aged between 2 and 4 years of age, found a daily average of 79 minutes of screen exposure, which, although is lower than the time found in other studies, is still above the recommended time. Nonetheless, research also shows that families of higher socioeconomic status and with more educational qualifications tend to adhere more to the recommended time of screen exposure, and therefore their children are less exposed to screens than children from families coming from lower socioeconomic strata (Fung et al., 2023; Lan et al., 2020; Rocha et al., 2023).

Thus, research has supported the existence of a negative effect of digital media use on children's linguistic development, but the existing research focuses mainly on passive screen exposure, such as watching television. When considering children under three years, in fact, passive screen exposure, such as watching cartoons, movies or videos on TV or in other devices, accounts for the majority of digital media use (Bhutani et al., 2024; Sundqvist et al., 2021). However, the COVID-19 pandemic brought several societal changes, including a more recurring use of digital media to communicate. Previous research with children around 2 to 2;6 years old has suggested that children can learn new words through the use of digital media, but only in situations in which there are live interactions and video chat with an adult (Roseberry et al., 2014).

Research has also shown a negative association between screen exposure and other two variables that have a positive effect in language development: sleep

quality and quantity (Knowland et al., 2022; Turnbull et al., 2022) and shared book reading (Karrass & Braungart-Rieker, 2005; Mol et al., 2008; Noble et al., 2019). On the one hand, previous studies have consistently shown that screen exposure is related to children's reduced sleeping time (Lan et al., 2020; Mallawaarachchi et al., 2022; Marinelli et al., 2014) and to sleep disturbances, such as nightmares and night awakenings (Brockmann et al., 2016; Cavalli et al., 2021; Ricci et al., 2021). This association between screen exposure and a reduction in sleep quantity and quality has been explained mainly by both the decrease in melatonin due to the screens' blue light and the arousal caused by the media contents (Garrison et al., 2011; Green et al., 2017). Some research has also found that more shared book reading was associated with less screen exposure (and vice-versa) not only in the case of school-aged children (Nolan et al., 2022), but also in the case of children under three years (Osika et al., 2023). However, this result has not been found universally. For example, a study by Taylor et al. (2018) conducted in the United Kingdom found no inverse relationship between screen exposure and shared book reading with children aged between 6 and 36 months. However, the sample of this study was highly educated, with 81.7% of the parents having a higher education degree. Therefore, the educational level of the families may also play a role in this relationship.

The present study

This study aims at contributing to the understanding of the impact of digital media on children's early language development by exploring the interplay between media exposure and other key determinants of linguistic development (book reading, maternal education and sleeping problems), given the scarcity of studies that have investigated conjointly all these variables and their complex interrelationships. Specifically, this research seeks to answer the following questions:

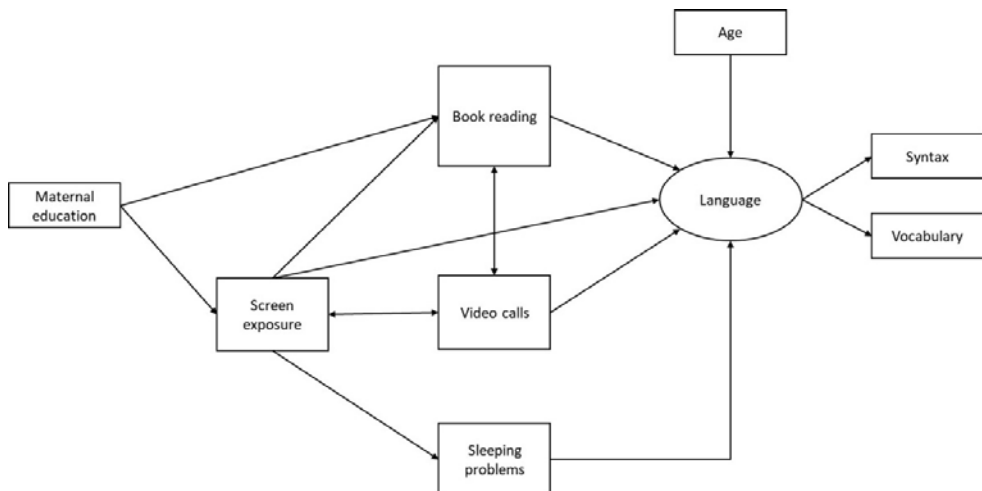
- a) Does digital media use influence children's early language development? Does this effect vary depending on whether its use involves interaction (as in video calls) or is it limited to mere passive exposure to screens?
- b) To what extent is the use of digital media related to other family practices that have been shown to have a positive effect on promoting early language, such as shared book reading?
- c) Are these family practices modulated by the family socioeconomic status?
- d) To what extent does the use of digital media affect other determinants of early development, such as sleep quality?

Given the results of the previous research mentioned above, we anticipated that the frequency of shared book reading and video calls would have a positive relationship with children's linguistic development. On the other hand, we expected

that the time of screen exposure would have a negative effect on children's linguistic development, which may be mediated by sleeping problems. Regarding socioeconomic status (SES), in this study, we considered maternal education as a proxy of SES. Following previous literature, we predicted that children from mothers with lower educational levels would be more exposed to screens and participated with less frequency in shared book reading practices, which in turn would be associated with lower levels of linguistic development. Figure 1 represents the conceptual model under study.

Figure 1

Hypothetical model for the expected relationships among digital media use, shared book reading, sleeping problems, children's linguistic skills and maternal education



METHOD

Participants

The data of this study came from a project that investigates the acquisition of European Portuguese as an L1 by children whose first years of life took place in the context of the COVID-19 pandemic (LCF/PR/FP22/62010012). Relevant information about children and their family environment was collected through their parents or main caregivers in March and April 2023. Families had to have at least one child aged between 30 and 42 months to be eligible. Children who met any of the following criteria were excluded: a) birth before 9 months of gestation with a weight of less than 1500 grams, b) previous diagnosis of a developmental disorder,

and/or c) parents who only spoke to them in a language other than Portuguese. A total of 402 respondents filled out the online survey created for this research. After discarding data from interviewees whose responses either indicated the presence of serious outliers in any of the variables studied or suggested that the child might have a neurodevelopmental disorder, the final sample of this study consisted of 362 children and their families. Table 1 summarizes the main sociodemographic information of the study sample. As shown in the table, the sample included a similar proportion of boys and girls, the average age of children was around 3 years and there were no significant age differences between boys and girls ($t_{(360)} = 0.031, p = .976, d = .00$). The sample was mainly composed of children whose mothers have a higher education level (around 63% of the mothers had a qualification equivalent to a university degree). The distribution of boys and girls ($\chi^2_{(1)} = 0.026, p = .873$) and children's age ($t_{(360)} = 0.793, p = .429, d = .09$) was similar in families with mothers with a higher education degree and families where the mother completed only the upper secondary level or below.

Table 1
Sociodemographic information of the sample

Variables	M (SD) [Minimum–Maximum]	N (%)
Child's age (in months)	35.42 (3.56) [30-41]	
Child's sex		
Female		187 (51.7)
Male		175 (48.3)
Mother's educational level		
Upper secondary or below (<12 years)		135 (37.3)
Post-secondary or above (>12 years)		227 (62.7)

Measures and instruments

Language development

The MacArthur-Bates Communicative Development Inventory III, Portuguese version (CDI-III-PT; Cadime et al., 2021) was used to measure children's linguistic development. This is a parental report inventory that includes two subscales: vocabulary and syntactic complexity. The first one includes a checklist of 166 words divided into four lexical categories: (1) body parts and related words (34 words); (2)

food and related words (37 words); (3) mental terms (45 words); and (4) emotions and related words (50 words). The syntactic complexity subscale consists of a 26-item checklist that presents different types of syntactic structures that children are expected to produce at this level. For each item, parents must indicate whether the child produces the word or the target structure. In the validation study for the Portuguese population (Cadime et al., 2021), high internal consistency values were obtained (KR-20 = .981 and KR-20 = .911, for each subscale respectively). Reliability for the current sample was also high (KR-20 = .986 for vocabulary and KR-20 = .939 for syntactic complexity).

Shared book reading

Shared book reading was assessed through one question asking parents how frequently they read to their children during the last 30 days, using a six-point Likert scale: (1) never; (2) 1-3 times a week; (3) 4-6 times a week; (4) 7-9 times a week; (5) 10-12 times a week, and (6) more than 12 times a week. Similar measures are frequently used in research on shared reading (see e.g., Farrant & Zubrick, 2013; Hayes & Berthelsen, 2019).

Screen exposure

Children's screen exposure was assessed by four items, where parents had to estimate how much time children were exposed to television, computer, tablet or mobile phone screens, on a usual day (considering the last 30 days), regardless of being alone or not. Parents were asked to report the time spent in hours with each device, with the option to specify periods in half-hour increments (0.5 hours) or indicate no time spent (0 hours). The time of exposure to each device was then summed to obtain a total number of hours of screen exposure. The development of this measure took into account the findings of a systematic review on screen time measurement in children aged 0 to 6 years old (Byrne et al., 2021), which indicated that most measures consisted of one to three items that assessed duration of screen time on a usual day.

Frequency of video calls

Frequency of video calls was assessed by one question where parents had to estimate, on a usual day (considering the last 30 days), how often their child

participated in video calls, using a 5-point Likert scale: (1) never; (2) 1-2 times per day; (3) 3-4 times per day; (4) 5-6 times per day; (5) more than 6 times per day.

Sleeping problems

Children's sleeping problems were assessed by one question where the parents had to indicate whether their child has had sleeping problems during the last 30 days, such as restless sleep, trouble falling asleep, nightmares or waking up frequently during the night, using the following 4-point Likert scale: (1) no sleeping problems; (2) mild sleeping problems; (3) moderate sleeping problems, and (4) severe sleeping problems. Previous studies investigating children's sleeping problems have used similar single-item measures (see e.g., Covington et al., 2018). It has been suggested that single-item measures can be an appropriate procedure for measuring constructs which are not ambiguous and have a limited scope, especially when conducting surveys that collect a significant amount of data (Allen et al., 2022).

Procedure

The study obtained approval from the Institutional Ethics Committee at University of Minho (reference CEICSH 042/2023) and is part of a larger study whose main goal was to explore the effects of the COVID-19 pandemic on children's linguistic development (LCF/PR/FP22/62010012). Data collection for these measures was carried out during March and April 2023 by the company GfK metrics through an online survey that participating parents completed after providing voluntary and informed consent for their involvement in the study.

Statistical analyses

Firstly, data from continuous variables were verified to be normally distributed using skewness and kurtosis values within a range of ± 2 as criterion of normality (George & Mallery, 2016). Next, a descriptive analysis was performed on all the data. Nominal and ordinal variables were described in terms of frequencies and percentages. Normally distributed continuous variables were expressed as means (M), standard deviations (SD), and maximum and minimum values.

A chi-square test (χ^2) was performed on child's sex and mother's educational level to confirm that the group of families including mothers with higher education was matched with the group of families including mothers with upper secondary

or lower education with respect to the former variable. Student's *t*-tests for independent samples and Mann-Whitney *U*-tests were used to explore differences associated with sociodemographic variables. For independent *t*-tests, effect size was reported in terms of Cohen's *d* value, while rank biserial correlation coefficient (r_{rb}) was used to determine the strength and direction of the relationship between a dichotomous nominal variable and an ordinal variable. Cohen's *d* and r_{rb} values were interpreted as very small ($d < 0.20$; $r_{rb} < 0.10$), small ($0.20 \leq d < 0.50$; $0.10 \leq r_{rb} < 0.29$), moderate ($0.50 \leq d < 0.79$; $0.30 \leq r_{rb} < 0.49$), and large ($d \geq 0.80$; $r_{rb} \geq 0.50$), according to the benchmarks proposed by Cohen (1988). Spearman's correlations coefficients (ρ) were computed to describe bivariate associations between continuous and ordinal variables. For the interpretation of ρ values, the same cut-off points were considered as for r_{rb} . All univariate and bivariate statistical analyses were performed using IBM SPSS 27 for Windows and a *p*-value lower .05 was considered statistically significant in all the tests.

Structural equation modelling (SEM) was used as a multivariate analysis technique to examine patterns of interrelationships among variables of study. All variables were included in the model as observed variables except for language development construct, which was modeled as a latent variable measured by two indicators: vocabulary and syntax. A combination of indices was used to assess the overall fit of the model under consideration including a chi-square to degrees of freedom ratio (χ^2/df) lower than 2, a Comparative Fit Index (CFI) higher than .95, as well as a Root Mean Square Error of Approximation (RMSEA) below .05 (Hu & Bentler, 1999; Marsh et al., 2004). SEM was carried out using Mplus 7, applying a full information maximum likelihood estimator.

RESULTS

Descriptive and bivariate statistics

Descriptive statistics for the measures used in this study are presented in Table 2. Children's language development did not differ according to mothers' educational level: no significant differences associated with maternal education were observed in either vocabulary ($t_{(360)} = 1.103$, $p = .271$, $d = .12$) or syntax ($t_{(360)} = -1.565$, $p = .115$, $d = .17$).

Table 2

Descriptive statistics for variables of the study

Variables	<i>M (SD) [Minimum–Maximum]</i>	N (%)
Child's expressive language skills		
Vocabulary	51.73 (40.41) [0-166]	
Syntax	17.95 (7.33) [0-26]	
Screen exposure		
Time (hours a day)	3.23 (2.33) [0-12]	
Shared book reading		
Never		32 (8.8)
1 to 3 times a week		138 (38.1)
4 to 6 times a week		102 (28.2)
7 to 9 times a week		50 (13.8)
10 to 12 times a week		15 (4.1)
More than 12 times a week		25 (6.9)
Video calls		
Never		120 (33.1)
1 or 2 times a day		208 (57.5)
3 or 4 times a day		21 (5.8)
5 or 6 times a day		6 (1.7)
More than 6 times a day		7 (1.9)
Sleeping problems		
No sleeping problems		248 (68.5)
Mild sleeping problems		97 (26.8)
Moderate sleeping problems		12 (3.3)
Severe sleeping problems		5 (1.4)

In relation to the practices implemented by parents at home, more than 50% of participating families reported a frequency of shared reading activities greater than 3 times per week, and around 67% of parents claimed their child participated in video calls at least once a day, with no more than two daily video calls, in most cases (see Table 2). Children in the study spent an average of 3.23 hours a day watching or using screens, although the parents' report of daily time their child spent in front of media devices was highly variable across participating families. Maternal education was associated with this variability: families whose mothers did not have a higher education degree reported significantly more screen time ($M = 4.07$, $SD = 2.49$) than those with more educated mothers

($M = 2.73$, $DT = 2.09$; $t_{(243.826)} = 5.248$, $p < .001$, $d = .60$). Inversely, shared book reading was a practice significantly more frequent in families whose mothers had at least an undergraduate degree (63% of these families claimed to carry out this activity more than three times a week) than in those whose mothers had an educational level equal to upper secondary or lower (where only 36.3% engaged in these activities more than three times a week; $Z = -4.964$, $p < .001$, $r_{rb} = .30$). No association was found between the mother's educational level and the number of daily video calls ($Z = -0.403$, $p = .687$, $r_{rb} = -.02$). Regarding sleep quality, it should also be noted that around a third of the families interviewed reported that their child had sleeping problems, with the majority being of mild severity (see Table 2). Children's sleeping problems were not associated with mother's educational level ($Z = -0.457$, $p = .648$, $r_{rb} = -.02$).

Table 3 shows bivariate correlations among study variables. As expected, vocabulary and syntax correlated positively and significantly. Likewise, significantly positive relationships were also found between children's age and their expressive linguistic skills, which reflects an increase associated with age in the productive vocabulary, as well as in the syntactic complexity of the sentences generated by children. However, no significant association was found between children's age and household practices studied here, i.e., daily exposure to screens, number of video calls per day, and frequency of shared reading activities per week. Children's age also did not correlate with parent-reported children's sleeping problems.

Table 3

Spearman's correlations between ordinal and continuous variables of the study

	1	2	3	4	5	6	7
1 Age		.134*	.252***	-.005	.024	-.069	-.073
2 Vocabulary			.273***	.225***	-.127*	-.004	-.014
3 Syntax				.094 [†]	-.039	-.007	-.109*
4 Shared book reading					-.191***	.031	.080
5 Screen exposure						.141**	.068
6 Video calls							.105*
7 Sleeping problems							

Note. [†] $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Growth of vocabulary significantly correlated with both the frequency of shared reading activities and the time spent on screens, although in different ways. Specifically, the higher the frequency of shared reading activities reported by the family, the higher also the vocabulary score; but the longer the exposure time to screens, the lower the parent-reported proficiency level for this linguistic skill. In the case of syntax, a marginally significant positive association was observed only between the weekly frequency of shared book reading activities and the syntactic complexity of sentences produced by children.

No significant associations were found between the frequency of video calls and the children's expressive linguistic skills. In relation to the other family practices, the number of daily video calls correlated positively and significantly with the daily exposure time to screens, but it did not with the weekly frequency of shared reading activities. However, the daily screen time did relate significantly, although negatively, to shared reading practice; so, the longer the exposure time to screens per day, the lower the frequency of shared reading activities per week reported by the parents. Additionally, a higher frequency of video calls per day was also associated with more severe sleeping problems, which in turn were significantly related to lower performance in syntax.

Structural equation modelling

A structural equation model was tested, based on the literature review (Figure 1) and the results of bivariate statistics (Table 3). In this model, maternal education was tested as a predictor of both book reading and screen exposure. Besides age, sleeping problems, shared book reading, screen exposure and video calls were tested as predictors of children's linguistic skills. To test whether more screen exposure led to less time devoted to book reading, this relationship was considered in the model as well. As video calls also imply screen exposure, the covariance of these variables was also inserted in the model. Regarding the relationship between media use and sleeping problems, although in the bivariate statistics sleeping problems were correlated with a higher frequency of video calls, when considering the multivariate relationships, there was no significant relationship between these two variables. Rather, the study of the patterns of interrelations suggested an effect of screen exposure on sleeping problems, and thus this effect was introduced in the model instead of the effect of video calls on sleeping problems.

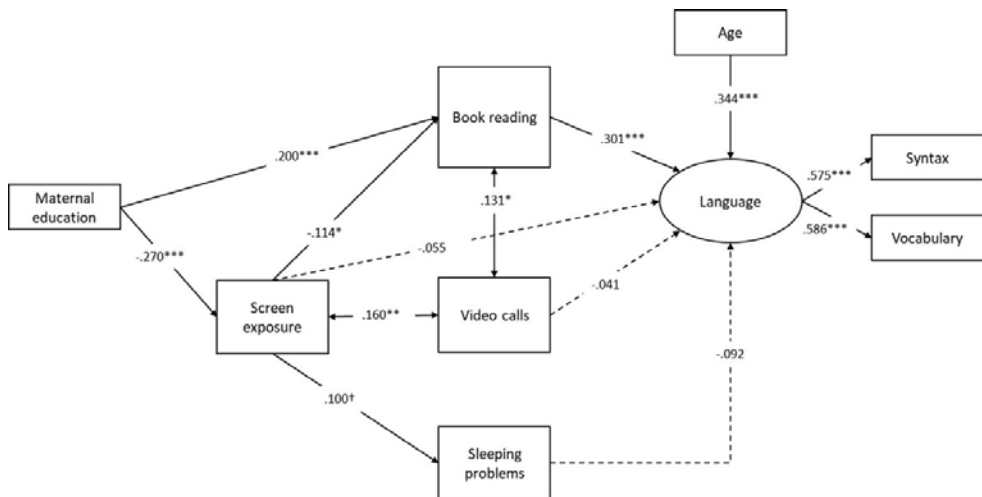
The fit of this model was good: $\chi^2_{(14)} = 21.237$, $p = .096$, CFI = .953, TLI = .916, RMSEA = .038 [.000, .068], SRMR = .037. As depicted in Figure 2, a higher level of maternal education was significantly associated with more shared book reading and less children's screen exposure. More screen exposure was, in turn, significantly associated with less shared book reading and marginally associated with more

sleeping problems ($p = .055$). Video calls were positively associated both with book reading and screen exposure. Besides age, the main predictor of children's linguistic skills was shared book reading. Screen exposure and video calls were not significantly related to children's language development.

Table 4 presents the indirect effects in the model. Maternal education indirectly predicted children's linguistic development via shared book reading, but not via screen exposure. A marginally significant indirect effect of maternal education on children's linguistic development via both screen exposure and book reading was also found. The remaining indirect effects were also not significant.

Figure 2

Model for the relationships among digital media use, shared book reading, sleeping problems, children's linguistic skills and maternal education



Note. † $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 4

Indirect effects (standardized estimates) linking maternal education and children's language development

Indirect effects	Estimate	SE	p
Maternal education → book reading → language	0.060	0.021	.005
Maternal education → screen exposure → language	0.015	0.020	.452
Maternal education → screen exposure → book reading → language	0.009	0.005	.070
Maternal education → screen exposure → sleeping problems → language	0.002	0.002	.294

DISCUSSION

The first research question was whether digital media use influenced children's early language development and whether the possible effect varied depending on whether its use involved an interaction or a passive exposure. The results indicate that children spent on average around three hours per day with screens, which is a much higher duration than recommended by WHO (2019) and AAP (2016). However, contrarily to previous research (Adelantado-Renau et al., 2019; Kostyrka-Allchorne et al., 2017; Madigan et al., 2020), the results of this study showed no significant direct effect of the passive screen exposure, nor of the frequency of video calls on children's linguistic skills.

Regarding passive exposure to screens, this finding might be related to the measure selected to collect the data: parents were simply asked to indicate how much time per day their children are exposed to a set of screens, including TV or other devices. This type of measure is commonly used in studies that resort to reported measures to obtain information about children's screen time (see e.g., Khan et al., 2017; Mustonen et al., 2022). However, considering more qualitative information in future studies, such as whether the child was exposed to screens alone or whether there was interaction with adults during the screen use could provide additional information to broaden understanding of its effect in early infancy. As previously indicated, screen co-viewing seems to be associated to children's better linguistic skills (Alroqi et al., 2023; Madigan et al., 2020), as parents of children under three years old can help them make sense of symbolic sources, thus compensating the possible negative effects of screens. Therefore, interaction with others might be a key factor when studying the relationship between screen exposure and children's linguistic development. Due to this reason, it was expected that the frequency of

video calls could have a positive effect on children's language skills, as video calls allow for contingent social interactions. However, such an effect was not observed in our study.

Although video calls have aspects that can positively contribute to children's linguistic development (e.g., contingent responses from adults, the possibility of turn-taking, among others), in contrast to passive screen exposure, they also have some limitations that can hinder this effect. These limitations are summarized in a review by Glick and Saiyed (2022): (a) there may be technical difficulties that lead to a low quality of video and sound; (b) the camera (instead of eye location) determines what is visible and participants tend to look at their on-screen partner (not the camera), making eye gaze different from on-site communication; and (c) shared physical contact and joint manipulation of objects are not possible. All these limitations can make video calls less effective in promoting children's communicative and linguistic development than in-person interactions. Moreover, in our study we only measured video calls frequency per day. About half of the participants reported that their children were involved in video calls once or twice a day, but no data about the duration, type of interactions and quality of the input received by children during these calls was collected. There is robust evidence that the quality of input has a stronger effect on children's linguistic development than the quantity (Anderson et al., 2021), which can be part of the reason why we found no effects. We also did not collect information about the physical presence of co-viewers and their behavior during the video calls, as the behavior of these co-viewers can minimize some of the previously referred limitations, by correcting technical issues or providing contingent responses in the talk with the conversation partner, therefore helping children to better understand what they see and hear during the video-calls (Glick & Saiyed, 2022; Myers et al., 2018). All these aspects should be considered in future research investigating the role of video calls in early linguistic development.

The second research question was to what extent the use of digital media was related to other family practices that have been shown to have a positive effect on promoting language, namely shared book reading. The results indicate a negative relationship between screen exposure and book reading, similarly to what has been found in other studies (Nolan et al., 2022; Osika et al., 2023). This finding seems to support the idea that screen time reduces the time available for other activities, such as book reading. However, the results also suggest that the frequency of these activities is modulated by the socioeconomic status of the family, as indicated by maternal education – a result allowing to answer our third research question. In families with mothers with a higher education degree, children spent less time with screens and had read books to them more frequently. In turn, book reading was the main predictor of children's language development. Shared book reading has

some features which are particularly important for fostering children's language development, and which are probably less prominent in other practices such as the ones that involve media use. First, written language exposes children to more complex input than everyday informal oral language use; this higher complexity in the written use of language may be defined in terms of higher lexical diversity, higher diversity of complex syntactic structures and, more generally, higher mean length of utterance (MLU) and speech rate (Hoff-Ginsberg, 1991). Moreover, there is evidence that parents engage in explicit vocabulary teaching during shared book reading (Hindman et al., 2014; Olszewski & Hood, 2023), which may not occur or be so frequent during media use. Future studies should explore this hypothesis.

The last research question regarded the relationship between digital media and sleep quality. Similarly to previous research (Brockmann et al., 2016; Cavalli et al., 2021; Ricci et al., 2021), the results of the SEM tested in this study suggested that the higher the time of screen exposure, the more sleeping problems identified in children. Although we did not collect data on whether screen exposure happened during the day or at night, our finding reinforces the negative link between excessive screen exposure and sleep quality in children. Even though the effect of sleeping problems on children's linguistic development did not reach significance, it is possible that prolonged sleeping problems can lead to learning difficulties in the future (Cardoso & Capellini, 2018). Therefore, programs aiming to raise awareness among parents concerning the relevance of reducing children's screen time are needed.

The main limitation of this study is data collection through parental reports. Although previous research has shown that parental reports are reliable, particularly in the case of language assessment (Cadime et al., 2021; Jarůšková et al., 2023), some social desirability can be present in some of the responses, particularly in the ones related to the household practices conducted with and by children. Moreover, data was collected online, which can have limited the participation of parents with lower digital skills. Thus, future studies should apply more inclusive data collection methodologies. Another interesting aspect to consider in futures studies is the influence of content to which children are exposed during screen time -as noted by Kostyrka-Allchorne et al. (2017), "*what* children watch may be more important than *how much* they watch" (p.53).

Conclusion

This study allowed to collect information on family practices with children between 30 and 41 months and to contribute to the discussion concerning the complex relations between these practices, the family socioeconomic status and early linguistic development. As for media use, and even though we confirmed

a higher screen exposure time than what is recommended for children under 5 years, there was no direct effect of screen exposure on language development – as measured by the CDI-III-PT. Nevertheless, our results also allow to confirm a negative effect of digital media use on other family practices with a positive effect on linguistic development, namely, shared book reading. In addition, the frequency of these family practices is modulated by socioeconomic status, measured in terms of maternal education. Finally, a negative effect of digital media use on the quality of sleep was identified. These results not only highlight the complexity of the relations between linguistic development and a set of diverse variables that may directly or indirectly determine children's linguistic environment, but they also justify particular attention to excessive screen exposure in the early years.

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Creative problem-finding and problem-solving in Primary Education. Influence of gender, grade and school

Búsqueda y resolución creativa de problemas en Educación Primaria. Influencia del género, curso y centro

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ABSTRACT

Creativity has been defined as a key competence for the 21st century. Its presence in the educational debate has been intensified by the attention paid by the Organization for Economic Cooperation and Development and the latest educational laws, as is the case in Spain. In this context, the objective of the present study is to assess the creativity of Primary Education students, analyzing the influence of variables such as gender, grade and educational center. Participants were 1679 students from twelve educational centers homogeneously distributed among the six grades of this educational stage, with ages between 5-13 years. A problem-finding and problem-solving test was administered. The results show an increase in creativity throughout Primary Education, but with a clear decrease in 8- and 9-year-old students, which could be related with the so-called “fourth-grade slump”. There are also statistically significant differences between men and women both in the search and problem-solving phases. The influence of the educational center on students’ creativity is evident, with the average percentile varying between 32.0 and 53.4, and obtaining statistically significant differences between them. This allows us to conclude the unequal attention that creativity is receiving in educational centers and the necessary reflection on instructional changes that contribute to channeling creative thinking in a particularly sensitive stage of development. Future studies will analyze the influence of the different methodologies used in educational centers on students’ creativity.

Keywords: creativity, creative thinking, problem-solving, competence assessment, Primary Education

RESUMEN

La creatividad ha sido definida como la competencia clave del siglo XXI. Su presencia en el debate educativo se ha visto intensificada por la atención prestada por la Organización para la Cooperación y el Desarrollo Económico y las últimas leyes educativas, como es el caso español. En este contexto, el objetivo del presente estudio es evaluar la creatividad de los estudiantes de Educación Primaria, analizando también la influencia de las variables género, curso y centro educativo. Los participantes fueron 1679 estudiantes de doce centros educativos distribuidos homogéneamente entre los seis cursos de esta etapa educativa, con edades comprendidas entre 5-13 años, a los que se administró una prueba de búsqueda y resolución de problemas. Los resultados muestran un aumento de la creatividad a lo largo de la Educación Primaria, pero con una clara disminución en los alumnos de 8 y 9 años, que cabría relacionar con la denominada “depresión del cuarto grado”. Existen, además, diferencias estadísticamente significativas entre hombres y mujeres en las fases de búsqueda y de resolución del problema. La influencia del centro educativo en la creatividad de los estudiantes queda patente, variando el percentil medio entre 32.0 y 53.4, y obteniéndose diferencias estadísticamente significativas entre ellos. Esto permite concluir la desigual atención que la creatividad está recibiendo en los centros educativos y la necesaria reflexión

sobre cambios instruccionales que contribuyan a canalizar el pensamiento creativo en una etapa de desarrollo especialmente sensible. Futuros estudios analizarán la influencia de las diferentes metodologías empleadas en los centros educativos en la creatividad de los estudiantes.

Palabras clave: creatividad, pensamiento creativo, resolución de problemas, evaluación de competencias, Educación Primaria

INTRODUCTION

Creativity and education

Creativity, understood as “the interaction between aptitude, process, and environment with which an individual or a group produces a perceptible, new, and useful product in accordance with the social context” (Plucker & Beghetto, 2004, p. 154), is demonstrated as a construct in whose definition its social nature is emphasized. This connects with its relevance for educating 21st-century societies, which are characterized by their constant and rapid technological, economic, and social changes (with explicit mention of the Covid-19 pandemic), typical of a new world that demands an innovative attitude (Patston et al., 2021). However, the relationship between creativity and education is relatively recent.

The early studies by Torrance or Guilford in the mid-20th century did not advocate for a conceptualization of creativity as a talent that could be educated. These studies focused on identifying creative individuals, particularly relating it to IQ and personality types. It was not until the late 20th century that an author like Csikszentmihalyi decisively contributed to rethinking creativity, focusing on the possibility of learning how to channel it according to his theory of creative flow (2004). Since then, studies have emerged showing the importance of education and educational institutions in nurturing students’ creative skills, with aims that are not only personal or professional but also social (Vincent-Lancrin et al., 2019).

However, without the commitment of the Organization for Economic Co-operation and Development (OECD) to promote creativity in education (OECD, 2019), the recent changes in educational systems in this regard, as seen paradigmatically in Spain, would be difficult to explain. The recent Organic Law on the Modification of the Organic Law of Education (LOMLOE) of 2020 grants great importance to creativity from its preamble, and then firmly adds that “creativity will be worked on in all subjects” (p. 122874). This completes the gradual attention that recent educational laws have demanded, ranging from the vague references in the General Education Law (LGE) of 1970 and the Organic Law on the General Organization of the Educational System (LOGSE), where creativity is identified with innovation or even discovery learning, to the reflection in the Organic Law on the

Quality of Education (LOCE) of 2002 on the social and educational importance of creativity and its role as an indicator of educational quality. As is well known, this law was never passed, but its focus gained traction in subsequent laws: the Organic Law on Education (LOE) of 2006 emphasizes attending to “the students’ ability to [...] develop creativity” (p. 16) both in Primary Education (art. 16.2 and 17.b) and Secondary Education (art. 33.k); and the Organic Law for the Improvement of Educational Quality (LOMCE) of 2013 defines creativity in its preamble as one of the necessary transversal competencies, as well as one of the indispensable cognitive skills, for shaping active, entrepreneurial, and innovative individuals.

These recent aspects highlight the multidisciplinary attention that creativity has received and underscore its great educational value in clear relation to essential aspects such as communication, teamwork, and adaptability. Special mention should be made of the relationship between creativity and the capacity to find suitable solutions to challenges and complex problems in various domains, such as daily life, academics, professional life, or, among others, personal matters. Therefore, it is not surprising to see a proliferation of studies on problem-finding and problem-solving, particularly in specific disciplines such as Experimental Sciences (Solaz-Portolés & Sanjosé, 2007) but also in Language and Literature (Pont-Niclòs et al., 2024), for example. Regarding mathematical creativity, researchers distinguish between mathematical creativity at the professional and school levels, highlighting that, in the latter case, mathematical creativity involves generating novel solutions and formulating new questions within the field of Mathematics. Thus, mathematical creativity is closely related to problem-solving, and some scholars consider it the ability to generate useful and creative solutions to problems using mathematical models (Nadjafikhah et al., 2012).

All of this, along with the demonstrated direct relationship between creativity and academic performance, explains the proliferation of studies in educational contexts that support the ability to train students in creative and innovative thinking, especially during the sensitive formative years of Primary Education (Alfonso-Benlliure & Santos, 2016). However, it is important to note that research conducted with teachers shows that they do not feel prepared to effectively promote creativity among students, mainly due to the demands of an extensive curriculum and the pressure to achieve good results in standardized national tests (Makel, 2009). It is concerning that teachers who have a positive attitude toward fostering creativity in the classroom do not design activities to develop it in their teaching practices (Bereczki & Kárpáti, 2018), and that there are even studies showing that there is no alignment between certain implicit theories about creativity (often associated with originality or artistic creation) and explicit theories based on research (Mullet et al., 2016). This leads to situations where behaviors that are not creative are considered creative and vice versa (truly

creative behaviors are censured), such that what seems like fostering creativity in the classroom is actually the opposite, what has been defined as an “illusion of knowing” (Skiba et al., 2010). Moreover, the curricula do not provide guidelines or directions on how teachers can implement creativity in the classroom (Patston et al., 2021). In this regard, studies call for intensifying teacher training in creativity (Echegoyen-Sanz & Martín-Ezpeleta, 2021; Martín-Ezpeleta et al., 2024).

These issues help explain the mediocre creativity results in the Programme for International Student Assessment (PISA), where South Korea ranked first with an average score of 38.1 out of a possible 60 points. Spain is at the OECD average, with 32.8 points, indicating that there is much room for improvement (OECD, 2024). These PISA tests measure creativity in 15-year-old students, but they can be seen as a tool for evaluating the health of educational systems in relation to creativity. However, evaluations are needed at other educational levels and critical ages, thus generating creativity maps that detect problems in educational systems or serve to endorse and disseminate best practices.

The Evaluation of Creativity and the Creative Process of Problem-Solving

Although creativity and the creative process are closely related, it is important to note that they refer to different aspects of generating novel and useful ideas. While creativity is the ability to produce those ideas and is centered on the outcome or creative potential of the person, the creative process is the set of stages or steps through which a creative idea is developed, from its initial conception to its materialization. This also explains why the evaluation of creativity has always been a controversial topic due to the variety of existing conceptual definitions and the lack of reliability of the instruments used to measure it, which results in not always measuring the same aspect of creativity (Reiter-Palmon et al., 2019). Creativity tests are based on a variety of approaches and methods designed to measure different extremes of creative ability. Thus, some tests are based on principles of psychometric theory (Torrance, 1990), other assessment approaches are based on theoretical models of creative processes (Dollinger et al., 2004), and some tests are designed to evaluate creativity in specific domains (Hu & Adey, 2002; Singh, 1987). The Torrance model, the most widely used, evaluates creativity in terms of three aspects: fluency (number of ideas), flexibility (variety of ideas), and originality (rarity of ideas).

Numerous studies on the subject have determined that divergent thinking (DT), characterized by generating multiple ideas, solutions, or possible approaches to solve a problem or face a situation, is a fairly reliable predictor of good creative performance. For example, the work by Plucker (1999), based on longitudinal studies initiated by Torrance in the 1950s, shows that nearly half of the variance in

this creative achievement can be attributed to DT test scores. Therefore, these DT tests are among the most used to assess creativity in educational contexts (Reiter-Palmon et al., 2019).

However, creativity can also be assessed as the ability to solve problems creatively. According to Mayer (2003), a problem arises when, in a particular situation, a goal must be reached, but there is no predictable or systematic method to resolve it. The creative problem-solving model by Isaksen et al. (2011) includes three main phases: (1) understanding the challenge, (2) idea generation, and (3) preparation for action. In the first stage, students explore and define their knowledge of the problem, applying problem-finding to identify the issue at hand. In the second stage, the idea generation or problem-finding stage, students are asked to diverge and propose creative ideas to solve the problem. In the last stage, students must evaluate their ideas and identify the most creative ones, which is considered a final step before the ideas can be put into practice.

Another commonly used approach evaluates the creative process through the Problem Finding model by Getzels and Csikszentmihalyi (1976), based on the hypothesis that the way one engages with the problem—by identifying and defining it—determines the creativity of its solution. Additionally, “problem-finding skills” intervene throughout the process, from formulation to resolution. Runco (1994) considers problem-finding as a prerequisite for the following phases of problem-solving, considering it a creative act in itself.

In this regard, Runco and Bower (2023) emphasize the importance of novelty and originality in creativity, noting that only research into processes can determine the actual mechanism that individuals use to generate them. Studies on “problem-finding,” which encompass identification, definition, and construction of the problem (Jay & Perkins, 1997; Runco, 1994), show that questioning problems fosters the formation of creative ideas and helps focus on the problem or topic correctly. It is concluded that investing time in finding a problem is just as important as solving it.

In a study with university students who were presented with ill-defined or ambiguous everyday problems, it was shown that the process of problem construction positively influenced the creativity of the solution, although this could depend on the specific aspect of creativity being evaluated (Arreola & Reiter-Palmon, 2016). Similarly, Wigert et al. (2022) affirms that problem construction plays an essential role in creative problem-solving and that combining DT methods with convergent thinking methods (those in which individuals take available information and search for correct or conventional ideas) leads to more creative solutions than using only divergent methods. Also, in tasks involving creative problem-solving (where open-ended and undirected problems were presented in the scientific and social sciences domains) with 4th and 5th grade primary school students, Van Hooijdonk et al.

(2020) concluded that it is more productive to apply fact-finding and problem-searching methods (which are positively related to fluency and originality) than to use idea-searching methods. Indeed, students are able to recognize their most creative ideas but without dismissing other specific elements of creativity when searching for solutions.

It is of interest to understand the different variables that may affect students' creativity or their ability to solve problems creatively, as both abilities are closely related (Abdulla et al., 2020). This allows for identifying factors that enhance or limit creative development and helps design teaching strategies that promote creativity in various contexts. Several studies have addressed the development of different aspects of creativity across educational stages. A recent meta-analysis (Said-Metwaly et al., 2021) of 41 studies involving more than 40,000 students showed a general trend toward the ascending development of DT at all levels, with some discontinuities in 4th and 7th grades. Duval et al. (2023), using convergent and divergent tasks based on drawing, observed dynamic stages of development for both types of thinking (convergent and divergent). Thus, the loss of divergent thinking was counterbalanced by a gain in convergent thinking, especially during the decline in 4th grade. Regarding creative problem-solving and problem-finding, Alfonso-Benlliure and Santos (2016) demonstrated that while the overall value of creativity showed an upward trend as the grade level in Primary Education increased, mainly due to the DT component, the value assigned to other components studied, such as originality or material transformation, followed fluctuating paths, and the component of atypical manipulation remained stable throughout this educational stage.

The influence of gender on creative skills is still unclear, and according to Ivcevic et al. (2022), it is necessary to examine this influence across a wide range of tasks and creative domains. According to a review conducted by Baer and Kaufman (2011) in 21 studies using different DT tests, the remote association test (RAT), or evaluative thinking, no significant differences were found based on gender. Men scored higher than women on three studies analyzing DT, while women scored better in nine of the studies (six of which were DT). In another 19 studies, the results were mixed. In a more recent review of 133 articles published between 1975 and 2020 (Nakano et al., 2021), most studies reported gender differences, with 45.2% favoring women, 23.3% favoring men, and 31.5% showing varying results based on the evaluated content.

According to Rhodes (1961), there are four essential pillars in the study of creativity, known as the 4Ps: Person, Process, Product, and Press. For the "Press" aspect, it is crucial to consider the influence of the educational institution on students' creative performance. A review by Thomas and Berk (1981) highlighted a complex relationship for developing creativity, where an intermediate environment

(neither too structured nor too open or flexible) best promoted creativity. Recent research has shown the positive influence of alternative pedagogies with greater emphasis on individual initiative and action-based learning, such as in Montessori schools (Duval et al., 2023) or Waldorf schools (Besançon et al., 2015) for the case of creativity in children and adolescents, respectively.

Problem-finding and creative problem-solving skills are essential for success in the 21st century. The primary objective of the present study is to assess the creative problem-finding and problem-solving process of Primary Education students and study the variables that influence students' creativity, providing an opportunity to better understand how students are developing these key skills to face future challenges. By evaluating these skills in Primary Education students, we are identifying areas of strength and opportunities for improvement in developing these fundamental skills from an early age. Consequently, by understanding how these skills develop in childhood, educational practices can be improved to better prepare students for future careers and roles in an increasingly complex and changing world. This leads to the following research questions:

- (i) What is the creative capacity of Primary Education students in problem-finding and problem-solving tasks?
- (ii) How does their creativity evolve throughout this educational stage?
- (iii) Do variables such as gender or school environment influence students' creativity?

METHOD

Design and Contextualization

This is an exploratory, quantitative, and cross-sectional study conducted with a convenience sample during the 2021-2022 and 2022-2023 academic years.

Prior to data collection, the school management teams, legal guardians, and participating students were informed about the scope and purpose of the research, as well as the data anonymization system and processing methods used, in accordance with the ethics committee of the University of Valencia. The questionnaires were administered on paper during a normal 45-minute class period in Spain. Both the teacher in charge of the class and a researcher were present while the students completed the task.

Participants

The study was conducted with 1679 students from 12 Spanish schools, both public (83.3%) and semi- private (16.7%), evenly distributed across the six grades of Primary Education, with a similar representation of schools from small towns and large cities. The demographic characteristics of the sample can be found in Table 1.

The gender distribution is quite balanced: 51.3% male, 48.7% female, with no students selecting the “other” gender option. The students’ age ranged from 5 to 13 years, with a mean age of 8.84 and a standard deviation of 1.75.

Table 1
Demographic Characteristics of the Sample Studied

Grade	N	Gender	Frequency	Percentage (%)
First	277	Male	156	56.3
		Female	121	43.7
Second	294	Male	159	54.1
		Female	135	45.9
Third	264	Male	129	48.9
		Female	135	51.1
Fourth	296	Male	162	54.7
		Female	134	45.3
Fifth	296	Male	126	42.6
		Female	170	57.4
Sixth	252	Male	130	51.6
		Female	122	48.4

Assessment instrument

To evaluate the creativity of the students, the Child Creativity Test (TCI, for its acronym in Spanish) (Romo et al., 2008) was used. This test is based on the problem discovery model (Getzels & Csikszentmihalyi, 1976) and evaluates certain variables related to the identification, formulation, and solution of problems. The TCI, validated for a Spanish sample, has high validity and reliability, as well as robust

psychometric properties. Reliability was assessed using interrater agreement, with intraclass correlation coefficients of 0.95 for average measures and 0.80 for individual measures. The validity of the instrument, based on the consensus evaluation technique, showed an inter-judge agreement level, evaluated through Cronbach's alpha, of 0.80 (Romo et al., 2008). In the present study, two evaluators conducted the questionnaire scoring, achieving a good degree of agreement (0.876), calculated using Cohen's kappa for average measures. This is a figurative task, appropriate for younger children who may not yet have mastered reading and writing but are accustomed to drawing. The test consists of two phases: "Problem Formulation," in which children create a model using stickers with familiar figures, and "Problem Solving," in which they draw based on the initial model. These features make the test a playful activity that is more likely to bring out creative potential (Romo et al., 2016). Additionally, it has the advantage of covering all phases of the creative process, not just the final outcome as in divergent thinking questionnaires.

In the first phase, two variables are assessed: originality and atypical manipulation (AM). Originality refers to the degree of uniqueness in the choice of stickers among the 28 provided to the students when creating their model, compared to the reference population (Primary Education). AM evaluates atypical exploratory behaviors not included in the instructions (such as drawing, overlapping, or fragmenting the stickers) in creating the model.

In the second phase, five variables are assessed: material change (MC), interaction (IN), verbal elements (VE), deviation from the model (DM), and invented added figures (IAF). Specifically, MC evaluates the use of more than one material in the drawing; IN measures the clear and intentional relationship between two or more elements of the drawing; VE includes the use of verbal resources that complement the graphic expression (such as titles, speech bubbles, numbers, etc.); DM considers the evident distancing of the drawing from the initial model; and, finally, IAF scores the appearance of figures in the drawing that were not present in the initial model or sticker sheet.

The total direct score of the test corresponds to the sum of three sections: PD A, PD B, and PD C. PD A corresponds to the score obtained in the originality variable; PD B or process-product variables corresponds to the sum of AM, MC, IN, VE, and DM; and PD C corresponds to the score for IAF. The total score can be converted into a percentile, following the reference tables provided by the authors of the TCI questionnaire in the correction manual, to place the student within their normative group.

Data Analysis

The statistical analysis of the collected data was carried out using SPSS version 28. First, the mean and standard deviation of each of the creativity variables studied were calculated. To assess the normality of the data, the Kolmogorov-Smirnov test for a single sample was performed. Since all variables showed non-normal distributions, non-parametric tests were applied. The Mann-Whitney U test for independent samples was used to assess gender differences, and the Kruskal-Wallis H test was used to assess differences based on grade and educational institution. In the latter case, a *post hoc* analysis with Bonferroni adjustment was performed to test for significant differences through multiple comparisons. To study the possible differences in the various process-product variables, the Chi-square test was used. The significance level for all tests was set at .05. Effect size was calculated using Hedges' *g* or Cramér's *V* (for the Chi-square test), and its magnitude was evaluated according to Cohen's classification for Behavioral Sciences (Cohen, 1988).

RESULTS

General Descriptive Statistics

The general descriptive statistics show, in Table 2, the variables of the creative problem-solving process assessed by the TCI test. The variable PD A (originality) has the highest average score ($M = 0.64$, out of 1; $SD = 0.08$), while the group of variables within PD B ($M = 2.65$, out of 10; $SD = 1.95$) and PD C ($M = 0.20$, out of 1; $SD = 0.24$) show similar, proportionally much lower scores than PD A.

Table 2

Descriptive Statistics of the Various Variables in Creative Problem-solving

Variable	Minimum	Maximum	Mean	Standard Deviation
PD A	0.28	0.95	0.64	0.08
PD B	0.00	10.00	2.65	1.95
PD C	0.00	1.00	0.20	0.24
Total PD	0.35	11.74	3.49	2.07

Note. Scoring ranges: PD A (0-1), PD B (0-10), PD C (0-1), Total PD (0-12).

It is important to highlight that the total average score of the analyzed sample corresponds to a percentile of 46.19, which is very close to the 50% mark, meaning it aligns with the standard population.

Differences by gender

From the analysis based on gender, it is concluded that in the PD A variable, males slightly outperform females, whereas in the PD B variable, females score higher than their male counterparts. Regarding the PD C variable, both genders obtained identical results (see Table 3).

When considering the total score, females achieved a higher average ($M = 3.61$; $SD = 2.07$) compared to males ($M = 3.37$; $SD = 2.06$). These values correspond to percentiles of 46.35 and 46.04, respectively, which place both genders in the standard population.

To determine whether the differences found were statistically significant, the Mann-Whitney U test for independent samples was applied. The result showed significant differences based on gender in the PD A variable, with a large effect size ($g = 0.75$), and in the PD B variable, with a small effect size ($g = 0.15$).

Table 3
Differences in TCI Test Variables by Gender

Variable	Gender	Mean	Standard Deviation	z	p
PD A	Male	0.67	0.07	-16.787	.000***
	Female	0.61	0.09		
PD B	Male	2.51	1.94	3.150	.002**
	Female	2.80	1.95		
PD C	Male	0.20	0.24	0.805	.421
	Female	0.20	0.24		
Total PD	Male	3.37	2.06	0.594	.552
	Female	3.61	2.07		

Note. ** $p < .01$; *** $p < .001$.

Next, a detailed analysis of the different process-product variables (PD B) was conducted using the Chi-square test. Significant differences were found only in the

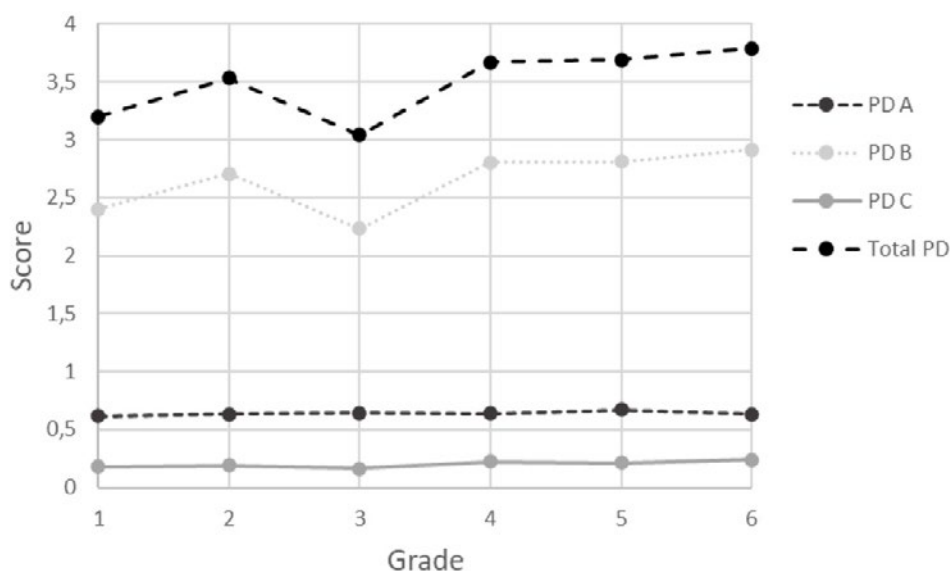
MC variable (material change): $\chi^2 (1, N = 1679) = 31.64, p < .001$, with a small effect size ($V = 0.137$).

Differences by grade

From the study of the scores obtained for different variables by students from different Primary Education grades, it can be seen (Figure 1) that only the process-product variables (PD B) evolve, while originality (PD A) and IAF (PD C) remain stable with consistent average scores across the grades.

It is noteworthy that for the process-product variables, there is a positive evolution as students progress through Primary Education, with increasingly higher average scores, except for third grade, where there is a notable decrease. The total score shows a similar progression to the PD B variable due to the higher weight of this variable (10 points out of a total of 12).

Figure 1
Scores for the Different Variable Groupings by Grade



To verify if the observed differences by grade were statistically significant, the Kruskal-Wallis test for independent samples was also performed. The results, shown in Table 4, indicate that the differences are significant in all variables (PD A, PD B, and PD C), as well as in the total score.

Table 4*Differences in TCI Test Variable Groupings by Grade*

Variable	H	p
PD A	69.815	<.001***
PD B	23.420	<.001***
PD C	18.809	.002**
Total PD	33.699	<.001***

Note. **p<.005; ***p<.001.

Since the PD B variable is made up of different process-product variables, and in order to examine in more detail where these differences lie, the Chi-square test was applied to each one. Significant differences were found in each of the five variables forming the group, all with small effect sizes, as shown in Table 5.

Table 5*Differences in the Variables Comprising PD B by Grade*

Variable	Chi-square	p	V
AM	20.13	.001***	.102
MC	21.42	<.001***	.113
IN	27.61	<.001***	.127
VE	19.21	.002**	.107
DM	15.47	.009**	.093

Note. **p<.01; ***p<.001.

Influence of the Educational Institution

To determine whether there were differences between students across primary education grades in the schools studied, the Kruskal-Wallis test for independent samples was applied to the total direct scores. Significant differences were found in all grades except for 6th grade, as shown in Table 6.

Table 6

Differences in Creativity of Students by Educational Institution for Each Grade

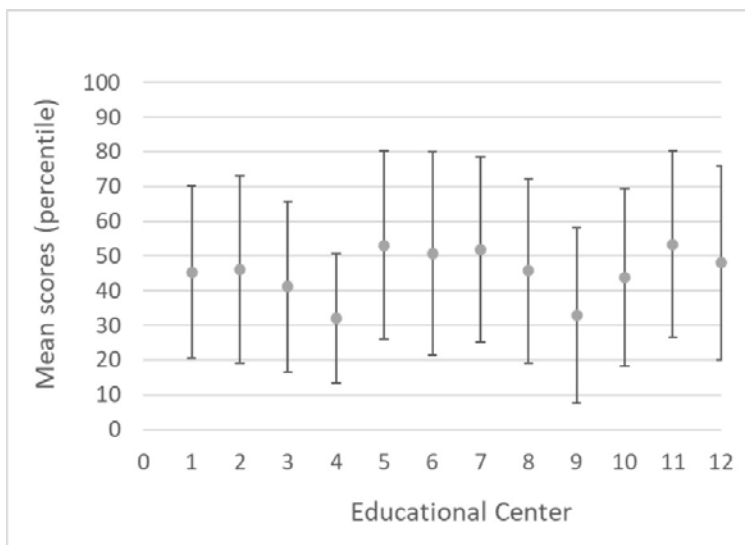
Grade	H	p
First	24.219	.004**
Second	26.790	.002**
Third	40.379	<.001***
Fourth	19.994	.010**
Fifth	55.037	<.001***
Sixth	13.801	.055

Note. **p<.01; ***p<.001.

In Figure 2, the mean scores obtained by students from each of the schools studied are shown. These data are presented in percentiles to eliminate the influence of the grade. It can be seen that some schools have percentiles around the 32% mark (schools 4 and 9), placing them well below the standard population, while others have values just slightly above 50% (schools 5, 6, 7, and 11). To analyze global differences between schools, the Kruskal-Wallis test for independent samples was applied, taking the percentile score to eliminate the influence of grade. Significant differences between schools were found, with $H(11, n = 1679) = 56.44$, $p < .001$. *Post hoc* comparisons were conducted using the Mann-Whitney test with Bonferroni adjustment, finding statistically significant differences between school 9 and schools 1 ($p = .003$), 2 ($p = .001$), 5 ($p = .000$), 6 ($p = .000$), 7 ($p = .000$), 8 ($p = .003$), 10 ($p = .040$), 11 ($p = .000$), and 12 ($p = .004$), with no significant differences found between the remaining schools.

Figure 2

Differences in the Average Scores obtained by Students from Different Educational Centers



DISCUSSION AND CONCLUSIONS

The objective of the present study was to examine the creativity of students during Primary Education and analyze the influence of the variables of grade, gender, and educational institution. Based on the obtained results, it is evident that the development of creativity increases as students advance through the Primary Education grades. These findings are consistent with studies conducted by Alfonso-Benlliure and Santos (2016) using the same instrument, as well as with the extensive meta-analysis carried out by Said-Metwaly et al. (2021) and the more recent research by Duval et al. (2023), among others. This upward trend may be due to older students becoming more creative as they gain more experience and knowledge, as a solid and broad knowledge base aids creativity by providing evaluative criteria to assess the quality and relevance of their ideas, thus enhancing their creative potential (Alfonso-Benlliure & Santos, 2016). However, children's creativity is often viewed as a static personality trait that does not consider potential changes over time (Kupers et al., 2019).

From this study, it is clear that not all variable groupings measured by the TCI test showed an increase as the grades advanced. Thus, PD A, which measures “Originality,” and PD C, which evaluates “Invented Added Figures (IAF),” remained virtually constant, while the process-product variables, integrated into PD B (which include atypical manipulation, material change, interaction, verbal elements, and model deviation), showed a steady upward trajectory. These variables are those with the highest weight in the final score of the test (10 points out of a range of 12) and, therefore, have a greater predictive power for creative performance (Romo et al., 2008).

The development of creativity throughout childhood and adolescence has been the subject of numerous studies. Research measuring creativity as divergent thinking has identified a non-linear development pattern across childhood (Said-Metwaly et al., 2021). Torrance (1968) described three declines in performance at the ages of five, nine, and twelve. There is some controversy regarding the decline that occurs at age nine, known as the “fourth-grade slump,” which has been the subject of numerous studies but with contradictory results. This study confirms a decline at third grade (8–9 years), which aligns with the phenomenon mentioned above, most commonly observed in fourth grade (Saggar et al., 2019), although some studies suggest a range of ages from 8 to 10 years (Duval et al., 2023). Alfonso-Benlliure and Santos (2016) found that global creativity and evaluative thinking skills showed an upward trajectory during Primary Education in Spanish students, in line with other dimensions such as intellectual and developmental, but divergent thinking showed irregularities due to motivation influences. Duval et al. (2023) concluded that there is a depression in divergent thinking in the fourth grade, which is compensated by an increase in convergent thinking. These authors suggest that the observed decrease might be caused by peer pressure and the need to adapt to social norms, such as those found in school environments, as social contexts influence creative thinking (Duval et al., 2023), or by internal factors like brain maturation.

Regarding the influence of gender on creativity, the present study found that females achieved a higher total average score than males, although the differences in percentile scores were minimal (46.35 vs. 46.04), placing both groups within the standard population. Nevertheless, significant differences were found in originality (in the problem-finding phase), where males scored higher, and in the material change variable (in the problem-solving phase), where females scored higher. These findings align with those presented by Ivcevic et al. (2022) in a study of Spanish students. It is worth noting that among reviews of gender differences in creative thinking, between 30% and 50% of studies found no significant differences between males and females, and those that did find differences have not identified a consistent pattern to explain them (Ivcevic et al., 2022; Nakano et al., 2021),

suggesting that gender differences in creative output are contradictory and warrant further research (Alfonso- Benlliure & Santos, 2016).

The role of the educational institution in the development of creativity is critical because, according to Rhodes' (1961) 4Ps theory of creativity, the external context in which the creative process takes place is one of the key factors. Educational institutions can provide the environment for creativity to be either enhanced or inhibited. Schools should offer students opportunities for exploration, experimentation, and problem-solving. Teachers can design activities and projects that stimulate creativity, foster originality, and encourage innovation. It is crucial for students to have the freedom to express themselves and share their ideas creatively and to be encouraged to think beyond conventional responses. In this sense, various studies have demonstrated that the type of institution, perceived teaching styles, and employed methodologies (Thomas & Berk, 1981; Besançon et al., 2015; Duval et al., 2023) influence students' creativity. This study has confirmed the importance of the educational institution in the creativity of its students, as significant differences were found between the schools analyzed. Future research aims to delve deeper into this issue to determine whether these differences are due to the nature of the institution or the methodologies used, comparing more innovative project-based schools with those using traditional methods. This is a promising line of investigation already being explored through a longitudinal study monitoring a school that recently began implementing a project-based approach, which will evaluate the evolution of students' creativity over four years.

Despite the limitations of this study, such as the sample size—which, though large, cannot be considered fully representative—the convenience sampling method, the cross-sectional design rather than longitudinal, and the limitations of the employed instrument (though validated), it can be concluded that the variables of gender, grade, and educational institution influence the creativity of Primary Education students. Furthermore, the results allow for triangulation with previous studies, although most of them come from different educational systems and countries, highlighting the need to complete the map of creativity in Spain. This task is pressing, as we are living in a particularly important moment for creativity, with the implementation of LOMLOE and its transdisciplinary focus on creativity, while international educational debate about this competency construct has never been as intense as it is now. It is worth noting that the results for this sample align with a moderate channeling of creativity in schools, leaving plenty of room for improvement.

Studies like this one are necessary to legitimize instructional changes based on evidence, such as general mediocrity but also excellence in certain schools, which should be carefully analyzed and their best teaching practices shared. Complementary to this, it is especially important to continue fostering

technical debate about creativity in educational institutions. This also involves a transfer process that includes completing teachers' training with scientific reflection on creativity and specific techniques to foster it in early ages. In this regard, the creation of a Creative School Plan is proposed, which, following the established model of the School Reading Plan, would involve planning actions to foster creativity collectively (even inviting creative risks in the classroom); since creativity, as specified by LOMLOE, must be worked on in all subjects—not only due to its transdisciplinary nature but also because it is an excellent strategy for fostering divergent thinking and demonstrating that what has been learned is useful for problem-solving.

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The importance of feedback in the flipped classroom: motivation and academic performance in university students

La importancia del feedback en el aula invertida: motivación y rendimiento académico en universitarios

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ABSTRACT

The flipped classroom has generated great interest among teachers and members of the scientific community due to its encouraging results. However, this methodological approach has some fundamental characteristics, including teacher feedback. Few studies have analysed how teacher feedback affects variables of educational interest (e.g. motivation and academic performance), which is the focus of this research. A total of 255 university students participated over three academic years, divided into one group that received teacher feedback ($n = 125$) and another group that did not ($n = 130$). A quasi-experimental design with pretest and post-test measures was used, in which participants watched a total of 16 instructional videos and responded to a series of related questions, as well as completing a questionnaire on their motivational regulations, validated in the university context (PLOC-U). They also indicated the grade they expected to achieve at the end, another variable included in this research as a marker of academic performance. An interaction effect (time \times treatment) was observed in intrinsic motivation ($F[2]=4.250$, $p=.040$; $\eta^2=.017$) in favour of the group that received feedback, which was the only group to improve. Another interaction effect was observed in external regulation ($F[2]=10.734$, $p=.001$; $\eta^2=.041$), which was higher in the group with feedback. Another significant finding is the interaction effect observed in the variable of amotivation ($F[2]=6.035$, $p=.015$; $\eta^2=.023$), suggesting that the trend towards increased amotivation was mitigated only in the group that received feedback. Finally, the results show an improvement in the expected grade over the transcript grade for both groups (with and without feedback); however, the group that received feedback achieved a significantly higher grade ($Z = 4.492$; $p < .001$; $ES = .28$). In conclusion, the importance of feedback in the application of the Flipped Learning model is highlighted for positively impacting variables such as motivation and academic performance

Keywords: flipped classroom, teaching methods, active learning, educational technology, blended learning, instructional effectiveness

RESUMEN

El aula invertida ha despertado gran interés entre docentes y miembros de la comunidad científica por sus alentadores resultados. Sin embargo, este enfoque metodológico tiene unas características fundamentales, entre ellas el *feedback* del docente. Pocas investigaciones han analizado cómo afecta el *feedback* del docente sobre variables de interés educativo (e.g. motivación y rendimiento académico) cuyo aspecto constituye el objetivo de esta investigación. Participaron 255 estudiantes universitarios a lo largo de tres cursos académicos, divididos en un grupo que recibió *feedback* del docente ($n = 125$) y otro grupo que no recibió *feedback* ($n = 130$). *Un diseño cuasiexperimental con medidas pretest y post-test fue utilizado, en el que los participantes visualizaron un total de 16 vídeos instruccionales y respondieron a una serie de cuestiones en relación con los mismos, y cumplieron un cuestionario sobre sus regulaciones motivacionales, validado al contexto universitario*

(PLOC-U). Además, los participantes indicaron la nota que esperaban obtener al finalizar, otra variable incluida en esta investigación como marcador de rendimiento académico. Se observó un efecto de interacción (tiempo x tratamiento) en motivación intrínseca ($F[2]=4.250$, $p=.040$; $\eta^2=.017$) a favor del grupo que recibió *feedback*, siendo el único que mejoró. Otro efecto de interacción se observó en la regulación externa ($F[2]=10.734$, $p=.001$; $\eta^2=.041$), siendo mayor en el grupo con *feedback*. Otro hallazgo significativo es el efecto de interacción observado en la variable desmotivación ($F[2]=6.035$, $p=.015$; $\eta^2=.023$), sugiriendo una tendencia al aumento en desmotivación amortiguada únicamente en el grupo que recibió *feedback*. Finalmente, los resultados muestran una mejora de la nota esperada sobre la nota del expediente de ambos grupos (sin vs. con *feedback*), sin embargo, el grupo que recibió *feedback* obtuvo significativamente mayor calificación ($Z=4.492$; $p<.001$; $ES=.28$). En conclusión, se destaca la importancia del *feedback* en la aplicación del modelo *Flipped Learning* para incidir positivamente en variables como la motivación y el rendimiento académico.

Palabras clave: aula inversa, métodos de enseñanza, aprendizaje activo, tecnología educacional, aprendizaje combinado, eficacia docente

INTRODUCTION

The COVID-19 pandemic marked a historic milestone in global health but also created a turning point in the global education system, exposing vulnerabilities and forcing an unprecedented adaptation. As a preventive measure, classes were suspended in schools, universities, and other educational institutions, affecting the regular academic and professional training of 90% of the student population worldwide (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020). Subsequently, in higher education, distance learning was initially used exclusively for certain courses, while blended learning began to be implemented in others, particularly for subjects with a strong practical component (Hassan Rakha & Abdo Khalifa, 2024).

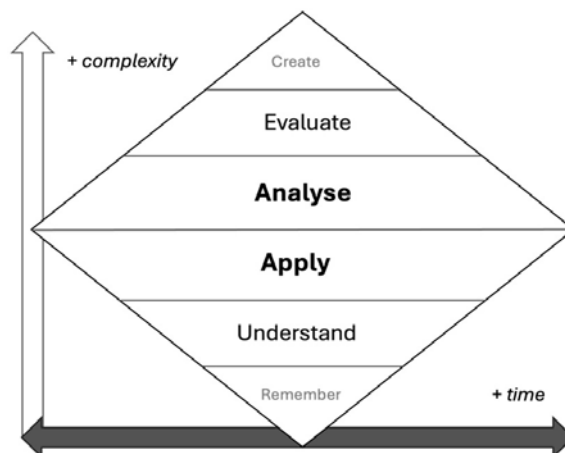
The flipped classroom model (FL) is a specialized form of blended learning in which students receive instructional materials (notes, web videos, recorded lectures, etc.) before attending in-person sessions (Thai et al., 2017). In 2018, Jon Bergmann and a group of experts updated the original definition coined in 2014 (Santiago & Bergmann, 2021, p. 24):

FL is a pedagogical model that enables educators to reach every student, in every classroom, every day. This approach reverses the traditional classroom model by introducing conceptual content before class, allowing teachers to use classroom time to guide each student through activities, strategies, and active practices related to the fundamental concepts previously covered.

As observed in the updated definition, for its creators (Bergmann & Sams, 2012), FL is not merely about “watching videos” or completing some tasks before each class. Instead, to implement an effective FL approach, a series of additional characteristics must be met, distinguishing it from other similar models (self-directed learning, independent study, distance learning, etc.). On one hand, the FL approach reduces direct instruction in the group or collective space—not denying its importance but rather emphasizing the convenience of shifting it more significantly to the student’s individual space. On the other hand, this transformation allows the classroom or group space to become an active and dynamic learning environment where teachers and students interact, replacing traditional lecture-based instruction with active and participatory learning. This group space can be transformed into an active and collaborative learning environment through a variety of methodologies that enhance student interaction and engagement. Among these methodologies are peer teaching, project-based learning, mastery learning, inquiry-based learning, role-playing, case studies, scenario-based learning, simulations, structured discussions, the initiation-response-feedback method, peer learning and review, cooperative learning, and gamification (Santiago & Bergmann, 2021). Each of these methodologies enables the adaptation of classroom activities to students’ needs, fostering deep and active learning around the concepts already covered in the individual space. Aligned with this approach, an adaptation of Bloom’s taxonomy (1956) to the FL model is presented in a diamond shape (Figure 1), representing classwork time. This model emphasizes dedicating more time to activities where the teacher (the student’s most valuable resource) aids precisely when it is most needed: applying and analysing content.

Figure 1

Bloom’s Taxonomy Adapted to the Flipped Learning Model (created based on Santiago & Bergmann, 2021, p. 28)



Consequently, a key advantage of the FL model is that it allows teachers to provide feedback to students after their individual work at home, granting greater prominence to teacher intervention within the framework of formative assessment. Hattie & Timperley (2007) state that feedback is one of the most powerful instructional interventions for enhancing learning. This feedback is understood as the response that teachers provide to guide and improve student learning within the group space, helping to bridge the gap between the student's current knowledge and the desired learning objectives. To achieve this, feedback plays an essential role in answering the three key questions proposed by Hattie & Timperley (2007): *Where am I in the learning process?* – allowing students to understand their current position in relation to the objectives; *What is expected of me?* – helping them clearly grasp the task requirements; and *How do I reach those goals?* – providing the necessary guidance on actions and strategies to close the gap between current and desired performance.

In this way, it not only enhances self-regulation and fosters deeper, more autonomous learning, but also strengthens intrinsic motivation and promotes positive attitudes toward learning (Wisniewski et al., 2020). According to the meta-analysis conducted by Wisniewski et al. (2020), an important distinction is made between different types of feedback that can be applied in the FL model, reinforcing the effectiveness of teacher intervention. Among these types are reinforcement or punishment feedback, which applies pleasant (or aversive) consequences to increase or decrease the frequency of a desired response; corrective feedback, which provides information about the task in terms of whether the response is correct or incorrect; and high-information feedback, which not only includes details about the task but also about self-regulation, such as monitoring student attention or motivation throughout the learning process. Additionally, Finn et al. (2018) demonstrated that feedback provided to students, when accompanied by examples, improves performance and conceptual understanding of the subject, reinforcing its central role in the FL model and its positive impact on learning.

Recent reviews have analysed the effects of the FL model in both university settings (Bosch-Farré et al., 2024; Galindo-Domínguez & Bezanilla, 2019; Prieto et al., 2020) and non-university contexts (Gosálbez-Carpena et al., 2022). Although Spain has been identified as the country with the highest contribution of publications and interest in this model within the field of Physical Education (Østerlie et al., 2023), other reviews indicate a greater number of publications in the Asian and American continents, particularly in the fields of science and education (Bosch-Farré et al., 2024). This highlights the cutting-edge relevance of the topic and underscores the variables that have attracted researchers' interest

On the one hand, student motivation is the most studied variable (Gosálbez-Carpena et al., 2022; Østerlie et al., 2023). Although most included studies conclude that the FL model enhances motivation, few have examined motivation from the perspective of Self-Determination Theory (SDT, Ryan & Deci, 2019), which has already demonstrated extensive coherence and applicability. Specifically, one of its mini-theories, the Organismic Integration Theory, explains how different forms of motivational regulation influence various individual behaviours. This theory distinguishes three types of motivation: *intrinsic motivation*, which is based on engaging in an activity for the inherent satisfaction it provides; *extrinsic motivation*, which focuses on performing an activity to gain external recognition or to achieve something; and *amotivation*, which refers to the absence or loss of motivation toward the activity.

Considering that student motivation exists along a continuum (Figure 2), the Organismic Integration Theory describes different subtypes of *extrinsic motivation*, some more controlled and others more autonomous (Ryan & Deci, 2020). At the most controlled end, an individual may be motivated by external rewards or pressures, known as *external regulation* (ER). Next, within controlled motivations, is introjected regulation, where behaviours are guided by internal control to avoid anxiety, shame, or guilt associated with failure, with a strong focus on self-approval and the approval of others. On the autonomous side of *extrinsic motivation*, identified regulation and *integrated regulation* are found. The former refers to the conscious acceptance of the value of the activity. The latter, the most autonomous form of extrinsic motivation, implies that the individual not only recognizes and values the activity but also considers it coherent with their interests and core values. However, integrated regulation is difficult to assess through tests, as it tends to saturate in factor analyses of intrinsic motivation within university settings (Sanchez-De Miguel et al., 2023). More autonomous forms of *extrinsic motivation* are more enduring than controlled forms; individuals persist in the activity even in the absence of external rewards, guided by a sense of value and purpose in their actions (Ryan & Deci, 2020).

Figure 2

Self-determination continuum in the different types of motivation (adapted from Deci & Ryan, 2000)



Motivation is one of the most analysed factors in studies on FL (Østerlie et al., 2023). These studies have primarily focused on primary and secondary education levels rather than conducting a detailed analysis of motivation types under SDT in higher education contexts. In fact, recent studies, such as that of Gil-Botella et al. (2021), have demonstrated that the FL approach significantly increases intrinsic motivation and decreases amotivation in primary school students. Hinojo Lucena et al. (2019) reported similar results in both primary and secondary students, showing increased motivation when comparing the FL model with a control group. In secondary education, Martínez-Campillo (2017) observed that student motivation doubled when using FL, and Østerlie & Kjelaas (2019) found that this approach increased motivation toward participation in Physical Education (PE) classes. On the other hand, some studies (Campos-Gutiérrez et al., 2021; Gómez-García et al., 2019) did not find a significant increase in student motivation under the FL model compared to traditional methods. However, these results were attributed to factors such as the short duration of the FL intervention or abrupt methodological changes.

Despite the positive results regarding motivation in pre-university levels, the literature reveals a clear lack of scientific studies exploring these effects in university students from the specific perspective of SDT. There is a need for a thorough analysis of how different types of motivation are influenced by the FL approach, especially regarding the impact of teacher-generated feedback within university settings.

Therefore, the present study aims to address this research gap by providing empirical data on the outcomes related to changes in different types of motivation among university students after the implementation of an FL approach understood through the lens of SDT.

On the other hand, most studies (Chiang et al., 2019; Ferriz-Valero, Østerlie, García-Martínez, et al., 2022; Ferriz-Valero, Østerlie, Penichet-Tomas, et al., 2022; Marqués-Molíás et al., 2019; Moreno-Guerrero et al., 2024; Soriano-Pascual et al., 2022) have observed significant differences in learning outcomes or academic performance after applying an FL model, demonstrating its effectiveness at all educational levels, especially in higher education (Bosch-Farré et al., 2024). Taking a deeper look at the relationship between the FL model and academic performance, a research gap still exists. Goh & Ong (2019) concluded that FL is more effective for students with low academic performance, whereas Wozny et al. (2018) found that it is more effective for students with above-average academic records.

Finally, although teacher intervention is a key aspect in these variables (Fenandez-Rio et al., 2023; Ferriz-Valero et al., 2024) as well as in the effective implementation of the FL model, no research has focused on how teacher feedback affects the variables that attract researchers' interest—student motivation and academic performance in higher education.

Objective and Hypotheses

Based on the above, the objective of this study was to quantitatively assess the effects of teacher-provided feedback (i.e., reinforcement, corrective, and high-information feedback) during the implementation of the FL model on motivation and academic performance in university students enrolled in a teaching degree.

Based on this objective and the robustness of SDT, the following research hypotheses were proposed:

Hypothesis 1 (H1). Students who followed the FL model with teacher feedback showed a significant increase in intrinsic motivation compared to the group that did not receive teacher feedback.

Hypothesis 2 (H2). Students who followed the FL model with teacher feedback showed a significant decrease in amotivation compared to the group that did not receive teacher feedback.

Hypothesis 3 (H3). Students who followed the FL model with teacher feedback showed a significant improvement in academic performance compared to the group that did not receive teacher feedback.

METHODOLOGY

Research Design

The research was conducted over three academic years (2021-22, 2022-23, and 2023-24) within official teaching programs at a Spanish public university. The study followed a quasi-experimental design with convenience sampling (i.e., access to the sample), including two treatment groups (experimental and control) as well as pre- and post-intervention measurements. The first experimental group implemented the FL model, requiring students to watch 16 pre-class videos related to the subject (learning in the individual space), allowing the collective space to be used for teacher-generated feedback (reinforcement, corrective, and high-information feedback). In contrast, the second control group followed the same video-watching routine at home but did not receive teacher feedback in the group setting. This control group, referred to as the “no-feedback” group, represents a variation of the FL model that does not fully meet its criteria but allows the research design to isolate the role of teacher feedback within the FL approach concerning motivation and academic performance. To test the proposed hypotheses, four classes were randomly assigned to the “no-feedback” group and another four to the “with-feedback” group, while ensuring that the same three instructors ($n=3$) taught both groups (all experienced in flipped learning). This methodological choice aimed to control for potential teacher-related effects, ensuring that identical content and

teaching styles were used in both treatment groups. The study design was based on previous research in similar studies (Thai et al., 2017, 2020). Finally, the study received ethical approval from the Ethics Committee of the University of Alicante (UA-2023-05-27_2).

Participants

A total of 400 university students initially participated in the study (M age = 20.47 years; SD = 2.63). The inclusion criteria for this research were: 1) Being enrolled for the first time in the core second-year course of the Primary Education Teaching degree at the University of Alicante (Spain). 2) Belonging to one of the groups taught by an expert in Flipped Learning. 3) Having digital devices and internet access at home. A total of 255 students were included in the final sample, of whom 154 were female (60.4%), after excluding 145 students for meeting one or more of the following exclusion criteria: a) Irregular class attendance, i.e., attending less than 80% of all sessions ($n = 21$). b) Failure to properly complete the questionnaires ($n = 76$). c) Failure to sign the informed consent form ($n = 48$).

Intervention Program

According to Hastie & Casey (2014), a rigorous intervention should include: a) A detailed description of the curricular elements of the intervention. b) A comprehensive validation of the intervention model. c) A precise description of the program's context. The following sections describe these elements in detail. The intervention was conducted within the second-year mandatory course Didactics of Physical Education, which is part of the Primary Education Teaching degree and accounts for six ECTS credits in the Spanish university system. The primary objective of the course is to provide future Primary Education teachers with basic knowledge of motor learning and sports education.

The course content is organized into 11 topics, of which only three were included in the intervention (see Table 1). Assessment, which is part of one of the dependent variables (academic transcript grade), was structured as follows: fieldwork assignments (20%), demonstration of mastery of acquired knowledge (25%), competence in designing a Physical Education learning scenario (25%), and a written exam (30%).

Table 1
Summary of Research Design (Curricular Elements)

	Content	Video Resource (min:sec)	Session No. (~115 min)
Topic 3 – Teaching Styles I	Conceptual Approach	6:01	1
	Traditional Styles	6:52	
	Participatory Styles (Reciprocal Teaching)	4:08	2
	Participatory Styles (Small Groups)	1:47	
	Participatory Styles (Microteaching)	2:52	
	Total	21:40	
Topic 4 – Teaching Styles II	Individualized Styles	7:18	3
	Socializing Styles	3:33	
	Cognitive Styles: Guided Discovery	5:09	4
	Cognitive Styles: Problem Solving	2:21	
	Creative Styles	3:33	5
	Conclusions	4:04	
	Total	26:38	
Topic 6 – Basic Physical Capacities	Physical Capacities in Primary Education	4:47	6
	Flexibility	6:40	
	Strength	8:06	
	Endurance	8:24	7
	Speed	4:24	8
	Total	32:21	8 sessions (~16 hours)

Note. min= minute; seg=second.

The intervention program was conducted by three instructors who were experts in the Flipped Learning approach (5–7 years of experience), with an average of nearly 10 years of university teaching experience (9.5 ± 2.52 years). A single instructor led the intervention within each group and remained in charge throughout the process, minimizing any potential bias resulting from multiple professionals intervening. To facilitate video viewing by students, the Edpuzzle platform (<https://edpuzzle.com>)

was used. A key advantage of this platform over others (e.g., YouTube) is that all students have free access to their personal accounts through a highly intuitive and user-friendly interface, allowing them to access and watch all videos without issues. Additionally, an essential aspect of implementing the FL approach, which this study aims to demonstrate, is that Edpuzzle allows students to answer embedded questions within the videos prepared for the course. This feature enables instructors to track who has watched the videos and under what conditions. The platform represents a highly valuable resource for research due to the data it provides, including the total time spent watching the video, the segments replayed, and whether students correctly answered the embedded questions. Moreover, it allows feedback (reinforcement, corrective, and high-information feedback) to be provided to students both in the individual space (via the digital platform) and in the group space (only for the “with-feedback” group).

As shown in Table 1, the intervention was conducted over eight sessions, each lasting 115 minutes, spanning approximately four weeks, with a total duration of around 16 hours. Both the “no-feedback” and “with-feedback” groups followed the same course content, used the same educational platform (Edpuzzle), and watched the same videos (16 videos in total), amounting to approximately 80 minutes of viewing time. These videos were recorded by a single instructor (the principal investigator) but were designed and supervised by the other instructors (Figure 3). Additionally, both treatment groups answered the same set of questions (45 questions, including open-ended, true/false, and multiple-choice formats) while watching each video (Appendix 1).

The session structure consisted of four main phases, specifically designed so that the only difference between the two groups was the presence or absence of teacher feedback:

Phase 1. Reinforcement and Corrective Feedback (only for the with-feedback group). The instructor focuses primarily on incorrect responses given by most students in the pre-class video or on the segments that were most frequently rewatched.

Phase 2. Peer Teaching. The instructor begins the group space with a peer-teaching dynamic in small groups (5–6 students), where each group reviews the key points covered in the video. After 10 minutes, the instructor randomly selects a group to share their conclusions with the entire class and then provides high-information feedback (only for the with-feedback group) on the group’s interventions and the concepts discussed, delving into critical points or common misconceptions.

Phase 3. Case Study or Practical Scenario. The instructor presents a practical case that students must solve in groups. During this activity, the instructor provides high-information feedback (only for the with-feedback group), offering real-time corrections and reinforcement. The no-feedback group completes the activity

autonomously, receiving general guidance from the instructor but no direct feedback, encouraging reflection and self-assessment among group members.

Phase 4. Structured Discussion. To conclude, each group shares its potential solutions to the problem or case, moderated by the instructor. The goal of this discussion is to integrate knowledge and reflect on the different responses, achieving a deeper level of understanding. The instructor moderates the discussion, providing clarifications and/or specific recommendations.

Figure 3

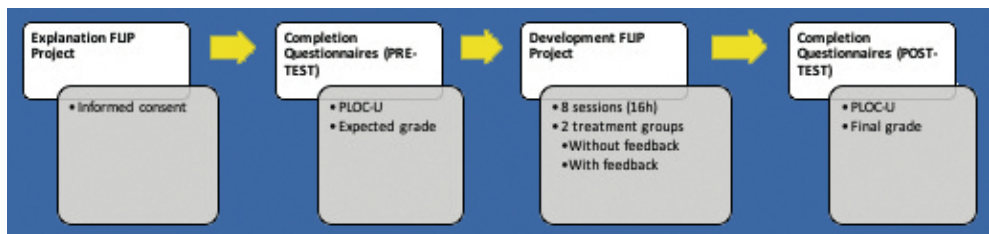
Screenshot from the video on Topic 6 (Basic Physical Capacities) detailing the fundamentals of strength development in childhood



Below, as a summary, a diagram of the research design implemented in this study is presented (Figure 4).

Figure 4

Research Design Outline



Instruments and Variables

Perceived Locus of Causality Scale (PLOC-U). This questionnaire aims to measure students' motivation regulation in the university context and is designed based on the principles outlined by Self-Determination Theory (SDT; Sanchez-De Miguel et al., 2023). It consists of 20 items (Table 2) grouped into five factors (four items per-factor), preceded by the phrase: "*I specifically attend the practical part of the course...*", measuring the entire motivational spectrum described by SDT, from intrinsic regulation to amotivation. Responses to the 20 items were provided on a 6-point Likert scale (1 = completely disagree to 6 = completely agree). This scale type was deliberately chosen to avoid central tendency bias. The Cronbach's alpha values ranged between .75 and .84 across all factors, indicating good internal consistency.

Table 2

Perceived Locus of Causality Scale in University Students (PLOC-U)

Factor	Items
Intrinsic Regulation	1. ... because, in the end, what matters is what I learn, rather than the points I get from the continuous assessment of practical sessions.
	6. ... because I find satisfaction in improving my technical and physical activity skills.
	11. ... because I enjoy acquiring additional knowledge that complements the theoretical part of the subject.
	16. ... because practical sessions make the subject more engaging for me.
Identified Regulation	2. ... because it helps me to better complement theoretical knowledge.
	7. ... because I see that working well on the practical component of this subject is important for me.
	12. ... because I want to acquire technical and practical resources.
	17. ... because it is an important part of my training as a sports educator.
Introjected Regulation	3. ... because if I do not attend, I feel bad about myself.
	8. ... because it serves as a reference for passing the subject later.
	13. ... because it gives me one more step towards passing the subject.
	18. ... because I worry about not attending the practical sessions.

Factor	Items
External Regulation	4. ... because the practical assessment system allows me to obtain up to 5 points towards the final grade of the subject.
	9. ... because, more than learning, what matters most is obtaining points for the practical component.
	14. ... because this is what I have to do within the academic context I am in.
	19. ... because, otherwise, I would not achieve the minimum grade to pass.
Amotivation	5. ... but I do not see the benefit of practical sessions.
	10. ... but I do not understand why this subject needs to have practical sessions.
	15. ... but I still do not see the advantages of these practical sessions.
	20. ... but, to be honest, I do not know why I attend the practical sessions.

Note. The preceding phrase is: "In particular, I attend the practical component of the subject because..."

Student Academic Transcript Grade. This scalar variable measures the score obtained by the student in their academic transcript upon completion of the course, using a 0 to 10 scale.

Data Analysis

The statistical software SPSS version 28.0.0.0 (190) was used for all analyses. Descriptive statistics for each factor (mean and standard deviation) were calculated. The Kolmogorov-Smirnov normality test was performed, revealing non-normal distributions in all cases ($p < .05$). To analyse baseline differences between the two treatment groups, a Mann-Whitney U test was used. An intragroup comparison (Wilcoxon test) was then conducted to analyse pre-test vs. post-test differences. Finally, to test the hypotheses, a repeated-measures analysis of variance (2x2 ANOVA) was conducted to enhance the robustness of the analysis. The dependent variables were the five motivational regulations (intrinsic, identified, introjected, external, and amotivation). Time (pre- and post-intervention) was the within-subjects factor, while group (no-feedback vs. with-feedback) was the between-subjects factor. The Levene test was used to assess homoscedasticity, the Mauchly test to assess sphericity, and the Box test to assess equivalence of covariance matrices. All assumptions were met except for data normality and the Mauchly test, leading to the use of multivariate contrasts. Effect size was calculated using Microsoft Excel (Dominguez-Lara, 2018). For the Mann-Whitney U and Wilcoxon tests, effect sizes were classified as small (0.1–0.3), medium (0.3–0.5), and large

(>0.5) (Cohen, 2013). For ANOVA, effect size was determined using partial eta squared (η^2), with thresholds for small (.01–.059), medium (.06–.13), and large ($\geq .14$) effects. A 95% confidence interval was calculated for the differences, and the significance level was set at $p < .05$.

RESULTS

Initial Differences Between Treatment Groups (Pre-Test)

The baseline characteristics of both groups are presented in Table 3, including the statistical differences obtained using the non-parametric Mann-Whitney U test. In the pre-test, the groups showed similar initial values, except for the variables intrinsic regulation ($Z = 3.692$; $p < .001$), introjected regulation ($Z = 2.618$; $p = .009$), and amotivation, where the with-feedback group had higher values in the first two variables and a lower value in amotivation.

Table 3

Mean \pm Standard Deviation of Initial Differences Between Groups Using the Mann-Whitney U Test (Pre-Test)

Variable	Full Sample		Without feedback (n=130)		With feedback (n=125)		Z	Sig.	ES
	M	DT	M	DT	M	DT			
Motivational Regulations in Practice (Range 1-6)									
Intrinsic Regulation	5.06	0.74	5.04	0.72	5.09	0.76	0.649	.517	-
Identified Regulation	5.22	0.76	5.20	0.74	5.25	0.77	0.781	.435	-
Introjected Regulation	4.51	0.84	4.46	0.81	4.56	0.88	0.973	.331	-
External Regulation	3.92	1.01	3.94	0.97	3.89	1.05	-0.184	.854	-
Amotivation	1.73	0.98	1.84	1.14	1.61	0.82	-1.082	.279	-
Academic Performance									
Expected grade	7.11	0.76	7.11	0.70	7.11	0.81	-0.165	.869	-

Note. M = Mean; SD = Standard Deviation; ES = Effect Size.

Longitudinal Differences Within Each Treatment Group (Pre vs. Post-Test)

Table 4 presents the results obtained from the non-parametric Wilcoxon test. The results indicated that, on the one hand, the no-feedback treatment group showed a decrease in intrinsic regulation ($Z = -2.813$; $p = .005$) and identified regulation ($Z = -2.022$; $p = .043$), while an increase was observed in external regulation ($Z = 3.893$; $p < .001$) and amotivation ($Z = 7.247$; $p < .001$).

On the other hand, the with-feedback treatment group showed increases in introjected regulation ($Z = 2.913$; $p = .004$) and external regulation ($Z = 6.160$; $p < .001$) as well as academic performance relative to the expected grade ($Z = 6.669$; $p < .001$).

Table 4

Mean \pm Standard Deviation of Intragroup Comparative Analysis Using the Wilcoxon Test

Variable	Pre-test		Post-test		Z	Sig.	ES
	M	DT	M	DT			
Without Feedback Treatment Group (n=130)							
Motivational Regulations in Practice (Range 1-6)							
Intrinsic Regulation	5.04	0.72	4.94	0.67	-2.813	.005	.25
Identified Regulation	5.20	0.74	5.13	0.72	-2.022	.043	.18
Introjected Regulation	4.46	0.81	4.54	0.70	1.855	.064	.16
External Regulation	3.94	0.97	4.20	0.80	3.893	<.001	.34
Amotivation	1.84	1.14	3.10	1.54	7.247	<.001	.64
Academic Performance							
Expected Grade vs. Final Grade	7.11	0.70	7.65	1.10	3.872	<.001	.34
With Feedback Treatment Group (n=125)							
Motivational Regulations in Practice (Range 1-6)							
Intrinsic Regulation	5.09	0.76	5.12	0.62	0.541	.589	-
Identified Regulation	5.25	0.77	5.22	0.65	-1.434	.151	-
Introjected Regulation	4.56	0.88	4.75	0.70	2.913	.004	.26
External Regulation	3.89	1.05	4.54	0.83	6.160	<.001	.55
Amotivation	1.61	0.82	1.85	1.21	1.282	.200	-
Academic Performance							
Expected Grade vs. Final Grade	7.11	0.81	8.32	1.01	6.669	<.001	.60

Note. M=Mean; SD = Standard Deviation; ES = Effect Size.

Final Differences Between Treatment Groups (Post-Test)

Table 5 presents the results obtained after applying the Mann-Whitney U test. After the intervention, the results indicate significant differences in intrinsic regulation ($Z = 2.044$; $p = .041$), introjected regulation ($Z = 2.167$; $p = .030$), external regulation ($Z = 3.405$; $p < .001$), and academic transcript grade ($Z = 4.492$; $p < .001$), with higher values in the with-feedback treatment group. Conversely, the variable amotivation ($Z = -6.890$; $p < .001$) was significantly higher in the no-feedback group.

Table 5

Mean \pm Standard Deviation of Final Differences Between Groups Using the Mann-Whitney U Test (Post-Test)

Variable	Full Sample		Without feedback (n=130)		With feedback (n=125)		Z	Sig.	ES
	M	DT	M	DT	M	DT			
Motivational Regulations in Practice (Range 1-6)									
Intrinsic Regulation	5.03	0.65	4.94	0.67	5.12	0.62	2.044	.041	.13
Identified Regulation	5.18	0.69	5.13	0.72	5.22	0.65	0.823	.411	-
Introjected Regulation	4.65	0.70	4.54	0.70	4.75	0.70	2.167	.030	.14
External Regulation	4.37	0.82	4.20	0.80	4.54	0.83	3.405	<.001	.21
Amotivation	2.26	1.30	3.10	1.54	1.85	1.21	-6.890	<.001	.43
Academic Performance									
Expected Grade	7.72	0.95	7.65	1.10	8.32	1.01	4.492	<.001	.28

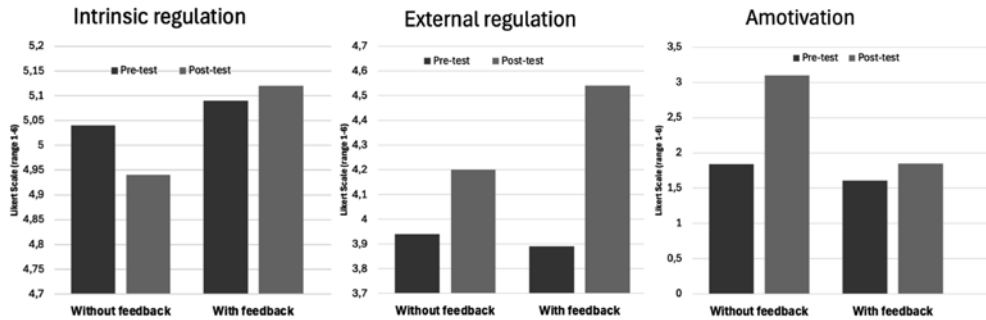
Note. M=Mean; SD = Standard Deviation; ES = Effect Size.

Hypothesis Testing

An interaction effect (Time x Treatment) was observed in the variables intrinsic regulation ($F[2] = 4.250$, $p = .040$; $\eta_p^2 = .017$), external regulation ($F[2] = 10.734$, $p = .001$; $\eta_p^2 = .041$), and amotivation ($F[2] = 6.035$, $p = .015$; $\eta_p^2 = .023$) (Figure 5). In other words, statistically significant longitudinal differences (pre vs. post-test, $p < .05$) were found in the impact of the treatment (with-feedback vs. no-feedback) during the implementation of Flipped Learning on these three study variables.

Figure 5

Representative bar chart of the effect of the Flipped Classroom intervention for both treatment groups (with vs. without feedback) on the variables Intrinsic Regulation, External Regulation, Amotivation, and Group Work



DISCUSSION

The FL model has emerged as an alternative approach to traditional university teaching, yielding positive results and, consequently, attracting the interest of the scientific community in recent years (Prieto et al., 2020). As presented in the state of the art, numerous studies have focused on analysing the effectiveness of the model concerning variables such as student motivation and academic performance (Bosch-Farré et al., 2024; Oudbier et al., 2022). However, other essential aspects of FL implementation have not been thoroughly explored, such as the role of teacher-generated feedback, a fundamental characteristic of the model (Santiago & Bergmann, 2021). It is important to highlight that, in this research, the “no-feedback” group does not represent FL in its strictest form but rather an experimental variation designed to isolate the effect of feedback within the FL context. The study of feedback importance remains underexplored in the scientific literature regarding FL implementation. Therefore, the objective of this study was to evaluate the effects of teacher-provided feedback during the implementation of the FL model on key educational variables, such as motivation and academic performance in university students.

The findings of this study confirm a significant interaction effect (time x treatment) on intrinsic motivation, with a small effect size ($\eta p^2 = .017$). It is important to highlight that this difference is observed despite the initially high scores of both treatment groups (above 5 out of 6). In other words, teacher-generated feedback plays a key role in enhancing students’ intrinsic motivation, as a significant difference is observed in the feedback group compared to the no-feedback group. In fact, the no-feedback group shows a significant decrease in post-test scores compared to the

pre-test (Table 4), underscoring the impact of feedback on the most self-determined form of motivation in students. Therefore, Hypothesis 1 (H1) is accepted.

Although these results are novel and contribute to advancing the current theoretical framework on the FL model in higher education, numerous studies have already reported improvements in intrinsic motivation following the implementation of the FL model at other educational levels, such as primary education (Gil-Botella et al., 2021) and secondary education (Ferriz-Valero, Østerlie, García-Martínez, et al., 2022; Ferriz-Valero, Østerlie, Penichet-Tomas, et al., 2022). However, other studies (Campos-Gutiérrez et al., 2021; Gómez-García et al., 2019) did not find changes in intrinsic motivation or even reported a decline in motivation among female students in secondary education. This discrepancy in results may be attributed to significant differences in the implementation of this pedagogical model, as most studies lack sufficient detail to determine whether they follow recommended FL implementation guidelines (Bergmann & Sams, 2012).

The influence of the FL model on learning lies in its ability to motivate students to actively participate in their educational process, fostering greater personal engagement in their learning experience (Craft & Linask, 2020; Steen-Utheim & Foldnes, 2018). Thus, the benefits of the FL model largely depend on how it impacts student motivation and their willingness to engage both inside and outside the classroom (Gilboy et al., 2015).

Feedback plays a central role in the implementation of the FL model, not only due to its positive impact on intrinsic motivation and academic performance but also because of its ability to foster self-regulated learning skills (López-Belmonte et al., 2023). In this context, Zhang et al. (2023) analysed how different types of feedback significantly improved self-regulation skills and academic performance in pre-class activities among university students. Similarly, Esmaeili et al. (2020) compared the effects of feedback in English as a Foreign Language (EFL) class, finding that integrating the FL model with explicit feedback led to greater improvements in retention and grammar learning. This finding complements the evidence from the present study, demonstrating that the type of feedback can significantly modulate the benefits of FL.

Moreover, the decrease in intrinsic and identified regulation in the no-feedback group after the intervention suggests that the lack of feedback may weaken more autonomous forms of motivation (i.e., intrinsic motivation, integrated regulation, and identified regulation) in students, despite the absence of a significant interaction effect (Time x Treatment) for identified regulation. According to the definition of identified regulation, this type of motivation implies that the individual perceives tasks as aligned with their personal values (Ryan & Deci, 2019). For Vasconcellos et al. (2020), helping students develop this more internalized personal value is a

challenge not only for teachers but also for the educational system itself. Therefore, more specific research is needed to address questions related to this issue.

Conversely, an interaction effect was observed for external regulation, with a small effect size ($\eta^2 = .041$). This indicates that students who followed the FL model with teacher feedback experienced a significant increase in more controlled extrinsic motivation compared to the no-feedback group. As demonstrated in previous research, external regulation is understood as a powerful form of motivation, although it is difficult to sustain over time, as it describes behaviours regulated by external contingencies (Ryan & Deci, 2017, 2020). Moreover, considering that university students are already adults and that higher education is not compulsory, they may develop an increased personal value toward the contingencies of the FL model. At first glance, this reasoning might reinforce the opposite idea, namely that students actively participate in class for intrinsic reasons (as stated in H1). However, it could also be interpreted as an indicator that participation in the innovative approach is related to a tangible reward, such as an increase in their expected course grade. Conversely, students might also perceive a negative response to questions as potentially leading to a decrease in their final grade. One could argue that the use of the Edpuzzle educational platform, which allows students to answer questions with correct and incorrect responses, could also explain this result. However, the no-feedback group did not receive qualitative information about their answers to these questions, making this argument purely speculative.

Another significant finding is the interaction effect (Time x Treatment) observed in the amotivation variable, with a small effect size ($\eta^2 = .023$). This suggests that the tendency toward increased amotivation was mitigated only in the group that received feedback during the FL model implementation. Therefore, Hypothesis 2 (H2) is accepted. This result highlights the importance of support mechanisms and continuous monitoring in the training process of university students, such as teacher feedback, to sustain student interest and engagement within the FL framework. Although a slight decrease in amotivation was expected in the feedback group, the previously mentioned motivational regulations may be significantly influenced by various antecedents or social agents, as well as by the instructional videos used as FL model teaching resources. A total of 16 videos were used, all uniformly edited, without music or special effects, which appears to be closely related to student engagement and motivation (de la Mora Velasco et al., 2021). This factor could partially explain the observed result.

Other more conclusive studies have indeed observed a decrease in amotivation in primary education (Ferriz-Valero et al., 2017; Gil-Botella et al., 2021), secondary education (Ferriz-Valero, Østerlie, García-Martínez, et al., 2022; Ferriz-Valero, Østerlie, Penichet-Tomas, et al., 2022), and high school (Bachillerato) (Ferriz-Valero et al., 2017) in groups that implemented the FL model compared to traditional

teaching. A lack of research at the university level has been identified, making this result a valuable contribution to the theoretical framework of the FL model in higher education. However, further studies are needed to strengthen the robustness of these findings.

Finally, the results show an improvement in the expected grade compared to the final academic transcript grade in both groups (no-feedback vs. with-feedback), meaning that students achieved higher final grades than initially expected. However, the non-parametric Mann-Whitney U test revealed a significant difference in the academic transcript grade variable, indicating that the group receiving teacher feedback obtained a significantly higher final grade ($Z = 4.492$; $p < .001$; $ES = .28$). Therefore, Hypothesis 3 (H3) is accepted. This result is likely the most widely supported by the existing scientific literature, as evidenced by most studies analysed in various systematic reviews and meta-analyses within the university setting (Bosch-Farré et al., 2024; Galindo-Domínguez & Bezanilla, 2019; Prieto et al., 2020; Zheng et al., 2020). Furthermore, this study highlights that the teacher's role through feedback as part of formative assessment enhances the teaching and learning process, aligning with findings from other researchers (Finn et al., 2018). This confirms that the FL model is not merely about "watching videos" or providing materials before class, but rather involves active engagement and structured pedagogical support.

First, all participants belong to the same university and the same undergraduate degree program. Future studies with samples from different universities and degree programs would be necessary to generalize the results. Additionally, the study focused on a single course, making it necessary to conduct further research in other subjects (mandatory, elective, etc.) to determine whether the FL model is more effective in theoretical courses or, conversely, in more practical ones. Another important limitation concerns the presence of missing data during the intervention. A significant number of participants ($n = 145$) were excluded for various reasons, such as absenteeism, failure to complete pretest or post-test questionnaires, or lack of signed consent. This could have influenced the validity of the results, particularly regarding motivation, as absenteeism and non-compliance with measurement instruments may be linked to motivational factors. Since a detailed analysis of the distribution of these cases between groups was not conducted, this aspect should be considered a limitation when interpreting the study's results.

CONCLUSIONS

In the present study, the impact of the Flipped Learning (FL) model, with and without feedback, on various motivational regulations and academic performance

in university students was investigated. Various statistical tests were used to analyse the results obtained in the two treatment groups over three academic years.

The conclusions are as follows:

- The importance of teacher-provided feedback in the FL model implementation is highlighted, as it plays a fundamental role in increasing students' intrinsic motivation, showing a notable difference between the group that receives feedback and the group that does not.
- Teacher-generated feedback in the FL model plays a key role in mitigating the increase in student amotivation, showing a significant difference between the group that receives feedback and the group that does not.
- Teacher-provided feedback in the FL model allows students to achieve higher academic performance.

THEORETICAL AND PRACTICAL IMPLICATIONS

The present study has several theoretical and practical implications. At a theoretical level, this study advances knowledge on the Flipped Learning (FL) model, highlighting the crucial role of teacher feedback in its implementation. This work provides a solid foundation for future research aimed at optimizing FL effectiveness and suggests new lines of study related to the impact of these dynamics in different educational contexts and academic levels. At a practical level, this study underscores the need for educators to integrate continuous and meaningful feedback processes to maximize the benefits of FL. Feedback not only enhances intrinsic motivation but also helps mitigate amotivation and improves academic performance, making it an essential element in FL planning. Finally, this study offers a practical guide for educational institutions and teachers seeking to innovate their teaching methods, demonstrating how a well-implemented approach can contribute to more effective and engaging learning experiences.

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ANEXX 1

Questions Presented in Each of the Videos

Factor	Items
Conceptual Approach	<ul style="list-style-type: none"> a. What do you understand by a teaching style? b. One of the objectives of Muska Mosston's classification of teaching styles was to analyze them based on the level of student independence in learning. (T or F) c. Why use teaching styles? d. Which teaching style is better?
Traditional Styles	<ul style="list-style-type: none"> a. Explain in your own words what a traditional teaching style is. b. List two advantages of direct instruction. c. List two disadvantages of task assignment. d. Which of the three teaching styles presented in the video allows the most student independence in learning?: i. Modified direct instruction; ii. Direct instruction; iii. Task assignment.
Participatory Styles (Reciprocal Teaching)	<ul style="list-style-type: none"> a. What is the main characteristic of participatory styles? b. Identify a key aspect to consider when presenting a task to students. c. Provide an example (other than the one shown in the video) of how you would apply this teaching style.
Participatory Styles (Small Groups)	<ul style="list-style-type: none"> a. How does it differ from reciprocal teaching? b. What is the main characteristic of small-group teaching?
Participatory Styles (Microteaching)	<ul style="list-style-type: none"> a. What is meant by "student participation"? b. Can you provide a practical example of this teaching style?
Individualized Styles	<ul style="list-style-type: none"> a. What are individualized teaching styles based on? b. List two advantages of group work. c. List two disadvantages of programmed instruction. d. Which of the four teaching styles presented in the video allows the most student independence in learning? i. Modular teaching; ii. Programmed instruction; iii. Individualized programs; iv. Group work.
Socializing Styles	<ul style="list-style-type: none"> a. Explain what an effective teaching style is. b. How do the teaching styles described in the video prioritize the role of students in the classroom?
Cognitive Styles: Guided Discovery	<ul style="list-style-type: none"> a. State and explain one advantage of cognitive styles. b. Develop an example of how the guided discovery teaching style is applied. c. The guided discovery teaching style is based on continuous problem-solving. (T or F)
Cognitive Styles: Problem Solving	<ul style="list-style-type: none"> a. Can you explain the concept of the cognitive teaching style known as problem-solving in Physical Education? b. In the problem-solving teaching style, questions are formulated exclusively by students. (T or F)

Factor	Items
Creative Styles	a. Can you create an application of the creative style in a Physical Education class?
Conclusions	a. What do traditional teaching styles imply? b. Which of the six principles do you think is the most important? Why? c. Describe, in your own words, one way of understanding teaching styles. d. Some teaching styles are more important than others depending on the content to be taught by the teacher, who ultimately selects the most appropriate one. (T or F)
Physical Capacities in Primary Education	a. A good physical condition developed through basic physical capacities leads to better health in students. (T or F) b. Why is the development of basic physical capacities a key topic in primary school student development? c. List two advantages of developing basic physical capacities in primary school students.
Flexibility	a. What is flexibility based on? b. Provide an example of a static stretch and a dynamic stretch. c. Muscle elasticity must be specifically trained during primary education. (T or F)
Strength	a. Plyometric training with heavy weights is recommended in primary education. (T or F) b. Explain a game or activity that develops upper body strength.
Endurance	a. Aerobic endurance training in primary education is very important. Justify this statement. b. Describe a physiological adaptation derived from aerobic endurance training. c. Lactic anaerobic endurance training is highly important in primary education due to its beneficial effects on the respiratory and endocrine systems. (T or F)
Speed	a. What determines the success of a sports movement to increase the probability of success? b. Describe a game that develops reaction speed. c. Speed is the only basic physical capacity that declines from birth to old age. (T or F)

Note. T or F = True or False.

Parental control and aggression in children and adolescents: a systematic review of the literature

Control parental y agresión en niños y adolescentes: una revisión sistemática

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ABSTRACT

There is considerable research on aggression in children and adolescents that highlights the relevance of parenting strategies as antecedents. However, there are few researchers that systemize the available studies on effects of the subtypes of parental control on each specific category of aggression. The present review is an attempt to integrate in the same study the updated research on the differential effects of both, behavioural and psychological control, on aggression, in general, and its types (open, relational, proactive, reactive, bullying), in particular. For this review, studies published between 2018 and 2023 that were deemed relevant to the topic were searched, coded, and classified. As a result, 28 works were identified. The results showed that greater parental psychological control seems to contribute to externalizing behaviour and more specifically to the aggression of their children, without this relation being moderated by the country of origin, nor the cultural normativity of psychological control in the country of study, nor the age of the adolescent. On the other hand, sufficient consensus has not been found in the conceptualization and measurement instruments of parental behavioural control or in the results on the associations of this type of control with the externalizing and/or aggressive behaviour of children, evidencing that culture can act as a moderating variable. In the coming years, the authors could focus on agreeing on the concept, components and measurement instruments of parental control, especially behavioural control, considering the specificity of the different categories of aggression, and elucidating the role of gender of the parent and the adolescent in each of these specific relations.

Keywords: parental behavioural control, parental psychological control, aggression, externalizing behaviour, adolescence, gender

RESUMEN

Actualmente contamos con una considerable cantidad de investigación sobre la agresión entre niños y adolescentes que destaca la relevancia de las estrategias parentales como antecedentes. Sin embargo, existen pocos estudios que sistematicen los trabajos disponibles sobre los efectos de los subtipos de control parental en cada categoría específica de agresión. La presente revisión es un intento de integrar en un mismo estudio las investigaciones actualizadas sobre los efectos diferenciales del control, tanto conductual como psicológico, sobre la agresión, en general, y sus tipos (abierta, relacional, proactiva, reactiva, bullying), en particular. Para esta revisión se buscaron, codificaron y clasificaron estudios publicados entre los años 2018 hasta el 2023, que consideramos relevantes en la temática. Como resultado, se identificaron 28 trabajos. Los resultados mostraron que un mayor control psicológico parental parece contribuir a la conducta externalizante y más concretamente a la conducta agresiva de sus hijos, sin que esta relación sea moderada por el país de origen, ni la normatividad cultural del control psicológico en el país de estudio, ni la edad del adolescente. Por otro lado, no se ha encontrado consenso suficiente entre los estudios revisados en la conceptualización e instrumentos de medida del control

conductual parental ni en los resultados sobre las asociaciones de este tipo de control con la conducta externalizante y/o agresiva de los hijos, evidenciándose que la cultura puede actuar como variable moderadora. En los próximos años, los autores podrían centrarse en consensuar el concepto, los componentes y los instrumentos de medida del control parental, especialmente el control conductual, considerar la especificidad de las distintas categorías de agresión, y dilucidar el papel del género del progenitor y del adolescente en cada una de estas relaciones específicas.

Palabras clave: control conductual parental, control psicológico parental, agresión, conducta externalizante, adolescencia, género

INTRODUCTION

The late childhood and adolescent years represent a period characterized by rapid and sometimes intense changes in physical, psychological, and intellectual development. During this stage, adolescents are deeply engaged in constructing their own identities, and the challenges posed by this process can lead to imbalances in their attitudes and emotions. These imbalances, in turn, may manifest as behavioral changes, such as the emergence or intensification of aggressive behavior (Petersen et al., 2015). In fact, aggressive behavior during this transition to youth are highly prevalent. While there are differences based on age, gender, and other individual, family, and school-related variables, as well as the country under analysis, various studies estimate a prevalence ranging from 13% to 48.6% of adolescents involved in some form of aggression (e.g., Lebrun-Harris et al., 2020). Moreover, during this developmental stage, aggressive behavior—whether newly emerging or intensified—are the most common and persistent form of social maladjustment, with significant long-term consequences for mental health and individual and social well-being (Wolke & Lereya, 2015).

Precisely because of its harmful impact on aggressors, victims, and society itself, aggression has garnered significant theoretical and empirical attention since the 1960s. Early research focused on overt forms of aggression (more characteristic of boys than girls), but since the 1990s, studies have also included relational aggression. This type of behavior includes actions such as ostracism, social exclusion, spreading false and malicious rumors, or threatening to end friendships (Casas et al., 2006). Later, research progressed from focusing solely on the form of aggression to also examining its function, which has deepened our understanding of why young people behave aggressively (Little et al., 2003). Considering function, a distinction is made between proactive aggression, which is goal-oriented, calculated, devoid of emotional charge, and motivated by external rewards; and reactive aggression, which refers to retaliatory behavior in response to hostility and is often accompanied by negative emotions such as anger and anxiety.

Additionally, both the form and function of aggression gradually change as adolescence progresses, likely associated with the development of social and cognitive processes. Research suggests that aggression tends to become less physical and more verbal and relational throughout childhood and adolescence (Björkqvist, 2018). Regarding function, although research findings are less clear, aggressive behavior seems to become more person-oriented and hostile in nature with age (Fite et al., 2008). In recent decades, research has also focused on a specific type of aggression: school bullying. This form of aggression is defined as intentional, repeated aggressive behavior aimed at causing harm to others, based on a perceived power imbalance. It has high prevalence in late childhood and adolescence and entails negative consequences for mental health (Noncentini et al., 2018). Despite the substantial knowledge gained about aggression and associated factors, a more comprehensive and integrated understanding of aggressive behavior is still necessary.

Among the factors studied as antecedents to aggression in childhood and adolescence, those related to the family environment have received special attention. It has been concluded that parental figures play a key role in the aggressive behavior of children and adolescents. Influenced by Baumrind's theory (1971), many of these studies have focused on the relationships between parenting practices and the development of aggression in those under their care, finding both direct and indirect, as well as positive and negative, effects. In a review, Masud et al. (2019) concluded that authoritarian parenting has a greater impact on the development of aggression during childhood compared to authoritative and permissive parenting. From this analytical perspective, it is noteworthy that these authors suggest that differences between authoritative and authoritarian parenting styles in the exercise of parental control may be a key factor in understanding the varying impact of these styles on aggression.

In this vein, it is worth noting that, in recent decades, a significant number of researchers on parenting strategies have shifted their attention from traditional typologies (parenting styles) to the separate study of the specific dimensions that comprise them. This shift has spurred research on the control exercised by responsible adult figures and its effects (Kuppens et al., 2009).

Some authors have argued that parental control should not be viewed as a unidimensional construct, as it may encompass various elements with different meanings (Hoeve et al., 2009). Thus, behavioral control and psychological control in parenting are considered two distinct forms of parental control (Barber, 1996). The former refers to the specific strategies employed by responsible adult figures to supervise, manage, or regulate behavior during childhood and adolescence, such as monitoring activities and whereabouts, as well as establishing rules and restrictions to guide actions. In contrast, psychological control focuses on implicitly manipulating

the behavior of those under their care by regulating their emotions, thoughts, and feelings, using tactics such as personal attacks, inducing guilt, asserting authority, and withdrawing affection.

From a theoretical perspective, relationships between parental control practices and aggression are suggested. These relationships have been explained by social learning theory (Bandura, 1977) and coercion theory (Reid et al., 2002), which propose that parental figures model aggressive behavior in children and adolescents when they use various control strategies such as coercion, punishment, or manipulation. The relationships between parental control and aggression have also been linked to attachment theory, suggesting that insensitive and rejecting behavior by adult figures foster insecure attachment. This insecurity may lead to perceiving others as unreliable and hostile, potentially triggering aggressive behavior in social relationships (Michiels et al., 2008). This view aligns with social processing theory, which attributes aggression to the inappropriate attribution of hostile intentions in social situations, leading to aggression as a response (Crick & Dodge, 1996).

On the other hand, according to self-determination theory (Ryan & Deci, 2000), aggression may arise when the need for autonomy in childhood and adolescence is unmet by overly controlling adult figures. In such cases, aggression may occur as a protest against the frustration of being unable to satisfy needs, desires, and motivations (frustration-aggression theory; Breuer & Elson, 2017).

However, from an empirical perspective, the results of studies evaluating the relationship between parental control and aggression in childhood and adolescence have not always been consistent. In the case of behavioral control, a large body of studies concludes that appropriate levels of this type of control (neither too low nor too excessive) are positively associated with self-control and social adaptation in childhood (e.g., Zhang et al., 2022). While it is true that behavioral control exercised by responsible adult figures involves the presence of rules and requirements, it is also true that effective control often entails the imposition of consequences, which can vary greatly and encompass a wide range of parental behavior in response to noncompliance with agreed-upon rules and limits. In this regard, research has shown that certain disciplinary techniques, such as the withdrawal of privileges or inductive reasoning, promote appropriate child behavior and prevent misconduct. Conversely, other techniques, such as coercion or physical punishment, are considered counterproductive because they induce aggression, feelings of hostility, and rejection. Baumrind (2012) asserts that parental behavioral control, while it can sometimes be a form of positive parenting as many authors have suggested, can also have negative consequences when coercive strategies or punishment are used as methods of power assertion.

On the other hand, regarding parental psychological control, studies have linked it to physical aggression in childhood and adolescence (Chen et al., 2020), relational aggression (Blossom et al., 2016), reactive aggression (Fite et al., 2021), and proactive aggression (Rathert et al., 2011). It has also been shown that this type of parental control increases the likelihood of children and adolescents engaging in bullying behavior (Yu et al., 2019). However, these studies are fewer in number, and their results have also shown some inconsistency (Kuppens et al., 2009).

In addition to primary studies, some review papers have explored the relationship between parental control and aggression in childhood and adolescence. For example, Rothbaum and Weisz (1994) conducted a quantitative and general analysis of the associations between parental behavior and externalizing behavior in children. Among their conclusions, they reported a positive relationship between coercive and punitive strategies used by responsible adults and these types of behavior in their children. Other meta-analytic studies have associated corporal punishment with high levels of aggression and delinquency (e.g., Gershoff & Grogan-Kaylor, 2016). In the research by Hoeve et al. (2009), they reviewed the associations with delinquency (including aggressive behavior) and concluded a positive relationship with behavioral and psychological parental control, as well as a negative relationship with parental supervision. For his part, Pinquart (2017) identified in his study that the strongest relationships between externalizing behavior and parenting strategies were found for psychological control and physical punishment. Some authors have specifically examined the effects of parental psychological control, concluding that there is a positive association between this type of parenting strategy and general behavioral problems (Yan et al., 2020), particularly with relational aggression (Kuppens et al., 2013).

It is interesting to note that one of the most extensively studied moderators in the relationship between parental control and aggression in childhood and adolescence has been gender, both of the subject and the parent. However, the results of these studies have also been unclear. For example, the meta-analysis by Rothbaum and Weisz (1994) indicated that the impact of parental control on aggression was stronger among girls than boys, while other recent research has found no evidence of the moderating role of adolescent gender (Kuppens et al., 2013; Pinquart, 2017). Similarly, the evidence regarding whether adolescent aggression is more strongly related to maternal or paternal psychological control is also inconsistent (Beliveau et al., 2023).

Lastly, although these review studies have provided valuable conclusions, they have rarely distinguished within the same work the impacts of behavioral and psychological parental control on aggressive behavior in childhood and adolescence (Guo et al., 2023). Therefore, it is considered that an updated review of the literature integrating the effects of both behavioral and psychological parental control on

different types of aggression (overt, relational, proactive, reactive, bullying) could contribute not only to refining the concepts of both types of control but also to clarifying some of the inconsistencies that still remain. From this perspective, such inconsistencies may stem from the fact that both the explanatory theories and the moderators acting in these relationships are specific to the different types of aggression. Furthermore, it is considered that in the later years of childhood and adolescence, on the one hand, the dimensions of parental control may become more differentiated, and on the other hand, aggressive behavior tend to stabilize and become more discriminated not only by form but also by function. This period is also deemed relevant for bullying, making a review focused on this stage more conducive to understanding these relationships.

Objectives of the Present Review

In this context, the main objective of this systematic review is to evaluate the nature of the association between parental control and aggression in children and adolescents aged 8 to 18 years by synthesizing the knowledge published on this topic over the last five years. The aim is to determine whether different types of parental control, behavioral or psychological, constitute risk factors for various categories of aggression in children (overt, relational, proactive, reactive, bullying), taking into account the gender of both the responsible adult figure and the young individual. Additionally, the review seeks to expand the current knowledge base by identifying other potential moderators of this relationship in each case.

To achieve these objectives, a series of research questions were formulated:

1. How are behavioral and psychological parental control currently conceptualized? What measurement instruments are used to evaluate the different subtypes of parental control?
2. What differential relationships exist between the various subtypes of parental control and each specific category of aggression considered? Are these relationships different when the parent is the mother or the father, and for sons and daughters? Can potential moderators of the relationship between parental control and aggression in children be suggested based on the results of the studies analyzed in each case?
3. Can the findings from the analyzed studies suggest the next steps in research on the effects of parental control on aggression in children and adolescents?

METHODOLOGY

The research design involved a systematic review (SR) based on the PRISMA guidelines (Moher et al., 2009; Page et al., 2021). The study was conducted in five phases: (1) Selection criteria for studies; (2) Definition of the search strategy; (3) Data extraction; (4) Bias assessment; and (5) Data synthesis and analysis. The entire process was carried out using the Rayyan tool (Ouzzani et al., 2016), which facilitates data collection and review.

It is important to note that, due to the high heterogeneity observed in the criterion variables, it was decided, following Ruiz-Hernández et al. (2018), to perform a narrative synthesis of the results, as conducting a meta-analysis was not feasible.

Study Selection Criteria

The inclusion criteria for the literature search were as follows: (1) Quantitative studies with a cross-sectional or longitudinal design; (2) The study must include parental psychological control (mother or father) or parental behavioral control (mother or father) as a predictor variable; (3) The study must include child or adolescent aggression as a criterion variable; studies considering externalizing behavior as a criterion variable were also included, as this encompasses aggression among other behavior; (4) Participants must be between the ages of 8 and 18; (5) The study must be written in English or Spanish; (6) The study must have been published in peer-reviewed scientific journals between January 1, 2018, and December 31, 2023; (7) Studies must be published in open-access journals to allow full access to the article.

Search Strategy

In January 2024, a comprehensive literature search was conducted for studies published between 2018 and 2023 across the databases Web of Science, Scopus, SciELO, PsycInfo, Medline, PubMed, ERIC, and PsycArticles. The search strategy used combinations of “AND” and “OR” connectors in titles, abstracts, and keywords. The search terms included both English and Spanish iterations:

In English:

“Parental behavioral control” OR “Parental behavioural control” OR “Parental psychological control” OR “Parenting control dimension” AND “Aggression” OR

“Aggressive behavior” OR “Aggressive behaviour” OR “Bullying” OR “Externalizing behavior” OR “Externalising behavior” AND “Children” OR “Adolescents” OR “Adolescence.”

In Spanish:

“Control comportamental parental” OR “Control conductual parental” OR “Control psicológico parental” AND “Agresión” OR “Comportamiento agresivo” OR “Bullying” OR “Acoso escolar” OR “Comportamiento externalizante” OR “Problemas de comportamiento” AND “Niñ*” OR “Adolescentes” OR “Adolescencia.”

The same search strategy and equations were consistently applied across all selected databases to ensure uniformity. Terms related to parental control, aggression, and externalizing behavior in children and adolescents were included. The combination of terms and connectors “AND” and “OR” was identical across all searches to guarantee comparability of results among the various platforms consulted.

Data Extraction

Data extraction involved three independent reviewers who examined titles, abstracts, and keywords, resolving disagreements by consensus. In a second phase, selected studies were independently reviewed by two evaluators, who discussed discrepancies. If no agreement could be reached, a third evaluator intervened to determine whether the study met the inclusion criteria.

Bias Assessment

Study quality was assessed using a checklist addressing the following questions: Are the research objectives clearly specified?; Was the study designed to achieve these objectives?; Are the techniques used clearly described and their selection justified?; Are the variables adequately measured?; Are the data collection methods adequately described?; Is the purpose of the data analysis clear?; Are the statistical techniques used to analyze the data adequately described and justified?; Are negative results (if any) reported?; Do researchers discuss any issues with the validity/reliability of their findings?; Are all research questions adequately answered?; and How clear are the links between the data interpretation and the conclusions?

Data Synthesis and Analysis

Selected studies were coded into two summary tables based on the study design (longitudinal or cross-sectional). The tables included the following information for each study: Authors, publication date, study location, objective, sample characteristics (gender distribution, retention rate, age range), type of parental control and its denomination, measurement instruments, informants of parental control, criterion variable (externalizing behavior, aggression and its subtype, measurement instruments, and informants), moderator variables, and key findings relevant to this review's objectives. For longitudinal studies, the duration was also recorded.

RESULTS

Figure 1 shows the outcomes of each stage of the review process. Using the described search strategy, a total of 1,080 publications were initially identified. Subsequently, 319 studies were excluded as duplicates. A further 726 studies were eliminated during the review of the remaining works for various reasons, such as sample characteristics, research design, or topics unrelated to the investigation. Of the remaining articles, 35 were retained after applying inclusion and exclusion criteria through the review of titles, keywords, and abstracts. These were subjected to a full critical reading, resulting in the exclusion of seven studies. Table 1 presents the excluded articles and the reasons for their exclusion. The process concluded with the selection of 28 articles included in this analysis.

Figure 1

Selection process (following the PRISMA guidelines; Moher et al., 2009; Page et al., 2021)

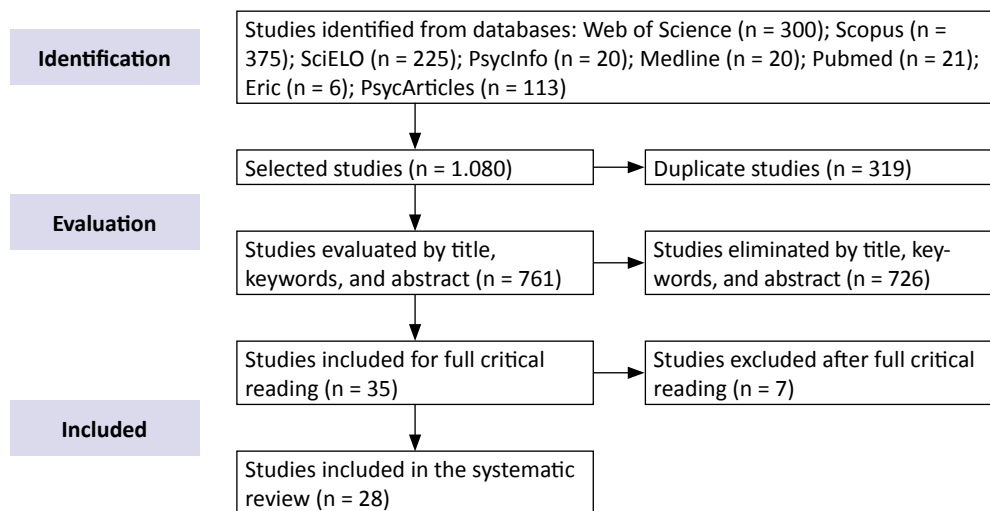


Table 1

Excluded studies

Authors/Date	Reason for Exclusion
1. Calders et al. (2020).	Control was not the predictive variable but appeared in the article as a characteristic of the styles used as predictive variables.
2. Cole et al. (2021).	Psychological control was used as a mediating variable rather than a predictive variable.
3. Del Puerto-Golzarri et al. (2022).	Control was not the predictive variable but appeared in the article as a characteristic of the styles used as predictive variables.
4. Li et al. (2021).	Did not use psychological control as a variable; instead, it studied physical punishment.
5. McClain et al. (2020).	Psychological control was used as a moderating variable rather than a predictive variable.
6. Peets et al. (2022).	In the first year of the longitudinal study, participants were six years old. Although they were 8–9 years old in the final year, most of the study occurred before preadolescence.
7. Yang et al. (2023).	Control was not the predictive variable but appeared in the article as a characteristic of the styles used as predictive variables.

The annexed tables summarize the findings of the longitudinal and cross-sectional studies included in this review. Of the analyzed articles, 16 were longitudinal, encompassing a total sample of 11069 subjects, while 12 were cross-sectional, with a total sample of 13334 subjects. Most studies involved a gender-homogeneous sample. The age range covered 8 to 18 years, representing preadolescence, early adolescence, middle adolescence, and late adolescence. It should be noted that parental behavioral control was measured using different terms, concepts, and evaluation tools. Moreover, in most cases, parental control was examined alongside other predictive variables, and some studies included moderating variables.

It is also worth mentioning that in some studies, the criterion variable was externalizing behavior, which includes aggression and other behavior such as delinquency or rule-breaking, depending on the study. Among studies that considered aggression as the criterion variable, some focused on general aggression, while others examined specific types.

Concept and Measurement of Parental Control

As shown in the annexes, some of the reviewed articles simultaneously analyzed the effects of psychological and behavioral parental control (Di Giunta et al., 2022; Fuentes-Balderrama et al., 2020; Guo et al., 2023; Houtepen et al., 2019; Lansford et al., 2018; Selçuk et al., 2022), with three of them being longitudinal. Of the remaining studies, 14 (Ahemaitijiang et al., 2021; Bai et al., 2020; Basili et al., 2021; Chen & Cheng, 2020; Chen et al., 2020; Huey et al., 2020; Kochanova et al., 2021; Laird & Frazer, 2020; León del Barco et al., 2019; Metro et al., 2019; Safdar & Khan, 2019; Tian et al., 2019; Van Heel et al., 2019; Lin et al., 2022, with eight being longitudinal) focused on the effects of psychological control, and six on behavioral control (Álvarez-García et al., 2019; Rothenberg et al., 2020a; Rothenberg et al., 2020b; Rothenberg et al., 2020c; Yang et al., 2022; Vrolijk et al., 2023), with all but one being longitudinal.

Regarding the concept of parental psychological control, 88.5% of the articles were based on Barber's (1996) definition or on definitions by other authors derived from Barber's concept (e.g., Silk et al., 2003; Soenens et al., 2004). Psychological control was described as a coercive, passive-aggressive, and intrusive type of control characterized by hostility toward adolescents, often manifested through covert strategies such as invalidating feelings, inducing guilt, or creating environments where acceptance depends on the adolescent's behavior. Most measurement tools were scales (or subscales of broader scales) based on Barber's (1996) proposals, either translated, adapted, or developed by the authors themselves. Examples include the Psychological Control Scale – Youth Self-Report (Barber, 1996), the

Parental Psychological Control Questionnaire (PPCQ) (Cheng, 2014), and subscales from the Psychological Control and Autonomy Granting Scale (Silk et al., 2003), among others.

Only one study used an observational measure (also based on Barber's characteristics of psychological control) during a parent-child discussion task in a controlled setting, coded using an adapted Likert scale from the Minnesota Longitudinal Study of Parents and Children (Sroufe et al., 2005). This was the study by Ahemaitijiang et al. (2021), conducted with preadolescents.

There was less consensus regarding the concept of parental behavioral control and the terminology used for this variable. Only a few works (Di Giunta et al., 2022; Guo et al., 2023; Selçuk et al., 2022) referred to Barber's (1996) definition distinguishing it from psychological control. Other authors (e.g., Rothenberg et al., 2020a; Rothenberg et al., 2020b; Rothenberg et al., 2020c) conceptualized it as parental efforts to monitor their children's activities, communicate clear expectations, and redirect behavior.

The authors Lansford et al. (2018) highlight the emphasis on complete obedience from children, distinguishing it from other parental behavior such as monitoring (knowing with whom the child spends time or limiting the teenager's activities). However, Yang et al. (2022) and Kapetanovic et al. (2020) argue that behavioral control includes parents' active attempts to monitor their children (even using the term parental monitoring), soliciting information (referred to as parental solicitation), tracking activities, and controlling adolescent behavior through rule-setting. For Vrolijk et al. (2023), behavioral control is a form of monitoring in which parents require children to keep them informed and ask permission about their unsupervised free time, without necessarily providing further guidance or feedback, thus distinguishing it from solicitation, which they consider a different form of parental monitoring. Similarly, Fuentes-Balderrama et al. (2020) refer to it as imposition, describing parental behavior used to punitively dictate beliefs and behavior to limit or eliminate undesirable behavior, regardless of the child's desires and needs. Meanwhile, Houtepen et al. (2019) argue that parental behavioral control is similar to the control exercised by parents who support autonomy, by setting clear rules for the child's behavior (even using the term support for autonomy). Authors Cui & Lan (2020) define it as a form of harsh parenting discipline, characterized by higher levels of power assertion, also including psychological control.

Furthermore, a variety of instruments are used in the articles to measure behavioral control. The most common has been the parental behavioral control subscale from the Parental Acceptance-Rejection/Control Questionnaire-Short Form (Rohner, 2005), both in its versions for parents and adolescents (Di Giunta et al., 2022; Lansford et al., 2018; Rothenberg et al., 2020a; Rothenberg et al.,

2020b; Rothenberg et al., 2020c). In contrast, Vrolijk et al. (2023) and Kapetanovic et al. (2020) used the Dutch version of the scale developed by Stattin and Kerr (2000), in versions for adolescents and/or parents; Fuentes-Balderrama et al. (2020) used a shortened version of the Parental Practices Scale by Andrade and Betancourt (2008), for parents. Only Houtepen et al. (2019) used another subscale from the same scale (Leuven Adolescent Perceived Parenting Scale (LAPPS), Soenens et al., 2004) used to measure psychological control. Guo et al. (2023) employed the Parental Control Questionnaire developed by Wang et al. (2007; to measure behavioral control, the subscales of parental solicitation, and parental restriction), an instrument completed by adolescents. The Dimensions of Parenting Style Questionnaire (Álvarez-García et al., 2016; an adaptation of the scale developed by Oliva et al., 2007) was completed by adolescents in the study by Álvarez-García et al. (2019). Finally, in the research by Selçuk et al. (2022), the Parental Solicitation and Parental Rules Scales (Kerr & Stattin, 2000) were used, completed by mothers and adolescents.

Effects of Parental Control on Adolescent Aggression and Moderating Variables

A key objective of this work was to investigate the effects of both forms of parental control on externalizing behavior, and more specifically, on aggression in preadolescents and adolescents. As shown in the tables in the annexes and in Table 2, from the articles reviewed, 46.4% used externalizing behavior as the criterion variable. Among these studies, nine analyzed psychological control as a predictor variable (Bai et al., 2020; Basili et al., 2021; Fuentes-Balderrama et al., 2020; Kochanova et al., 2021; Laird and Frazer, 2020; Lansford et al., 2018; León del Barco et al., 2019; Selçuk et al., 2022; Van Heel et al., 2019), and eight (Álvarez-García et al., 2019; Fuentes-Balderrama et al., 2020; Kapetanovic et al., 2020; Lansford et al., 2018; Rothenberg et al., 2020a; Selçuk et al., 2022; Vrolijk et al., 2023) studied the effects of parental behavioral control.

Table 2
Articles Reviewed Based on the Predictor and Criterion Variables

	Externalizing Behavior	Aggression
Psychological Control	(1) Lansford et al. (2018)* (6) Laird y Frazer (2020) (11) Basili et al. (2021) (19) León del Barco et al. (2019) (22) Bai et al. (2020) (25) Fuentes-Balderrama et al. (2020)* (28) Selçuk et al. (2022)*	(2) Meter et al. (2019) (3) Van Heel et al. (2019) (4) Chen et al. (2020) (5) Huey et al. (2020) (10) Ahemaitjiang et al. (2021) (12) Di Giunta et al. (2022)* (13) Lin et al. (2022) (16) Guo et al. (2024)* (18) Houtepen et al. (2019)* (20) Safdar y Khan (2019) (21) Tian et al. (2019) (24) Chen & Cheng (2020) (27) Kochanova et al. (2021)*
Behavioral Control	(1) Lansford et al. (2018)* (7) Rothenberg et al. (2020a) (8) Rothenberg et al. (2020b) (15) Vrolijk et al. (2023) (17) Álvarez-García et al. (2019) (25) Fuentes-Balderrama et al. (2020)* (26) Kapetanovic et al. (2020) (28) Selçuk et al. (2022)*	(9) Rothenberg et al. (2020c) (12) Di Giunta et al. (2022)* (14) Yang et al. (2022) (16) Guo et al. (2024)* (18) Houtepen et al. (2019)* (23) Cui y Lan (2020)*

Note. Articles marked with an asterisk (*) are those that studied both parental psychological control and behavioral control as predictor variables, so they appear in both rows.

The results of the reviewed studies consistently showed that parental psychological control was related to higher levels of externalizing behavior in their children. However, this effect was moderated by different variables; for instance, some authors found this relationship only when the externalizing behavior was reported by the parents (Lansford et al., 2018), while others found it only in the case of maternal psychological control, but not paternal (Basili et al., 2021). Regarding gender as a moderator, some authors did not find this moderating effect (Basili et al., 2021; Guo et al., 2023; Van Heel et al., 2019), while others found the effect to be stronger in boys (León del Barco et al., 2019). Other variables analyzed as moderators, but which did not show this conditional effect, were cultural normativity regarding psychological control as parental behavior and parents' beliefs about the effects of such behavior (Lansford et al., 2018), the country of origin and the adolescent's age (León del Barco et al., 2019), self-control (Bai et al., 2020), as well as warmth and legitimacy (Selçuk et al., 2022). Surprisingly, one study (Fuentes-Balderrama

et al., 2020) found that psychological control, but only in the case of fathers, had a negative effect on adolescents' externalizing behavior.

As for the relationship between parental behavioral control and externalizing behavior in children, the results of the studies were less consistent. Some of them did not find significant effects (Fuentes-Balderrama et al., 2020; Lansford et al., 2018; Rothenberg et al., 2020b; Vrolijk et al., 2023). Selçuk et al. (2022) observed a negative association between behavioral control and externalizing problems. Others found significant effects, although depending on certain moderating variables; for example, only in some countries or cultural groups such as Jordan, Sweden, and Thailand (Rothenberg et al., 2020a), or in cultures where parental behavioral control was less normative, and the effects were measured in the same year (Rothenberg et al., 2020b). Neither the parents' gender (Fuentes-Balderrama et al., 2020; Rothenberg et al., 2020b; Vrolijk et al., 2023), nor the informant of parental behavioral control (Vrolijk et al., 2023), nor maternal warmth or adolescents' beliefs about the legitimacy of parental control (Selçuk et al., 2022) were found to moderate the relationship between parental behavioral control and externalizing behavior in preadolescents and adolescents.

The 53.6% of the studies reviewed considered aggression in general as a criterion variable (Ahemaitijiang et al., 2021; Cui & Lan, 2020; Di Giunta et al., 2022; Houtepen et al., 2019; Huey et al., 2020; Lin et al., 2022; Rothenberg et al., 2020c; Tian et al., 2019; Van Heel et al., 2019; Yang et al., 2022), or open aggression (Chen et al., 2020; Safdar & Khan, 2019), relational aggression (Chen & Cheng, 2020; Meter et al., 2019; Safdar & Khan, 2019), reactive aggression (Guo et al., 2023; Kochanova et al., 2021; Safdar & Khan, 2019), or proactive aggression (Guo et al., 2023; Kochanova et al., 2021; Safdar & Khan, 2019) specifically. Among these studies, thirteen analyzed psychological control as a predictor variable (Ahemaitijiang et al., 2021; Chen et al., 2020; Chen & Cheng, 2020; Di Giunta et al., 2022; Guo et al., 2023; Houtepen et al., 2019; Huey et al., 2020; Kochanova et al., 2021; Lin et al., 2022; Metro et al., 2019; Safdar & Khan, 2019; Tian et al., 2019; Van Heel et al., 2019) and six studied the effects of parental behavioral control (Cui & Lan, 2020; Di Giunta et al., 2022; Guo et al., 2023; Houtepen et al., 2019; Rothenberg et al., 2020c; Yang et al., 2022).

The results from the reviewed studies showed a positive relationship between psychological control and general aggression in children (Ahemaitijiang et al., 2021; Cui & Lan, 2020; Houtepen et al., 2019; Huey et al., 2020; Lin et al., 2022); in one of these studies, this relationship was moderated by physiological synchrony in the parent-child relationship (Ahemaitijiang et al., 2021), and this effect was only observed when the synchrony was stronger. In another study, the relationship was not confirmed through a regression that included gender and subject effort control as moderators (Huey et al., 2020), and these moderators were not significant. The

gender of the subject and the parent did not show significant moderators in the same study. However, in the research by Cui & Lan (2020), moderating effects of gender and adolescent determination profile (perseverance and consistency) were observed, such that both paternal and maternal harshness increased aggressive behavior in boys with Profile 1 (low perseverance and consistency) and Profile 3 (high perseverance and consistency). Similarly, Lin et al. (2022) found a moderating effect of adolescent self-esteem in the relationships between psychological control and aggression, specifically for adolescents with low self-esteem, where parental psychological control predicted peer deviance and increased aggression. When the effect of parental psychological control on relational aggression was studied, one of the studies did not find a significant association (Meter et al., 2019), while the other found a significant relationship mediated by children's normative beliefs about relational aggression, with this indirect effect being evident only for girls (Chen & Cheng, 2020). In the latter study, the parent's gender was not shown to be a moderator. Among the articles that analyzed the relationship between psychological control and other types of aggression, Chen et al. (2020) observed an indirect effect on physical aggression through impulsivity, and Guo et al. (2023) found an effect on reactive aggression.

On the other hand, only five studies analyzed the effects of parental behavioral control on aggression in preadolescents and adolescents (Di Giunta et al., 2022; Guo et al., 2023; Houtepen et al., 2019; Rothenberg et al., 2020c; Yang et al., 2022). One of them showed that higher parental behavioral control at age 9 predicted higher aggressive behavior at age 10, and this effect was not moderated by culture. Conversely, another study found a negative transactional dyadic relationship between maternal behavioral control and child aggression from ages 11 to 15; however, the relationship between paternal control and adolescent aggression was also negative but unidirectional (adolescent aggression did not predict subsequent paternal control). In this study, the subject's gender did not have a moderating effect. A third study showed no relationship between parental behavioral control and child aggression. Meanwhile, Di Giunta et al. (2022) observed that paternal control was negatively associated with young people's self-efficacy beliefs in managing anger, which in turn was associated with lower aggressive behavior in the youth. Lastly, Guo et al. (2023) showed that parental behavioral control positively predicted reactive aggression and proactive aggression in 7th-grade students, with no gender differences.

DISCUSSION AND CONCLUSIONS

Theoretical and empirical evidence regarding the effects of parenting on children has almost invariably specified two fundamental components of

parenting: support, referring to the affectionate or protective behavior of parents, and control, referring to parental behavior related to regulation and discipline, which can be exercised with varying degrees of sensitivity. While there is broad agreement on the benefits of the first of these dimensions for children, the effects of control have been more controversial. In an attempt to bring more precision to the research on the effects of control, Barber (1996) differentiated between psychological control and behavioral control. The aim of this systematic review was to synthesize the findings from the past five years on the effects of these two dimensions of control on externalizing behavior, specifically aggression in preadolescents and adolescents.

Concept and Measurement of Parental Control

Regarding the conceptualization and measurement of psychological and behavioral parental control, the reviewed articles suggest greater consensus on psychological control than on behavioral control. From this perspective, the distinction between behavioral and psychological control by parents remains promising for resolving part of the complexity that still exists in understanding parental control and its associations with children's aggression. Additionally, it is evident that the terms "psychological control" and "behavioral control" are appropriate because they allow for an understanding of the distinction between parental control of children's psychological world and parental control of adolescent behavior, thus capturing the original differentiation proposed by Schaefer (1965a; 1965b) and Barber (1996). However, following the review, it is necessary to reach greater consensus among authors regarding the concept and measurement of behavioral parental control, as noted by Barber et al. (2005). From this perspective, the need persists to clarify the concept and specify its components (for example, parental knowledge of children's activities and company, monitoring of these activities, rule-setting) and to design, validate, and reach a consensus on measurement tools. Moreover, it is important to consider the form (negotiation, coercion, punishment) and the frequency and intensity of parental efforts to enforce their expectations, as this could help explain the differences in study results concerning the association between behavioral parental control and aggressive behavior in adolescent children.

Effects of Parental Control on Adolescent Aggression and Moderating Variables

Psychological

Parental Control

In the past five years, studies have consistently shown that higher psychological parental control can contribute to the development of externalizing behavior, especially aggressive behavior in children, as evidenced by the results. Furthermore, this effect does not appear to be conditioned by the country of origin, the cultural norms surrounding psychological control in the study context, or the age of the adolescent. The only factors that emerge as potential moderators of this relationship are the informant of externalizing behavior in preadolescents and adolescents, physiological synchrony in the parent-child relationship, the adolescent's self-esteem, and their school connection.

Although the effects of psychological parental control on externalizing behavior in children have been less studied than the effects of behavioral control—because some authors have pointed out that psychological control seems to have more marked effects on the emergence of internalizing rather than externalizing problems (Soenens et al., 2010)—several studies and previous reviews had already found associations between this type of psychological control and adolescent conduct problems or antisocial behavior (Batanova & Loukas, 2014; Hoeve et al., 2009; Pinquart, 2017). These effects have been explained by the fact that adolescents try to achieve greater autonomy and independence and may perceive their parents' attempts at psychological control as intrusive and inappropriate, leading them to escape this situation by engaging in externalizing behavior (Galambos et al., 2003). Previous studies included in this review also found specific relationships between parental psychological control and different types of aggression. For example, Kuppens et al. (2009) observed specific associations between parental physical and psychological control and children's participation in physical and relational aggression, respectively. The effects of psychological control on relational aggression have been explained by the fact that children of psychologically controlling parents learn coercive and aggressive behavior from their parents and later engage in similarly relationally aggressive behavior with their peers (e.g., Kuppens et al., 2013). However, previous work has also demonstrated significant links between psychological control and both forms of aggression among children (Nelson & Crick, 2002; Nelson et al., 2013).

Regarding potential variables that condition the relationship between psychological parental control and adolescent externalizing behavior/aggression, on one hand, the review confirms the idea that this effect appears to be independent of culture and other individual characteristics of adolescents, as noted by Barber

et al. (2005). Special mention should be made of the frequency with which gender, whether of the parent or adolescent, has been studied as a moderator. The authors cited, Barber et al. (2005), conclude that the lack of differences in outcomes with fathers versus mothers, and with male versus female subjects, further emphasizes that the fundamental nature of the relationship between psychological parental control and adolescent externalizing behavior is the intrusiveness experienced by the adolescents. The review indicates that the results from the past five years on the relevance of the parent or adolescent's gender in this relationship are far from clear, being significant in some studies and irrelevant in others. However, when these effects manifest, it appears that, regarding the parent's gender, maternal psychological control tends to have a greater impact than paternal control. In relation to the adolescent's gender, the effect seems more pronounced in males, except in the case of relational aggression, where the impact is greater in females.

Therefore, while the evidence suggests that experiencing psychological control is generally harmful to human development, it is essential to clarify its specific effects on the different components of externalizing behavior and various types of aggression, using varied methodologies. It is also crucial to conduct longitudinal analyses that explore the role of both parent and adolescent gender in large samples, which would allow for a transactional analysis between psychological parental control and adolescent externalizing behavior, either confirming or refuting the effects suggested by this research. Finally, it would be pertinent to investigate other potential moderating variables, such as those identified in this systematic review, such as the informant of adolescent behavior and physiological synchrony in the parent-child relationship.

Parental Behavioral Control

In line with the lesser consensus in the conceptualization and measurement tools of parental behavioral control compared to psychological control, found in this review, the results in the last five years regarding the associations of this type of control with externalizing and/or aggressive behavior in children have been less consistent. Most of these studies found no significant effects. In studies where such effects did appear, they were sometimes positive effects on externalizing behavior, and only in certain cultures such as Jordan, Sweden, or Thailand, sometimes coinciding with cultures where parental behavioral control was less normative (although in the case of effects on aggression, these did not depend on culture), and sometimes negative effects on aggression. Neither the gender of the parents nor that of the adolescents, nor the informant of parental behavioral control conditioned these effects.

In a prior review by González-Cámara et al. (2019), it was concluded that to determine whether parental behavioral control can be beneficial or harmful to children (in terms of externalizing behavior, or more specifically aggression), it is necessary to focus on the concept and tools used to measure this type of control rather than culture or the normative nature of behavioral control within a culture. In fact, as in our review, when behavioral control is understood as monitoring and setting norms, it seems to be consistently beneficial; however, when control includes punishment and coercion, it has harmful effects on children. It is also important to note that some authors have found that the relationship between parental behavioral control, particularly that characterized by punitive behavior, and adolescent aggression is curvilinear, meaning that both low and excessive levels of control have a more positive effect on adolescent aggression (Van Heel et al., 2019).

On the other hand, Barber et al. (2005), understanding behavioral control as monitoring and knowledge of adolescent activities, found a negative relationship with antisocial behavior in children, with a clear differentiation by gender; thus, they showed that mothers' behavioral control, more than fathers', is consistently associated with adolescent antisocial behavior, particularly in the mid-adolescence years. These results have not been confirmed by those found in this review of studies from the past five years. In addition to the differences in conceptualization and instruments, which were already anticipated previously, there may be that, throughout the 21st century, the gap between fathers and everyday family management problems has decreased, and fathers' knowledge of their children's friends and activities has increased, which could have brought the role of behavioral control of fathers and mothers closer.

In any case, it seems clear that, regarding behavioral control, one should begin by attempting to conceptualize this type of control and the tools to measure it. Furthermore, it is necessary to differentiate between the various components (rule-setting, monitoring, punishment, or other types of control) to analyze which of them may be beneficial and which may be harmful to children and clarify the type of relationship, linear or curvilinear, of each component. Once the concept has been agreed upon, it would be necessary to analyze the potential moderating effects of the parent's and adolescent's gender, the latter's age, as well as culture, on the relationship between each component of parental behavioral control and externalizing behavior, specifically aggression in children.

The systematic review of the effects of parental control on aggressive behavior in adolescents has important implications for education, particularly in the school context. The evidence highlights how psychological and behavioral control dynamics in the home can significantly influence students' behavior, affecting their interactions with peers, teachers, and the school environment. Parental psychological control,

by fostering externalizing behavior such as aggression, underscores the need for educational interventions aimed at strengthening students' socioemotional skills and promoting positive communication between families and schools. On the other hand, when behavioral control is exercised consistently and appropriately, it can be a protective factor that encourages rule adherence and the development of prosocial behavior. In this context, schools can play a crucial role in parent training and promoting parenting styles that foster an emotionally healthy environment, thereby contributing to students' well-being and academic success.

Study Limitations

While this review has demonstrated the relevance of parental control, both psychological and behavioral, in the emergence or development of externalizing behavior, particularly aggression, during the preadolescent and adolescent stages, it also presents some limitations. First, the search was limited to a specific time window (2018–2023), two languages (English and Spanish), a few specific keywords, and additional inclusion criteria. Therefore, some relevant studies may not have been considered. However, it is noted that the variety of databases considered ensures a sufficiently broad search. Second, this work was a systematic review, not a meta-analysis as initially planned, which would have required a single criterion variable (a relevant aspect given the scarcity of studies specifying the type of externalizing behavior) and greater homogeneity in measurement instruments. Third, the study considered preadolescence and adolescence as a single age range, as most of the reviewed research was longitudinal, and only one included age as a moderating variable. Therefore, future studies should address this moderating variable, as puberty and the specific physical and psychological characteristics associated with it may play an important role. Finally, it must also be considered that some studies gathered information on parental control from the adolescents' perspective (perceived control) and others from the parents' perspective.

Conclusions and Future Research

This review has highlighted several gaps that future studies could explore to enhance the body of knowledge on this topic. First, the conceptualization and measurement tools of parental behavioral control are unclear, and different authors use the same term to refer to different aspects of control. It is a priority for future research to reach a consensus on the nomenclature, concept, and components of parental control (rule-setting, monitoring, knowledge of activities

and friendships, imposition, punishment, coercion, etc.), as well as on their measurement instruments. Second, many studies consider externalizing behavior as a criterion variable, although it consists of different dimensions that may be affected by different factors in various ways. Therefore, future studies could aim to simultaneously assess, using the same methodology, the specific relationships between psychological and behavioral parental control and the components of externalizing behavior (rule-breaking, aggression, and delinquency), as well as the different subtypes of aggression (overt and relational, proactive and reactive). Third, the various conceptualizations, measurement tools, informants, and methodological designs have not allowed for a clear determination of the relevance of a number of moderating variables such as the gender of the parent and the child, the adolescent's age, and culture-related variables, and the normative nature of control in those cultural groups. This review allows us to hypothesize about these issues, but future well-designed studies must confirm these hypotheses.

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ANNEXES

Table 1
Included Longitudinal Studies

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(1) Lansford et al. (2018); China, Colombia, Italy, Jordan, Kenya, Philippines, Sweden, Thailand, and the United States	Study whether the cultural normativity of parental beliefs and behavior moderates the relationships between these parental behavior and child adaptation.	1,298 participants (51% girls); 91% retention rate	8 – 13 years	Psychological and behavioral parental control	Psychological Control and Autonomy Granting (Silk et al., 2003; 3 items); adolescents. Parental Acceptance- Rejection/Control Questionnaire- Short Form (Rohner, 2005; 5 items); parents.	Externalizing Behavior	<i>Child Behavior Checklist</i> (CBCI; Achenbach, 1991; 33 items), madres y padres.	Cultural normativity of parental beliefs and behavior	Psychological control predicted externalizing behavior when reported by parents. Cultural normativity did not moderate this relationship. Behavioral parental control showed no significant relationships with externalizing behavior.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(2) Meter et al. (2019); United States	Study (a) whether parental psychological control predicts future social aggression in parents and adolescents, (b) whether parents' social aggression is related to their use of psychological control with their children, (c) whether parents' and adolescents' social aggression is associated with changes in each other's social aggression over time, and (d) changes in psychological control.	174 subjects (52% girls); 67%	15–17 years old at the beginning of the four-year study	Parental psychological control; parental psychological control	Subscales of Guilt Induction (5 items), Love Withdrawal (3 items), and Invalidating Feelings (2 items) from the Parental Psychological Control Scale (Barber, 1996; Nelson et al., 2006); parents	Relational aggression	Adapted version of the Social Behavior Scale (Crick, 1996; 3 items); teacher	No	Parental psychological control did not predict children's relational aggression over time.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(3) Van Heel et al. (2019); Belgium	Examine the transactional and indirect associations between parental control (proactive, punitive, and psychological), personality, and two subtypes of externalizing problem behavior (rule-breaking and aggressive behavior), using a three-wave longitudinal design throughout adolescence.	1,116 subjects (49% girls); 79%	11 – 19 years	Parental psychological control	Parental Regulation Scale (PRS-YSR; Barber, 2002; 12 items); Parental Behavior Scale – Short Form (PBS-S; Van Leeuwen et al., 2013; 4 items); Barber's Psychological Control Scale (Barber, 1996; 8 items); and Verbal Hostility Scale (Nelson & Crick, 2002; 6 items); mothers and fathers.	Externalizing problem behavior (aggression and rule-breaking)	Youth Self Report (YSR; Achenbach, 1991; "aggressive behavior," 17 items, and "rule-breaking," 14 items); adolescents.	Gender	No mediating effects of adolescent personality were found in the relationships between parental control and externalizing behavior. Similarly, no mediating effects of parental control were observed in the relationships between adolescent personality and externalizing problems. Rule-breaking behavior was positively associated with proactive, punitive, and psychological parental control. Aggressive behavior was also positively associated with proactive, punitive, and psychological parental control.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(4) Chen et al. (2020); Guangdong (China)	Analyze the reciprocal associations between parental psychological control, child impulsivity, and child physical aggression in a one-year longitudinal study.	689 subjects (44,1% girls);	8 – 12 años	Control psicológico parental	Parental Psychological Control (Barber 1996; 8 items); preadolescentes.	Agresión física	Buss-Warren Aggression Questionnaire (BWAQ; Maxwell 2008; 8 items); preadolescentes.	No hay	Se encontró un efecto indirecto longitudinal del control psicológico de los padres sobre la agresión física infantil a través de la impulsividad infantil. Sin embargo, el efecto indirecto inverso a través de la impulsividad no fue evidente.
(5) Huey et al. (2020); Lituania	Study the bidirectional longitudinal effects of parental support and psychological control on adolescents' internalizing and externalizing problems, including self-esteem as a longitudinal mediator and adolescent gender as a moderator of direct and indirect relationships.	917 subjects (51,4% girls)	14 – 17	Parental psychological control	Psychological Control Scale – Youth Self-Report (Barber, 2008; 8 items); preadolescentes.	Buss-Warren Aggression Questionnaire (BWAQ; Maxwell 2008; 8 items); preadolescentes.	None	A longitudinal indirect effect of parental psychological control on child physical aggression through child impulsivity was found. However, the reverse indirect effect through impulsivity was not evident.	En cada intervalo de tiempo, un mayor control psicológico se asoció con aumentos posteriores en agresión, y viceversa. La autoestima no medió estos efectos y tampoco fueron moderados por el género del sujeto o del progenitor.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(6) Laird & Frazer (2020)	Provide evidence of whether negative emotional reactions or psychological reactance mediate the relationships between parental psychological control and subsequent externalizing problem behavior.	242 subjects (50.8% girls); 64% retention rate	14–17 years	Parental psychological control; Psychological control	<i>Psychological Control Scale – Youth Self-Report</i> (Barber, 2000)	Conductas externalizantes; comportamiento antisocial	<i>Problem Behavior Frequency Scale</i> (Farrell et al., 2000; 27 items), adolescentes	No hay	El control psicológico parental (reportado por adolescentes) se asoció positivamente con el comportamiento antisocial en el T1. El control psicológico parental (reportado por padres) se asoció positivamente con el comportamiento antisocial en el T3.
(7) Rothenberg et al. (2020a); Colombia, Italy, Jordan, Kenya, Philippines, Sweden, Thailand, and the United States	Study the effects of parental warmth and behavioral control on the trajectories of children’s externalizing and internalizing behavior across 12 cultural groups.	1,298 subjects (51% girls; 79% retention rate)	8–14 years	Parental Behavioral Control	<i>Parental Acceptance-Rejection/Control Questionnaire–Short Form</i> (Rohner, 2005; 5 items); mothers, fathers, and adolescents.	Externalizing Behavior	<i>Child Behavior Checklist</i> (CBCL; Achenbach, 1991; 33 items), mothers and fathers. <i>Youth Self-Report (YSR; Achenbach, 1991; 30 items); adolescents</i>	Cultural group	Parental behavioral control was associated with the emergence of externalizing problems in three cultural groups studied (Jordan, Sweden, and Thailand) and persisted after the age of 8 in Jordan and Sweden.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(8) Rothenberg et al. (2020b); China, Colombia, Italy, Jordan, Kenya, Philippines, Sweden, Thailand, and the United States	Investigate the bidirectional relationships between parental warmth and behavioral control and children's externalizing and internalizing behavior. Explore whether these associations differed between mothers and fathers and across cultures with varying normative levels of warmth and parental control.	1,315 subjects (51% girls); 93%.	8–13 years	Parental Behavioral Control	Parental Acceptance-Rejection/Control Questionnaire-Short Form (Rohner, 2005; 5 items); mothers, fathers, and adolescents.	Externalizing Behavior	Child Behavior Checklist (CBCL; Achenbach, 1991; 33 items); mothers and fathers. Youth Self-Report (YSR; Achenbach, 1991; 30 items); adolescents.	Cultural Normativity of Warmth and Behavioral Control; Parent Gender	No significant effects of parental behavioral control on children's subsequent externalizing behavior were found, nor differences based on the cultural normativity of warmth and behavioral control or between mothers and fathers. However, significant effects were observed for externalizing behavior measured in the same year, particularly in cultural groups where parental control was less normative.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(9) Rothenberg et al. (2020c); China, Colombia, Italy, Jordan, Kenya, Philippines, Sweden, Thailand, and the United States	Study the bidirectional relationships between parental warmth and behavioral control and children's aggression and rule-breaking across 12 cultural groups (9 countries).	1,298 subjects (51% girls); 82% retention rate	8 – 13 years	Parental Behavioral Control	Parental Acceptance-Rejection/Control Questionnaire-Short Form (Rohner, 2005; 5 items); mothers, fathers, and adolescents.	Aggression	Child Behavior Checklist (CBCL; Achenbach, 1991; 20 items), mothers and fathers. Youth Self-Report (YSR; Achenbach, 1991; 19 items); adolescents	No	The only effect of parental behavioral control on adolescent aggression found was that higher parental behavioral control at age 9 predicted greater aggressive behavior at age 10 across all cultures.
(10) Ahe-maijiang et al. (2021); China	Examine the relationships between parental emotion-related behavior (psychological control and parental emotion dysregulation) and child aggression, as well as the moderating role of physiological synchrony between parents and children in these relationships.	89 subjects (45% girls); 82% retention rate	7 – 12 years	Parental Psychological Control	Observation of parents and children during a discussion task using the Minnesota Longitudinal Study of Parents and Children scale (Sroufe et al., 2005); observers.	Aggression	Child Behavior Checklist (CBCL; Achenbach, 1991; 20 items), parents.	Physiological Synchrony in Parent-Child Relationships	For children with stronger physiological synchrony with their parents, parental psychological control positively predicted child aggressive behavior.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(11) Basili et al. (2021); Italy, Colombia and United States.	Analyze the dyadic and cumulative effects of maternal and paternal psychological control on adolescents' antisocial behavior and anxiety-depressive symptoms in three countries.	376 subjects (47% girls, evenly distributed across the sample); 78.5%	13 – 16 years	Parental Psychological Control	Adapted version of the Psychological Control and Autonomy Granting Scale (Silk et al., 2003; 8 items); mothers and fathers	Antisocial Behavior	Youth Self-Report (YSR; Achenbach, 1991; 11 items); adolescents.	Gender of subject and parent; Country of origin	Significant positive direct associations were found between maternal psychological control, but not paternal, and adolescents' antisocial behavior, regardless of the country of origin. This effect did not vary based on the gender of the adolescent.
(12) Di Giunta et al. (2022); Italy	Investigate whether adolescents' regulation of specific negative emotions and self-efficacy beliefs to manage these emotions mediate the relationship between parental rejection and control and adolescents' aggressive behavior and depressive symptoms.	103 subjects (43% girls); 99%	15,5 - 16,7 years	Parental Psychological and Behavioral Control	The Parental Acceptance-Rejection/Control Questionnaire-Short Form (PARQ/Control-SF; Rohrer, 2005; 17 items); adolescents	Aggressive Behavior	Child Behavior Checklist (CBCL; Achenbach, 1991; 20 items), family; Youth Self-Report (YSR; Achenbach, 1991; 5 items); adolescents	None	Parental control was negatively associated with adolescents' self-efficacy beliefs for managing anger, which in turn was associated with lower aggressive behavior. Maternal rejection was positively related to aggressive behavior, which was negatively linked to self-efficacy in anger management.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(13) Lin et al. (2022); Guangdong (China)	Examine the role of deviant peer affiliation (DPA) and self-esteem in the association between parental psychological control (PPC) and aggressive behavior.	438 subjects (48.6% girls); 24, 22%	11 – 15 years	Parental Psychological Control	Parental <i>Psychological Control Scale</i> (Yu et al., 2017; Chinese version; 8 items); <i>adolescents</i>	Aggressive Behavior	Buss-Warren <i>Aggression Questionnaire</i> (Maxwell, 2008; 19 items), <i>adolescents</i> .	Self-Esteem	Deviant peer affiliation mediated the relationship between parental psychological control and aggression, and self-esteem moderated the mediation by deviant peer affiliation. Specifically, for adolescents with low self-esteem, parental psychological control predicted deviant peer affiliation, increasing aggression. No indirect effects were observed for adolescents with high self-esteem.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(14) Yang et al. (2022) United States	Examine the longitudinal associations within families between parental monitoring and adolescent aggression, as well as gender differences (of parents and adolescents) in these associations.	977 subjects (52% girls); 78%	11,5 – 15 years	Parental Behavioral Control; Parental Monitoring	5 previously validated items (Lippold et al., 2014); mothers and fathers separately	Aggression	<i>Child Behavior Checklist (CBCL; Achenbach, 1991; 17 items measuring verbal and relational aggression); mothers and fathers separately.</i>	Gender of subject and parent	Maternal behavioral control and adolescent aggression showed a transactional dyadic relationship from ages 11 to 15, where adolescents with more controlling mothers showed less aggression, and more aggressive adolescents predicted lower maternal control one year later. However, the relationship between paternal control and adolescent aggression was also negative but unidirectional (adolescent aggression did not predict subsequent paternal control).

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(15) Vro- lijk et al. (2023); Netherlands	Examine family- level links between parental monitoring (behavioral control and solicitation) and adolescents' externalizing behavior, controlling for family differences.	497 subjects (43.1% girls); 88%	13 – 18 years	Parental Behavioral Control	Dutch version of the scales (Kerr & Stattin, 2000; Stattin & Kerr, 2000; 5 items); adolescents reporting on mothers and fathers; mothers and fathers	Externalizing Behavior	<i>Child Behavior Checklist (CBCL;</i> <i>Achenbach, 1991;</i> <i>33 items); mothers</i> <i>and fathers Youth</i> <i>Self-Report (YSR;</i> <i>Achenbach,</i> <i>1991; 31 items);</i> <i>adolescents</i>	Parent Gender; Autonomy Support; Informant	For variables reported by adolescents, evidence was found only for the effect of externalizing behavior on maternal behavioral control one year later, with no moderating effect of autonomy support. For variables reported by parents, evidence was found only for maternal behavioral control predicting externalizing behavior one year later, with no moderating effect of autonomy support.

Authors, Date, Location	Objective	Sample (Composition), Retention Rate	Age Range	Type, Label of Parental Control	Measurement, Informants of Parental Control	Criterion Variable	Measurement, Informants of Criterion Variable	Moderating Variables	Relevant Results
(16) Guo et al. (2023); China	Examine the developmental characteristics of proactive and reactive aggression and the role of parental control in China.	484 subjects (47.93% girls); 92.3%	T1: 11.66 years	Parental Control (Psychological and Behavioral)	Parental Control Questionnaire (Wang et al., 2007; subscales: psychological control and behavioral control); adolescents	Reactive and Proactive Aggression	Children completed the Reactive-Proactive Aggression Questionnaire (RPQ; Fu et al., 2009; 23 items)	Gender	Both parental psychological and behavioral control positively predicted reactive aggression among 4th and 7th-grade students, while only behavioral parental control positively predicted proactive aggression in 7th-grade students, with no gender differences.

Table 2
Included Cross-Sectional Studies.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(17) Álvarez-García et al. (2019); Asturias (Spain)	Analyze the effect of family affection-communication and parental behavioral control) (antisocial friendships) on adolescents' antisocial behavior; also analyzing the mediating role of impulsivity and empathy.	3199 subjects (49,2% girls)	11 – 18 years	Parental Behavioral Control, Behavioral Control	Dimensions of Parenting Style Questionnaire (Álvarez-García et al., 2016), adaptation of Oliva et al., 2007); adolescents.	Externalizing Behavior (Antisocial Behavior)	Self-report scale by Álvarez-García et al. (2016, 4 items); adolescents	None	Affection and communication were negatively associated with impulsivity, reducing the likelihood of antisocial behavior. Conversely, behavioral control was positively associated with impulsivity, increasing the likelihood of antisocial behavior.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(18) Houtepen et al. (2019); Netherlands	Estudiar las asociaciones entre el control del esfuerzo, el control psicológico y el apoyo a la autonomía parentales, y los problemas externalizantes (agresión interpersonal y violación de reglas) e internalizantes (problemas depresivos y de ansiedad).	866 sujetos	11 – 16 años	Control psicológico y control conductual parental; Control psicológico parental y Apoyo a la autonomía	<i>Leuven Adolescent Perceived Parenting Scale</i> (LAPPS; Soenens et al. 2004), <i>Control Psicológico Parental</i> (16 ítems), adolescentes para padres y madres; Apoyo a la autonomía (5 ítems), adolescentes para los padres.	Agresión	<i>Antisocial Behavior Questionnaire</i> (ASBQ), basado en <i>Self-report Delinquency Scale</i> (Moffitt and Silva 1988; 10 ítems).	Género del sujeto, Control del esfuerzo	El control psicológico parental correlacionó positivamente con la agresión interpersonal. Sin embargo, significación no se corroboró en los análisis de regresión ni fue moderado ni por el género del sujeto ni por el control del esfuerzo. No hubo relación significativa del control conductual parental con la agresión, ni fue moderado ni por el género del sujeto ni por el control del esfuerzo.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(19) León del Barco et al. (2019); Spain	Study the relationships between parental psychological control and mental health (emotional and behavioral disorders).	762 subjects (53.8% girls)	11 – 14 years	Parental Psychological Control	Scale for the Evaluation of Parental Educational Styles of Adolescents (EES-C; Oliva et al., 2007; 8 items); adolescents	Externalizing Behavior	Strengths and Difficulties Questionnaire (SDQ; Muris et al., 2003; 5 items from the conduct problems subscale and 5 items from the hyperactivity subscale); adolescents.	Adolescent Gender and Age	Adolescents who perceive high levels of parental psychological control are 4.8 times more likely to develop externalizing behavior. A gender effect was detected, with boys who perceive high levels of parental psychological control being more likely to exhibit externalizing problems (62.7%).

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(20) Safdar & Khan (2019); Pakistan	Examine the mediating role of emotional dysregulation in the relationships between parental psychological control and adolescent aggression.	350 subjects (50,3% girls)	13 – 18 years	Parental Psychological Control (Dependency-Oriented and Achievement-Oriented)	Dependency Oriented and Achievement Oriented Psychological Control Scale (DAPCS; Soenens et al, 2010; 20 items; 2 subscales)	Reactive (Overt and Relational) and Proactive (Overt and Relational) Aggression	Peer Conflict Scale (PCS; Marsee & Frick, 2007; 40 items; 4 subscales), adolescents.	None	The results revealed a positive relationship between parental psychological control, emotional dysregulation, and adolescent aggression. Emotional dysregulation significantly mediated the association between psychological control and the forms of aggression.

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(21) Tian et al. (2019); Guangdong (China)	Analyze whether deviant peer affiliation mediates the relationship between parental psychological control and adolescent aggressive behavior, and whether this indirect link is moderated by school connectedness.	4265 subjects (51.7% girls)	9-19 years	Parental Psychological Control	<i>Psychological Control Scale-Youth Self-report (Barber, 1996; 8 items); adolescents</i>	Aggression	<i>Buss-Warren Aggression Questionnaire (BWAQ; Maxwell, 2008; Chinese version by Lin et al., 2018; 19 items); adolescents</i>	School Connectedness	When parents exercise high levels of psychological control, adolescents are more likely to form negative friendships, which in turn could promote more aggressive behavior. This relationship was moderated by school connectedness, with aggressive behavior being higher in adolescents with lower school connectedness than in those with higher levels.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(22) Bai et al. (2020); China	Clarify how parental psychological control impacts adolescents' externalizing behavior by introducing the mediating and sequential roles of need frustration and self-control. The moderating effect of self-control is also explored.	1118 subjects (55,5 % girls)	12 – 18 years	Parental Psychological Control (Dependency-Oriented and Achievement-Oriented); Parental Psychological Control	Dependency-oriented and Achievement-oriented Psychological Control Scale (Soenens et al. 2010; Dependency-Oriented, 8 items, Achievement-Oriented: 9 items); adolescents about mothers and fathers	Externalizing Behavior	Strength and Difficulties Questionnaire (SDQ; Goodman et al. 2010), mothers and fathers separately	Self-control	Parental psychological control was indirectly associated with externalizing behavior through need frustration and self-control in both maternal and paternal models. Additionally, a significant indirect effect was found between need frustration and externalizing problems through self-control in both models.

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(23) Cui & Lan (2020); China	Identify determination profiles in a sample of Chinese adolescents based on two dimensions (perseverance and consistency) and examine whether adolescent gender and determination profiles moderate the association between harsh parental discipline and aggressive behavior.	1156 subjects (46,5% girls)	10 – 13 years	Parental Behavioral Control; Harsh Parental Discipline	Adaptación Chinese adaptation of the Ghent Parental Behavior Scale (GPBS; Van Leeuwen and Vermulst, 2004; 18 items); adolescents about each parent	Aggression	Youth Self-Report (YSR; Achenbach, 1991; 9 items); adolescents	Determination profiles (perseverance and consistency) and gender	The positive association between paternal harshness and aggressive behavior was significant for adolescents with low levels of perseverance and consistency (Profile 1). Additionally, the positive association between maternal harsh discipline and aggressive behavior was significantly stronger for adolescents with high levels of perseverance and consistency (Profile 3). The association between parental harsh discipline and aggressive behavior was not significant for girls, regardless of their perseverance and consistency levels.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(24) Chen & Cheng (2020) China	Examinar el papel mediador de las creencias normativas de los niños sobre la agresión relacional en la asociación entre el control psicológico parental y la agresión relacional de los hijos, y si este posible efecto indirecto depende del género del hijo.	341 sujetos (48,7% chicas); 88,1%.	11 - 12	Control psicológico parental; Control psicológico parental	Versión china del <i>Parental Psychological Control Questionnaire</i> (PPCQ; Cheng, 2014; 8 ítems); adolescentes para el padre y la madre por separado.	Agresión relacional	Nominación por pares (Cheng, 2014; 4 ítems); adolescentes de todos los compañeros de clase	Género del sujeto y del progenitor	El efecto del control psicológico paternal y maternal en la agresión relacional de los niños fue mediado por las creencias normativas de los niños sobre la agresión relacional. Solo en el caso del control psicológico paternal este efecto indirecto fue moderado por el género del sujeto, de forma que solo fue evidente para las niñas.
(25) Fuentes-Balderrama et al. (2020); México	Identify the association of inconsistent discipline, parental psychological control, and parental imposition with the development of behavioral problems (externalizing and internalizing) in preadolescents.	306 subjects (48.8% girls)	Average age: 10 years (SD = 0.92)	Parental Psychological Control; Parental Behavioral Control; Parental Imposition	Reduced version of the Parental Practices Scale by Andrade & Betancourt (2008; 3 items for psychological control subscale and 3 items for parental imposition); mothers and fathers	Externalizing Behavior	Spanish translation (Rivera Gutiérrez, 2013) of the Strengths and Difficulties Questionnaire (SDQ) (Goodman et al., 2000); adolescents	Parent Gender	While neither paternal nor maternal imposition had effects on externalizing behavior, psychological control—only in the case of fathers—showed a negative effect (surprisingly, for the authors) on adolescents' externalizing behavior.


Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(26) Kapetanovic et al. (2020); China, Colombia, Italy, Jordan, Kenya, Philippines, Sweden, Thailand, USA	Examine the reciprocal associations between parent-driven communication efforts (parental solicitation and behavioral control) and adolescent-driven efforts (adolescent disclosure and secrecy) and adolescents' psychological problems (internalization and externalization).	1087 subjects (50% girls); 91,7%	13 – 15 years	Parental Behavioral Control; Patterns of Parental Communication (Solicitation and Behavioral Control)	Youth Knowledge, Disclosure, Control, and Solicitation Scale (Stattin and Kerr 2000)	Externalizing Behavior	Youth Self Report Form of the Adolescent Behavior Checklist (Achenbach, 1991; 30 items); adolescents.	Adolescent Gender	Parental solicitation and behavioral control did not predict adolescents' externalizing problems in any culture after accounting for previous levels of externalizing problems and adolescents' communication efforts.


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(27) Kochanova et al. (2021); USA	Explore whether the associations between parental stress and adolescents' reactive and proactive aggression are mediated by psychological control, acceptance, and lax control.	282 subjects (49,3% girls)	12 – 17 years	Parental Psychological Control; Maternal Psychological Control	Parent Report of Parent Behavior Inventory (PRPI); Mar- golles & Weintraub, 1977; Schaefer, 1965b; 56 items	Proactive and Reactive Aggression	Child and Adolescent Behavior Inventory (CABI; Burns et al., 2015; 8 items, ODD scale), mothers; Proactive and Reactive Aggression Measure (PRAM; Dodge & Coie, 1987; 6 items); mothers	None	Parental stress was negatively associated with both proactive and reactive aggression. Psychological control mediated the relationship between parental stress and reactive aggression but not proactive aggression. Lax control mediated the link between parental stress and proactive aggression but did not mediate the link with reactive aggression. Acceptance mediated the associations between parental stress and both proactive and reactive aggression.

Autores, fecha, localización	Objetivo	Muestra (composición)	Rango de edad	Tipo, etiqueta del control parental	Medida, informantes del control parental	Variable criterio	Medida, informantes de la variable criterio	Variables moderadoras	Resultados relevantes
(28) Selçuk et al. (2022); Turkey	Examine a model of relationships between parental control, adolescents' interpretations of specific control practices, and adolescents' adaptation problems, as well as the moderating roles of maternal warmth and perceived legitimacy of control practices in these relationships.	689 adolescents (7th, 8th, and 9th grade)	13,95 years	Parental Psychological and Behavioral Control; Psychological and Behavioral Control	<i>Psychological Control Scale— Youth Self-Report (PCS-YSR; Barber, 1996; 8 items), adolescents and mothers; adaptation of Parental Solicitation and Parental Rules Scales (Kerr & Stattin, 2000; 5 items), adolescents and mothers</i>	Externalizing Behavior	<i>Youth Self Report/ 11-18 (Achenbach, 1991; 18 items), adolescents; Child Behavior Check List/6-18-CBCL (Achenbach, 1991; 18 items), mothers.</i>	Maternal Warmth and Adolescents' Perceptions of Parental Control Legitimacy	The findings indicated that, regardless of the informant, higher psychological control was associated with more negative interpretations of parental psychological control, which in turn was related to greater externalizing problems. Conversely, higher behavioral control was associated with less negative interpretations of behavioral control, which in turn was linked to fewer externalizing problems. Adolescents' perceived maternal warmth moderated the relationship between perceived psychological control and interpretations of psychological control.

Career indecision and career indecisiveness in high school and vocational training students: a scoping review

Indecisión vocacional evolutiva y compleja en Secundaria, Bachillerato y Formación Profesional: una revisión sistemática exploratoria

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ABSTRACT

Recent events underscore the need for inclusive and sustainable vocational guidance adapted to a context marked by uncertainty, digitalization, stress, and disruptions in the spaces in which adolescents develop. It is key to understand the difficulties that this population may manifest in their transitions, to make vocational decisions. Utilizing the PRISMA-Scr statement, this scoping review examined the literature published between 2007 and 2023 related to the factors that influence career indecision and career indecisiveness, the existing instruments used to measure them in the adolescent population, and the intervention programs applied in their prevention or treatment. Following the predetermined inclusion criteria, 78 papers (N = 825) identified in indexed journals were analyzed. The CIPP-C method was applied for the analysis, which allowed us to present the results in an integrative multidimensional model that would enable us to conjecture the possible relationships between the systems of variables identified, which is one of the main contributions of this work. The results found highlight the heterogeneity of contextual, cognitive, emotional, behavioral, and personality factors in both indecision types, the reliability and validity of unidimensional and multidimensional instruments at a cross-cultural level to assess them, and the presence of intervention programs on developmental career indecision in educational settings. It is concluded that further research is needed for specific evidence-based programs for those with career indecisiveness and for vocational training students. Additional research is also needed for greater representation of qualitative and mixed studies, which collect the experience of undecided students in globalized, digitalized, climatic, and health emergency contexts. Finally, as implications for practice, a narrative, cognitive-behavioral, and systemic approach is recommended. Moreover, specific elements are proposed for intervention in career indecisiveness.

Keywords: career indecision, systematic review, career guidance, career counseling, decision making, career choice, adolescents

RESUMEN

Acontecimientos recientes subrayan la necesidad de una orientación vocacional inclusiva, sostenible y adaptada a un contexto marcado por la incertidumbre, la digitalización, el estrés y las interrupciones en los espacios en que se desarrollan los adolescentes. Para ello es clave entender las dificultades que puede manifestar esta población en sus transiciones, para tomar decisiones vocacionales. Este trabajo presenta una revisión sistemática exploratoria, siguiendo la declaración PRISMA-Scr, de la literatura publicada entre 2007 y 2023 relacionada con los factores que influyen en la indecisión vocacional evolutiva y compleja, los instrumentos existentes y utilizados para evaluarlas en población adolescente, y los programas de intervención aplicados en su prevención o tratamiento. Siguiendo los criterios de inclusión predeterminados se analizan 78 trabajos (N = 825) identificados en revistas indexadas. Para su análisis y conceptualización se ha aplicado el método CIPP-C, que ha permitido presentar los resultados en un modelo multidimensional integrador

que posibilita conjeturar a futuro las posibles relaciones entre los sistemas de variables identificadas y que constituye una de las principales aportaciones de este trabajo. Los resultados encontrados destacan la heterogeneidad de factores contextuales, cognitivos, emocionales, conductuales y de personalidad en ambos tipos de indecisión, la fiabilidad y validez de instrumentos unidimensionales y multidimensionales a nivel transcultural para evaluarlas, y la presencia de programas de intervención en indecisión vocacional evolutiva en los espacios educativos. Se concluye la necesidad de programas específicos, basados en la evidencia, para quienes presentan indecisión vocacional compleja y para estudiantes de Formación Profesional. También se necesita mayor representación de estudios cualitativos y mixtos, que recojan la experiencia de los estudiantes indecisos en contextos globalizados, digitalizados, de emergencia climática y sanitaria. Por último, como implicaciones para la práctica se recomienda una aproximación narrativa, cognitivo-conductual y sistémica y se propone contemplar elementos específicos para la intervención en indecisión vocacional compleja.

Palabras clave: indecisión vocacional, revisión sistemática, orientación profesional, toma de decisiones, elección profesional, adolescencia

INTRODUCTION

The 2030 Agenda adopted by the United Nations (2020) addresses the need for new perspectives in vocational guidance to meet present and future challenges. Researchers have presented inclusive and sustainable proposals, integrating individual identity with environmental, social, and economic factors (Di Maggio et al., 2021; Echeverría & Martínez-Clares, 2024; Santilli et al., 2020). The effects of the COVID-19 pandemic, digitalization, and technologies based on artificial intelligence (AI) (Borbély-Pecze & Gyöngyösi, 2024), have transformed educational environments (Ortí Martínez et al., 2024; Osorio León & Borja, 2020). Vocational guidance programs assisted by electronic devices have emerged alongside initial digital transformations and since proliferated (Hernández-Franco, 2014). However, their use has remained largely confined to the search for vocational information (Organization for Economic Co-operation and Development [OECD], 2024; Requejo Fernández et al., 2022).

Effective vocational guidance requires recognizing both the difficulties young people have and their sources of support. Key difficulties include economic pressures from unemployment and job insecurity (Macdonald et al., 2024) and socio-economic and environmental uncertainties, which negatively affect people's health and well-being (Nota et al., 2020). Recent events have caused significant disruptions in the social and educational conditions through which adolescents conceptualize their futures (Carey et al., 2023), altering their aspirations and perceptions (Malinić et al., 2024; Santilli et al., 2020). Teachers and healthcare professionals have reported

increases in anxiety, loneliness, low self-esteem, and depression (Echavarren, 2024; Jen et al., 2024). Sources of support include family (Barnes et al., 2020; Carey et al., 2023), teachers (Wong et al., 2021), and peers (Carey et al., 2023; Lent & Brown, 2020).

Two out of five students exhibit career indecision per PISA (2022; OECD, 2024), a figure that has risen since 2018 and which affects student well-being (Şeker, 2020) and commitment to their choices (Šverko & Babarović, 2019). This is a relevant finding, alongside the dropout rate in Vocational Education and Training (VET) (Salvà Mut et al., 2024) and university education (Conferencia de Rectores de las Universidades Españolas [CRUE], 2024).

Researchers have traditionally divided career indecision into two types: developmental and chronic (indecisiveness) (Crites, 1969; Holland & Holland, 1977; Rivas, 1998). They have also proposed several theoretical models to understand the types (Gati et al., 1996; Germeijs & De Boeck, 2002; Lent & Brown, 2020; Osipow et al., 1976; Saka et al., 2008; Sampson et al., 2023; Savickas, 2020). Developmental career indecision refers to the difficulties that individuals face when making vocational decisions, typically emerging before starting the process, due to lack of preparation, or during the process, due to insufficient or excessive information or inconsistent information. Indecisiveness, by contrast, is more persistent and is associated with emotional and personality-related aspects such as self-concept and identity, a pessimistic outlook on life, maladaptive problem-solving approaches and anxiety. Based on these two conceptualizations, Levin et al. (2020) propose more specific typologies according to the type of difficulty: unmotivated, indecisive, chronic, unrealistic, uninformed and conflicted. Counselors have defined both types through a list of difficulties encountered during vocational decision-making processes and assess them through specific psychometric instruments.

Likewise, narrative theoretical models, such as career construction and life design (Savickas, 1995; Savickas, 2020; Savickas et al., 2009), highlight the subjective experience of the individual exhibiting career indecision, interpreting it as a manifestation of change and the formation of a new psychosocial identity in the personal search for meaning. These models emphasize adaptability and agency in individuals while also recognizing the influence of social and cultural contexts (Lent & Brown, 2020; McMahon & Patton, 2019). Specifically, in the Spanish context, various authors have conceptualized career indecision and indecisiveness in the adolescent stage (Castelló & Cladelas, 2021; Gómez & Rivas, 1997; Lozano & Repetto, 2007).

Recent systematic reviews report a direct relationship between career indecision and personality traits (Martincin & Stead, 2015), self-assessments (self-efficacy and self-esteem) in the general population (Udayar et al., 2020), and depression and negative thoughts among adolescents (Amaral et al., 2023). The latter study points to the scarcity of literature on the impact on mental health of career indecision and the transition from compulsory education to the labor market. Additionally,

Priyashantha et al. (2022) identified areas requiring further research, including individual differences, contextual factors, social factors, and subjective well-being because of career indecision.

Xu and Bhang (2019) identify different multidimensional instruments, such as the Career Decision-Making Difficulties Questionnaire (CDDQ; Gati et al., 1996), Emotional and Personality-related Career Difficulties Questionnaire (EPCD; Saka et al., 2008), and the Career Indecision Profile (CIP; Hacker et al., 2013). They propose conceptualizing career indecision (both developmental and chronic) through a five-factor model: (1) general factors such as neuroticism, generalized anxiety and self-esteem; decision-making process-specific factors such as (2) anxiety, (3) lack of information, (4) lack of preparation, and (5) interpersonal conflicts and inconsistent information. Reviews of specific instruments and their cross-cultural validity are also available (Levin et al., 2020).

Finally, protocols based on major theoretical models have proven effective in career planning and vocational guidance. Those with the most significant positive impact include key resources such as workbooks and written exercises, individualized interpretations and feedback, labor market information in-session, modeling, attention to building support sources, personalized guidance, values clarification, and psychoeducation to continue the process until achieving the defined goals (Brown et al., 2003; Whiston et al., 2017). International studies are conclusive: participating in guidance activities prevents career indecision (OECD, 2024).

Since the causes that can lead to career indecision and indecisiveness differ, each type requires distinct counseling strategies and interventions (Blustein et al., 2019; Brown et al., 2012). Career indecision primarily requires psychoeducation on how to make a vocational decision and academic and professional information aligned with the individual's interests, whereas career indecisiveness requires more in-depth vocational guidance (Maree & Magere, 2023; Sampson et al., 2023). Lent and Brown (2020) mention a possible overlap between clinical therapy and vocational counseling when working with individuals whose problems are neither exclusively related to career indecision nor clinically pathological such as low self-esteem, anxiety, lack of motivation, low self-efficacy, worry, irrational beliefs.

Career indecision is a construct with a long history of study and remains active in research agendas due to the needs and challenges posed by the current times of globalization, climate emergency and post-pandemic recovery. Bian (2023) stresses the need for contemporary research that examines in depth the thoughts and feelings of those who experience career indecision. As an initial step, this study aims to analyze factors that have been studied concerning different types of career indecision and consider different theoretical models, measurement instruments, and intervention programs for adolescents. A review of the scientific literature can benefit both counselors in their practice and the advancement of

research in this field. Systematic scoping reviews (Manchado-Garabito et al., 2009; Tricco et al., 2018), are appropriate for exploring the nature and characteristics of empirical studies, assessing the extent of research conducted (in this case on career indecision), identifying key concepts, possible gaps, and types and sources of practical evidence. Anguera (2023) suggests mixed-methods reviews at the methodological level, including quantitative, qualitative, and mixed studies.

Objectives

The general objective of the study is to review the most relevant scientific literature on career indecision and career indecisiveness in upper secondary school (years 9th to 12th) and basic and intermediate VET students. The specific research objectives are:

1. To identify the key variables associated with career indecision and career indecisiveness.
2. To analyze the instruments used to evaluate career indecision and career indecisiveness .
3. To examine the intervention programs targeting career indecision and career indecisiveness.

The integrative general map we propose may serve as a useful tool for advancing towards more inclusive and sustainable career guidance practices.

METHOD

The present scoping review uses the phases and criteria outlined by *Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews* (PRISMA-ScR, Tricco et al., 2018), and implements the framework for conducting scoping reviews proposed by Peters et al. (2015, 2020). The steps undertaken are outlined below.

Search strategy

The literature review was conducted in August 2023. An initial exploratory search was performed in specialized psychology and education databases, such as PsycInfo, Psycodoc, and ERIC, to identify and select key concepts. Subsequently, we searched for the selected terms, listed in Table 1, in the specialized databases PsycInfo, Psycodoc, Medline, and ERIC; multidisciplinary databases Web of Science (WOS), Scopus, and Dialnet; and, due to its relevance, the specialized *Journal of*

Vocational Behavior. The search fields included: title, abstract, and keywords. For each database, appropriate filters, strategies and Boolean operators ‘OR’ and ‘AND’ were employed to combine terms. The protocol was registered with the Open Science Framework (OSF), following PRISMA-ScR recommendations (OSF AQMJH, <https://osf.io/aqmjh>).

Table 1
Keywords used in the search

Career indecision	Adolescent
Career indecision	Adolescent
Career decision making difficulties	Teenager
Career indecisiveness	High school
Indecisiveness	
EPCD	
CDDQ	
Occupational indecision	
Decisional procrastination	

Note. This table shows an example of a query string in Psycinfo (career indecision OR career decision making difficulties OR career indecisiveness OR indecisiveness OR EPCD OR CDDQ OR occupational indecision OR decisional procrastination) AND (adolescent OR teenager OR high school).

Eligibility criteria

The following inclusion and exclusion criteria were used in the search, screening, and selection of studies: (1) only peer-reviewed journal articles were included; (2) studies involving students in their final years of secondary school (years 9th to 12th) and VET were considered; (3) studies in Spanish and English were included, as these are the reviewers’ languages; (4) only studies carried out between 2007 and 2023 were considered, with the temporal reference being the work of Saka and Gati (2007), as this timeframe allows for an examination of research developments while minimizing potential publication bias from either very old or exclusively very recent studies; and (5) empirical studies (quantitative, qualitative, and mixed) on career indecision were included and excluded works without methodological information.

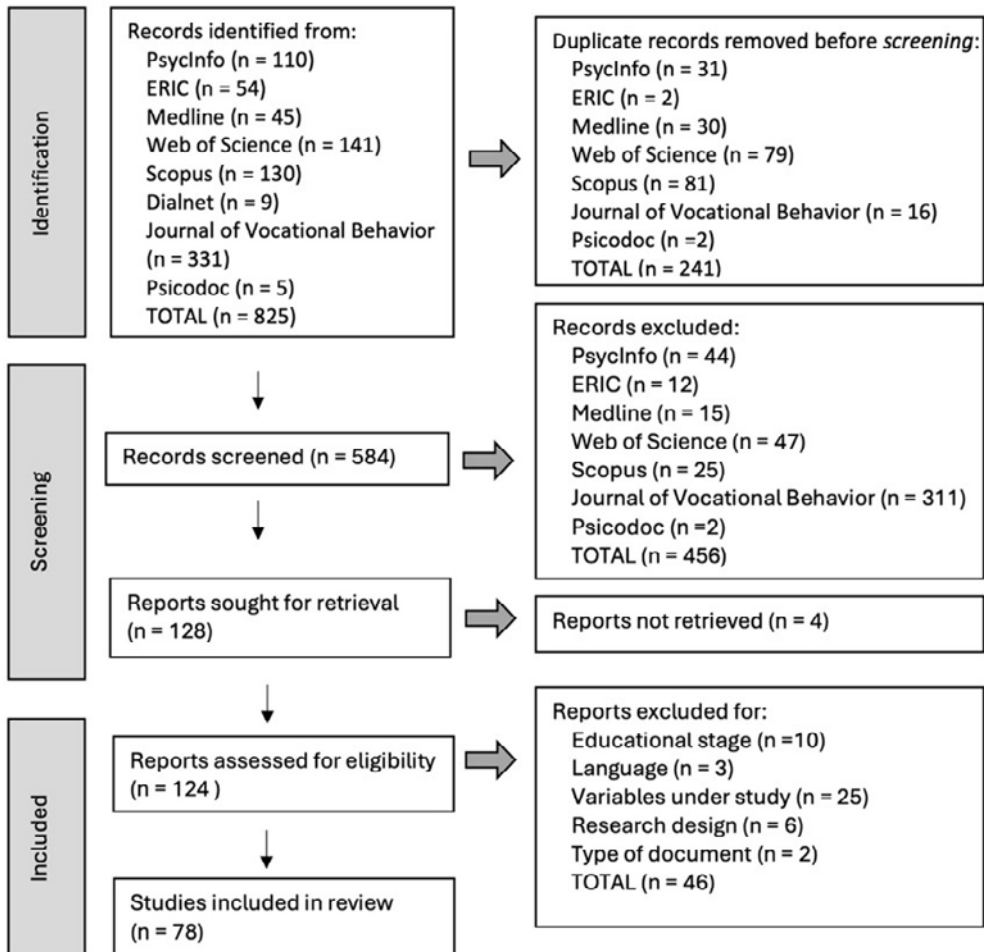
Study selection

As shown in the PRISMA-ScR flow diagram (Figure 1), a total of 825 articles were identified in the full database search. After removing duplicate references, the

abstracts, keywords, and titles were screened based on the inclusion and exclusion criteria. The studies that passed this preliminary screening phase were thoroughly reviewed in full text. Discrepancies were discussed among the authors, who selected and analyzed 78 studies published across 44 academic journals.

Figure 1

PRISMA flow diagram used in the search strategy with results



Data extraction

For in-depth reading and analysis of the 78 selected publications a codebook was created (Martínez-Serrano et al., 2022) following the recommendations of the scoping review methodology (Peters et al., 2015, 2020). This codebook captured the main information from each study: (a) authors' details, (b) main objectives, (c) educational stage, (d) sample or participants information, (e) type of intervention, (f) applied methodology, (g) type of research design, (h) type of analysis conducted, (i) type of indecision, (j) study dimensions, and (k) data analysis techniques applied (Appendix: Tables A1 and A2). The results and limitations were also examined. This approach facilitated the synthesis of the data to meet the objectives of the current scoping review.

To systematically conceptualize the variables associated with career indecision and indecisiveness, we applied the CIPP evaluation model (Stufflebeam & Shinkfield, 2007). The acronym CIPP corresponds to the following phases: Context, Input, Process, and Product. Context variables refer to the influence of environmental factors, such as socioeconomic, cultural, and family aspects. Input variables refer to characteristics inherent to the individual. Process variables have a dynamic relationship with both the environment and the individual, meaning they can be modified and are therefore amenable to intervention for their development and implementation. The product phase pertains to the central focus of this study: career indecision and indecisiveness. Additionally, a fifth phase is included, encompassing consequence variables: those arising after and because of the product variables. The extended model is summarized with the acronym CIPP-C.

RESULTS

Descriptive analysis of the literature

The 78 selected research papers examine variables and constructs related to career indecision and indecisiveness, the validation of measurement instruments or focus on intervention programs aimed at reducing or preventing career indecision. These studies were conducted in 24 countries, predominantly in Europe (53%), with three studies (4%) identified in Spain, followed by Asia (26%), Oceania (10%), America (9%) and Africa (3%). One study included samples from both France (Europe) and South Korea (Asia).

Most participants were from urban areas (53%), predominantly middle-class, with sample sizes ranging from a single case to over 2,509 participants. Almost all studies (96%) included both male and female participants, while only eight studies (8%) involved VET students, none of which focused on intervention programs. All

studies collected information directly from students, primarily in school settings and through self-report instruments administered in a single application. Additionally, four studies (5%) incorporated parental figures as informants (Denault et al., 2019) or as part of the intervention process (Maree, 2020; Rochat & Rossier, 2016; Taveira et al., 2009), and two studies (3%) included information from mentors and teachers (Culpepper et al., 2015; Maree, 2020).

The studies predominantly adopt a quantitative approach (94%). Only three studies (4%) are qualitative, and two (2%) use a mixed-methods approach.

To describe the results of the data analysis, the information was organized according to the previously stated research objectives: the variables studied and their relationship with career indecision and indecisiveness were reviewed in 66 studies (85%), the instruments used to evaluate career indecision and indecisiveness were examined in 78 studies (100%) and the intervention programs were analyzed in 14 studies (18%).

Research objective 1: Variables associated with career indecision and indecisiveness

The first objective was to conceptually identify the key variables associated with career indecision and indecisiveness in adolescent students in the final years of schooling, for which the CIPP-C model was applied. Variables were identified in 66 studies (85%). The results of the analyses are summarized in Table 2 for career indecision and in Table 3 for career indecisiveness. The inclusion of variables in each dimension (context, input, product, process or consequences) was based on the substantive concept proposed by the authors in the analyzed articles, as detailed in Table A1. Product variables, representing the outcome of the influence of context, input, and process variables, are career indecision and career indecisiveness, measured as either unidimensional or multidimensional constructs. A minority of studies (5%) examine both constructs (Di Fabio & Kenny, 2011; Di Fabio & Palazzeschi, 2012; Di Fabio & Saklofske, 2014; Lo Presti et al., 2017).

Context variables

Regarding context variables, nine studies (12%) reference the educational year group, with mixed findings. Specifically, for career indecisiveness, final-year students scored higher (Baltacı et al., 2020), while no differences were found in other cases (Öztemel, 2013). Additionally, students from lower socio-economic statuses demonstrated higher levels of indecision (Kalalahti et al., 2017).

Furthermore, 18 studies (23%) reported that greater social support (including parental, school, and peer support) was associated with a lower prevalence of career indecision, with the strongest relationship observed with parental support. Authoritarian and permissive parenting styles had a positive relationship with career indecision (Koumoundourou et al., 2010), although authoritarian parenting was also linked to reduced difficulties (Sovet & Metz, 2014). These differences may be influenced by cultural factors, as the study was conducted with adolescents from South Korea and France.

On the other hand, career indecisiveness was associated with low perceived social support, high paternal psychological control in boys, and emotional detachment from both mothers and fathers.

Input variables

Input variables play a crucial role in understanding the dynamics of vocational indecision. Among the studies reviewed, 10 (13%) focused on career indecision, while 15 (19%) examined career indecisiveness (Tables 2 and 3). Regarding gender, 18 studies (23%) found no differences in career indecision as a global construct (Babarović & Šverko, 2016; Duru, 2022; Günes & Owen, 2020), although differences were identified depending on the dimensions considered in the applied instruments (Bacanli, 2016; Duru, 2022; Kalalahti et al., 2017; Lozano & Repetto, 2007). These studies are not included in Tables 2 and 3 due to the extensive detail in their descriptions. Girls exhibited higher levels of career indecisiveness, except for two studies (Gómez-Arbeo, 2010; Öztemel, 2013). One Turkish study (1%) reported that stress associated with being female directly influenced career indecision in their collectivist culture (Arslan et al., 2022).

The six studies (8%) examining personality traits consistently identified neuroticism as the strongest predictor of career indecision. In three studies (4%), career indecisiveness was positively associated with neuroticism and negatively associated with conscientiousness, extraversion, and openness to experience. The respective tables provide additional information on the personality traits examined.

Moreover, one Canadian study (1%) found no relationship between perceived linguistic identity and difficulties related to career decision-making (Sovet et al., 2017).

Table 2
CIPP-C Model: Antecedents and consequences of career indecision as the product

Context	Input	Process	Consequence
Educational year group (Azpilicueta et al., 2019; Babarović & Šverko, 2016; Bacanli, 2016; Duru, 2022; Kulcsár et al., 2020; Lozano & Repetto, 2007; Šverko & Babarović, 2019)	Personality traits: (+) Neuroticism* (Ambiel et al., 2018; Duru et al., 2021; Kirdök & Korkmaz, 2018; Marcionetti & Rossier, 2016; Pečjak & Košir, 2007)	(+) Worry (Karacan-Ozdemir, 2019) (+) Vocational anxiety* (Šeker, 2020) (+) Academic procrastination (Günes & Owen, 2020) (-) Time perspective (Ferrari et al., 2010) (-) Self-efficacy at: a) career decision-making (Charokopaki & Argyropoulou, 2019; Duru, 2022; Duru et al., 2021; Marcionetti & Rossier, 2016); b) career search (Jemini-Gashi et al., 2021; Nota et al., 2007); c) generalized (Argyropoulou et al., 2007) (-) Self-esteem (Charokopaki & Argyropoulou, 2019) (-) Career maturity (Babarović & Šverko, 2016; Duru, 2022; Patton & Creed, 2007a) (-) Career adaptability (Babarović & Šverko, 2019; Karacan- Ozdemir, 2019; Parola & Marcionetti, 2022) (+) Self exploration (Paixão & Gamboa, 2022) (+) Dispersion of vocational interests (Argyropoulou et al., 2007)	(+) Career planning and exploration (Creed et al., 2007) (-) Occupational intention (Jung, 2018) (+) Vocational anxiety (Nalbantoglu-Yilmaz & Cetin-Gunduz, 2018) (+) Emotional distress (Kulcsár et al., 2020) (-) Salary at 34 years old (Sabates et al., 2017) (-) Engagement in career construction* (Šverko & Babarović, 2019) (-) Study satisfaction* (Šverko & Babarović, 2019)
Social relationships: (+) Parental interference (Parola et al., 2023); over parenting (Arslan et al., 2022); and parental lack of engagement (Parola & Marcionetti, 2022; Parola et al., 2023) (-) Social support (Jemini-Gashi et al., 2021); family support (Nota et al., 2007); parental support (Marcionetti & Rossier, 2016; Parola et al., 2023; Parola & Marcionetti, 2022); family cohesion in male students (Koumoundourou et al., 2010) Parental style: (+) authoritarian and permissive (Koumoundourou et al., 2010; Sovet & Metz, 2014) (-) authoritative (French) and authoritarian (South Korean) (Sovet & Metz, 2014) Socioeconomic-status: (+) low (Kalalahi et al., 2017)	(-) Conscientiousness, extroversion, openness, and agreeableness (Duru et al., 2021; Marcionetti & Rossier, 2016; Šverko & Babarović, 2019) (+) External locus of control (Kirdök & Harman, 2018) (-) Emotional-intelligence (trait)* (Di Fabio & Saklofske, 2014) (-) Core self-evaluations (Koumoundourou et al., 2010) Gender: (+) Female role stress (Arslan et al., 2022) Decision making styles: (+) Panic and avoidant (Pečjak et al., 2019) (-) Self-confident (Pečjak et al., 2019)	(-) Hope for success (Zaleszczyk & Kot, 2015) (-) Mental well-being* (Šeker, 2020) (-) Life satisfaction (Parola & Marcionetti, 2022) Motivation: (+) Controlled (Paixão & Gamboa, 2022); occupational amotivation* (Jung, 2013a, 2013b, 2018; Jung & McCormick, 2010; Jung & Young, 2017). (-) Autonomous* (Paixão & Gamboa, 2022)	

Note. Only direct relationships that evolve in the same direction (+) or in the opposite direction (-) to the product are collected. *Relationships that predict indecision.

Table 3
CIPP-C Model: Antecedents and consequences of career indecisiveness as the product

Context	Input	Process	Consequence
Educational year group (+) Last Year (12th) (Baltaci et al., 2020)	Personality traits: (+) Neuroticism* (Di Fabio & Palazzeschi, 2013; Germeijs & Verschueren, 2011b; Öztemel, 2014)	(+) Vocational anxiety (Lo Cascio et al., 2013; Vignoli, 2015)	(+) Seek career counseling (Ambiel et al., 2018)
No differences (Öztemel, 2013)	(-) Conscientiousness, extroversion (Germeijs & Verschueren, 2011b; Öztemel, 2014) and openness (Germeijs & Verschueren, 2011b)	(+) Self exploration* (Ambiel et al., 2018); (-) Career exploration* (Ambiel et al., 2018; Vignoli, 2015)	(-) Decision stability (Germeijs & Verschueren, 2011a)
Social relationships: (+) Paternal psychological control (Lo Cascio et al., 2015)	(+) Anxiety (trait) (Germeijs & Verschueren, 2011a; Lo Cascio et al., 2013; Santos & Ferreira, 2012; Santos et al., 2014; Vignoli, 2015)	(-) Self-esteem* (Lo Cascio et al., 2013, 2015; Santos & Ferreira, 2012; Santos et al., 2014; Santos & Gonçalves, 2017; Soytürk & Öztürk, 2019)	
(-) Family communication (Lo Cascio et al., 2013)	(-) Emotional-intelligence (trait)* (Di Fabio & Saklofske, 2014)	(-) Generalized self-efficacy (Ambiel et al., 2018)	
(-) Mother and father attachment (Vignoli, 2009)	(-) Core-self evaluations (Di Fabio & Palazzeschi, 2012)	(-) Perceived cognitive failure (Di Fabio & Palazzeschi, 2013)	
(-) Perceived social support* (Baltaci et al., 2020)	(+) External locus of control (Santos & Ferreira, 2012; Santos et al., 2014)	(-) Goal instability* (Santos & Gonçalves, 2017)	
	Gender: (+) Female (Baltaci et al., 2020; Germeijs & Verschueren, 2011b; Lo Cascio et al., 2013, 2015; Soytürk & Öztürk, 2019; Vignoli, 2009)	(-) Basic psychological needs (Baltaci et al., 2020)	
		(-) Meaning in life (Gómez-Arbeo, 2010)	

Note. Only direct relationships that evolve in the same direction (+) or in the opposite direction (-) to the product are collected. *Relationships that predict indecision.

Process variables

Twenty-nine studies (37%) examined the relationship between process variables and career indecision (Table 2), while 11 studies (14%) explored their connection to career indecisiveness (Table 3). These variables include aspects such as vocational exploration, which encompasses self-exploration (self-knowledge) and environmental career exploration (gathering academic and professional information and engaging in relevant experiences). Additionally, self-efficacy has been studied in three distinct forms: self-efficacy in the career decision-making process, self-efficacy in career search, and generalized self-efficacy.

The most studied process variables influencing career indecision are low self-efficacy (9%), low career adaptability (5%), low career maturity (4%), and low career exploration (4%). One study (1%) found that undecided students display greater dispersion in academic interest areas compared to their decided peers (Argyropoulou et al., 2007), although it identified no significant differences in terms of types of vocational interests in career indecision (Lozano & Repetto, 2007). Vocational anxiety has been examined both as a predictor (Şeker, 2020) and as a consequence of indecision (Nalbantoglu-Yilmaz & Cetin-Gunduz, 2018), indicating the need for clearer conceptual delineation.

In addition, five studies (6%) report a positive relationship between occupational indecision and occupational amotivation, socio-familial influence, and other cognitive processes (such as cultural orientation, multipotentiality, perfectionism, and expectations), identifying amotivation as both the sole direct predictor and a mediating variable (Jung & McCormick, 2010). These studies provide empirical support for a model applied to processes associated with university access (Jung, 2013b), gifted adolescents (Jung 2013a; Jung 2018), and economically disadvantaged individuals (Jung & Young, 2017).

The most studied variables related to career indecisiveness are low self-esteem, high vocational anxiety, and low career exploration (Table 3).

Consequences variables

Finally, regarding the consequences, six studies (8%) are related to career indecision (Table 2), and two studies (3%) are associated with career indecisiveness (Table 3). Students with career indecisiveness exhibit greater instability in their choices (Germeijs & Verschueren, 2011a). Similarly, those with career indecision show lower engagement and satisfaction with their studies (Šverko & Babarović, 2019) and an increase in career planning and exploration behaviors (Creed et al., 2007).

Research objective 2: Instruments for measuring career indecision and indecisiveness

The second objective was to analyze the measurement instruments used to evaluate career indecision and indecisiveness in adolescents. Self-report instruments were the most frequently used (87%) (Table 4), and five studies (6%) utilized more than one instrument.

Table 4

Classification of measurement instruments for career indecision and indecisiveness in adolescents

Unidimensional instruments	Studies	Intervention programs
Career Decision Scale (CDS; Osipow, et al., 1976)	11	3
Career Indecision Scale (Teixeira & Magalhães, 2001)*	1	
Indecisiveness Scale (IS; Germeijs & De Boeck, 2002, 2003)*	7	
Indecisiveness Scale (IS; Frost & Shows, 1993)*	6	1
Personal Indecisiveness Scale (Bacanlı, 2000, 2005)*	2	
Career Decision Inventory (CDI; Çakır-Mehmet, 2004)	3	2
Multidimensional instruments		
Career Factors Inventory (CFI; Chartrand et al., 1990)**	1	
Vocational Indecision/Decision (Gómez-Arbeo, 1992)*	1	
Career Decision Making Difficulties Questionnaire (CDDQ; Gati, et al., 1996; Gati & Saka, 2001)#	24	4
Career Decision Profile (Jones & Lohmann, 1998)#	1	
Ideas and Attitudes on School-Career Future High School Version (Soresi & Nota, 2003)	1	1
Emotional & Personality-Related Career Decision-Making Difficulties (EPCD; Saka et al., 2008)*	3	
Coping with career indecision instruments		
Coping with Career Indecision Scale (CCIS; Turan, 2017)		1

Note. Instruments evaluating career indecisiveness(*), instruments measuring both types of indecision (**), and instruments for career indecision including a generalized indecision subscale (#). Without asterisk: instruments exclusively evaluating career indecision.

A total of 13 different measurement instruments were identified. For career indecision, the most commonly applied instruments were the CDDQ (36%), which includes a generalized indecision subscale, and the CDS (18%). For career indecisiveness, the most frequently used instruments were the IS (9%) (Germeijs & De Boeck, 2002, 2003) and the IS (9%) (Frost & Shows, 1993), followed by the CDI (6%) and the EPCD (4%). Additionally, one study (1%) (Pečjak & Košir, 2007) employed the Decision Making Questionnaire (Tuinstra et al., 2000), which focuses on assessing individuals' decision-making styles to examine career indecision. The use of unidimensional and multidimensional instruments was evenly distributed. As an indicator of validity, the number of studies and intervention programs employing these instruments is summarized in Table 4.

Seven of the applied measurement instruments have been adapted for use in 16 countries and translated into their respective languages (Table 5). Among these, the CDDQ, which has been used in 13 countries, retains structures like the original version, though not identical, or does not confirm all factors. This is notably true for the adaptations in Turkish (Bacanlı, 2016), Spanish (Lozano, 2007), Slovenian (Pečjak & Košir, 2007), French (Rochat & Rossier, 2016), and Croatian (Babarović & Šverko, 2016, 2019).

Self-designed surveys were used in seven studies (9%) (Jung, 2013a, 2013b, 2018; Jung & McCormick, 2010; Jung & Young, 2017; Kalalahti et al., 2017; Sabates et al., 2017), and three studies (4%) used interviews (Maree, 2020; Maree & Magere, 2023; Rehfuß & Sickinger, 2015). The Career Construction Interview (Savickas, 2012) has been confirmed as a valuable tool to assist high school students in their career decision-making process and as a pre-screening instrument to identify students requiring more extensive guidance (Rehfuß & Sickinger, 2015).

Table 5

Measurement instruments for career indecision and indecisiveness adapted to other countries and languages: reliability data

Countries	CDS (Osipow et al., 1976)	CDDQ (Gati et al., 1996; Gati & Saka, 2001)	IS (Frost & Shows, 1993)	IS (Germeijs & De Boeck, 2002, 2003)	EPCD (Saka et al., 2008)	CFI (Chartrand et al., 1990)
Albania	.95					
Argentina	.81					
Canada (French)		.94				
China	.73 - .76	.81 - .87				
South Korea		.92				
Croatia		.74 - .92				
France		.91		.84 - .86		
Greece	.80 - .86	.92				
Slovenia		.55 - .93				
Spain		.89 - .91				
Italy	.82	.73 - .93	.85	.83 - .85		.84
Poland		.88				
Portugal	.87 - .90		.80 - .83			
Romania		.80				
Switzerland (Italian)		.91				
Turkey	.86	.82 - .93			.81 - .91	

Note. The minimum and maximum reliability values of the instruments reported in the analyzed studies are included.

Research objective 3: intervention and prevention of career indecision and indecisiveness

The intervention programs identified (18%) were analyzed according to the instruments used, the CIPP-C structure in terms of the variables considered, and the value and impact of career guidance in intervening or preventing career indecision.

In terms of duration, interventions ranged from a single session (Maree, 2020; Rehfuss & Sickinger, 2015) to five months (Culpepper et al., 2015). They were conducted in both group and individual formats, predominantly in-person and within school settings. Two programs were delivered in group and digital formats, focusing on participant engagement and the impact of counselors/mentors. All studies assessed career indecision using a range of measures (Table 4), with the CDS and CDDQ being the most prominent, or through interviews. Data were collected before and after the intervention, but only four studies (5%) included a follow-up after the intervention: three weeks (Ferrari et al., 2012), three months (Rochat & Rossier, 2016), or four months later (Maree, 2020; Turan & Çelik, 2022).

One program addressed career indecisiveness (Di Fabio & Kenny, 2011), but did not establish specific targets to address it. However, three studies (4%) analyzed the intervention's impact on career indecisiveness, suggesting the effectiveness of motivational interviewing and the promotion of emotional intelligence (Di Fabio & Kenny, 2011; Maree, 2020; Rochat & Rossier, 2016).

Most interventions were conducted by counselors, though some involved teachers (Chen et al., 2022) or mentors (Culpepper et al., 2015). Three studies (4%) incorporated family participation (Maree, 2020; Rochat & Rossier, 2016; Taveira et al., 2009) or professionals from various occupational fields (Kutlu & Bedel, 2021). Methodologically, the studies were primarily quasi-experimental, with assignments to experimental and control groups (4%) and case studies (4%) (Maree & Magere, 2023; Rehfuss & Sickinger, 2015; Rochat & Rossier, 2016).

Interviews formed the foundation of several interventions, particularly those based on career construction theory and life design frameworks. These approaches emphasized life history, interpretative processes, and action plans for life projects, demonstrating their effectiveness in addressing career indecision (4%) (Maree, 2020; Maree & Magere, 2023; Rehfuss & Sickinger, 2015). One study (1%) piloted motivational interviewing, adapted from interventions for individuals facing addiction issues in their change process (Rochat & Rossier, 2016).

Addressing context, input, process, and consequence variables, the programs targeted key factors as previously described. Context-related aspects primarily involved support (Ferrari et al., 2012), family communication, peer communication (Taveira et al., 2009), teacher communication (Maree, 2020), and family influence (Maree & Magere, 2023; Shea et al., 2009). Specific programs working with at-

risk students also considered topics absent in other interventions, such as sexism, racism in the workplace, migrant experiences, cultural context, and skills training for applying to study or financial aid or seeking employment (Culpepper et al., 2015; Shea et al., 2009). Additionally, the interventions reduced the social stigma associated with career counseling in certain groups.

In the intervention programs reviewed (Table 6), the most prominent process variables include self-exploration (14%) and career exploration (13%). Self-exploration encompasses activities such as identifying interests, reflecting on autobiographical information, understanding personality, evaluating skills, exploring academic self-concept, clarifying values and aspirations, and promoting reflection and self-awareness. Career exploration involves investigating career options, occupational groups, academic pathways and study opportunities, transitioning to post-secondary education, and accessing guided information about universities and the labor market.

To address the consequences of vocational indecision, several programs also focus on action planning (8%) (Chen et al., 2022; Gu et al., 2020; Maree, 2020; Maree & Magere, 2023; Rochat & Rossier, 2016; Taveira et al., 2009), selecting subjects and academic pathways (4%) (Chen et al., 2022; Ferrari et al., 2012; Gu et al., 2020), and career choice (3%) (Gu et al., 2020; Maree & Magere, 2023). Additionally, they address the anticipation of challenges, solutions, barriers, and available resources for decision-making (3%) (Shea et al., 2009; Taveira et al., 2009), and the development of coping strategies (4%) (Rochat & Rossier, 2016; Shea et al., 2009; Taveira et al., 2009).

Table 6
Process variables addressed in each program

Variable	Atli (2016)	Chen et al. (2022)	Culpepper et al. (2015)	Di Fabio y Kenny (2011)	Ferrari et al. (2012)	Gu et al. (2020)	Kutlu y Bedel (2021)	Maree (2020)	Maree y Magere (2023)	Rehfuß y Sickinger (2015)	Rochat y Rossier (2016)	Shea et al. (2009)	Taveira et al. (2009)	Turan y Çelik (2022)
Self-exploration	X	X	X		X	X		X	X	X	X	X	X	
Career exploration	X	X			X	X	X	X	X			X	X	X
Career maturity/ Career adaptability	X	X								X				X
Ability-based emotional intelligence				X										

Variable	Atli (2016)	Chen et al. (2022)	Culpepper et al. (2015)	Di Fabio y Kenny (2011)	Ferrari et al. (2012)	Gu et al. (2020)	Kutlu y Bedel (2021)	Maree (2020)	Maree y Magere (2023)	Rehfuß y Sickinger (2015)	Rochat y Rossier (2016)	Shea et al. (2009)	Taveira et al. (2009)	Turan y Çelik (2022)
Self-esteem			X											
Academic achievements			X					X						
Hope					X									
Optimism					X									
Self-efficacy					X	X		X				X	X	
Irrational beliefs					X		X		X		X		X	
Motivation														X
Time perspective				X	X	X						X		X
Career goals					X									

The inclusion of key resources in career counseling processes, as outlined by Brown et al. (2003) and Whiston et al. (2017), is illustrated in Figure 2. However, several studies do not provide detailed information on this aspect (Di Fabio & Kenny, 2011; Gu et al., 2020; Turan & Çelik, 2022).

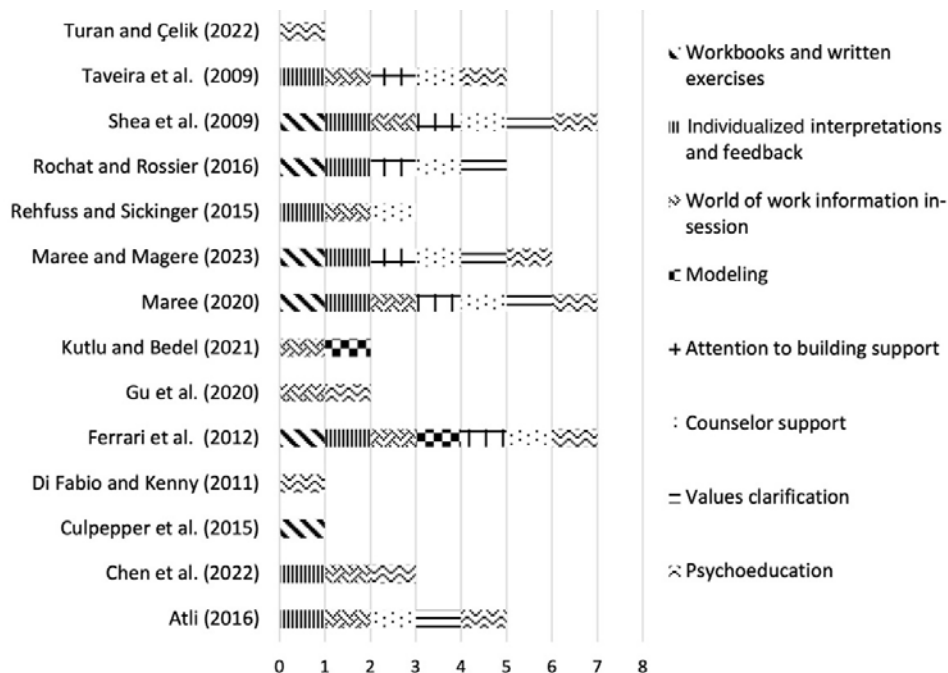
- Vocational information exploration during sessions: searching for and analyzing academic and professional information.
- Written tasks and exercises: encouraging participants to analyze their work while promoting active participation and enhancing their self-efficacy.
- Value clarification: reflective self-exploration exercises and joint reading of reflections.
- Building support: involving the family, either directly or by analyzing their influence (roles, occupations, values), and/or including teachers, friends, and partners. This involves identifying barriers and resources.
- Individualized interpretations and feedback: developing coping skills and strategies, accompanied by personal progress monitoring and goal formulation.
- Counselor support: facilitating dialogue about the relationship between information and plans, addressing doubts, and complementing this with participant evaluations.

Although not explicitly listed as a key component, sociocultural topics are also addressed. Additionally, Ferrari et al. (2012) emphasize the importance of curiosity,

persistence, optimism, and risk-taking. Providing opportunities for contact with the professional world is also significant, particularly for the modeling component.

Figure 2

Key components in career counseling



DISCUSSION AND CONCLUSIONS

The purpose of this scoping review was to describe research on career indecision and indecisiveness, the associated variables, the instruments used for their measurement, and intervention programs targeting students in their final years of secondary education and VET. By addressing these three aspects simultaneously, this review provides a comprehensive perspective on contextual, social, and personal factors. The analysis applied the CIPP-C method, which allows for future research to hypothesize potential causal relationships among identified variable systems, marking one of the study's main contributions.

The first objective was to conceptualize the variables associated with career indecision and indecisiveness. Findings align with existing literature (Gati et al., 1996; Saka et al., 2008), emphasizing personality traits, particularly neuroticism

(Martincin & Stead, 2015); process-related self-efficacy for career indecision; and self-esteem for career indecisiveness (Udayar et al., 2020). Career exploration (Kleine et al., 2021) was also identified as critical, especially as many adolescents revised their aspirations following their experiences during the pandemic (Carey et al., 2023). Vocational anxiety and career adaptability were significant, particularly during transitional stages marked by rapid social change (Leung et al., 2022).

Additional factors include motivation, which is particularly relevant to career indecision, and anxiety and emotional intelligence traits, which are more pertinent to career indecisiveness. Adolescent girls, who reported increased feelings of loneliness during and after the pandemic (Jen et al., 2024), experienced career indecisiveness more often. While most research has focused on the antecedents of vocational indecision, fewer studies have examined its consequences or its impact on vocational decision-making (Bian, 2023).

Among contextual factors, parental figures stand out as primary sources of career guidance during the pandemic (Carey et al., 2023). However, no studies addressed other significant figures, such as teachers (Wong et al., 2021) or peer support (Carey et al., 2023; Lent & Brown, 2020). Positive interpersonal relationships were crucial for coping during and after the pandemic and for future decision-making (Carey et al., 2023). Maree (2022) emphasized that being part of and guided by one's community is vital for successful interventions.

There is a need for further research into how macro-level factors, such as globalization, migration, neoliberalism, and natural resource exploitation, affect young people's academic, professional, and life projects (Nota et al., 2020; Pryashantha et al., 2022). These influences were particularly evident in the post-pandemic context (Carey et al., 2023). Savickas (1995) highlighted the importance of contextualizing career indecision and incorporating individuals' subjective experiences and career adaptability. Some reviewed studies also identify factors such as hope, future orientation, well-being, life satisfaction, and optimism (Charokopaki & Argyropoulou, 2019; Ferrari et al., 2010; Parola & Marcionetti, 2022; Şeker, 2020; Zaleszczyk & Kot, 2015), which are significant in the post-pandemic context.

Career indecisiveness has received less research attention. Traditional vocational theories viewed uncertainty as a temporary process that could be minimized through proper planning, assuming career paths were predictable (Nota et al., 2020). However, career indecisiveness requires addressing personal and socio-contextual uncertainties as well as the emotional difficulties individuals face. This includes understanding the influence of immediate factors (family and school) and distal factors (political, economic, and environmental) on young people.

The second objective was to analyze the tools used to assess career indecision and career indecisiveness. The psychometric characteristics of the reviewed instruments demonstrated reliability and cross-cultural validity. However, there

was limited representation of populations from Africa and South America, as noted in previous studies (Levin et al., 2023; Xu & Bhang, 2019). Instruments for career indecisiveness have fewer adaptations compared to those for career indecision, leading to a greater number of country-specific tools (Bacanli, 2000, 2005; Çakır-Mehmet, 2004; Gómez-Arbeo, 1992; Teixeira & Magalhães, 2001). Narrative interviews have also proven diagnostically valid (Maree, 2020; Maree & Magere, 2023; Rehfuß & Sickinger, 2015).

The third objective addressed intervention programs for career indecision and career indecisiveness. Effective interventions for career indecision typically focus on psychoeducation, vocational information, and psychosocial aspects (Maree & Magere, 2023). These programs use measurement tools to identify individual difficulties and assess the impact of interventions. However, most of the reviewed studies did not include follow-ups, limiting knowledge of the long-term effectiveness of interventions.

No specific intervention studies on career indecisiveness were identified. This may be due to confusion surrounding constructs (Bian, 2023) or an overlap between career counseling and clinical therapy processes (Lent & Brown, 2020). Collaboration between these fields is crucial for addressing career indecisiveness (Blustein et al., 2019). Emotional intelligence training was highlighted as a key area, helping regulate emotions, cope with stress, and improve mental health and interpersonal relationships (Pena Garrido, 2024).

Our findings align with Amaral et al. (2023), who emphasized the lack of research on the relationship between vocational indecision, depression, and negative thoughts among adolescents. This is especially important given the rise in mental health challenges and post-pandemic vocational uncertainties (Jen et al., 2024; Malinić et al., 2024), particularly in at-risk populations (Gittings et al., 2021). Internationally, career counselors are observing the impact of these factors on decision-making processes and problem-solving (Marks et al., 2021). Professionals need to support young people from an individual and inclusive perspective, addressing current risks (Di Maggio et al., 2021).

Digital resources remain underutilized in vocational interventions, despite their increased use during the pandemic (Chen et al., 2022). These resources focus on career exploration, self-reflection, and promoting students' active roles in designing and developing their academic and professional projects (Requejo Fernández et al., 2022). The limited use of digital tools may be due to a lack of protocols for their appropriate and ethical application, as noted by Borbély-Pecze and Gyöngyösi (2024), or the need for better training among educators to enhance their digital competencies (García-Ruiz et al., 2023).

Interventions targeting VET students were notably absent, despite high dropout rates in this group. Programs tailored to these students and further research on

this stage of education are urgently needed. Romero-Rodríguez et al. (2022) suggest creating synergies between education systems and companies to support the school-to-work transition, providing workplace-based learning opportunities, and fostering interpersonal skills and active methodologies that encourage critical thinking, discovery and the identification of real challenges from a collective, socially fair and ethical perspective.

Lastly, the review highlighted the limited representation of studies that have a more global and inclusive vision, i.e. that consider cultural aspects, gender, migrant or economically disadvantaged populations. As noted by Bian (2023), the prevalence of quantitative studies limits understanding of individuals' lived experiences with vocational indecision and the exploration of contextually current relevant factors, especially for VET students. Additionally, recent research on vocational indecision in Spanish remains scarce, likely due to traditional educational priorities that focus on academic performance and dropout prevention over other guidance needs.

Theoretical and practical implications

Contemporary career guidance requires addressing uncertainty, emotional identification and management, training self-management skills, adapting to change, and fostering a sustainable future (Di Maggio et al., 2021; Echeverría & Martínez-Clares, 2024; Lent & Brown, 2013; Santilli et al., 2020). It also necessitates consideration of factors such as culture and gender (Santilli et al., 2020; Tian & Hou, 2023), as academic and career expectations are largely shaped by cultural, social, and individual expectations.

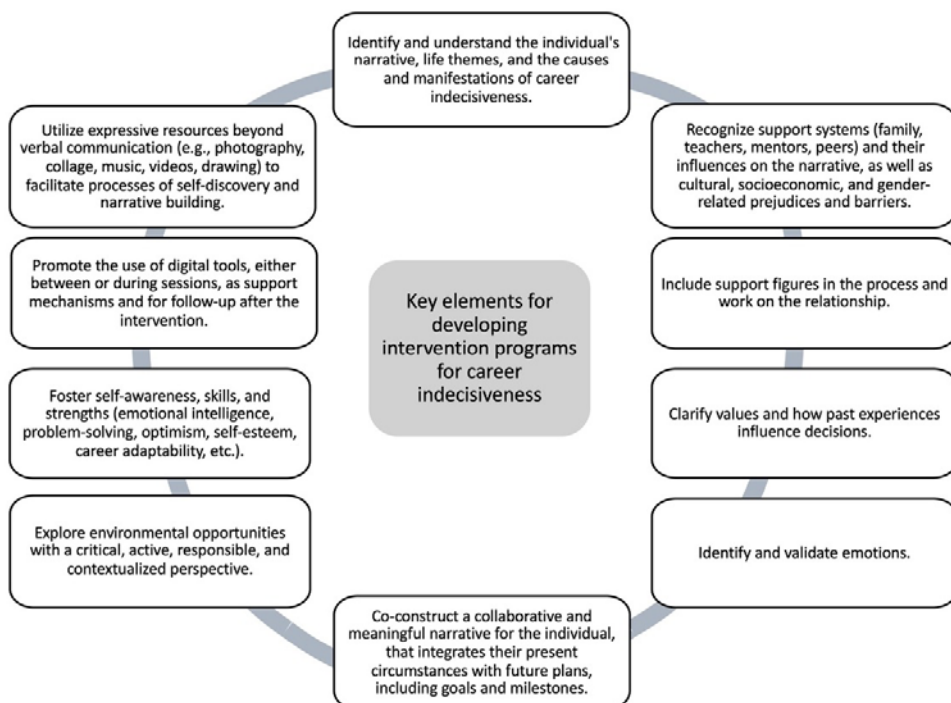
To achieve this, it is essential to gather annual information about students' processes. This allows educators to adapt to the evolving realities of maturing students and contextual factors, cultivating their sense of control, responsibility in decision-making, active participation in society, and capacity to anticipate and solve potential problems (Hernández-Franco, 2019; Parola & Marcionetti, 2022). Furthermore, community-based interventions can help young people feel like active agents through dialogue, reflection, and guidance, involving families, alumni, and local professionals (Barnes et al., 2020; Gu et al., 2020).

Based on this review, we propose the CIPP-C model as a conceptual framework to guide the variables to be included in future intervention programs. Specifically for career indecisiveness, we recommend a narrative, cognitive-behavioral, and systemic approach, focusing on the dynamism of identity and its influences during transitions. This approach activates personal resources to address present challenges and opportunities while preparing individuals for the future with a critical, supportive, meaningful, and empowered perspective.

By combining these approaches, interventions can more effectively support the reconstruction of personal and academic-professional narratives, promoting the adjustment and strengthening of the systems that influence the individual. Therefore, as a synthesis of our review, we propose considering the key components for intervention programs outlined in Figure 3.

Figure 3

Key elements for developing intervention programs for career indecisiveness



Limitations and future research

This study has some limitations. For example, the integration of different methodological approaches and measurement instruments restricts the generalizability of the results. Additionally, by including only peer-reviewed articles published in journals, relevant work, such as grey literature, may have been excluded. Finally, regarding the multidimensional measurement instruments, the relationship

between their subscales and career indecision and career indecisiveness has not been analyzed in detail.

We highlight several areas of interest for future research. These include studies employing qualitative and mixed methods to capture the subjective experiences of students with vocational indecision in the context of globalization, climate emergencies, and health crises. Research focusing on indecision among VET students is also needed, as is the application of evidence-based intervention protocols for those with more persistent indecision (indecisiveness). Furthermore, implementing academic and career guidance actions in digital formats, leveraging the opportunities offered by AI, represents a promising avenue for exploration.

This review provides a model for gathering and analyzing information which can facilitate the development of new intervention protocols based on the identified variables, existing programs, and instruments for evaluating career indecision and career indecisiveness. Moreover, in the post-pandemic socio-educational context, addressing career indecisiveness is particularly important, as it affects adolescents' mental health, self-esteem, and future outlooks. A shift is needed from short-term solutions to the development of long-term support systems within the framework of lifelong guidance, enabling interventions to adopt a systemic and eco-social perspective. We hope that this review will be useful for educators, counselors, and policymakers.

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APPENDIX

Table A1

Variables analyzed in the review: Codebook

Variable	Code
Objective	(1) To study the relationship between career indecision and other factors; (2) to identify the process that predict career indecision; (3) to recognize the variables that explain the intention to seek career counseling; (4) to study the effectiveness of interventions for career indecision and decision-making difficulties, among other factors.; (5) to adapt and validate career indecision scales; (6) to examine the relationship between career indecisiveness and other factors; (7) to analyze the predictive effect of different factors in career indecisiveness; (8) to examine the differences between decided and undecided students; (9) to analyze the predictive effect of career planning/exploration; (10) to analyze factors that can affect career interests and expectations; (11) to evaluate an emotional intelligence program; (12) to examine time perspective and its relationship with other variables; (13) to study the effectiveness of an intervention aimed at fostering time perspective and career decidedness; (14) to study the predictive validity of career indecisiveness in post-decisional problems; (15) to study cognitive processes associated with occupational indecision in gifted adolescents; (16) to study career decision-making processes associated with university access.; (17) to study career indecision in economically disadvantaged individuals; (18) to analyze changes in attitudes, experiences, and interests during the final year of school, based on place of origin, aspirations, and gender; (19) to consider the value of interviews in academic and career counseling services.; (20) to identify different motivational profiles; (21) to study the potential consequences of career indecision and indecisiveness; (22) to identify decidedness-indecisiveness profiles; (23) to develop and evaluate the effectiveness of a vocational intervention tailored to linguistic and cultural issues for migrant students; (24) to study career development in students; (25) to evaluate the applicability of career construction model of adaptation for explaining after-school career transition in adolescence
Educational Stage (ES)	(1) High School (upper secondary); (2) Vocational education and training (VET)
Participants (P)	(1) Mixed (females and males); (2) Females; (3) Males; (4) Students; (5) Parents; (6) Teachers/mentors
Intervention type (IT)	(1) Group; (2) Individual
Method	(1) Mixed; (2) Quantitative; (3) Qualitative
Research design (RD)	(1) Non experimental; (2) Experimental; (3) Quasi-experimental; (4) Transversal; (5) Longitudinal; (6) Group (cohort) evolution; (7) Comparison of pre-post measures; (8) Descriptive/Exploratory; (9) Grounded theory; (10) Narrative; (11) Instrument design; (12) Single case

Variable	Code
Data collection tool	(1) Assessment measure; (2) Interview; (3) Other documents (grades, reports, autobiography...)
Indecision	(1) Career indecision (2) Career indecisiveness (3) Unidimensional; (4) Multidimensional
Study dimensions (variables)	(1) Sociodemographic data (gender, age, educational year group, ethnicity...); (2) personality traits; (3) seek career counseling; (4) career adaptability; (5) career decision-making self-efficacy; (6) career exploration; (7) optimism; (8) strategies for coping with career indecision; (9) generalized self-efficacy; (10) coping strategies; (11) vocational interests; (12) career maturity; (13) basic psychological needs; (14) perceived social support; (15) self-esteem; (16) ability-based emotional intelligence; (17) fluid intelligence; (18) self-evaluation; (19) decision-making styles; (20) cognitive failures; (21) trait emotional intelligence; (22) time perspective; (23) hope; (24) trait anxiety; (25) commitment to the choice; (26) choice stability; (27) career decisional tasks (orientation, self-exploratory and broad exploratory behavior, decisional status); (28) academic procrastination; (29) social support; (30) career self-efficacy; (31) allocentrism- family; (32) occupational intention; (33) idiocentrism-future; (34) social influence-family; (35) occupational amotivation; (36) multipotentiality; (37) information on university access; (38) income due to university study; (39) expectancy for university success; (40) interest/enjoyment of University study; (41) indecision with university entry; (42) desirable occupation; (43) perfectionism; (44) recognition from others; (45) living up to potential; (46) determination of transition; (47) difficulties in learning and studying; (48) bullying; (49) upper secondary and career choice; (50) family adaptability and family cohesion; (51) parental style; (52) worry; (53) emotional distress; (54) irrational beliefs about career choice; (55) family communication; (56) parental psychological control; (57) parental support; (58) vocational anxiety; (59) amotivation to access university; (60) autonomy for career decision making; (61) parental career-related behaviors; (62) occupational expectations; (63) perceived career barriers; (64) self-regulation; (65) life satisfaction; (66) vocational identity; (67) locus of control; (68) goal instability; (69) mental well-being; (70) linguistic identity; (71) physical activity; (72) attachment to mother and father; (73) hope for success; (74) work values; (75) study satisfaction; (76) scores/academic achievements; (77) meaning in life; (78) occupational discrepancies; (79) over-parenting; (80) female role stress; (81) conformity to feminine norms; (82) career goals; (83) participation in extracurricular activities; (84) school appreciation; (85) trust in education; (86) vocational orientation; (87) maximizing tendencies; (88) vocational development; (89) occupational aspirations; (90) quality of program implementation; (91) attendance; (92) family influence; (93) value thoughts of family; (94) expectancy for occupational success; (95) salary/ occupational income
Data analysis	(1) Statistical-descriptive analysis; (2) Univariate/bivariate analysis; (3) Multivariate analysis; (4) Content analysis; (5) Exploratory/confirmatory factor analysis; (6) Correlational/Inferential analysis; (7) Discriminant analysis

Table A2

References and analysis of the selected studies applying the codes from Table A1

Author(s)	Objective	ES	P	IT	Method	RD	Instruments	Indecision	Dimensions	Analysis
1. Ambiel et al. (2018)	1; 2; 3	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 2; 3; 4; 5; 6	1; 3
2. Argyropoulou et al. (2007)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	9; 10; 11	3; 5
3. Arslan et al. (2022)	1	1	2; 4; 5	-	2	1; 4; 8	1	1; 3	1; 79; 80; 81; 87	3; 6
4. Atli (2016)	4	1	1; 4	2	2	3; 7	1; 2; 3	1; 3	12	2; 4
5. Azpilicueta et al. (2019)	5	1	1; 4	-	2	1; 4; 8	1	1; 2; 3; 4	1	1; 5
6. Babarović y Šverko (2016)	24	1	1; 4	-	2	1; 4; 8	1	1; 4	1; 4; 88	1; 5; 6
7. Babarović y Šverko (2019)	5	1	1; 4	-	2	1; 4; 8	1	1; 4	5; 88	1; 3; 5
8. Bacanlı (2016)	5; 8	1	1; 4	-	2	1; 4; 8	1	1; 4	1	1; 3; 5
9. Baltacı et al. (2020)	6; 7	1	1; 4	-	2	1; 4; 8	1	2; 4	1; 13; 14	1; 2; 6; 7
10. Charokopaki y Argyropoulou (2019)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 5; 7	1; 3
11. Chen et al. (2022)	4	1	1; 4	1	2	3; 7	1	1; 4	1; 12; 66	1; 3; 6
12. Creed et al. (2007)	9	1	1; 4	-	2	1; 5; 6	1	1; 3	1; 5; 12; 15	1; 2; 3
13. Culpepper et al. (2015)	4	1	1; 4; 6	1	2	3; 7	1; 2; 3	1; 3	15; 76; 90; 91	1; 2
14. Denault et al. (2019)	1	1	1; 4; 5	-	2	1; 5; 6	1; 2	1; 3	1; 6; 83	1; 3; 5
15. Di Fabio y Kenny (2011)	4; 11	1	1; 4	1	2	2; 7	1	1; 2; 3; 4	16	1; 2
16. Di Fabio y Palazzeschi (2012)	1	1; 2	1; 4	-	2	1; 4; 8	1	1; 2; 3; 4	2; 17; 18; 19	1; 3; 6
17. Di Fabio y Palazzeschi (2013)	1	1; 2	1; 4	-	2	1; 4; 8	1	2; 3	2; 17; 20	1; 3; 6

Author(s)	Objective	ES	P	IT	Method	RD	Instruments	Indecision	Dimensions	Analysis
18. Di Fabio y Saklofske (2014)	1; 6	1	1; 4	-	2	1; 4; 8	1	1; 2; 3; 4	2; 5; 16; 17; 21	1; 3; 6
19. Duru (2022)	1	1; 2	1; 4	-	2	1; 4; 8	1	1; 4	5; 12	1; 2; 3; 6
20. Duru et al. (2021)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	2; 5	1; 3; 6
21. Ferrari et al. (2010)	1; 12	1	1; 4	-	2	1; 4; 8	1	1; 4	1; 22	1; 2; 3; 6
22. Ferrari et al. (2012)	4; 13	-	1; 4	1	2	3; 7	1	1; 4	7; 22; 23	1; 2
23. Germeijs y Verschueren (2011a)	14	1	1; 4	-	2	3; 5; 7	1	2; 3	24; 25; 26	1; 3; 5; 6
24. Germeijs y Verschueren (2011b)	6; 14	1	1; 4	-	2	3; 5; 7	1	2; 3	2; 27	1; 3; 6
25. Gómez-Arbeo (2010)	6	1	1; 4	-	2	1; 4; 8	1	2; 4	1; 77	2; 3; 6
26. Grigor y Turda (2022)	6	1	1; 4	-	2	1; 4; 8	1	1; 4	7; 74	5
27. Gu et al. (2020)	4	1	1; 4	1	2	3; 7	1	1; 4	1; 5	1; 2; 6
28. Günes y Owen (2020)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 28	2; 6
29. Jemini-Gashi et al. (2021)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 29; 30	1; 3; 6
30. Jung (2013a)	15	1	1; 4	-	2	1; 4; 8	1	1	1; 31; 32; 33; 34; 35; 36; 43	1; 3; 5; 6
31. Jung (2013b)	16	1	1; 4	-	2	1; 4; 8	1	1	1; 34; 37; 38; 39; 40; 41; 42; 59	1; 3; 5; 6
32. Jung (2018)	15	1	1; 4	-	2	1; 4; 8	1	1	1; 31; 33; 34; 35; 36; 43	1; 3; 5
33. Jung y McCormick (2010)	1	1	1; 4	-	2	1; 4; 8	1; 2	1	1; 11; 34; 35; 44; 94; 95	1; 3





Author(s)	Objective	ES	P	IT	Method	RD	Instruments	Indecision	Dimensions	Analysis
34. Jung y Young (2017)	2; 17	1	1; 4	-	1	9; 11	1; 2	1	1; 35; 36; 45; 92; 93	1; 3; 4; 5
35. Kalalahti et al. (2017)	2; 18	1	1; 4	-	2	1; 4; 8	1	1	1; 46; 47; 48; 49; 84; 85; 86; 89	1; 3
36. Karacan-Ozdemir (2019)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	1; 4	1; 3; 6
37. Kirdök y Harman (2018)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	67	1; 2
38. Kirdök y Korkmaz (2018)	2	-	1; 4	-	2	1; 4; 8	1	1; 4	2; 16	3; 6
39. Koumoundourou et al. (2010)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	18; 50; 51	1; 3; 6
40. Kulcsár et al. (2020)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	1; 52; 53	1; 3; 6
41. Kutlu y Bedel (2021)	4	1	1; 4	1	2	3; 7	1	1; 3	1; 54	1; 2
42. Lo Cascio et al. (2013)	6	1; 2	1; 4	-	2	1; 4; 8	1	2; 3	1; 15; 24; 55	1; 3; 6
43. Lo Cascio et al. (2015)	6	1	1; 4	-	2	1; 4; 8	1	2; 3	1; 15; 56	1; 2; 3
44. Lo Presti et al. (2017)	5	1	1; 4	-	2	1; 4; 8	1	1; 2; 3; 4	24	1; 5
45. Lozano (2007)	5	1; 2	1; 4	-	2	1; 4; 8	1	1; 4		5
46. Lozano y Repetto (2007)	1	1; 2	1; 4	-	2	1; 4; 8	1	1; 4	11	1; 3
47. Marcionetti y Rossier (2016)	1	1; 2	1; 4	-	2	1; 4; 8	1	1; 4	2; 14; 15; 57;	1; 3; 6
48. Maree (2020)	4; 19	1	3; 4	2	1	10; 12	1; 3	1	6; 11; 30; 76; 92	4; 6
49. Maree y Magere (2023)	4; 19	1	1; 4	1	3	10; 12	1; 2; 3	1	6; 93	4
50. Nalbantoglu-Yilmaz y Cetin-Gunduz (2018)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	58	3; 6

Author(s)	Objective	ES	P	IT	Method	RD	Instruments	Indecision	Dimensions	Analysis
51. Nota et al. (2007)	1	1; 2	1; 4	-	2	1; 4; 8	1	1; 3	30; 57	1; 3; 6
52. Öztemel (2013)	5	1; 2	1; 4	-	2	1; 4; 8	1	2; 4	1	1; 2; 3; 5
53. Öztemel (2014)	6	1	1; 4	-	2	1; 4; 8	1	2; 3; 4	1; 2; 15	1; 3; 6
54. Paixão y Gamboa (2017)	20	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 6; 60	1; 3; 6
55. Paixão y Gamboa (2022)	1; 2	1	1; 4	-	2	1; 4; 8	1	1; 3	6; 60	1; 3; 6
56. Parola et al. (2023)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	61	1; 5
57. Parola y Marcionetti (2022)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	4; 61; 65	1; 2; 3; 6
58. Patton y Creed (2007a)	1; 10	1	1; 4	-	2	1; 4; 8	1	1; 3	5; 12; 62; 63; 89	6; 7
59. Patton y Creed (2007b)	10	1	1; 4	-	2	1; 4; 8	1	1; 3	1; 12; 15; 62; 82; 76; 78; 89	1; 2; 6
60. Pečjak y Košir (2007)	2; 8	1	1; 4	-	2	1; 4; 8	1	1; 4	2; 64; 65	1; 2; 3; 7
61. Pečjak et al. (2019)	2	1; 2	1; 4	-	2	1; 4; 8	1	1; 4	49	1; 3; 5; 6
62. Rehfuß y Sickinger (2015)	1; 19	1	1; 4	1; 2	3	5; 7; 10; 11	1; 3	1	1; 12; 63; 64	4
63. Rochat y Rossier (2016)	19	1	3; 4	1	3	7; 12	1; 2	1; 4	68; 78	4
64. Sabates et al. (2017)	21	1	1; 4;	-	2	1; 5; 6	1	1	1; 25; 63; 76; 92; 95	1; 6
65. Santos y Ferreira (2012)	6	1	1; 4	-	2	1; 4; 8	1	2; 3	15; 24; 66; 67	1; 3
66. Santos et al. (2014)	22	1	1; 4	-	2	1; 4; 8	1	2; 3	15; 24; 49; 66; 67	1; 7
67. Santos y Gonçalves (2017)	6; 7	1	1; 4	-	2	1; 4; 8	1	2; 3	15; 68	1; 3
68. Şeker (2020)	1	1	1; 4	-	2	1; 4; 8	1	1; 3	58; 69	1; 6; 3

Author(s)	Objective	ES	P	IT	Method	RD	Instruments	Indecision	Dimensions	Analysis
69. Shea et al. (2009)	4; 23	1	1; 4	1	2	3; 7	1; 2	1; 3	3; 5	1; 2
70. Sovet et al. (2017)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	70	1; 2; 5
71. Sovet y Metz (2014)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	5; 51	1; 3; 6
72. Soytürk y Öztürk (2019)	6	1	1; 4	-	2	1; 4; 8	1	2; 3	1; 15; 71	1; 2; 3; 6
73. Šverko y Babarović (2019)	25	1	1; 4	-	2	1; 4; 5; 8	1	1; 4	2; 4; 18; 25; 75; 76; 88	1; 2; 3; 6
74. Taveira et al. (2009)	4	1	1; 5	1	2	3; 7	1	1; 3	6	1; 2
75. Turan y Çelik (2022)	4	1	1; 4	1	2	3; 7	1		4; 8	1; 2; 5
76. Vignoli (2009)	6	1	1; 4	-	2	1; 4; 8	1	2; 3	15; 72	1; 3
77. Vignoli (2015)	6; 7	1	1; 4	-	2	1; 4; 8	1	2; 3	6; 24; 58	1; 3; 6
78. Zaleszczyk y Kot (2015)	1	1	1; 4	-	2	1; 4; 8	1	1; 4	73	1; 2; 3

Reconnecting with nature in digital times: The power or supremacy of municipal education policies?

Reconectar con la naturaleza en tiempos digitales: ¿El poder o la supremacía de las políticas educativas municipales?

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ABSTRACT

This article aims to examine the role played by municipal policies in (re)connecting with nature in global digitalization environments. It specifically analyzes how local government can impact the narratives developed by young people about more sustainable educational models and facilitators of links with the natural environment. At a methodological level, a first phase of fieldwork consisted of different activities (directed/undirected, with or without technological resources) involving 154 boys and girls between 9 and 12 years (110) and between 13 and 16 years (44), carried out in different urban natural environments as well as in nature contexts with two weekend camping trips. Data analyzed come from a total of 193 informal interviews conducted by means of direct observation during the field trips. The main results are, on one hand, the role that local administrations are taking on in both formal and non-formal governance issues and, on the other, the capacity shown by the actors under study, from their narratives and actions, in the co-construction of environmental education policies and the consolidation of healthy environments. It is concluded that there is a need to articulate a systematized channel of collaboration between actors (such as schools and municipalities) that have had, until now, less political experience.

Keywords: local government, digitalization, young people, technology, nature, environmental education

RESUMEN

El objeto de este trabajo se centra en examinar el papel que juegan las políticas municipales en las prácticas de (re)conexión con la naturaleza en entornos de digitalización global. En concreto, el artículo analiza las posibles implicaciones que tienen las Administraciones locales en las narrativas que elaboran los jóvenes sobre modelos educativos más sostenibles y facilitadores de vinculación con el entorno natural. A nivel metodológico, se ha realizado una primera fase de trabajo de campo, articulada a través del desarrollo de diferentes actividades (dirigidas/ no dirigidas, con o sin recursos tecnológicos), por parte de 154 niños y niñas de entre 9 y 12 años (110) y entre 13 y 16 años (44), ejecutadas en varios entornos naturales urbanos, así como en contextos de naturaleza en los que se han realizado dos acampadas de fin de semana. Los datos que se analizan provienen de un total de 193 entrevistas informales desarrolladas en el marco de la observación directa llevada a cabo en las salidas de campo. Como resultados principales, se comprueba, por un lado, el papel que están asumiendo las Administraciones locales en cuestiones de gobernanza tanto formal como no formal y, de otro, la capacidad que muestran los actores objeto de estudio, desde sus narrativas y acciones en la co-construcción de políticas de educación ambiental y en la consolidación de entornos saludables. Se llega a la conclusión de la necesidad que existe de articular un cauce sistematizado de colaboración entre actores que (como los centros y los municipios) han tenido, hasta el momento, un menor recorrido político.

Palabras clave: administraciones locales, digitalización, jóvenes, tecnología, naturaleza, educación ambiental

INTRODUCTION

International education management models have undergone substantial changes in recent years, turning towards more decentralizing regulations as part of a global strategy of policies on accountability (Fontdevila, 2019; Parcerisa & Verger, 2016) and promoting school autonomy (Andrews et al., 2019; OECD, 2023). However, local administrations are still residually recognized as power structures in education in many geographical contexts, from a comparative perspective and in relation to other territorial levels (regional or central).

Although it is true that it is a form of governance subject to continuous evolution, as demonstrated by the fluctuations in how some education narratives are articulated with management models (Bolívar & Murillo, 2017; European Commission, 2017). For example, the paradigm of educational success has thus been explained based on the recognition of decentralized systems, although at different levels of competence regulation. While in the 1990s, success was justified by the distribution of powers at any administrative level (regional, local, central), in recent decades it is justified by convergence achieved with educational institution governance. This has led to the discourse on educational sovereignty being transferred to two territorial management models with less political and comparative development (local administration and schools), and to project the idea that governance models with their own identity elements are shaped at each of these levels of power.

In the case of Spain, regulations on municipal policies have increased educational powers for local government —historically focused on the creation, construction, maintenance and safeguarding of public schools (preschool, elementary, special education), also in cooperation with education administrations and compliance with mandatory schooling— to other, non-formal developments that today are proof of the great progress made by municipalities in achieving institutional collaboration projects (Blanco et al., 2018; Subirats, 2022).

The recent passing of Organic Law 3/2020 of December 29, amending Organic Law 2/2006 of May 3, on Education (LOMLOE in Spanish) reinforces alliances between contexts by insisting on the need to foster ‘la articulación y complementariedad de la educación formal y no formal con el propósito de que esta contribuya a la adquisición de competencias para un pleno desarrollo de la personalidad’ (‘the articulation and complementarity of formal and non-formal education for the purpose of contributing to the acquisition of competences for full personality development’) (Article 5 bis). Under these circumstances,

collaboration in social management at municipal level starts to stand out as a solid line of research on the overall well-being of the general population, specifically younger people (Vidal & Castro, 2022). Some authors, such as Barfield et al. (2021) associate the prevention of mental health-related problems with local nature programs, often set in rural contexts, extending the idea that the territory has local assets for health, which are understood as factors or resources that improve health and well-being at individual and community level in certain contexts. A line of study that underlines how public policies are responsible for promoting health and well-being in local territories to respond to major challenges such as the crisis in social cohesion and climate change.

All these studies are beginning to establish the thesis that health —understood holistically— covers not only illnesses, but also a wide spectrum of knowledge such as physical and mental health, and socioeconomic well-being, considering non-medical factors (economic and social) as key in achieving global well-being (Barton & Grant, 2013; Hancock & Duhl, 1988; Northridge, 2003). From an ecological perspective and with an approach based on Social Determinants of Health (SDH) (Butler-Jones, 2012), the resources and social capitals of the different contexts can be decisive in promoting healthy territories.

This new approach linking local policies with social and healthy development also contemplates the need to move from a deficit-based model to a collective coproduction model designed to encourage participation by actors involved in the territory, showing that polycentric governance and participatory research are essential elements in building resilient cities (Cargo & Mercer, 2008; Harting et al., 2022; Holkup et al., 2004; Leung, 2004). Decentralized and multi-level management of urban green spaces has a positive impact on local ecosystemic services (Hancock & Duhl, 1988; Israel et al., 2006; Webb et al., 2018) as the community takes on a dynamic role in the identification and co-creation of a culture that recognizes the value of its assets (Reyes-Riveros et al., 2021).

The European Commission (2021, p.6) defines these nature-based solutions as those ‘that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience [...] through locally adapted, resource-efficient and systemic interventions.’ The opportunity of Nature-Based Solutions (NBS) as a response to different social challenges is recognized globally, from the UN Agenda 2030 for Sustainable Development to the United Nations Framework Convention on Climate Change (UNFCCC) and its Paris Agreement, which has been signed by over 130 countries (IUCN, 2020). The EU has played a leading role in this process according to its R&D priorities and contribution to the UN Agenda 2030 for the SDGs. NBS are mainly effective due to their possibilities for adaptation to local conditions,

economic efficiency, policy and management capacity, stakeholder participation, and appropriate spatial scale and long-term performance.

The paradigm shift in health and how it relates to the territory, from a SDH perspective, are an opportunity to co-create well-being spaces at local level based on community participation and close involvement of actors such as schools, which have historically had a poorly defined responsibility in social management and are now recognized as necessary (Benninger et al., 2021; Goodwin & Young, 2013; Horii et al., 2016; Peters, 2005; Shamrova & Cummings, 2017; Teixeira & Gardner, 2017) to design and accept the proposed solutions (Frow et al., 2016; Mendez, 2015; Webb et al., 2018).

MUNICIPAL POLICIES AND PRACTICES FOR (DIGITALLY) RECONNECTING WITH NATURE

Municipal policies recognized as an expression of the democratization of social life in cities have generally forged participation spaces for different collectives at local level (Subirats, 2017; Vaillant, 2008). Social development that has contributed to articulating and then consolidating organic structures in the local context, as well as generating frameworks regulating powers, scopes and actors responsible for these municipal actions. In Spain, structures for public participation have been spreading since 2007, complemented by specific bodies for children and young people.

Open spaces of power that have been built on citizen sovereignty, focused for a long time on groups conventionally legitimized for participation —adults or the elderly— and which have opened up to children and young people in recent years as new groups deserving of attention due to their involvement in the co-construction of public policies (Cano et al., 2021). Examples of youth participation, the San Francisco Youth Commission for example (Checkoway et al., 2005), confirm that the municipality is a real means to strengthen more democratic societies based on local governance, encouraging the involvement of young people in policy formulation, in decision making, and in mobilization for civil rights.

This confirmation of the revitalization of municipal social and educational fabric through child-youth participation (Cano et al., 2021; Novella et al., 2021) is part of an institutional framework concerned with favoring participation in local governance with independent projects or as part of specific programs such as 'Child Friendly' (UNICEF, 2017). Current political agenda (SGD) has gradually and ever more explicitly introduced child and youth participation as a foundation for creating efficient, responsible and inclusive institutions at all levels, especially local. UNESCO (2019) collaborates directly in participatory democracy projects specializing in youth public policies rolled out in different sectoral actions. In

Europe, the joint EU-COE project ‘CP4 EUROPE – Strengthening National Child Participation Frameworks and Action in Europe’ implemented between 2021 and 2023 is a new paradigm of child and youth participation in a setting — institutional governance— that is very unknown and distanced from these groups (Council of Europe, 2023). The aim of this project is to map the reality of child-youth participation in different states, creating formal strategies that provide mechanisms of power for the younger population.

According to these premises, the article attempts to take another step forward in order to reflect on how local government can impact the narratives developed by young people about more sustainable educational models and facilitators of links with the natural environment. In other words, at this point it is not a question of verifying the democratic benefits of child-youth participation, a thematic review that is widely contrasted (Augsberger et al., 2023; Collins et al., 2018; Novella et al., 2021), but of exploring whether municipal policies (organic structures, programmatic planning, etc.) have any impact on current educational issues such as the construction of child-youth identities and their connection with nature in environments of digitalization. Research by Cano et al. (2021) largely begins this theory by introducing the value of digital environments as spaces to optimize participation and guarantee civil rights among young people, even though the core idea is still the democratization of how municipalities function. These authors study digitalization to highlight that local administrations make poor use to digital environments, which are merely informative, not proactive, decisive, or executive.

Hence, the core issue of this article raises other relevant cross-cutting elements that aim to rethink the hegemony of local administrations as educational subjects in shaping educational models and to verify the relationship between municipal action and schools. As Coll and Rivera (2019, p.19) point out, are schools becoming ‘institutions that, for some, have driven collective socialization but are losing validity day by day’? Or on the contrary, are education institutions a new asset in the process of co-creating nature-based solutions as argued by authors including Benninger et al. (2021) and Cummings (2017).

INSTITUTIONAL CONTEXT

Set in the scope of territorial policies, this article is an attempt to open a line of research on the weight that organic structures provided by local administrations can have in the development of municipal education profiles in terms of awareness policies with natural environments (public policies mediated or not by digitalization, governance styles, etc.). The study is limited to Salamanca and its province based on this city’s background in participation.

Salamanca was one of the main municipalities to formalize the Municipal Education Institute (IME in Spanish) in the 1980s, giving the city powers to support schools. The IME has now evolved to become the Salamanca City of Culture and Knowledge Foundation, an institution that will be analyzed in this article to identify its training options and then verify the correlation between municipal actions and the young population, all for the purpose of responding to the question: Can local policies encourage a greater connection with nature in children and young people (aged 9 to 15)?

Another three types of scenarios are also analyzed for child-youth participation; these are described by Novella et al. (2021). Specifically, they are participation in a municipal body such as the Child-Friendly City, of which the municipality of Carbajosa (Salamanca) is a member. In both cases the initial scenarios are more formal in terms of the participation of children and teenagers, but with different nuances. The first offers support for education in schools and with narrow scope for decision-making capacity, while children take on an active role in creating municipal public policies in the second scenario. All with the idea of responding to research questions such as whether municipal public policies (existence of leisure institutions, programmatic planning, education budgets, organic municipal structure, etc.) are conditioning narratives (discourses, reflections, words) that can express the connection and awareness of school children in their relationship with nature.

(Local) institutions and actions for connecting with the natural and digital environment: Salamanca City of Culture and Knowledge Foundation

The Salamanca City of Culture and Knowledge Foundation was created by the city council and is a cultural and educational legal entity. It aims to foster, promote, carry out, produce, program, organize and implement cultural, educational, and artistic or leisure activities. Its specific purposes also include the organization and management of Municipal Music and Dance Schools; public preschool education (0-3 years) management; creation of lifelong learning and support programs for non-profit entities and bodies; creation, publication and distribution of publications and educational material as a complement to the activities organized by the Foundation.

In this sense, the Foundation is a channel for the City Council to participate as another agent in the teaching process. Each year it offers the city's schools a series of activities in collaboration with other municipal bodies so they can apply to take part in them. Activities are divided into thematic blocks and scheduled for all education levels, from preschool to high school, as well as vocational training and special education.



Various entities collaborate in implementing the proposals, all of them local: Council Education Department, Lorenzo Milani Farm School, Institute of Natural Resources and Agrobiology of Salamanca IRNASA-CSC and the Tormes-EB foundation, among others. Most initiatives are also linked to projects and programs such as the LIFE Vía de la Plata project (LIFE19 CCA/ES/001188). This initiative is part of Savia, the Salamanca Infrastructure Strategy, and is designed to set up a green infrastructure network in the city. The goal is to involve citizens in the process with public participation, training and dissemination. It is a European project co-funded by the European Commission LIFE program and headed up by the Municipal Housing and Urban Development Board.

(Local) institutions and actions for connecting with the natural and digital environment: Carbajosa de la Sagrada

Carbajosa de la Sagrada has been recognized as a 'Child Friendly City' by the Permanent Secretariat of the Child Friendly Cities initiatives, formed by the Ministry of Social Rights and Agenda 2030, the Spanish Federation of Municipalities and Provinces, the 'Needs and Rights of Childhood and Adolescence' University Institute (IUNDIA) and UNICEF Spain since 2012. A recognition based on various initiatives to promote children participating in public life, thus guaranteeing their rights. One of these is the City of Children municipal program,

Important due to its projection at various levels. In terms of municipal politics, boys and girls participate in local organic structures, forming part of the plenary session through the Children's Council that meets up to three times a year to explain and share their proposals for improvement of the government representative. At social level, because its 'with the eyes of children' program analyzes and shares municipal needs, broadcasting them on the 'little voice' radio program where they can not only express their concerns and perspectives with the rest of the population, but it is also a tool for connecting with schools, guaranteeing that both actors are jointly responsible for social and civic matters. Organically, this form of participation is an initiative in which participation experiences are managed by local government (Cano et al., 2021) as part of municipal actions encompassing different institutions and actors, and with continuity over time.

The council is also involved in the Program for the renaturalization and adaptation to climate change of school playgrounds. Its main goal is to significantly transform outdoor school spaces through renaturalization. This project includes educational goals associated with physical health, healthy habits, inclusion, and equality by creating green spaces, school vegetable gardens, vertical gardens, ground permeability and other nature-based solutions, funded by REACT-EU (Program for

climate adaptation through renaturalization of public-school playgrounds in Castile and León funded by REACT-EU).

Collaboration between the Natural Heritage Foundation of Castile and León, the Regional Department of Public Work and Environment, and the Regional Department of Education, has made it possible to implement this program in line with the agenda 2030, providing teacher training, monitoring and assessment to guarantee effectiveness.

The Playgrounds activity has included 65 elementary and high schools in Castile and León (35 in rural areas), promotes the integration of teaching outdoors, and adapting the syllabus to outdoor spaces in line with healthy habits at school. This program is a response to the COVID-19 pandemic. In the Child Friendly City of Carbajosa de la Sagrada, children actively participate in improving the municipality; they propose ideas through the Children's Council that meets with the mayor three times per year. Since 2007, the Ladera and Isabel Reina de Castilla schools have been encouraging children to take part in assemblies and councils where their requests are presented at annual meetings, all with support from the Regional Department of Education.

METHOD

Population and sample selection

The fieldwork phase comprised different activities in the natural urban spaces of Carbajosa, Aldehuela, Isla del Soto and Würzburg, as well as weekend camps at an environmental initiative center (in Almenara de Tormes), and at the Peña Negra Hostel (in the Sierra de Béjar mountains). Outings that included guided and unguided activities, some with technology and others tech-free, but all intended to record information on the children's behavior and level of connection in a natural and urban natural setting, mediated by technology. Connection with the natural environment was recorded by means of observational studies on behavior: respect/disrespect, care/abuse, interaction, satisfaction, happiness, and with discourses developed on what the context of the activity suggested and evoked in them. The goal of this research is to create a tech solution that facilitates a child's bond with nature without causing dependency, anxiety or stress.

The study sample was 154 boys and girls, 110 aged between 9 and 12 years old and 44 between 13 and 16. Selection criteria included age, voluntary participation in the study, and availability for the dates scheduled for the event. A total of 193 audio and video interventions were collected from the 154 participants. All the children's families filled out an informed consent form on Research Projects on minors or legally incapacitated individuals.

Instruments

Data analyzed come from a total of 193 informal interviews conducted by means of direct observation during the field trips. They collect the children's feelings and opinions during activities in the natural environment. Each participation was recorded and then transcribed for later analysis.

Analysis

Once the interviews were collected and transcribed, they were analyzed using the text mining method described by Caballero and Campillo (2021). This type of analysis requires a text body to be converted into an $X_{p \times n}$ data matrix with 'p' words and 'n' documents by calculating the frequency each word is repeated in each document (interviews).

This matrix, also known as a lexical table (Lebart & Salem, 1988) is created along with applying a lemmatization protocol to homogenize and simplify the data. A protocol that involves converting all verb conjugations to their infinitive and adapting nouns and adjectives to their singular masculine form in Spanish. The matrix is also simplified by deleting empty or complementary words such as prepositions, conjunctions or determiners. Software by French laboratory IRaMuTeQ version 0.7 alpha 2 was used to create the lexical table.

Having obtained the matrix, a mathematical transformation known as characterization value (Caballero & Campillo, 2021) was applied to reweight the matrix based on maximum characterization instead of maximum frequency. The value is calculated with the formula:

$$f'_{np} = \frac{f_{np}}{\sqrt{\max_{f_i} \sqrt{\max_{f_j}}}}$$

After applying and transposing this transformation ($X_{n \times p}$), data were analyzed with a one-way Manova Biplot (Vicente, 1992) considering the city hosting the event as a grouping variable. This analysis can project rows (participating boys and girls) and columns (words) from a matrix to a reduced-dimension graph considering the directions of maximum separation between groups. In other words, this multivariate analysis allows us to graphically study differences between groups (cities) knowing which variables (words) cause the distinction. Groups are represented by a point on the Cartesian plane and a circle representing the confidence limits calculated using a univariate method with the Bonferroni (1936) and Agresti (2018) correction.

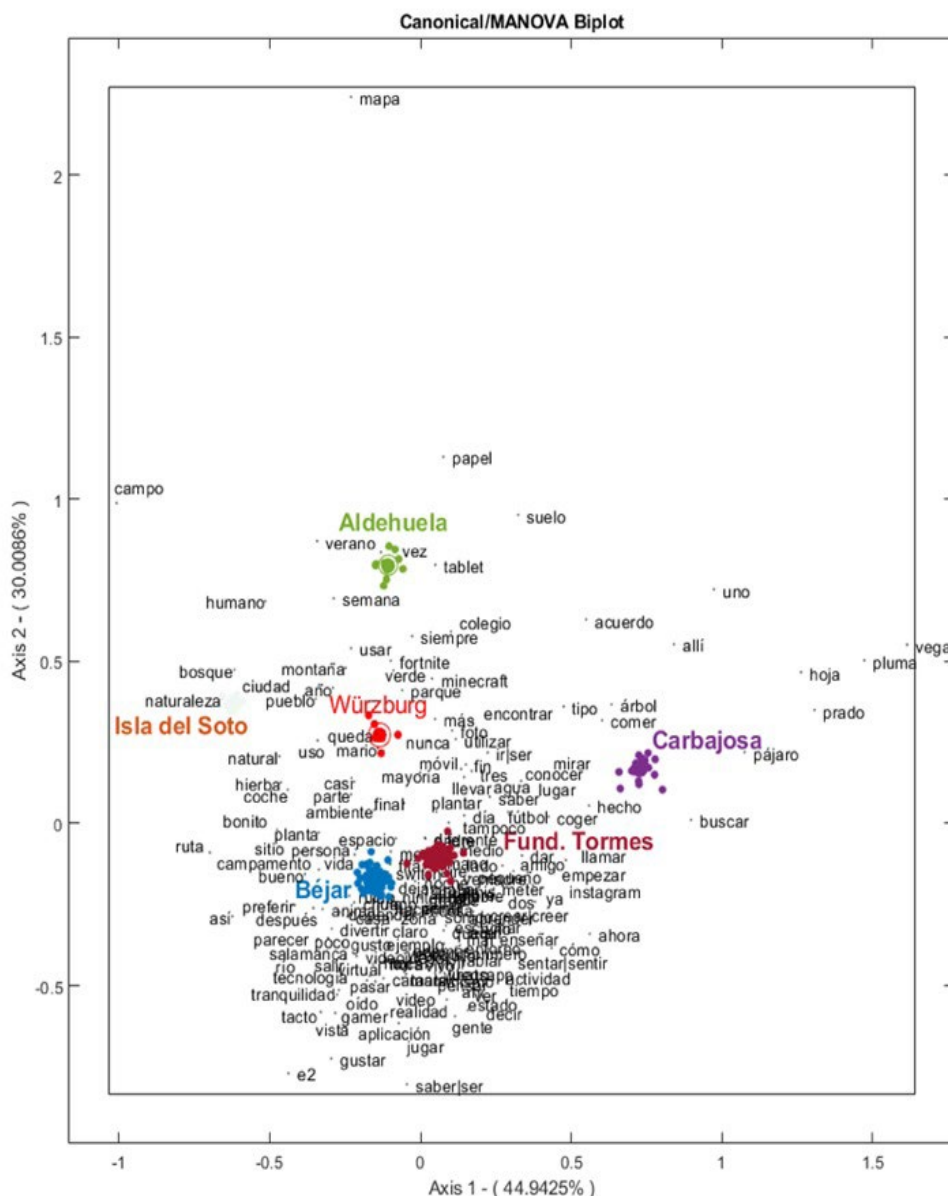
RESULTS

The multivariate analysis of discourses collected in interviews (figure 2) reveals a difference between the different schools of the children taking part in the activities. Despite this significant statistical difference, certain similarities can be observed at qualitative level. The discourse of children from Carbajosa de la Sagrada —beneficiaries and participants of municipal policies for children such as ‘Child Friendly Cities’— can be found on the first quadrant and with a strong alignment with the first abscissa axis. Its relative position compared to other groups clearly sets it apart with its own, well-differentiated discourse.

In the second quadrant and more aligned with the second axis is the group from Aldehuela which, although clearly distanced from the other groups, is not qualitatively distant from others (Würzburg or Isla el Soto) located around the same set of words. These three spaces represent the environments dedicated to field trips in the city of Salamanca.

Finally, the groups representing weekend trips to the Sierra de Béjar mountains and Almenara de Tormes, organized by the Tormes Foundation Located between the third and fourth quadrant, are aligned on the negative values of the second axis and are opposite to the discourse found in the urban field trips in Salamanca.

Figure 2
Multivariate analysis of discourses collected



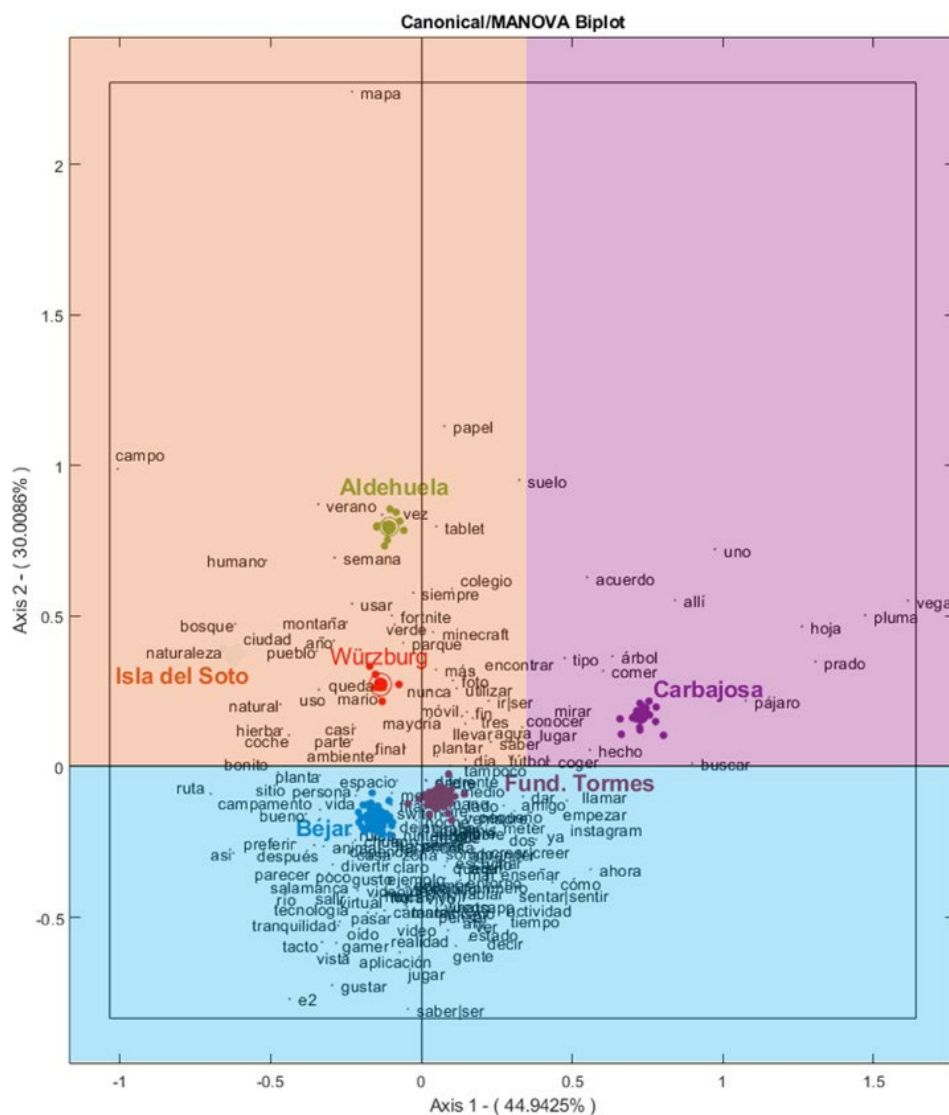
Each of these groups can be characterized by paying attention to the composition of the thematic blocks (figure 3) by recovering the keywords that characterize each subspace of the plane.

The space around the Carbajosa group (block 1, in purple) therefore has words such as meadow, feather, leaf, field, search, tree, eat, discover, look and play. A discourse that clearly highlights elements of nature mentioned along with actions aimed at observation, learning and play, which could be explained by how this group of children used the natural setting as a context for social, personal and relational development, as well as the appropriation of a culture of participation consolidated by municipal institutions. During the years of compulsory education, schools participate in the Child Friendly City municipal project, working on the ecological, social and technological perspective of the environments in collaboration and coordination with different actors. Hence, the most repeated words are related with nature (tree, bird, feather, meadow, field), but also how the environment is used (eat).

Block 2 (in orange) is represented by groups taking urban field trips in Salamanca (Aldehuela, Isla del Soto and Würzburg). In this case, the words refer to the specific or even exceptional nature of the natural setting: village, summer, week, but also countryside, forest, nature, natural, mountain, green, park, etc., introducing technology from (or in) the natural context such as tablet, Fortnite, Minecraft, photo or cell phone. Children in this second block participate in the activity in natural environments (mostly urban) but with a more technical dimension (knowledge of maps, cartography, recording hiking routes with digital technology, etc.), which demonstrates that the children are familiar with the environment but that it is also widely represented by tech apps. Finally, thematic block 3 (in blue) would characterize weekend trips to Sierra de Béjar and Almenara de Tormes. They present a much richer discourse (more words and space on the larger plane) with a combination of senses along with uses of technology during the activities proposed by the event monitors. Words include hearing, sight, touch, along with know, like, appear, tranquility, prefer and have fun on one hand (third quadrant), and friend, call, Instagram, feel, teach, activity, technology, video, virtual reality, gamer, people, status, etc. The more plural narrative offered by this activity format would be justified by spaces created for playing with technology, but also by the power of designing actions to reconnect with nature by using the senses. A key idea for building child-youth participation policies. It is worth noting that some of the boys and girls participating in these experiences have never had direct contact with natural environments or been taught about environmental development, but their immersion in planned actions to raise awareness of nature has contributed to developing narratives more related with sensory imagination. Free time reserved

for playing with technology has also led them to relate natural contexts with digital development.

Figure 3
Group characterization by keywords



In summary, the data analysis gives three major discourses that characterize the different areas of work. Urban trips in Carbajosa Child Friendly City on one hand, with a discourse clearly aimed at observing nature, birds and the environment. On the other, urban trips in Salamanca with a discourse also focused on nature, but broader and more open (nature, forest, mountain) combined with the use of certain technologies, especially video games such as Fortnite or Minecraft. Finally, weekend camping trips show a discourse centered on a combination of senses with the use of technology in natural spaces.

DISCUSSION-CONCLUSIONS

This article focused on studying child-youth groups proposes three major areas of reflection on the role played by municipal policies in (re)connecting with nature in global digitalization environments. The power that local administrations are taking on in matters of non-formal governance, but also with implications in the formal scope, is evident. This sovereignty is exercised in two directions: actions planned by municipal organic structures and through measures linked with local government seeking the engagement and participation of young people, making this political actor a point of great educational interest. The analysis conducted thus shows that the territory conceived as a new space of power for social well-being and sustainable development is the result of lines of research that emphasize the conception of a new paradigm around healthy spaces determined by non-classical factors of well-being to focus (one of the novel developments) interest on groups, such as children and young people, increasingly more susceptible to participation in institutional structures and bodies.

This block of analysis essentially redimensions and updates the key value attributed to the non-formal space in emerging areas of pedagogy, such as digital reconnection of nature. The role played in some cases by municipal policies creates a new educational framework in which what some authors, such as Todd (2024), have called the 'ecology of encounters' in reference to the transformation capacity of education from the potential of 'interconnection' and 'vital understandings'. An educational model that transcends schooling to become a common project for well-being (Säfsström, 2023, cited in Todd, 2024, p.46).

The second point for reflection is related to the capacity shown by children-youths, from their narratives and actions and as (recognized) institutional actors, in the co-construction of environmental education policies and the consolidation of healthy environments. An idea backed by the discourse of international bodies such as UNESCO (2021) and the European Commission (2022), also receiving strong support from domestic policies (Espejo Villar et al., 2025). Their active role in non-formal governance offers a more human, relational, and transformative dimension

(Augsberger et al., 2023; Collins et al., 2018; Novella et al., 2021) in a framework of post-humanist thinking, critical of the role of institutions, while contributing to the creation of more solid and lasting environments. This idea reconnects with the concept of post-material well-being proposed by Díaz-Romanillos (2024), based on community participation and a 'more significant dimension of human well-being' (Díaz-Romanillos, 2024, p.72).

Recognizing children-youths as a political actor would provide answers to the research questions mentioned at the beginning of this article by verifying that it is precisely the work of schools in collective socialization (Coll & Rivera, 2019, p.19). This not only keeps them current (they do not lose validity), but they are a necessary link in the process of reconnecting with nature.

Finally, and in relation to the legitimacy of this group in territorial management, it is key to highlight that municipal policies contain matters related to structural designs for participation. Narratives generated by young people in more horizontal, plural and open contexts guarantee a continuous level of commitment and behavioral responsibility with the natural environment, as previously pointed out by Todd (2024). Although it can be understood in terms of hegemony and supremacy in relation to the role currently played by schools, this power taken on by local administrations in the construction of emerging pedagogical models goes far beyond this idea. In this article, we believe that it is an opportunity to focus attention on good practices provided by institutions and the institutional actions of municipal policies. Yet it is also true that without going as far as to raise the dilemma between municipal policies and school policies, the article can open a field of research on choice of school in relation to joint participation by municipal institutions in the construction of sustainable and digital educational models.

Finally, it is vital to understand that local planning of ecological, technological and relational development education actions, while important, is insufficient to achieve greater awareness and a higher level of child-youth involvement with the environment. This would put the spotlight on schools, reinforcing the initial idea that these entities are a new asset in the process of digitally reconnecting with nature (Benninger et al., 2021; Cummings, 2017). Additionally, their responsibility in education could contribute to refuting unfounded theses on digitalization that often support political actions and decisions (L'écuyer et al., 2025). Articulating a systematized channel of collaboration between actors (such as schools and municipalities) that have had, until now, less political experience is essential to achieve the goals of the agenda 2030.

LIMITATIONS

While we are aware that the line of research addressed in this article is relevant not only because it is necessary and topical, but also as it provides an effective and real extension of the map of actors involved in education, we must acknowledge that one of its main limitations is that this first study has focused on a local context with a strong educational tradition in the non-formal sphere but with a scope of action limited to a territory that may not be representative in the international — or even national— geopolitical panorama. This despite discourses and narratives taken from the institutional strategies of recognized international actors such as UNESCO, OECD, European Union, etc., all point in this direction.

We feel that it is important to continue exploring this line of research, increasing its representative scope to other contexts and related themes (child-youth participation in health and social well-being models, for example).

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STEM degree trajectories among students in Catalonia: initial performance, gender and social origin

Trayectorias de los estudiantes en carreras científico-técnicas en Cataluña: rendimiento inicial, género y origen social

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ABSTRACT

This article explores the trajectories of STEM (Science, Technology, Engineering and Mathematics) degree students in Catalonia (Spain), focusing on the influence of initial academic performance in interaction with the sociodemographic factors of gender and parental educational level (PEL). By analysing a longitudinal database of 7 academic years (2012-2019) on newly enrolled STEM students in the Catalan face-to-face higher education system (11 universities; n= 10,274), it is examined how these factors influence the ability of students to persist and succeed in this academically difficult environment. A Group-Based Trajectory Model (GBTM) is used to rank student trajectories based on their annual rate of achievement. The predicted probability of belonging to each group is then calculated from several binary logistic regression models that introduce interactions between the various factors and, finally, first and second differences are calculated to estimate the influence

of these factors on group membership. The results indicate that first-year performance is a strong predictor of trajectory, with PEL and gender acting as moderators. Specifically, students from families with a university education and women tend to have better trajectories and greater persistence, even when they face first-year poor performance. The research contributes to understanding the factors that affect persistence and dropout in STEM degrees, highlighting the importance of considering the trajectory as a whole, and social and gender inequalities.

Keywords: educational equity, Higher Education, women's education, first generation college students, STEM education, students' trajectories, student sociology

RESUMEN

Este artículo explora las trayectorias de los estudiantes universitarios en carreras STEM (Ciencia, Tecnología, Ingeniería y Matemáticas) en Cataluña (España), centrándose en la influencia del rendimiento académico inicial en interacción con factores sociodemográficos, como el género y el origen social. Mediante el análisis de una base de datos longitudinal de 7 años académicos (2012-2019) sobre estudiantes de nuevo acceso a carreras STEM en el sistema universitario presencial catalán (11 universidades; n= 10274), se examina cómo estos factores influyen en la capacidad de estos estudiantes para persistir y tener éxito en un ambiente académicamente difícil. El análisis utiliza un Group-Based Trajectory Modelling (GBTM) para clasificar trayectorias de estudiantes en base a su tasa de rendimiento anual. Posteriormente se calcula la probabilidad predicha de pertenecer a cada grupo a partir de varios modelos de regresión logística binaria que introducen interacciones entre los diversos factores y, finalmente, se calculan las primeras y segundas diferencias para estimar la influencia de dichos factores sobre la pertenencia a cada grupo. Los resultados indican que el rendimiento inicial es un fuerte predictor de la trayectoria, con el origen social y el género actuando como moderadores. En concreto, los estudiantes de familias con nivel educativo universitario y las mujeres tienden a mostrar mejores trayectorias y más persistencia, incluso cuando se enfrentan a un mal resultado inicial. La investigación contribuye a comprender los factores que afectan la persistencia y el abandono en las carreras STEM, destacando la importancia de considerar la trayectoria en su conjunto, y tomando en cuenta las desigualdades sociales y de género.

Palabras clave: equidad educativa, Educación Superior, mujeres estudiantes, primera generación de estudiantes en la universidad, carreras científico-técnicas, trayectorias estudiantiles, sociología del estudiante

INTRODUCTION

Over the past two decades, the principles of equity and the social dimension of higher education have increasingly been incorporated into the formulation of

European university policies (Rome Ministerial Communiqué, 2020). Among the most salient aspects of these policies is the recognition of the growing diversity of students accessing higher education. This diversity is shaped, firstly, by the fact that many students face initial disadvantages stemming from their social background, gender, ethnicity, or other factors of inequality (Ariño Villarroya, 2014). Secondly, it reflects the varied interests and objectives that guide students' decisions and actions, which do not always align with the priorities of the university institution.

In this scenario, simple performance indicators based on criteria of institutional efficiency such as graduation rates are no longer sufficient, but rather students' entire trajectories must be considered (Tinto, 2017; Troiano et al., 2024). Factors to consider include how the student progresses through university, whether they are able to overcome the challenges encountered in contexts of varying difficulty, and whether they remain on the degree originally chosen or they modify their path. While these aspects are obviously linked to performance and final achievement or graduation, they are not exactly the same, such that identical trajectories can lead to divergent final results, or very different trajectories can have an identical final result (Haas & Hadjar, 2019; Pfeffer & Goldrick-Rab, 2011).

Within this framework, it is essential to examine trajectories beyond the evident influence of academic achievement, considering the potential inequalities arising from how students face this achievement according to their social origin or gender. Furthermore, this study focuses on a particularly challenging context, that of STEM (Science, Technology, Engineering and Mathematics) careers.

Trajectories and transitions

A trajectory at university can be defined as a succession of events relating to a student, and is basically made up of situations they encounter and the decisions they make. Decisions are influenced by what has happened previously (that is, they are path-dependent) and by students' expectations and objectives as they go through the academic years. In this regard, the trajectory has many shared aspects with the transitions between educational stages, except that it is a much more continuous process.

When studying transitions, one of the most consistent findings is the importance of social background and gender in explaining the inclination to go on to later stages in the education system, beyond the academic performance obtained. To this effect, students whose parents have a high educational level and women have a clear propensity towards continuing in education, choosing to move on to later educational stages, especially through the academic route, including university (Bernardi & Triventi, 2020; Gil-Hernández, 2019; Organisation for Economic Co-operation and Development [OECD], 2020; Sánchez-Gelabert et al., 2024; Valdés, 2020).

Likewise, in the case of academic trajectories within the university, performance is the primary factor that determines what happens, which decisions are made, and what final outcomes are achieved. However, social attributes once again play a relevant role. In this regard, it is known that the children of parents with university degrees are more persistent, that is, they tend to remain within the university system (de la Cruz-Campos et al., 2023; Lorenzo-Quiles et al., 2023), even where there is a previous poor performance, using strategies or resources such as, for instance, changing their field of study (Sánchez-Gelabert & Troiano, 2023), just as it is known that women have a greater tendency to complete their degrees (The United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2021).

Trajectories and transitions in the STEM framework

The subjects taught in STEM degrees are usually highly academically challenging, which can be verified using subjective perception indicators and other more objective ones (González-Pérez et al., 2022; Sáinz, 2017). Furthermore, these degrees have a particular social composition, with more students who are men and with a high PEL, and a particularly striking male predominance in engineering.

Lower participation and a higher risk of dropping out are usually detected among students who are the first generation in their family to access university (Triventi, 2013). This trend is accentuated in the case of STEM degrees due to the increasing academic difficulty in this environment, and it being more difficult to overcome other barriers such as the perception of academic fit, the concept teachers have of these students and the impostor syndrome (Canning et al., 2020; Casanova et al., 2023; Dika & D'Amico, 2016; Ives & Castillo-Montoya, 2020).

This is also the case in Spain and Catalonia. Degree programmes that are more difficult to complete carry a risk that is significant enough for first-generation university students to avoid them (Ariño et al., 2022; Barañano Cid & Finkel Morgenstern, 2014; Secretaría General de Universidades, 2019; Troiano et al., 2017). Beyond access, there are apparently no specific studies on the persistence of first-generation students in STEM degrees in the Spanish or Catalan context, so this article aims to help fill this research gap.

In terms of gender, contrary to what happens in other areas of knowledge, women have minority access to STEM degrees (Mateos Sillero & Gómez Hernández, 2019; UNESCO, 2019), the distances increasing over time for the most technological subareas (Rodríguez & Lehman, 2017), but with a much smaller or non-existent gap for the life sciences subareas (Agència per a la Qualitat del Sistema Universitari de Catalunya, 2021; Usart et al., 2022).

Many studies have attempted to identify the factors that explain the distance between women and scientific and technical disciplines of this type. Among the

most prominent are the psycho-cognitive ones, such as the impostor syndrome and self-efficacy, the varying intensity of which is grounded in the experience the person has had with learning these subjects and their beliefs regarding whether they can be learned or if it is a question of natural talent (growth mindset). This is a particularly important factor in the case of mathematics, a subject that plays a leading role in many of the degrees in the STEM group (Kahn & Ginther, 2017; Malespina et al., 2023; Sebastián-Tirado et al., 2023).

Beliefs and interaction with significant others also intervene when it comes to assuming a gender role as one's own, together with attributing certain stereotyped values to science. In this regard, when the female role tends to be associated with community values, and the characteristics of science are associated with individualism and competitiveness, the lack of fit, interest and motivation become evident (Erdmann et al., 2023; González-Pérez et al., 2022; Petroff et al., 2022; Sebastián-Tirado et al., 2023).

Last, and also linked to socially attributed gender roles, the expectation of high professional demand in a highly competitive environment fits with the role of breadwinner focused on professional success assigned to men, while posing difficulties for commitment to family and child-bearing socially attributed almost exclusively to women (Petroff et al., 2022). Notably, all these aspects appear to soften when parents are highly educated, helping students to choose degrees that are not congruent with gender roles (González-Pérez et al., 2022).

International research indicates that there is a lower persistence of women in STEM degrees (Erdmann et al., 2023; Fisher et al., 2022; Kaganovich et al., 2023; Ma & Xiao, 2021). Remarkably, studies carried out in Spain and Catalonia point to the opposite trend, i.e. few women access STEM degrees, but they graduate more often than men in all branches of STEM except computer science (Mateos Sillero & Gómez Hernández, 2019; Usart et al., 2022). Having said that, although the dropout rate among women is lower in the Spanish context, when it does occur studies point to the same factors identified in other countries in conjunction with those examined previously to explain lower initial enrolment of women in STEM areas.

Self-efficacy thereby reappears, which is maintained or eroded depending on the context encountered when at university (Kahn & Ginther, 2017; Sebastián-Tirado et al., 2023), as well as beliefs about gender roles, affecting the ability to identify with the discipline, the sense of belonging and the feeling of isolation in a hostile climate, for example, when boys avoid interacting with their female colleagues or including them in work groups (Fisher et al., 2022; Hardtke et al., 2023; Rodríguez & Lehman, 2017; Sáinz, 2017; Sax et al., 2018). To these already known elements must be added the threat of stereotype (Pennington et al., 2016) that acts in varying degrees of intensity in contexts with micro-discrimination, generating stress, isolation and worsening of cognitive abilities (Fietta et al., 2023; González-Pérez et al., 2022; Ma & Xiao, 2021; Ong et al., 2018).

Standing out among the possible factors that could explain the greater persistence of women, and which has also been identified in some international studies evaluating interventions to improve women's retention (Erdmann et al., 2023; Vooren et al., 2022), is their high motivation to obtain a good education as a way to combat the structural difficulties of female discrimination in the labour market (Ariño et al., 2022; González-Pérez et al., 2022; Ma & Xiao, 2021; Petroff et al., 2022; Sánchez-Gelabert et al., 2024). From there, the factors that favour the persistence of women in STEM degrees depend on certain conditions, including having the support of family and friends (González-Pérez et al., 2022; Hardtke et al., 2023), whether the institution is welcoming enough to combat the stereotype of the discipline by means of policies of support, guidance and the promotion of interaction (Kahn & Ginther, 2017; Ong et al., 2018; Petroff et al., 2022), whether they have had effective prior guidance (Erdmann et al., 2023), and if they have a high perception of control capacity and self-efficacy (González-Pérez et al., 2022; Pennington et al., 2016).

In this context, the primary objective of this study is to examine how, given an initial level of academic performance (first-year performance), social background and gender influence the trajectory that the student will eventually develop. Particular attention will be given to exploring the case of students with poor initial performance who manage to overcome this adverse situation. A series of specific objectives are proposed:

1. To establish a typology of trajectories and describe it in terms of initial performance, final status, family educational background, and the gender of students predominant in each type;
2. To analyse the relationship between initial performance and trajectory type;
3. To examine the moderating effect of parental educational level on the relationship between initial performance and trajectory type;
4. To analyse the moderating effect of gender on the relationship between initial performance and trajectory type.

METHODOLOGY

Sample description

The sample is composed of a cohort of students who, in the 2012-2013 academic year, entered for the first time a degree offered by the 12 universities of the Catalan university system (n=44285). This system includes seven public universities (n=32663), four private universities (n=4246) and one distance university (n=7376). For the purposes of this article, the analysis focuses specifically on students enrolled in face-to-face universities in degrees belonging to the branches of Engineering and Architecture, and Science, commonly known as STEM degrees (n=10274).

In some of the variables analysed, the sample is reduced due to the lack of response to certain questions in the survey or due to the absence of data in the registry.

Table 1

Descriptive statistics of the study sample: new entrants to STEM degrees at onsite universities in the Catalan university System in 2012-2013

Parental Educational Level (PEL)	n	%	Age	n	%
Non-University	4845	51.28	Up to 25	9741	94.81
University	4603	48.72	26-35	411	4
<i>Total</i>	<i>9448</i>	<i>100</i>	Over 35	122	1.19
			<i>Total</i>	<i>10274</i>	<i>100</i>
Gender	n	%	Access route	n	%
Woman	3054	29.73	Academic track	7613	74.1
Man	7220	70.27	Vocational track	1217	11.85
<i>Total</i>	<i>10274</i>	<i>100</i>	Other	1444	14.05
			<i>Total</i>	<i>10274</i>	<i>100</i>
Field of study	n	%			
Sciences	2730	26.57			
Engineering/Architecture	7544	73.43			
<i>Total</i>	<i>10274</i>	<i>100</i>			
Admission grade					
Mean	s.d.	N	Min	Max	
8.83	2.10	9611	5.00	14.00	
Initial Performance Rate (IPR)					
Mean	s.d.	N	Min	Max	
67.12	34.09	10274	0	100	

Instruments and Variables

The longitudinal database on which the analyses were carried out has been built from the combination of registration and survey data, all of which are collected by the Department of Research and Universities of the Government of Catalonia.

The survey includes students' sociodemographic and educational information. The registration data are administrative data on first-year enrolment of a cohort of new students. To these data are added academic registration data for the following 6 years up to the 2019-2020 academic year.

The variables used in the analysis are as follows:

Dependent variable: Trajectories. This variable is derived from the construction of a typology based on the annual performance rate.

Independent variables: Initial performance rate (IPR), parental educational level (PEL), and gender.

Control variables: Field of study, admission grade, age, and access route.

Procedure

The analytical strategy is structured into two phases. In the first phase, corresponding to specific Objective 1, a typology of trajectories is constructed using the variable *annual rate of academic performance*, calculated by dividing the number of credits earned by the number of credits enrolled each year and multiplying the result by 100. Students who did not enrol in any credits in subsequent academic years and who did not graduate are assigned a rate of 0 for those years, indicating that they did not earn any credits during that period. Conversely, students who have already graduated are considered as missing from the year following their graduation, as they have completed all required credits, rendering the calculation of their performance rate irrelevant.

Once the trajectory groups have been established, they are descriptively characterized in relation to the independent variables (initial performance rate, parental educational level, and gender), as well as the final academic status of the students in each group.

In the second phase of the analysis, the dependent variable is redefined as the trajectory group to which each student has been assigned. First, the relationship between initial performance and trajectory is analysed, introducing parental educational level as a mediating variable in this relationship (Objectives 2 and 3). Subsequently, the analysis is repeated, incorporating gender as a mediating variable (Objectives 2 and 4).

Data Analysis

The typology of trajectories was developed using a Group-Based Trajectory Model (GBTM), proposed by Nagin (2005), with the TRAJ plugin for STATA (Jones & Nagin, 2013). This methodology groups similar trajectories based on repeated measurements

of the same variable. The procedure involves selecting an appropriate number of groups and determining, for each group, the polynomial order of the curve that represents each trajectory (Sánchez-Gelabert, 2022). Various models are tested for each group until the optimal model is identified, where all curves are statistically significant, no group represents less than 5% of the sample, and the Bayesian Information Criterion (BIC) no longer decreases when additional groups are included.

To estimate the probability of belonging to each of the trajectories identified by the GBTM (dependent variable: trajectory), two sets of binary logistic regressions were performed. In the first set, the independent variables included initial performance rate (IPR) and parental educational level (PEL), as well as their interaction. In the second set, the same procedure was followed, but gender was introduced as an independent variable interacting with IPR. In both analyses, the previously mentioned control variables were included.

The procedure recommended by Mize (2019) was followed for the estimation, interpretation, and presentation of nonlinear interaction effects. Predicted probabilities were calculated and plotted across the full initial performance distribution to determine the significance and magnitude of the effect. Subsequently, the first and second differences in the marginal effect of IPR, mediated by PEL or gender, were computed.

First differences involve measuring the marginal effect of IPR on the probability of belonging to a specific trajectory group, stratified by gender (male or female) or PEL (students with university-educated parents versus non-university-educated parents). The sign of the effect (and the slope of the line) indicates the growth relationship between the two variables; for instance, if the probability of belonging to a trajectory group decreases as performance increases, the marginal effect will have a negative sign.

On the other hand, second differences compare both marginal effects, providing a measure to determine whether the effect of IPR is more significant for one subgroup compared to the other.

RESULTS

University trajectories of a cohort of students doing STEM degrees

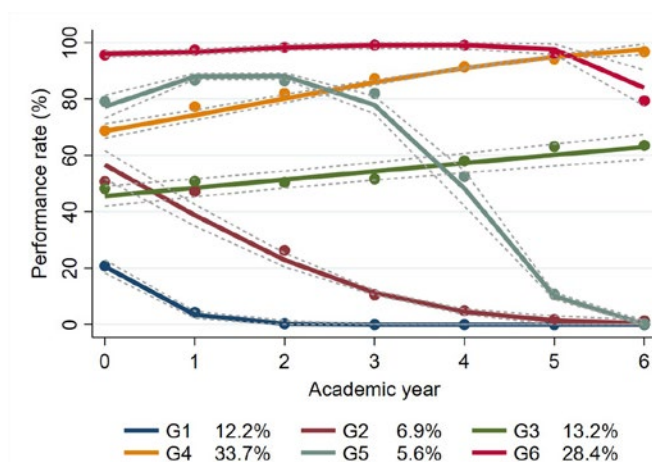
To address the first objective, the typology of trajectories followed by students is first presented, followed by a characterization of the resulting groups in terms of their initial performance rate (IPR), final status, and the predominant parental educational level (PEL) and gender in each group.

Using the GBTM, academic trajectory groups were estimated based on performance rates (number of credits passed divided by credits enrolled) for each year from 2012 to 2019. Table A1 of the annex contains the data of the successive

models tested, and Table A2 calculates the viability and quality indicators of the selected model.

Figure 1 is a representation of the evolution of the trajectory of the six groups that make up the final typology. The groups are ordered according to the average performance rate obtained by the students in the group at time 0 (IPR), which corresponds to the end of the first academic year (the exact average can be read in the last row of Table 2).

Figure 1
Group-based trajectory model



Note. Group labels: G1: Early dropout; G2: Slow dropout; G3: Intermediate; G4: Improvement; G5: Late dropout; G6: Optimal.

G1, which contained 12.2% of the sample, started the trajectory with very low performance (21% of credits achieved) and left the university system very quickly. Table 3 shows how the most likely final situation for these students is dropout (99%), with Table 2 evidencing a clear overrepresentation of first-generation students and men in this early dropout group.

G2, the slow dropout group containing 6.9% of the sample, started with half the number of credits passed, progressing with worsening performance until 90.5% of the group was in a situation of dropout at the end of our study period. An overrepresentation of male and first-generation students was again detected.

G3, which was labelled as *intermediate* and represented 13.2% of students, had worse initial performance (47.3% passed credits) compared to the previous group, but progressed in the opposite direction, remaining at an average level of

performance and with a majority managing to graduate (22.4%) or persist (71.7%). Once again, in this group there were more men with non-university PEL.

G4 was the largest group (33.7%). It was labelled as *improvement* because these students started the trajectory with just over two-thirds of credits passed, improving their performance over the years until almost 95% of them graduated, although mostly later than the expected time. Students with university PEL were somewhat more often included in this group, and there was almost no difference by gender.

G5, the late dropout group, made up of only 5.6% of students, was a mixture of somewhat diverse situations. Despite starting with a very good proportion of credits already achieved (77.9%) and generally staying at these levels, they ended up with very low performance rate and a large number of dropouts (60.9%). Very small differences were observed in terms of PEL and gender.

Last, G6 was the second largest group (28.4%), containing students who started with a very high average performance rate of 96.9% and continued in this vein, and were labelled *optimal*. Two-thirds of this group graduated on time and a further 30% later. Women clearly stand out in this group, and there is also an overrepresentation of university PEL.

Table 2

Percentage membership in each trajectory group according to Parental Educational Level (PEL) and gender, and the average of the initial performance rate (IPR)

	G1. Early dropout	G2. Slow dropout	G3. Inter- mediate	G4. Impro- vement	G5. Late dropout	G6. Opti- mal	n	Total %
PEL								
Non-University	14.98	7.7	13.21	32.57	4.71	26.83	4845	100
University	8.82	5.37	11.93	38.17	3.65	32.07	4603	100
Total	11.98	6.56	12.58	35.3	4.19	29.38	9448	100
Gender								
Woman	8.48	4.65	9.04	34.12	3.77	39.95	3054	100
Man	14.17	7.51	14.06	35.6	4.6	24.07	7220	100
Total	12.48	6.66	12.57	35.16	4.35	28.79	10274	100
IPR								<i>Media</i>
Mean	20.97	51.47	47.33	67.78	77.94	96.92		67.12
(s.d.)	(25.24)	(31.17)	(29.29)	(27.47)	(26.38)	(9.04)		(34.09)
n	1282	684	1291	3612	447	2958		10274

Table 3

Observed final status (7 years after admission) according to trajectory group. Percentages

	Graduated on time	Graduated with delay	Persistence	Dropout	Total	
					<i>n</i>	%
G1. Early dropout	0.31	0	0.86	98.83	1282	100
G2. Slow dropout	0.29	0	9.21	90.50	684	100
G3. Intermediate	0	22.39	71.73	5.89	1291	100
G4. Improvement	10.35	84.11	5.40	0.14	3612	100
G5. Late dropout	1.12	21.25	16.78	60.85	447	100
G6. Optimal	67.55	31.10	1.12	0.24	2958	100
Total	23.19	42.26	12.68	21.86	10274	100

In short, in this first part of the analysis, it is concluded that the optimal trajectory is much more followed by girls and the university PEL group, and obviously by those who perform better in the first year. It is also observed that the children of parents with a university degree are more capable of improving a not-so-good initial performance (G4 Improvement).

The relationship between initial performance and trajectory

In this second phase of the analysis, aligned with objectives 2, 3, and 4, the aim was to find out what influence PEL and gender have on the evident relationship between initial performance and the trajectory eventually followed by students. Ultimately, the goal is to determine whether these two sociodemographic variables play a moderating role in this relationship.

Firstly, the role of PEL is examined. Figure 2 shows the probabilities of belonging to each trajectory group according to initial performance and PEL (objectives 2 and 3). It can be observed that while the probability of belonging to G1 (early dropout) is closely related to the performance obtained in the first year (with a little compensation for low IPR in students with university PEL), this relationship is much weaker to explain belonging to the other two types of dropout groups, slow and late (G2 and G5, respectively).

IPR also clearly influences the probability of belonging to G6, characterised by optimal performance throughout the entire period, and with no differences by PEL. It also influences belonging to G3, the group that follows a trajectory that advanced slowly throughout the observed period, albeit weaklier.

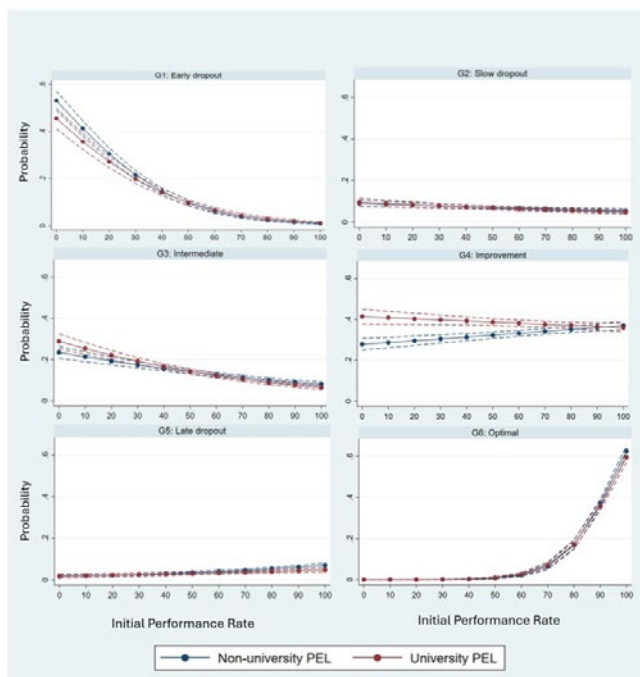
As can be observed in the graphs (Figure 2), when initial performance is poor (let's say from 0% to 40% of credits passed in the first year), the student is most likely to

belong to G1 (early dropout), G3 (slow progress) or G4 (greatly improving the initial situation). Among from these three options, small differences are observed in the trajectories that students follow according to their PEL.

In this regard, the early dropout of G1 at these performance levels is a little more likely to affect those with non-university PEL, while the reverse is that the slow progress of G3 is somewhat more likely among students with university PEL, and this trend is seen more clearly for the probability of following an improvement trajectory (G4), which is higher among those with university PEL. In fact, only for these three groups are the small second differences (Table 4) of the marginal effect of IPR statistically significant, at a p-value level of less than 0.01.

Figure 2

Effect of initial performance rate (IPR) and parental educational level (PEL) on the probability of belonging to each trajectory group. Predicted probabilities



Note. The predicted probabilities were calculated from a logistic regression for each trajectory group (belonging to Gx versus not belonging to Gx). In the model, the IPR and PEL, and the interaction between the two, were introduced as independent variables, in addition to the following vector of control variables: Gender, Admission grade, Access route, Age and Field of study. Confidence intervals at 95%.

Table 4 shows the marginal effect of IPR for each group (university PEL or non-university PEL), with positive, negative or zero results depending on the steepness

of the curve in the graphs in Figure 2. The effects are very small, with initial performance showing to have very little influence for some groups (the lines in the graph are almost flat and the marginal effects are close to zero). Only in the cases of the G1 and G6 does initial performance have a clear effect. The marginal effect of the IPR to explain belonging to G4 is close to zero along the entire initial performance distribution, although it is the group with the maximum distance between the two PELs. To this effect, this second very small difference is the only one that is significant at a level of $p < 0.001$.

Table 4

Marginal effect of initial performance rate (IPR) and parental educational level (PEL) on the probability of belonging to each trajectory group

	G1. Early dropout	G2. Slow dropout	G3. Intermediate	G4. Improvement	G5. Late dropout	G6. Optimal
Marginal effect of IPR						
Non- University PEL	-0.003 (0.000)***	-0.000 (0.000)***	-0.001 (0.000)***	0.001 (0.000)***	0.001 (0.000)***	0.012 (0.000)***
University PEL	-0.003 (0.000)***	-0.000 (0.000)***	-0.002 (0.000)***	-0.001 (0.000)*	0.000 (0.000)**	0.012 (0.000)***
Second difference						
	0.000 (0.000)**	-0.000 (0.000)	-0.001 (0.000)**	-0.001 (0.000)***	-0.000 (0.000)*	-0.000 (0.000)

*** $p \leq .001$ | ** $p \leq .01$ | * $p \leq .05$.

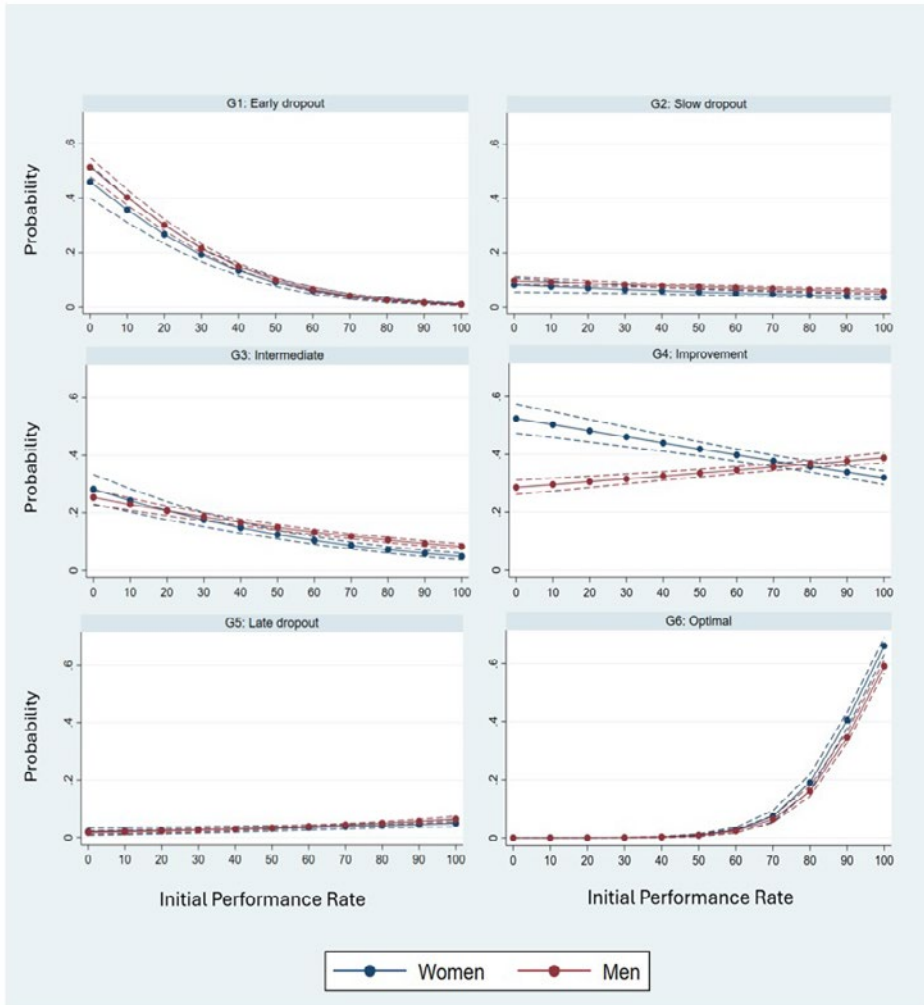
Next, the role of gender is examined as a possible moderating variable in the relationship between initial performance and the trajectory group to which a student belongs (objectives 2 and 4). Figure 3 shows these probabilities along the entire distribution of initial performance, for both men and women. Obviously, it is again the case that the influence of IPR (objective 2) is low in the groups of slow dropouts (G2) and late dropout (G5), while it is more important in explaining belonging to the other groups, especially early dropout (G1) and optimal performance (G6).

For the gender analysis, a greater interaction emerges in the improvement trajectory (G4). This means that girls manage to improve their trajectory more than boys, despite having started with some difficulty. Table 5 confirms that the most relevant differences are observed in G4, since this is the only second difference that is significant¹.

1 However, for both PEL and gender differences, the distance is so small that it does not allow the calculation of the decomposition of the direct effect and the mediated effect using the KHB method. The results show inconsistencies, giving negative values or losing statistical significance. The results can be seen in Table A3 and A4 of the annex.

Figure 3

Effect of initial performance rate (IPR) and gender on the probability of belonging to each trajectory group. Predicted probabilities



Note. The predicted probabilities are calculated from a logistic regression for each trajectory group (belonging to G_x versus not belonging to G_x). In the model, the IPR and the gender, and the interaction between the two, are introduced as independent variables, in addition to the following vector of control variables: Parental educational level, Admission grade, Access route, Age and Field of study. Confidence intervals at 95%.

Table 5

Marginal effect of initial performance rate (IPR) and gender on the probability of belonging to each trajectory group

	G1. Early dropout	G2. Slow dropout	G3. Intermediate	G4. Improvement	G5. Late dropout	G6. Optimal
Marginal effect of IPR						
Woman	-0.003 (0.000)***	-0.000 (0.000)**	-0.002 (0.000)***	-0.002 (0.000)***	0.000 (0.000)*	0.012 (0.000)***
Man	-0.003 (0.000)***	-0.000 (0.000)***	-0.001 (0.000)***	0.001 (0.000)***	0.001 (0.000)***	0.012 (0.000)***
Second difference						
	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.003 (0.000)***	0.000 (0.000)	-0.000 (0.000)

*** $p \leq .001$ | ** $p \leq .01$ | * $p \leq .05$.

DISCUSSION AND CONCLUSIONS

In the present study, the trajectories of students enrolled in STEM degrees within the Catalan university system have been analysed over a seven-year period. The primary aim has been to examine the influence of parental educational level (PEL) and gender on the well-known relationship between initial performance (in the first year) and subsequent academic trajectory. The specific objectives were as follows: 1) to construct a typology of the trajectories followed by students and characterize them; 2) to examine the relationship between initial performance and the trajectory followed; 3) to analyse the effect of PEL on this relationship; and 4) to analyse the effect of gender on this relationship.

Regarding objective 1, the findings revealed that, in STEM degrees, only 28% of the student cohort follows the trajectory envisioned by the institution. If those who follow an improving trajectory—thus approaching the “ideal trajectory” planned by the institution—are included, this figure rises to 62%. Nonetheless, there remain numerous cases in which students pursue paths requiring intervention and support to prevent their trajectory from ending in permanent dropout. Notably among them is a minority but still important group made up of students who follow an apparently successful trajectory and end up dropping out. This is a group that gathers diverse situations and needs further study to clarify the reasons and dynamics underlying this change of direction in their trajectory.

Inequality based on social origin is reflected in the fact that the most complex trajectories that most often lead to dropout are more followed by first-generation

students. This trend works in the same direction as the one found at international level (Dika & D'Amico, 2016; Ives & Castillo-Montoya, 2020; Triventi, 2013). However, the original contribution of this article is the specific analysis of the relationship between initial performance and trajectory followed (objective 2), showing that students with university PEL are more often able to overcome poor initial performance (objective 3).

The greater ability to improve initial poor performance among the children of university PEL is another demonstration of compensatory advantage which, although originally used to explain transitions between educational stages (Bernardi & Cebolla, 2014), can be applied here to the continuous transitions we find in a trajectory within a certain educational stage (Tieben, 2020). From the available data, it is not possible to identify what mechanisms are put in place to produce this effect of compensatory advantage when faced with setbacks, but the results of other researchers point to various resources to this effect. Good examples of this are complementary private classes, the financial means to extend the period to obtain the degree, reorientation of the trajectory towards other degrees, or simply the lower persistence of first-generation students when their first set of results at university are poor (Casanova et al., 2023; de la Cruz-Campos et al., 2023; Dika & D'Amico, 2016; Herbaut, 2020; Lorenzo-Quiles et al., 2023; Sánchez-Gelabert & Troiano, 2023; Tieben, 2020).

Gender inequality follows a different pattern (objective 1). First of all, it should be borne in mind that women represent only 30% of the population that accessed the Catalan university system for the first time in 2012 to study STEM degrees, when they represent the majority in the rest of the fields of study. However, women clearly follow better trajectories more often. This result differs from those obtained in the international arena (Erdmann et al., 2023; Fisher et al., 2022; Kaganovich et al., 2023; Ma & Xiao, 2021), but confirms what another research has found in Spain (Mateos Sillero & Gómez Hernández, 2019; Usart et al., 2022).

The present study shows that even when they have initial difficulties, women follow recovery trajectories more often than men do (objective 4). As mentioned in the theoretical introduction to this article, some research finds factors in favour of greater female persistence, such as the greater motivation to obtain a qualification that helps them in a discriminatory labour market (Ariño et al., 2022; González-Pérez et al., 2022; Ma & Xiao, 2021; Petroff et al., 2022; Sánchez-Gelabert et al., 2024), and having specific positive circumstances such as a supportive social and institutional environment or a high perception of self-efficacy (Erdmann et al., 2023; González-Pérez et al., 2022; Hardtke et al., 2023; Kahn & Ginther, 2017; Ong et al., 2018; Pennington et al., 2016; Petroff et al., 2022). Unfortunately, the data available here do not allow for verifying the influence of any of these factors, which is an important limitation of the present work. While the analysis has accurate administrative data, it lacks longitudinal survey information.

Another important limitation of this study derives from not having differentiated STEM degrees in a more detailed way. Although an important step has been taken by distinguishing STEM degrees from the rest of university degrees, and by systematically introducing the field of study variable as a control (differentiating between science and engineering), the degrees grouped in these two branches are very diverse from each other. In order to carry out a more precise analysis by sub-branch, a larger population or pooled samples of several nearby graduating classes would be necessary.

Despite these limitations, this study provides valuable lessons for guiding educational policies and interventions. Firstly, the findings highlight the existence of distinct types of dropouts occurring at different stages, probably linked to different motivations and circumstances. In addition to deepening our understanding of these patterns, especially of the puzzling late dropout, it is clear that universities need to implement continuous monitoring systems. Such systems would enable the early identification of at-risk situations and facilitate swift responses.

Secondly, although women remain a minority in STEM fields, they have shown better academic trajectories compared to men, even demonstrating recovery from poor initial performance—contrary to trends observed in many other parts of the world. If, as other referenced studies suggest, this responsiveness stems from higher achievement orientation and motivation, implementing interventions aimed at all students would be advisable. These interventions could include more effective pre-enrolment guidance for study selection and fostering intrinsic motivation once students embark on their academic journey, for instance, by linking academic knowledge with future professional practice.

Finally, the study reveals that students with university-educated parents exhibit a greater ability to overcome initial academic challenges. Previous research suggests that this resilience is facilitated by resources such as tutoring services, financial support to extend their studies, or academic reorientation. These forms of support, often inaccessible to students from lower socioeconomic backgrounds, could be provided by universities through complementary academic support services, personalized academic guidance (including reorientation), and more tailored mentoring programs.

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ANNEX

Table A1

Model selection process

Number of groups	Polynomial function	Model BIC 1 N=58,978	Model BIC 2 N=10,274	Groups < 5%	All the curves significant
1	3	-168257	-168252		sí
2	33	-152765	-152757	0	sí
3	333	-149723	-149710	0	sí
4	3333	-148007	-147989	0	no
4	3233	-148070	-148053	0	no
4	3133	-148234	-148218	0	sí
5	31333	-147244	-147224	0	no
5	21333	-147137	-147117	0	no
5	21323	-147132	-147114	0	no
6	213233	-146832	-146809	1	no
6	212233	-146827	-146805	1	no
6	212223	-146598	-146577	0	no
6	112223	-146593	-146573	0	no
6	111223	-146589	-146570	0	sí
7	1112233	-146440	-146417	2	no

The penultimate solution simultaneously lowers the absolute BIC value and has no group below 5%, and all the curves are significant (Sánchez-Gelabert, 2022). The last solution does not lower the absolute BIC value. The adjustment indicators meet the recommended criteria. The penultimate model is therefore taken as the final solution.

Table A2

Fit indicators for the selected model

	G1	G2	G3	G4	G5	G6
APPA	0.95	0.9	0.89	0.84	0.91	0.88
OCC	131.36	120.77	50.77	10.45	163.81	17.81

Table A3

Decomposition of the influence of parental educational level (PEL) on belonging to G4 (Improvement) mediated by the variable initial performance rate (IPR)

Decomposition of PEL and IPR		
	Coefficient	Standard Error
PEL mediated by IPR	-0.001	0.001
PEL direct influence	0.160**	0.046
PEL total influence	0.159**	0.046

*** $p \leq .001$ | ** $p \leq .01$ | * $p \leq .05$.
N=9016; Pseudo R²=0.02.

Table A4

Decomposition of the influence of gender on belonging to G4 (Improvement) mediated by the variable initial performance rate (IPR)

Decomposition of Gender and IPR		
	Coefficient	Standard Error
Gender mediated by IPR	-0.005	0.004
Gender direct influence	-0.072	0.051
Gender total influence	-0.077	0.051

Note: No value is significant.
N=9016; Pseudo R²=0.02.

Global competence in the Spanish compulsory education curriculum: a documentary analysis of LOMLOE

La competencia global en el currículo de la educación obligatoria española: un análisis documental de la LOMLOE

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ABSTRACT

In recent years, there has been a growing interest in global and/or world citizenship. In this regard, the OECD (2018) has promoted the incorporation of global competence into educational systems through the Programme for International Student Assessment (PISA). Therefore, this research has two objectives: to analyze how the four dimensions of global competence are represented in the new curriculum of compulsory education in Spain, and also to identify how they are developed in the LOMLOE. This work was carried out through Document Analysis of the Royal Decrees regulating compulsory education in Spain. Based on the OECD's (2018) conceptual framework, a tree of dimensions and parameters was designed to analyze the curricula using MAXQDA Analytics Pro 2024. These codes were

cross-checked with artificial intelligence (ChatGPT) via a prompt. Additionally, three stages in the curriculum development were distinguished: the political dimension, the curricular dimension, and learning situations. The results show that the four dimensions suggested by the OECD are unevenly represented in the Spanish curriculum. For instance, the first dimension is the most recurrent, while dimension 2 is underrepresented in both Primary and Secondary Education. Moreover, in the “political dimension” of the curriculum, the four dimensions are evenly distributed, whereas in classroom implementation (the dimension of learning situations), the fourth dimension is barely developed. Finally, it can be concluded that global competence is addressed in the LOMLOE, although not comprehensively. It is essential to ensure a balanced treatment in the curriculum to tackle global challenges. Additionally, it was observed that the discourse on sustainability has been integrated into this policy, but mostly from a symbolic perspective.

Keywords: global competence, documentary analysis, curriculum, educational policy, international organizations, curriculum

RESUMEN

En los últimos años se ha producido un creciente interés en la ciudadanía global y/o mundial. En esta línea, la OCDE (2018) ha fomentado la incorporación de la competencia global en los sistemas educativos a través del Programa para la Evaluación Internacional de Alumnos (PISA). Por ello, esta investigación persigue dos objetivos: analizar cómo se representan las cuatro dimensiones de la competencia global en el nuevo currículo de la educación obligatoria española y, también, identificar cómo se desarrolla en la LOMLOE. Este trabajo se ha desarrollado mediante el Análisis Documental de los Reales Decretos que regulan la enseñanza obligatoria en España. Tomando como referencia el marco conceptual de la OCDE (2018), se ha diseñado un árbol de dimensiones y parámetros para analizar los currículos empleando MAXQDA Analytics Pro 2024. Estos códigos fueron contrastados con la inteligencia artificial (ChatGPT) a través de un prompt. Por otro lado, se diferenciaron tres momentos en el desarrollo curricular: la dimensión política, la dimensión curricular y las situaciones de aprendizaje. Los resultados muestran cómo las cuatro dimensiones sugeridas por la OCDE se encuentran representadas de forma desigual en el currículo español. Así, se observa cómo la primera dimensión es la más recurrente, mientras que la dimensión 2 se encuentra infrarrepresentada tanto en Educación Primaria como en la Educación Secundaria Obligatoria. A su vez, en la “dimensión política” del currículo las cuatro dimensiones son homogéneas, mientras que en la concreción de aula (dimensión de situaciones de aprendizaje) la cuarta dimensión apenas es desarrollada. Finalmente, podemos afirmar que la competencia global se aborda en la LOMLOE, aunque no de forma integral. Es fundamental asegurar un tratamiento equilibrado en el currículo para afrontar los desafíos globales. Además, se observa cómo el discurso de la sostenibilidad se ha integrado en esta política, pero mayoritariamente desde una perspectiva simbólica.

Palabras clave: competencia global, análisis documental, plan de estudios, política educacional, organización internacional, currículo

INTRODUCTION

In today's society, characterized by its unprecedented interconnectedness and complexity, and driven by technological advances and increasing globalization, skills and competencies such as critical thinking, adaptability, creativity, and intercultural communication become essential. In this dynamic and changing paradigm, education must be geared towards forming global citizens who value and understand cultural, social, and environmental diversity, incorporating the Sustainable Development Goals (SDGs) and the skills and competencies needed in the 21st century (UNESCO, 2017).

In recent years there has been a growing academic, political, and social interest in addressing the concept of global citizenship, which has given rise to a diversity of interpretations and theoretical approaches (Gacel-Ávila, 2019). The Organization for Economic Co-operation and Development (OECD) has contributed significantly to the development of the notion of global citizenship competence, including for the first time the assessment of global competence in the 2018 "Program for International Student Assessment" (PISA) (OECD, 2018), as it has become the most influential international body in the field of education (Molina, 2017). This assessment provides both a total global proficiency score for each participating country and relative scores corresponding to each of the dimensions defined in the conceptual framework of the assessment (OECD, 2018, 2020). Thus, countries with overall scores above the mean (e.g. Scotland or Spain, within the first quartile), do not necessarily achieve the highest scores in all dimensions of global competence. In addition, the report identifies possible factors that may influence the degree of global competence achieved, such as sociodemographic or systemic issues. Thus, girls obtain better overall scores than boys, on average, as well as more economically advantaged students. On the other hand, the existence of curricula that contemplate intercultural and global education has also been pointed out as a factor that improves results (OECD, 2020).

In the framework of education to achieve the SDGs, a list of 17 goals considered fundamental to achieve global sustainability, covering aspects such as gender equality, poverty eradication, climate action, and the promotion of peace and justice (UNESCO, 2015), global competence is emerging as essential learning to achieve these goals (OECD, 2018; Reimers, 2020). In this context, UNESCO-IBE (2024) considers that a core curriculum design is a key component for building strong education systems. The curriculum gathers fundamental aspects of education, such as the minimum learning that students should achieve, how the teaching-

learning environments should be, or assessment, among others, articulating both the competencies necessary for lifelong learning and the competencies necessary for the comprehensive development of students. In this sense, the curriculum is the basis for an education system that guarantees quality learning and the preparation of students to exercise active and participatory citizenship at global and local levels (UNESCO, 2017), but its development must be adapted to the context of each school (Chandir and Blackmore, 2024).

Although the European Union (EU), like other international bodies, does not have competencies in education, its influence on the Member States is growing (Manso and Thoilliez, 2015). In this sense, the “Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación” (LOMLOE) is closely aligned with European education policies in several key aspects, such as a competency-based curriculum approach (López, 2020), equity and inclusion, and an education-oriented towards sustainable development and global citizenship that encompasses topics such as peace, human rights, international understanding and intercultural education, in addition to education that fosters local action essential to face the climate emergency (González-Calero, 2021).

Taking all the above into account, the main objective of this study is to analyze the treatment of the dimensions of global citizenship competence in the curricular regulations (Royal Decrees) of compulsory education in Spain (Primary Education and Compulsory Secondary Education), using the OECD’s conceptual framework (2018) as a reference. The focus on these educational stages is justified by the importance of compulsory education in shaping citizenship, as it aims to provide the fundamental knowledge, values, skills, and attitudes for individuals to participate actively, responsibly, and critically in society (LOMLOE, 2020; de Oliveira, 2023).

Global or world citizenship competence: international and supranational perspectives

The concept of citizenship has been extensively studied from Ancient Greece to the present day. Traditionally, this term has been associated with people’s national identity and, therefore, linked to the idea of the nation-state (UNESCO, 2015a). However, due to globalization, the development of human rights, the internationalization of businesses, and advancements in information and communication technologies, it has become essential to explore new models of citizenship (UNESCO, 2015a, 2015b).

In recent years, there has been a growing academic, political, and social interest in the concept of global citizenship (UNESCO, 2015b), which is emerging as a significant field of study (Martini & Robertson, 2024). However, it is important to recognize that this term is controversial and has led to the emergence of several

similar but distinct concepts (UNESCO, 2016; Martini & Robertson, 2024). Two of the main concepts are World Citizenship, promoted by UNESCO and the UN in Sustainable Development Goal 4.7 (UN, 2015), and Global Citizenship, supported by the OECD and the EU.

Beyond terminological debates, it is crucial to clarify that global citizenship does not seek to impose a single model worldwide (UNESCO, 2016). The essence of this concept is to advocate for a balance between local, national, and global interests (UNESCO, 2016). In this context, education plays a key role in fostering humanity's commitment to protecting both the species and the planet, which are, in essence, the ultimate goals of global citizenship. Thus, education and a gradual democratization of public policies—local, national, international, supranational, etc.—must lead to social transformation in favor of human rights and dignity (UNESCO, 2015b).

On the other hand, the concept of global competence proposed by UNESCO (2015b, 2016) falls within the paradigm of lifelong learning, both in formal and non-formal education and within a competence-based framework. This is reflected in UNESCO's (2015b, p. 15) definition of the basic conceptual dimensions of education for global citizenship:

- Cognitive: The acquisition of knowledge, understanding, and critical thinking about global, regional, national, and local issues, as well as the interrelationships and interdependencies among different countries and populations.
- Socio-emotional: A sense of belonging to a common humanity, sharing values and responsibilities, empathy, solidarity, and respect for differences and diversity.
- Behavioral: Effective and responsible action at local, national, and global levels to foster a more peaceful and sustainable world.

From the EU's perspective, global citizenship is seen as a sociopolitical necessity due to various circumstances. The organization expresses notable optimism regarding the positive effects of promoting global citizenship, as it is perceived as a response to current and future global crises (OJ, C349 E/99, 2013), particularly insecurity, violence, and the climate crisis (OJ, C207/39, 2017). The EU also recognizes the importance of involving local entities and civil society in the design, development, and evaluation of policies aimed at promoting global citizenship within the EU (OJ, C208/25, 2016). This assertion carries significant theoretical and political weight, as it aligns with the idea of building global citizenship from the local level (OJ, C207/39, 2017). Thus, the need to ensure the participation of diverse actors in political processes to strengthen global citizenship becomes evident. The EU advocates for fostering decentralized governance and cooperation to guarantee greater democratization and inclusion within and through public policies, which substantially contributes to the development of global citizenship (OJ, C207/39, 2017; OJ, C252/62, 2018).

This position aligns with the 2030 Agenda (UN, 2015), specifically, SDG 4, which calls for progress toward world citizenship (OJ, C252/62, 2018). Two key ideas emerge from European policies on this matter. First, in the specific case of the EU, there is a call to build global citizenship from European citizenship, seeing the latter as a starting point for developing humanistic projects on a global scale. To this end, the EU recognizes education and training as two cornerstones for achieving this goal (OJ, C228/68, 2019). Second, for this supranational organization, global citizenship necessarily includes a commitment to sustainable development (OJ, C252/62, 2018). However, it also emphasizes that it is the responsibility of states to promote citizens' critical thinking regarding development policies (OJ, C208/25, 2016).

After outlining the two most widely accepted political-educational perspectives, it is relevant to highlight that the discourse on global or world competence develops within a context of ideological disputes (UNESCO, 2016). On one hand, there are movements opposed to this discourse, arguing that it threatens local and national identity and interests. Additionally, Sanz et al. (2022) point out some of the main criticisms directed at the concept of global competence as defined by the OECD (2018). They argue that it has a predominantly Westernized focus, which also neglects the Global South. Furthermore, they consider it a potential tool for shaping future global workers. In this regard, Martínez-Usarralde (2021) also notes that inclusion is not one of the goals outlined by the OECD in its global competence framework, unlike UNESCO's framework. From another perspective, global competence also carries a strong critical component regarding existing social inequalities, which fosters the emancipation of oppressed groups and, therefore, poses a challenge to the establishment. However, in recent years, there has been a greater openness to universal values and youth-led initiatives, creating a more favorable context for the global competence discourse to gain traction worldwide.

Global competence according to the OECD

As seen in the previous section, education aimed at promoting global citizenship competence is based on concepts derived from various educational models, such as intercultural education, global citizenship education, and education for democratic citizenship (Cox et al., 2005; Boix-Mansilla & Jackson, 2013; Council of Europe, 2016; Hunduma & Mekuria, 2024). Despite differences in their approaches and scopes—whether focused on cultural differences, democratic culture, human rights, or environmental sustainability—these models share a common goal: to cultivate students' understanding of the world and empower them to express their perspectives and actively participate in society.

The OECD (2018) contributes to existing models by proposing a new perspective on defining and assessing the knowledge, skills, attitudes, and values necessary to achieve the objectives covered by these models. It defines global competence as “the capacity to analyze global and intercultural issues, appreciate different perspectives with respect for human rights, interact with people from different cultures, and take action for the common good and sustainable development” (p. 9).

The PISA conceptual framework for global competence is organized into dimensions comprising various components. Dimension 1 addresses knowledge and the ability to form opinions on global issues—such as poverty, human rights, geopolitics, or environmental degradation—in a critical and reasoned manner. A high level in this dimension indicates advanced thinking skills, including the ability to apply and integrate disciplinary knowledge and cognitive routines to formulate questions, analyze data, and construct arguments when explaining local, global, or cultural phenomena, as well as critically interpreting messages in the media. Dimension 2 focuses on understanding and valuing different perspectives and worldviews, emphasizing the ability to examine global issues from multiple viewpoints. Individuals competent in this dimension recognize that others’ worldviews may differ significantly from their own and that engaging with these perspectives requires analyzing their origins and implications. Dimension 3 describes the skills needed to interact with people from diverse cultures, including understanding intercultural norms, communication styles, and levels of formality. Competent individuals in this area adapt their behavior and communication flexibly, value respectful dialogue, and seek to include marginalized groups. This ability requires sensitivity, curiosity, and a willingness to engage with different perspectives while respecting cultural norms and ensuring open and effective communication. Dimension 4 focuses on the active and responsible role of youth in society in addressing local, global, and intercultural issues. Competence in this dimension involves advocating for human dignity, initiating global campaigns, or expressing opinions on social justice or climate change issues through social media. Ultimately, it reflects a commitment to contributing to a fairer, more peaceful, inclusive, and sustainable world.

Global competence in education systems: the curriculum as a starting point

According to UNESCO (2017), a well-designed curriculum framework is the cornerstone of a quality education system. What is made explicit in the curriculum provides a glimpse of the social imaginary and the aspirations that a country seeks to achieve through quality education. The content of curricula guides the nature of the knowledge, skills, values, and attitudes that children, adolescents, and youth must acquire in school to exercise their citizenship actively and democratically in the future (Henson, 2006; Doğanay, 2012).

Doğanay (2012) states that the scope of a curriculum that contemplates education for democratic citizenship makes explicit knowledge, values, attitudes, and skills such as political, economic, social, and cultural knowledge, values, and attitudes related to the culture for peace, commitment to human rights or the principles of sustainable development, or skills such as critical thinking or participation, among others. Moreover, for diversity and interculturality to come alive in school, there must be a close connection between pedagogical practice and a formal curriculum that makes these issues explicit (Vižintin, 2018).

The curricula developed considering the LOMLOE reinforce the competency approach, implying that, aside from knowledge acquisition, students must develop key competencies that enable them to apply what they have learned in different personal, social, and working contexts. These competencies include critical thinking, problem-solving, creativity, and digital competencies, among others, and place special emphasis on education in values, incorporating transversally aspects such as education for global citizenship and democratic coexistence, or education for sustainability and ecological transition, following the principles of the “Agenda 2030” (RD 157/2022; RD 217/2022), which are presented as a guiding framework for educational action (Reimers, 2020). All these approaches are aligned with the promotion of global competence during compulsory education. Thus, the curriculum emanates as a key element in addressing global challenges, promoting respect for global covenants, and, ultimately, forming an engaged citizenship (Reimers et al., 2018; Reimers, 2020).

METHOD

The design of this study has been developed based on the analysis of the current Royal Decrees (RD 157/2022; RD 217/2022) that document the minimum contents and competencies to be attained in compulsory education in Spain. The choice of this method is due to its ability to identify the theoretical and philosophical foundations of the curriculum (Bravo, 2018) and has proven useful in recent research related to curriculum analysis (Sánchez & López, 2019) and Education Policy (Neubauer, 2023).

Objectives and initial premises

This research pursues two objectives:

- Objective 1: Analyze how the four dimensions of global competence are represented in the curriculum of compulsory education in Spain.

- Objective 2: Identify how global competence is developed within this curriculum.

Additionally, two initial premises have been established, one for each objective. Thus, the study's hypotheses are as follows:

- Premise 1: The LOMLOE seeks to address the challenges of the 21st century through the development of global competence, contributing to all its dimensions in a balanced way.
- Premise 2: Global competence and its dimensions are developed in all elements of the curricular design of the LOMLOE in a transversal manner.

Instruments for data collection and analysis

A book detailing families and codes was developed to facilitate systematic data collection. This tool is based on the four dimensions of global competence proposed by the OECD (2018). From this foundation, five codes were generated for each dimension using an inductive-deductive approach, relying on the descriptions provided by this international organization. Following the initial selection of these codes, they were cross-verified with the assistance of artificial intelligence (ChatGPT), employing a prompt that requested the creation of five codes derived from the previously mentioned descriptions. Additionally, the dimension of "curricular elements" consists of three codes that pertain to the functions of the curriculum:

- Political Dimension: This refers to the symbolic function of discourse and the curriculum, which is often clearly expressed in the preamble of policies and subjects.
- Curricular Design: This establishes the pedagogical approach of the curriculum, which in this case is framed within a competency-based approach.
- La situación de aprendizaje (SdA): hace referencia al último nivel de concreción curricular. En cierta manera, son los elementos curriculares que orientan la acción docente en el aula.

Learning Situation (SdA, for its initials in Spanish): This pertains to the final level of curricular specification, representing the elements that guide teaching actions in the classroom. As a result of this comprehensive process, the final book of families and codes was created (See Table 1):

Table 1*Book of families and codes*

Dimension	Codes	
Subject	"Math", "Music", "Civic and Ethical Values", etc.	
Curricular elements	Political dimension	"Preamble of the subject"
	Curricular design	"Specific competences" and "Key competences, output profile and operational descriptors".
	Learning situation	"Learning situations", "Basic knowledge" and "Evaluation criteria".
Global competence	Dimension 1: Examining issues of local, global, and cultural importance	"Multimodal literacy", "Media literacy", "Higher-order thinking skills", "Globalization as a phenomenon", and "Knowledge and critical thinking".
	Dimension 2: Understanding and appreciating the perspectives and worldviews of others	"Democratic citizenship", "Social justice in global perspective", "Culture of peace", "Empathy", and "Mutual understanding and comprehension".
	Dimension 3: Engaging in open, appropriate, and effective interactions across cultures	"Effective cooperation", "Multilingual competence", "Effective and respectful communication", "Inclusion of vulnerable and excluded groups" and "Intercultural and democratic competence".
	Dimension 4: Acting for the collective well-being and sustainable development	"Entrepreneurship", "Activism and social engagement", "Human rights and human dignity", "Global challenges" and "Sustainability".

Source. Own elaboration.

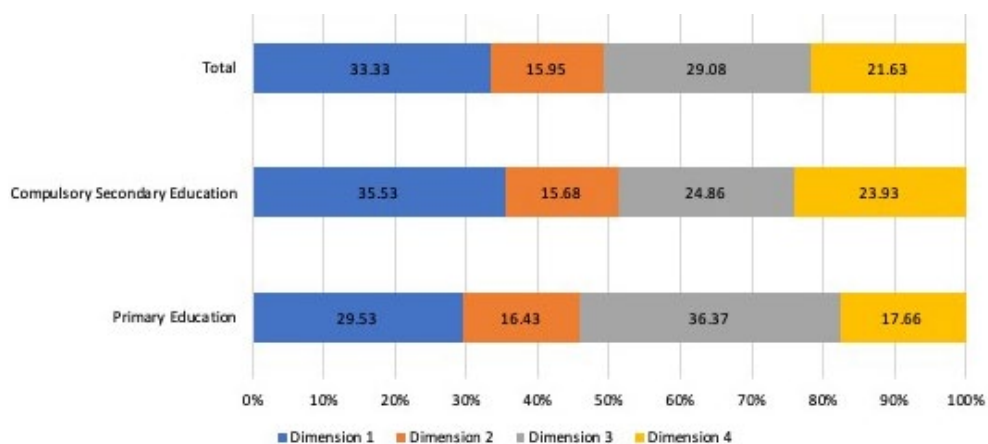
Subsequently, after defining the "memos" for each code, the coding of the current Royal Decrees of minimum teachings was initiated using MAXQDA Analytics Pro 2024. This process was also subjected to a double procedure to ensure consistency in the application of the book of families and codes, as suggested by Susilo and Dwi (2021). Finally, a set of analyses was carried out, among which the "code frequency," "code relation matrix," and "code by document matrix" stand out.

RESULTS

The four dimensions of global competence are represented in the curricula that regulate compulsory education in Spain, but the intensity with which they are developed differs substantially between them, and also between the Primary Education (EP) and Compulsory Secondary Education (ESO) stages (See Figure 1).

Figure 1

Representation (in %) of the 4 dimensions of global competence in the curricula of Primary Education (EP) and Compulsory Secondary Education (ESO)



Source. Own elaboration.

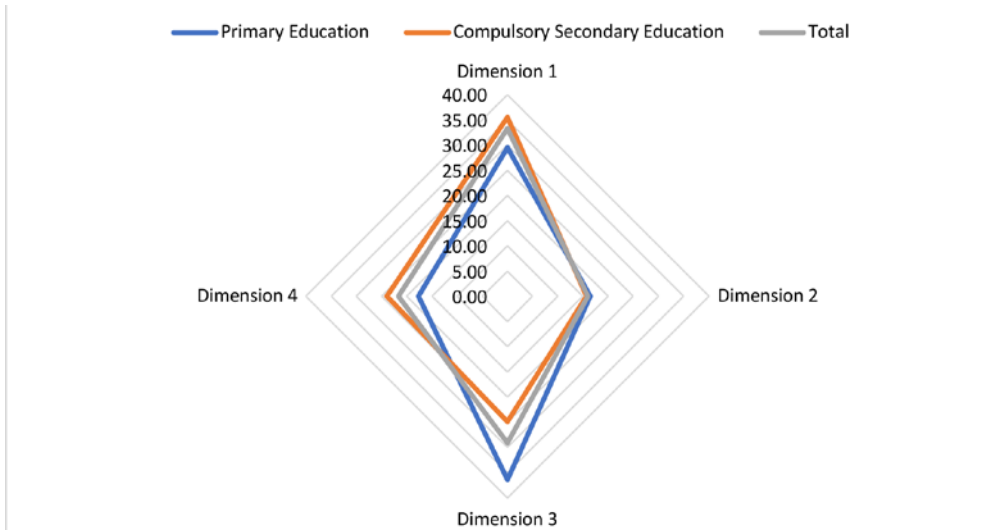
In the Primary Education (EP) stage, dimension 3 predominates (36.37%), while dimensions 2 and 4 have substantially lower representation (16.43% and 17.66%, respectively). The ability to “examine issues of local, global, and cultural importance” (dimension 1) occupies a middle ground, accounting for nearly 30% of the codes at this stage.

When comparing these data with those of the Compulsory Secondary Education (ESO) stage, we observe that dimension 1 increases its representation by 6% compared to EP, which is also the case for dimension 4. Meanwhile, dimensions 3 and 4 have similar levels, close to 24%. Dimension 2, on the other hand, shows divergence from the others, as it is the only dimension that maintains similar representation percentages in both EP (16.43%) and ESO (15.68%).

From a global perspective, it can be stated that the representation of global competence in compulsory education is skewed in favor of dimensions 1 (33.33%) and 3 (29.08%). In the second tier are dimensions 4 (21.63%) and 2 (15.95%), with the latter being the only one with representation below 20% (See Figure 2).

Figure 2

Representation of the 4 dimensions of global competence in the curriculum of compulsory education in Spain



Source. Own elaboration.

Analyzing in detail the dimensions and their indicators (see Figure 3), we observe that in dimension 1, “multimodal literacy,” “higher-order thinking skills,” and “knowledge and critical thinking” are the most frequently cited, with the latter gaining greater prominence in ESO (29.57%) compared to ep (17.36%). On the other hand, “media literacy” is more developed in ep (21.54%), whereas in ESO it is the second least represented indicator (9.91%). “Globalization as a phenomenon” shows similar percentages in both stages, though its presence is minimal.

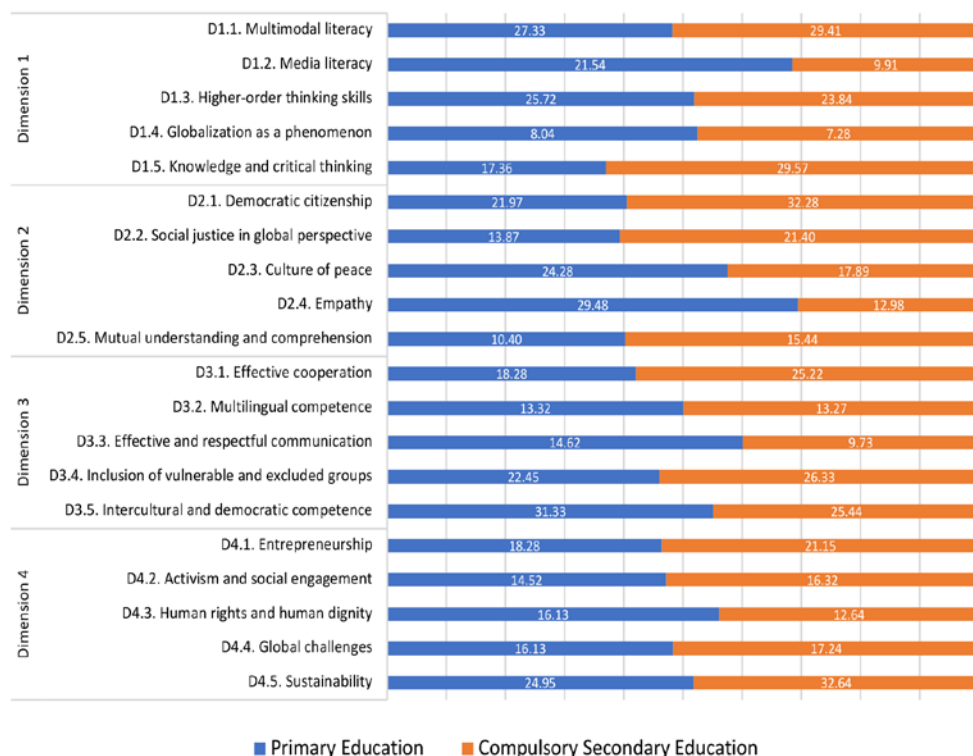
Regarding dimension 2, it can be highlighted that all its indicators experience notable fluctuations in representation between EP and ESO. While in EP the most developed indicators are “empathy” (29.48%) and “culture of peace” (24.28%), in ESO they are “democratic citizenship” (32.28%) and “social justice in a global perspective” (21.40%). However, both stages agree that “mutual understanding and comprehension” is the least represented indicator (10.40% and 15.44%, respectively).

In dimension 3, “plurilingual competence” is equally developed in both stages, while “effective cooperation” plays a more prominent role in ESO (25.22%) than in EP (18.28%). The same occurs with “inclusion of vulnerable and excluded groups.” On the contrary, EP places more emphasis on promoting “effective and respectful

communication” and developing “intercultural competence,” although the latter also has a notable presence in ESO.

Figure 3

Presence of the codes (in %) associated with each dimension by educational stage



Source. Own elaboration.

Finally, dimension 4 is the only one with a uniform representation of its indicators in both stages, although “human rights and human dignity” are slightly more developed in Primary Education (16.13%) than in Compulsory Secondary Education (12.64%). Furthermore, it is important to note that the two most frequent indicators have been “entrepreneurship” and “sustainability.”

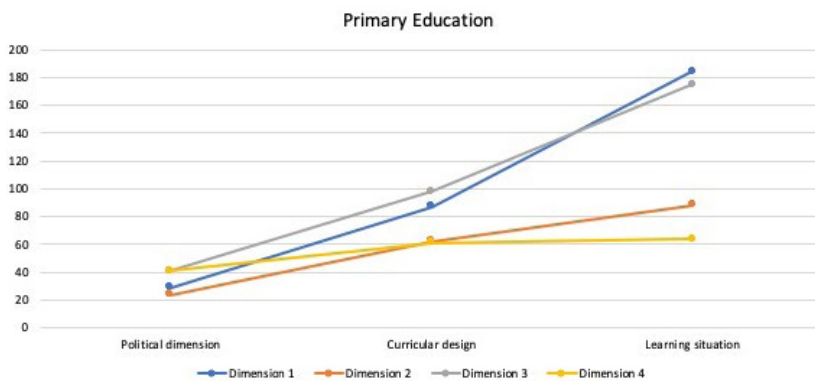
Additionally, it is relevant to understand the development of each dimension of global competence through the curricular elements of the analyzed stages. In this regard, the curricular design was differentiated into three nested, hierarchical levels: a “political dimension,” developed by the preamble of each subject, a “curricular design,” understood as the set of key and specific competencies guiding

the curriculum design, and lastly, the “SdA,” which refer to the concretization of the curriculum through basic knowledge and evaluation criteria.

That said, in EP, we observe how in the “political dimension,” all dimensions have a similar representation, although dimensions 3 and 4 stand out (41 codes each). However, dimension 4 loses prominence in the next level of “curricular design,” in contrast to the upward trend observed in the other three dimensions, something also seen with the “SdA.” In this final level of curriculum development, dimension 1 (81 codes) experiences a sharp increase, contrasting with the slight variation for dimension 4 (61 codes), making it the least represented within the “SdA.” Therefore, a gap is observed between dimensions 1 (184 codes) and 3 (175 codes) compared to dimensions 2 (88 codes) and 4 (64 codes), as the former have a notable overrepresentation compared to the latter two (See Figure 4).

Figure 4

Representation of the dimensions of global competence (expressed in the number of codes) at different levels of curricular design in Primary Education



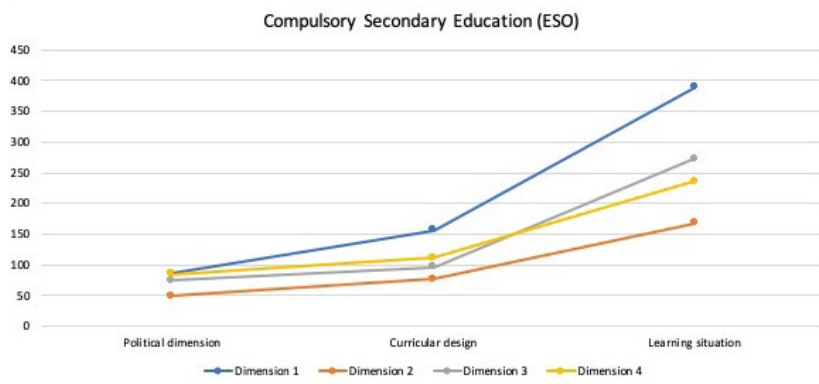
Source. Own elaboration.

The representativeness of the dimensions slightly differs between EP and ESO (See Figure 5). In the latter, dimension 1 (86 codes) and dimension 4 (85 codes) emerge as the most recurrent, with dimension 2 (49 codes) being the least cited for the “political dimension.” These data are reflected in the analysis of the “curricular design” level, although dimension 1 is noticeably more present than the others. However, in the “SdA,” a shift in trend is observed, as dimension 3 (273 codes) surpasses, for the first time in this stage, dimension 4 (236 codes). Meanwhile, dimensions 1 and 2 maintain their positions at all levels, with dimension 2 being the least represented both in the “political dimension,” “curricular design,” and

“SdA” (168 codes), far behind the codes presented by dimension 1 in the “SdA” (389 codes).

Figure 5

Representation of the dimensions of global competence (expressed in number of codes) at different levels of curriculum design in the Secondary Education stage (ESO)



Source. Own elaboration.

On the other hand, not all dimensions are evenly represented across all curriculum areas. Thus, dimension 1 and its indicators are addressed in a varied manner. On one side, “multimodal literacy” is mainly developed in the areas of “Foreign Language” and “Spanish Language and Literature,” while “globalization as a phenomenon” is more present in “Natural, Social, and Cultural Environment” (EP) and “Geography and History” (ESO). A distinctive feature of “media literacy” is that it is also worked on in “Art Education” in EP. Meanwhile, “higher-order thinking skills” are closely related to “Natural, Social, and Cultural Environment,” “Biology and Geology,” and “Mathematics”. Ultimately, “knowledge and critical thinking” are developed in different areas in the EP stage (“Natural, Social, and Cultural Environment” and “Civic and Ethical Values”) and ESO (“Spanish Language and Literature,” “Biology and Geology,” and “Geography and History”).

As for dimension 2, three of its main indicators (“democratic citizenship,” “social justice in a global systemic perspective,” and “culture of peace”) are mostly developed in both stages in the areas of “Geography and History” and “Civic and Ethical Values,” although “culture of peace” also has a significant presence in EP in the “Physical Education” area. “Foreign Language,” on the other hand, develops, among other aspects, “empathy” and “mutual understanding and comprehension.”

Dimension 3, meanwhile, is mainly developed in the areas of “Foreign Language” and “Spanish Language,” as they significantly contribute to promoting “plurilingual

competence,” “effective and respectful communication,” and “intercultural competence.” Furthermore, “effective cooperation” is extensively worked on in “Natural, Social, and Cultural Environment” in EP and in “Mathematics” in ESO. Lastly, the “inclusion of vulnerable and excluded groups” is an indicator primarily addressed by “Physical Education” and “Geography and History.”

Dimension 4, related to the ability to “act for the collective well-being and sustainable development,” is tangentially present in various areas. On the one hand, “entrepreneurship” is addressed in the EP stage in “Natural, Social, and Cultural Environment” and “Mathematics,” while in ESO, it appears in “Economics and Entrepreneurship.” Additionally, there is a core set of indicators, including “activism,” “global challenges,” and “human rights and human dignity,” which are developed in the subjects of “Natural, Social, and Cultural Environment,” “Geography and History,” and “Civic and Ethical Values.” However, the case of “sustainability” is particular, as its treatment differs significantly between EP (“Natural, Social, and Cultural Environment,” “Physical Education,” and “Civic and Ethical Values”) and ESO (“Geography and History,” “Technology and Digitalization,” and “Physics and Chemistry”).

DISCUSSION AND CONCLUSIONS

In response to the first objective of the study, we can conclude that the four dimensions of global competence proposed by the OECD are unevenly represented in the compulsory education curricula in Spain. More specifically, these results show how EP primarily focuses on equipping students with the competencies necessary to interact effectively and respectfully in intercultural contexts. In contrast, the ESO curriculum emphasizes the more cognitive dimension (dimension 1) of global competence. Therefore, we can infer that the Spanish educational system emphasizes the importance of fostering democratic coexistence skills from early education. However, in adolescence, there is a stronger focus on developing critical thinking skills, which are essential for recognizing inequality and forming informed positions on various global issues.

Meanwhile, dimension 2 is underrepresented in both stages. This finding is significant for two reasons. The first is that empathy is an essential requirement for committing to human rights and, ultimately, forms the foundation for developing prosocial behavior, as reflected in the LifeComp competency (Sala et al., 2020). The second reason is that one of the major contributions of the LOMLOE, at least theoretically, has been its focus on promoting emotional intelligence among students, although these findings contradict those obtained by Lozano and Hernández (2022). However, essential competencies such as “mutual understanding and comprehension,” “empathy,” and “recognizing and respecting other beliefs”

are relegated to a secondary level in the Royal Decrees of minimum teachings. As a result, from a competency-based perspective, global competence may not be fully developed, as a competence also requires promoting the socio-emotional dimension of the individual (UNESCO, 2015b), which directly aligns with the second dimension suggested by the OECD.

In summary, we could conclude that, according to the LOMLOE, a global citizen should (dimension 1) have high critical thinking skills, possess advanced higher-order thinking skills, and be multimodally literate (Bautista, 2007). Furthermore, they should (dimension 2) be empathetic and act in a culture of peace (Sala et al., 2020), especially (dimension 3) in intercultural and plurilingual contexts, fostering the inclusion of vulnerable groups and, ultimately, (dimension 4) acting for the collective well-being and sustainable development. In this regard, it is essential to highlight the role of teachers in promoting the exercise of citizenship for all students, particularly those from minority groups, through multilingualism and intercultural education (Burner & Osler, 2021).

From another perspective, addressing the second objective of the research, it seems that this competence is primarily developed across a set of subjects:

- “Language” and “Foreign Language”: these subjects play a central role in the curriculum, as they significantly develop (dimension 1) “multimodal literacy,” (dimension 2) “empathy,” “mutual understanding and comprehension,” (dimension 3) “intercultural competence,” “effective and respectful communication,” and “plurilingual competence.”
- “Environmental, Social, and Cultural Knowledge,” “Civic and Ethical Values,” and “Geography and History”: these subjects notably contribute to deepening (dimension 1) “globalization as a phenomenon,” (dimension 2) “democratic citizenship,” “social justice from a global systemic perspective,” “culture of peace,” (dimension 3) “effective cooperation,” and “inclusion of vulnerable and excluded groups.”

However, dimension 4 shows a significant divergence from the others, being similarly represented across both educational stages and a wide range of subjects, with the most pronounced example being the “sustainability” indicator. Therefore, we can affirm that dimension 4 is developed transversally in Spanish compulsory education, although it has less prominence than some of the other dimensions.

On the other hand, the way global competence is addressed across the different stages of curriculum implementation reflects a clear commitment, at least discursively, from the Ministry of Education and Vocational Training to promote this form of citizenship. This is evident in the balanced representation of all four dimensions within the “political dimension.” Specifically, the preambles of the legislations and, in this case, the subjects, reflect the ideology of the parties that create educational laws. However, as we move from symbolic discourse

to tangible actions, we see how the Royal Decrees emphasize two dimensions, particularly the first one. Thus, a deep gap emerges in how each dimension is developed in the curricular elements that guide teaching actions: basic knowledge and evaluation criteria. In this way, we can affirm that, symbolically—in the preambles—all dimensions of global competence are similarly represented, while in the classroom, in the final implementation of this law, the second and fourth dimensions are relegated to a secondary role. The case of the fourth dimension in EP is distinctive, as it is the only one that hardly increases its representation in the “SdA” dimension, while other dimensions double their number of codes. Therefore, we can conclude that the politically correct and socially supported discourse in favor of sustainability has been integrated into the LOMLOE (Navarro-González and Gavari-Starkie, 2024), although it has been done more symbolically than practically.

Thus, emphasis continues to be placed on cognitive issues (dimension 1), and social commitment, taking action, and education as a policy move to the background (dimension 4). If global competence is an opportunity to face socio-environmental challenges, not only within the EU but globally, it is essential to strengthen the fourth dimension beyond legislative intentions, promoting it through concrete actions in the classroom across all subjects.

That said, this research presents several limitations that must be addressed. The first of these is the design of the family and code book itself, which may be subject to a certain degree of subjectivity on the part of the research team, as is the case with any qualitative research. However, an innovative element is introduced by contrasting the suggested codes with artificial intelligence. On the other hand, the curriculum is analyzed at the national level, but its development may vary across regions due to the decentralization of the Spanish educational system. For all these reasons, future research would benefit from conducting a comparative study across different Autonomous Communities and in other countries. It would also be pertinent to replicate this study but referencing the UNESCO (2016) framework on global citizenship.

In conclusion, we can affirm that the curricula of compulsory education under the LOMLOE framework address global competence comprehensively, as it represents all the dimensions that make up this competence. However, this treatment could be considered deficient when considering the widespread underrepresentation of dimensions 2 and 4, as well as their lesser prominence in the curricular elements guiding classroom actions (“SdA”) compared to the stated intentions in the preambles and other parts of the regulations defined here as the “political dimension.” This is especially relevant given the current global change context and environmental and climate crisis we are immersed in, which requires

fostering, from the base curriculum designs, the commitment of both teachers and students to building a more just, peaceful, inclusive, and sustainable world.

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Transforming realities: students' learning through University Service-Learning in initial teacher training

*Transformando realidades: aprendizajes
del alumnado a través del Aprendizaje-
Servicio Universitario en formación inicial
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ABSTRACT

University Service-Learning (S-L), based on the theories of active methodologies, is conceived as a transformative tool that creates a culture to promote integral human development from civic awareness, the design of sustainable scenarios and the perspective of social justice, thus contributing to the fulfilment of the Sustainable Development Goals (SDG) collected in the 2030 Agenda. This case study aims to identify the learning that university students develop when they become involved in university S-L projects and experiences. The narratives of the conclusions of sixty-five Final Degree Projects and Master Thesis in the field of education carried out at the University of de Basque Country (UPV/EHU) have been analysed. The narratives have been coded in order to carry out a categorization process based on a deductive-inductive categorical system and with the help of Nvivo software. The triangulation of the analysis was multimodal. The students define S-L as a suitable means of developing university competences and completing their academic training. Through experiences and evaluation of them, they acquire conceptual and procedural learning: disciplinary knowledge, curricular content and professional competences; and they experience a change of identity by developing their critical reflection and values based on social justice and sustainability. By responding to real needs together with the community, the active role and leadership of the students is evident and they are involved throughout the process. However, the planning of S-L proposals also raises certain challenges such as the relationship with the collaborating entities and/or the management of time. Therefore, institutional management is proposed for these aspects and, thus, facilitating dynamic learning-teaching actions aimed at community contribution.

Keywords: activity learning, social justice, universities, teacher qualifications, identity

RESUMEN

El Aprendizaje-Servicio (ApS) universitario, basado en las teorías de las metodologías activas, se concibe como herramienta transformadora que crea una cultura para promover el desarrollo humano integral desde la conciencia cívica, el diseño de escenarios sostenibles y la perspectiva de la justicia social, contribuyendo así al cumplimiento de los Objetivos de Desarrollo Sostenible (ODS) recogidos en la Agenda 2030. Este estudio de caso pretende identificar los aprendizajes que desarrolla el alumnado universitario al implicarse en proyectos y experiencias de ApS universitario. Se han analizado las narrativas de las conclusiones de sesenta y cinco Trabajos Fin de Grado (TFG) y Trabajos Fin de Master (TFM) del ámbito de la educación realizados en la Universidad del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU). Las narrativas han sido codificadas para, posteriormente llevar a cabo un proceso de categorización basado en un sistema categorial deductivo-inductivo y con ayuda del software Nvivo. La triangulación del análisis ha sido multimodal. El alumnado define el ApS como medio adecuado para desarrollar competencias universitarias y completar su formación académica. A través de las vivencias y evaluación de las mismas, adquieren aprendizajes conceptuales y procedimentales: conocimientos disciplinarios, contenidos curriculares y

competencias profesionales; y experimentan un cambio identitario al desarrollar su reflexión crítica y valores basados en la justicia social y la sostenibilidad. Al responder a necesidades reales junto a la comunidad, el rol activo y de liderazgo del alumnado es evidente y se involucran a lo largo de todo el proceso. No obstante, la planificación de propuestas de ApS también plantea ciertos desafíos como la relación con las entidades colaboradoras y/o la gestión de los tiempos. Por ello, se propone la gestión institucional para dichos aspectos y, así, facilitar las acciones de aprendizaje-enseñanza dinámicas dirigidas a la contribución comunitaria.

Palabras clave: aprendizaje activo, justicia social, universidad, competencias del docente, identidad

INTRODUCTION

The signing of the Sorbonne Declaration in 1998 was the first step in initiating a political process to change higher education in Europe and to build the European Higher Education Area (EHEA). A year later, in 1999, the process was formalized with the Bologna Declaration, signed by 30 states from the European Union (EU) and others.

This Declaration marked a milestone in defining the parameters that govern the current European university system. Its purpose was to create a unified university system, in accordance with the principles of quality, mobility, diversity, international training, competitiveness, and employment.

The universities' immersion in the EHEA has brought about changes that pose challenges. New methodologies are needed, aligned with today's society, more active, where students take a leading role in their education and are aware of what happens in their environment in order to respond creatively and ethically to problems (Calderón, 2022). There is a call for more autonomous, experiential, constructive, meaningful, cooperative, and committed learning (Fernández, 2006).

This is reflected in the current laws and regulations on higher education. The Organic Law 6/2001, of December 21, on Universities (LOMLOU) proclaims innovation in the ways knowledge is generated and transmitted. Royal Decree 8222/2021, of September 28, which establishes the organization of university teaching and the procedure for ensuring its quality, considers the institutionalization of innovative teaching methodologies in the university context. The new Organic Law 2/2023, of March 22, on the University System (LOSU), emphasizes the importance of responding to the needs of society. In the context of Education Degrees, there is direct reference to collaboration with the social environment, active citizenship, and sustainable futures as basic competencies for professional practice (Orden ECI/3857/2007). It is also important to focus on the major challenges facing

the planet, currently contained in the 2030 Agenda in the form of Sustainable Development Goals (SDGs) (Naciones Unidas, 2015).

In the universal and shared commitment to sustainable development (Espejel, 2022), education plays a strategic and transversal role, and universities must promote a culture of social responsibility (CRUE, 2018). Higher education, and especially initial teacher training, must be holistic and integral, seeking active participation in community-based alternative change through knowledge and reflection (García-Rico et al., 2021).

In this line, Service-Learning (S-L) emerges as a transformative tool that promotes human development, designs sustainable future scenarios, and works on social justice for community coexistence (Candela-Soto et al., 2021). Its premise is to establish a link between educational growth and responding to social needs (Fernández-Prados & Lozano-Díaz, 2021).

More precisely, S-L is defined as an educational proposal that combines and integrates: (1) a learning process encompassing disciplinary knowledge, curricular content, values, and reflection on practice; and (2) a solidarity-based service, coordinated with the community, that seeks to address real social deficiencies in the local context (Lorenzo et al., 2019). It is an experiential, autonomous process that requires practical application and real involvement and/or commitment (Santos-Pastor et al., 2021).

Thus, the practical application of knowledge in real-world settings has a significant impact both on education and on society. Identifying social issues helps guide reflection to understand the identity of the context and its critical issues for the community (Escofet et al., 2016). By actively and critically addressing detected needs, the well-being of the community is promoted (Aramburuzabala et al., 2015; Ganga-Contreras et al., 2021). Services aim to change the environment, improving it and aligning with the foundations, principles, and skills of education for sustainability (Granados, 2010).

This symbiotic student-community relationship provides new meanings for the learning process (Butler et al., 2021). It offers the opportunity to develop fundamental life skills such as teamwork, empathy, effective communication, and problem-solving, as well as emotions and values (Blanco-Cano & García-Martín, 2021; Garay et al., 2021; Lázaro-Cayuso et al., 2023).

It also enhances students' ethical and social commitment, as community interaction challenges social inequalities and injustices (Butler et al., 2021; Zygmunt et al., 2020). This results in the active defense of groups in greater vulnerability, while students experience the sense that their actions can be transformative (Morales et al., 2020). All of this translates into the formation of a mindset based on social justice.

Moreover, in the case of initial teacher training, S-L serves as a motivational methodology in which students develop their pedagogical practice with the aim of ensuring inclusive learning opportunities (García & Cotrina, 2015). This allows them to build their own professional identity through critical reflection, being aware of their skills development (Giles et al., 2021).

Thus, in recent years, educational innovation and S-L have been coexisting and gaining ground in universities (Agrafojo et al., 2017; Candela-Soto et al., 2021; Sánchez-Caballé & González-Martínez, 2022). Both the World Conference on Higher Education and the Conference of Spanish University Rectors recognize the importance of institutionalizing S-L as a teaching strategy within the framework of university social responsibility (CRUE, 2018). In the same vein, recently, the G9 Group of Universities has decided to launch a network of S-L for its implementation (García-Rico et al., 2021), and many university educational centers are already working on its institutionalization (Gezuraga et al., 2023; Valderrama & Arocha, 2022).

Based on the relationship between S-L, active learning, and the social responsibility that higher education must respond to, this paper aims to identify the disciplinary knowledge, curricular content, professional competencies, critical reflection, and values of education for sustainability that university students develop through the implementation of S-L. All of this is carried out through the lens of the specific competencies in initial teacher training in the Final Degree Project.

Thus, the goal is to provide evidence on university-level S-L so that it can be extended as a permanent methodological strategy to all degree programs in response to comprehensive, high-quality education.

METHOD

Design

This study is situated within qualitative educational research, as it “involves a direct concern for experience as it is lived, felt, or experienced” (Sherman & Webb, 1988, p. 7). It examines the processes of practice in order to understand them and implement improvements from different perspectives, such as social justice (Santaella, 2006).

The chosen methodological framework intertwines narrative research and case study to provide a broad, descriptive analysis of the experience. The study analyzes the works produced by university students, using them as a vehicle to gather information about various events from the protagonist's voice (Susinos & Parrilla, 2016). The goal is to comprehensively understand the results of the learning process undertaken by students during the implementation of S-L in teacher training

(Vázquez-Recio & Angulo-Rasco, 2003). In this way, by approaching the reality of the experience, it will be possible to assess the impact that the S-L methodology has on the professional and personal development of higher education students.

Context and Participants

The context of this study is a project within the Campus Bizia Lab (CBL) program at the University of the Basque Country (UPV/EHU). This program aims to articulate an interdisciplinary approach to education for sustainability. To achieve this, it promotes the development of Final Degree Project (FDP) and Master Thesis (MT) based on challenges related to social, economic, and environmental issues.

The CBL project “Transforming Realities: University and Community Cooperating to Humanize Education through S-L in the Final Degree Project and Master Thesis” (Transforming Realities) is linked to the experiences and narratives analyzed in this study. It proposes the implementation of S-L as a methodology in the FDP course in Early Childhood and Primary Education Degrees or in the MT course in the Master’s program in Secondary Education, Vocational Training, and Language Teaching at UPV/EHU. Thus, it is an innovative teaching project that has been consolidated year after year, since 2018, in the Faculty of Education and Sport and the Faculty of Education, Philosophy, and Anthropology at UPV/EHU.

The students participating in the “Transforming realities” project as part of their FDP or MT must design, implement, and evaluate a solidarity-based service coordinated with and for the community, with the goal of addressing real social deficiencies identified in the most vulnerable local environments, thereby reducing inequalities. The services are typically linked to SDGs four (quality education), five (gender equality), and ten (reduced inequalities). The most common themes addressed include support for education in areas such as inclusion, gender, physical education, the arts, and digital resources.

Additionally, students are committed to engaging in critical reflection processes to identify the most significant aspects and outcomes of their learning experience (Escoda, 2017). To do this, students document what happens during their S-L projects through field notes with observations, anecdotes, or other evidence, including photographs (while ensuring the confidentiality of service recipients). Then, students use the collected documentation to develop a narrative script (Deeley, 2016), in which they delve into aspects of planning, implementation, and evaluation, such as the suitability of the methodology, agreements made in meetings, emotions and feelings, facilitating and hindering factors, and the quality and resolution of critical events.

At the conclusion of the service, students prepare the information gathered in their diaries for analysis. This process is carried out qualitatively through coding,

categorization, and interpretation (Barbour, 2013). Subsequently, in their FDP or MT, students present conclusions about their personal learning process.

For this study, a total of sixty-five narratives have been considered. Fifty-eight narratives were produced by fourth-year students from the Early Childhood and Primary Education Degrees who completed their FDP at the aforementioned faculties. The remaining seven narratives were created by students from the specified Master's program who completed their MT. All FDP and MT analyzed were developed and defended during the 2018/19, 2019/20, 2020/21, 2021/22, and 2022/23 academic years (see Table 1). The conditions for selecting the narratives included, on one hand, their belonging to the CBL project "Transforming realities" during one of the enumerated academic years and, on the other hand, that the author of the FDP or MT signed their informed consent.

Table 1

Distribution of the Number of FDP and MT Related to the Project Developed and Defended by Academic Year

Academic year	Number of FDP Defended	Number of MT Defended	Total narratives
2018/19	6	2	8
2019/20	21	1	22
2020/21	10	1	11
2021/22	10	1	11
2022/23	11	2	13
TOTAL	58	7	65

Source. Own elaboration.

Participation in the research has been entirely voluntary, with prior consent from all participants. Furthermore, the research has been conducted in accordance with ethical principles and the General Data Protection Regulation.

Instruments

Students participating in the CBL project "Transforming realities" must produce a reflective ethnographic narration throughout their S-L project, which will later be analyzed to assess their learning process and reflect on the results and conclusions. These conclusions from the FDP and MT have served as the primary instrument for gathering information for this study.

In the reflective ethnographic narrations, students document their observations, needs, interests, and involvement through their lived experiences, evaluations of the service, feelings during the process, reflections on critical events, and the most significant evidence (Rekalde et al., 2014). Analyzing all these elements and drawing conclusions allows students to become aware of what has been done and/or achieved (Puig et al., 2012).

Analysis

After completing and defending their FDP and MT based on S-L, students were asked for their informed consent to extract and analyze information from their written reports. The theses were stored, and to meet the study's objective, the conclusions section of each thesis was analyzed.

The narratives were coded with an alphanumeric code, following this formula: "E" for "estudiante" (student), followed by a number assigned alphabetically based on the author's name, an underscore, and the year of the thesis defense (e.g., E3_2019).

To ensure the analysis progresses from the particular to a more general perspective, a deductive-inductive categorical system was constructed (Rapley, 2014). This system was supported by both the reviewed theories and the emerging information from the narratives, which represents the main ideas in the form of dimensions and categories, as well as the hierarchical relationships between them (Coffey & Atkinson, 2003) (see Table 2).

For the dimensions, the blocks proposed by Arias-Sánchez et al. (2018) for analyzing field diaries of S-L experiences at the university level were used: Conceptual Learning, referring to disciplinary knowledge and/or curricular content associated with university training; Procedural/Professional Learning, relating to professional competencies; Identity Change Processes, regarding values; Experience Evaluation, considering more methodological aspects. Emerging categories in the analyzed narratives were placed within these dimensions.

The categorization process was defined and validated by four members of the research team involved in the CBL project "Transforming realities," all of whom are specialists in the field. Initially, the documents were individually analyzed, and emerging themes were extracted. These proposals were then shared and compared to define the dimensions and categories, considering both the proposed blocks and the emerging results from the analysis. Once the categorical system was defined, the information from the narratives was individually categorized, followed by cross-checking the analysis in pairs and between the pairs.

The dimensions and categories were turned into nodes in the NVivo software, which facilitates the organization, systematization, and analysis of

qualitative information through branched nodes that emerge from categorizing the information. This tool not only organizes the information but also allows for dynamic manipulation or modification of the initial classification and the counting of voices within each node.

The information was triangulated multimodally across different participants and at different stages (before, during, and after) (Richardson & St. Pierre, 2017).

RESULTS

The results are structured according to the categorical system. The number of occurrences of the dimensions and categories in the files, as well as the categorized references, are detailed in the table below, along with the percentage (rounded) of each number relative to the total (see Table 2).

Table 2
Categorical System

Dimension	Category	Files	%	References	%
Conceptual Learning				414	44
	Planning of teaching-pedagogical proposals	58	100	135	14
	Management of implementation	58	100	194	21
	Inclusion	21	40	48	5
	Disciplinary knowledge	27	51	37	4
Procedural Learning				258	27
	Relationship between theory and practice	9	17	11	1
	Critical thinking	19	36	51	5
	Reflection on educational/professional practice	45	85	102	11
	Autonomy	12	23	29	3
	Decision-making	23	43	47	5
	Social competencies	13	25	18	2

Dimension	Category	Files	%	References	%
Identity Change Processes				103	11
	Emotional competencies	19	36	24	3
	Commitment and involvement	24	45	43	5
	Awareness and social justice	21	40	36	4
Experience Evaluation				166	18
	Achievement of objectives	41	77	84	9
	Meaningful learning	42	79	73	8
	Reflective practice	6	11	9	1
TOTAL		58	100	941	100

Source. Own elaboration.

Conceptual Learning

Regarding learning related to disciplines and curricular content, the references in the analyzed narratives are abundant. A total of 44% of the references (n: 414) relate to this block, making it the most prominent.

All the narratives refer directly to the proposals designed and implemented as community service, as this is one of the central axes of S-L projects. The need to provide a creative response to a real need for a specific context has been a significant challenge for most students. This has required the implementation of various methodological strategies and the creation of original and specific materials. This is directly connected with curricular content from the different areas of their university training, including general and specific pedagogical and didactic knowledge.

“The meetings (dialogue and coordination) are essential for adequate planning. They allowed for an in-depth analysis of the center’s needs to direct the service to what had been diagnosed.” (E4_2019)

The implementation of the planning was an approximation to educational reality and the teaching profession, as it was necessary to analyze and make modifications during practice to correctly carry out the service and meet its objectives satisfactorily. Students had limited time (ten hours), which many found to be an obstructive factor. The timing of actions is not an easy task, especially in educational areas where they have no prior knowledge. On the contrary, the support from collaborating agents,

as well as the involvement and motivation of the service recipients, were seen as positive and even decisive factors for success.

"Certain aspects that may seem uncertain in the planning phase were naturally resolved during implementation, such as groupings for dynamics." (E29_2021)

"As a suggestion for improvement, the first thing I would mention is the lack of time. Before offering the service, it is important to get to know the users. This way, there would be more chances to prepare high-quality sessions that achieve the objectives. (...) Getting to know the environment and the people allows for tracking achievements and evaluating the impact of the service. In my case, I would have liked to have had more sessions." (E12_2020)

"I appreciate the great effort made by the center to carry out the project correctly." (E49_2023)

"In this sense, it is important to highlight the strength and desire to do things that the service users have." (E29_2021)

Students believe that this experience has been a great opportunity to complete their previous academic training. The proposals mainly aimed to improve and complement education so that it can respond comprehensively to today's reality. Disciplines such as physical education, coeducation, cooperation, oral expression, the digital realm, and especially inclusion were addressed. Due to the nature of S-L, university students chose to develop their services in educational centers and/or non-profit organizations that cater to vulnerable people or small, isolated populations, such as individuals with disabilities, functional diversity, or those in prison.

"Getting to know other realities up close changes previous ideas (or prejudices) and strengthens the perspective of inclusion." (E30_2022)

"My conception of inclusion has changed, and I have understood that real inclusion is still a challenge to overcome. Diversity is a great treasure and, at the same time, a constant challenge that teachers must respond to in a fair and democratic way." (E38_2022)

Procedural Learning

A total of 27% of the references (n: 258) refer to professional competencies related to the teaching career, with the following competencies standing out: the relationship between theory and practice, critical thinking, reflection on educational practice, autonomy, decision-making, and social competencies such as communication and teamwork.

By putting into practice what was learned theoretically, students activated critical thinking, accompanied by reflective action and self-criticism about their

teaching work. The narratives show that students were able to identify the strengths and weaknesses of their projects, being aware of the possibilities and limitations in each context and situation. Sometimes, both theory and service development or impact are questioned, demonstrating a mature pedagogical perspective. For this, the diary has been a helpful tool.

“Of course, there is no pedagogical action if we do not question ourselves. We must be critical, not with the environment, but with our own thoughts and beliefs.” (E9_2020)

“It is a proposal that allows us to integrate the learning of knowledge with service to others, being responsible. Ultimately, it has allowed me to reflect on educational action and enrich my personal view as a teacher.” (E56_2023)

As S-L is an active methodology where students are the protagonists, autonomy stands out as a determining factor and is perceived as significantly developed. A clear example of this is the real-time modifications made throughout the implementation, mentioned in the context of conceptual learning. After each modification, there is a critical incident, a pedagogical observation, a critical reflection, a decision-making process, and a response based on all of this. A large part of the students describe these decision-making processes in their narratives.

“S-L projects consist of various phases, and I must be the active protagonist of all of them. This is a great challenge that motivates me, but at the same time, it scares me.” (E46_2022)

“I believe these practices have given me different moments of reflection regarding my role as a future teacher. Being in front of a class always raises doubts, especially when something new is implemented. These are doubts that don’t stay in the gym next to the session you carried out, but go with you and remain until you find an answer. Writing the diary has given me the opportunity to remember the sessions over and over again, identifying areas for improvement without diminishing the value of those that made the service reach all students in the best way possible.” (E7_2020)

Regarding the development of social skills, students report that they have strengthened their communication skills and ability to work collaboratively. Designing, implementing, and evaluating S-L projects requires building relationships with community organizations, communicating and coordinating with responsible persons, and interacting actively with the service recipients.

“Moreover, I have developed competencies that are often given less importance than they should, such as social competence and initiative.” (E2_2019)

Identity Change Processes

S-L projects seem to have a direct impact on academic-professional and personal development. In 11% of the references extracted from the narratives (n: 103), emotional aspects are mentioned, with a focus on the values developed or strengthened.

The voices of the protagonists show the community-student bonds, materializing in social awareness and involvement. Diagnosing and responding to real needs has activated the empathy necessary to gradually build democratic citizenship.

"The diary has been vital for turning the experience into a personal reflection exercise, and it has activated emotional and intrapersonal intelligence." (E50_2023)

"I think this is an opportunity to get involved in a real need." (E42_2022)

"I have learned from this work as a teacher that one of my main objectives is to ensure that the school and the classroom are safe environments. In this way, all students would have the freedom to be, feel, and express themselves as they wish. Achieving that climate will respect each person, regardless of personal identity, sex, origin, needs, culture, etc. That is to say, a climate of respect will help reinforce the self-esteem and identity of students and teachers, while at the same time building a collective identity. However, this requires effort, and for that, my duty is to be in continuous learning, because I have internalized the ideas transmitted to us by the culture we were educated in, and this requires a process of deconstruction and reflection." (E20_2020)

The reasons why people flee their countries of origin are many, but by getting to know them, we realize we are privileged. The project has helped me to be grateful and to understand what is really important." (E30_2021)

Students mention values such as commitment to sustainability, emphasizing the importance of working on social justice through education. In many cases, the practice and subsequent critical reflection on S-L projects have led to active awareness.

"The service I provided has been a very enriching and educational experience for me. Through the service, I developed my social consciousness and responsibility, acquiring the necessary tools for my future teaching profession." (E29_2021)

"Often, we talk about social transformation in a very general way. We need to be aware and commit ourselves to social responsibility as active citizens. If we do not, social transformation becomes an empty concept." (E48_2023)

Experience Evaluation

In the narratives, students also analyze and evaluate S-L as a methodology, as indicated by 16% of the references (n: 166). S-L is described as a suitable means for university education and competency development, specifically referring to the Early Childhood or Primary Education Degree, and therefore to initial teacher training. S-L is an active methodology that transforms the way of learning.

“I have moved away from the traditional model and have learned and collaborated actively.” (E22_2020)

“This pedagogical model is consistent with the demands of constructivism, active pedagogy, cooperative learning, and active methodologies.” (E12_2022)

Participating students believe that S-L provides an opportunity to complete learning from different perspectives and in a meaningful way. The projects result in real experiences where the responses designed and implemented are also real, offering contextualized, practical, and active learning, while being transversal and integral. The achievements gained through service and the reflective practice promoted by the methodology are key.

“I consider it to be a very enriching project for my training. Academically, I have had the opportunity to contextualize the learning acquired in the degree, which I would have hardly had the chance to put into practice if it hadn’t been for S-L. I have identified that contextualized learning is more meaningful than isolated learning.” (E3_2019)

“I think it is essential to bring university students closer to reality and provide service to the community. In my case, throughout the degree, I missed this type of learning, one that connects with the community so that the learning is effective and closely linked to the curriculum. S-L methodology could be further encouraged through practices in various subjects, thus giving more meaning and application to learning.” (E33_2021)

DISCUSSION AND CONCLUSIONS

This study has examined the impact of S-L projects on university students involved in these projects as part of their FDP or MT. Through an ethnographic analysis of their reflections, the study explores the impact on students’ professional training and social commitment when they actively engage in experiential learning processes.

In the narratives, various conceptual and/or procedural learning processes are mentioned that are directly related to the basic competences of initial teacher training and to the specific competences that should be reflected in the TFG or

TFM, coinciding with the results of works such as that of Zygmunt et al. (2020). Services have been required to design, plan, monitor and evaluate teaching and learning procedures both in terms of curricular content and interdisciplinary knowledge. As noted by Marques et al. (2021), S-L projects present challenges such as planning and time management, which can be difficult for students, but these challenges are also a valuable source of practical learning. These difficulties are balanced by the support from other stakeholders involved, which often serves as a positive driving force for the students. The challenges have provided university students with a working knowledge of the classroom and its management and, as they have had to be addressed effectively, have directly impacted on the maturity of the critical perspective (Giles et al., 2021). Also, due to the contexts in which the services have been targeted, the disciplines most emphasised by the participating students are attention to diversity and inclusion, as in the work of Chiva-Bartoll et al. (2019).

The active role and leadership of students in S-L projects is evident in the narratives. This is consistent with similar findings in the literature (Butler et al., 2021; Campo, 2014; Fernández-Hawrylak et al., 2020; García & López-Vélez, 2019). The narratives show that the students' direct engagement with real-world situations allowed them to develop professionally, socially, and reflectively. As they sought solutions to identified community needs, students not only applied their theoretical knowledge but also engaged in self-assessment, which led to the growth of a more nuanced, critical perspective. This process of critical reflection triggered the development of their professional autonomy and decision-making capacity. S-L projects also created environments for collaborative work, fostering communication skills as students interacted with various community sectors and stakeholders.

The experiences have also maximized their interpersonal development. In the narratives, amidst emotions of doubt or fear, the values of responsibility and social justice stand out. The services have been based on active involvement and this has awakened the awareness and commitment of the students who are part of the project. Collaborating with different sectors of the community, becoming agents of change, contributes to assuming the educational dimension and the ethical sense of the teaching function to create a more sustainable community and foster democratic citizenship. All of this coincides with the keys identified in previous research with a similar objective (Aramburuzabala et al., 2015; Capella-Peris et al., 2020; López-de-Arana et al., 2019; Santos-Pastor et al., 2021; Zygmunt et al., 2020).

Regarding the assessment of S-L as a methodology, the students mention its functional value. As it involves real proposals in close environments, they describe it as an opportunity to carry out more meaningful actions that provide greater learning.

The narratives confirm that it is a competence-based approach characterized by the active protagonism of the students in their learning process. As described in the work of Capella-Peris et al. (2020) and Lorenzo et al. (2019), learning (content, skills and values) takes place in action and in cycles of reflection, understanding inequalities, working in teams and applying what they have learnt to become involved in the community. Therefore, the participating university students agree with Zarzuela et al. (2016) and argue that applying S-L in other higher education subjects can positively influence the quality of education as an emancipatory initiative.

In conclusion, S-L can be presented as an effective educational strategy and a driver for social change. The study advocates for the broader implementation and institutionalization of S-L in higher education to provide students with holistic learning opportunities while also fulfilling the university's social responsibility to address contemporary societal challenges.

It is important to note that, while the findings of this study may be applicable to higher education in general, the starting point of the analyzed narratives is the initial teacher training context. Therefore, one of the main limitations of this study is that the participating students are from a specific educational institution, and they were involved in the "Transforming Realities" CBL project. As a potential future direction, the research could be expanded to similar narratives in other contexts with different characteristics.

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Emotional intelligence and social skills as predictor variables of the competence profile of university students

Inteligencia emocional y habilidades sociales como variables predictoras del perfil competencial del alumnado universitario

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ABSTRACT

The university is a space for academic learning, as well as a key environment for developing professional, social and emotional competencies. The aim of this study is to determine the relationship between emotional intelligence and social skills as predictor variables of generic professional competencies of university students, influencing their well-being and academic performance. A non-experimental ex post facto, quantitative, descriptive and causal cross-sectional design was used. The sample, selected by stratified sampling, reached 423 students (78.90% female, 21.10% male). Social skills were measured with the Social Skills Scale by Gismero (2002), emotional intelligence with the TMMS-24 by Fernández-Berrocal et al. (2004), and competencies with the CECGEU by Solanes-Puchol et al. (2008). SPSS and AMOS 26.0 programs were used for data analysis, performing a descriptive analysis to analyse the relationship between variables and a structural equation model was developed to deepen the causal relationships of the variables. Significantly positive correlations were identified between social skills and generic professional competencies. Conversely, negative correlations were observed between emotional intelligence and both variables. The results indicated a negative effect of emotional intelligence on competencies, while social skills had a positive influence. A significant negative relationship was also observed between emotional intelligence and social skills. The study confirms the importance of social skills as a predictor of competence development. However, emotional intelligence showed a negative relationship with competencies, which contradicts previous studies. This suggests that greater emotional intelligence does not always translate into greater professional competencies, opening new lines of research on this interaction.

Keywords: emotional intelligence, social skills, competencies, university students

RESUMEN

La universidad es un espacio de aprendizaje académico, así como un entorno clave para desarrollar competencias profesionales, sociales y emocionales. El objetivo de este estudio es determinar la relación entre la inteligencia emocional y las habilidades sociales como variables predictoras de las competencias profesionales genéricas del alumnado universitario, influyendo en su bienestar y rendimiento académico. Se utilizó un diseño no experimental ex post facto, cuantitativo, descriptivo y causal con corte transversal. La muestra, seleccionada mediante muestreo estratificado, alcanzó los 423 estudiantes (78.90% mujeres, 21.10% hombres). Las habilidades sociales se midieron con la Escala de Habilidades Sociales de Gismero (2002), la inteligencia emocional con el TMMS-24 de Fernández-Berrocal et al. (2004), y las competencias con el CECGEU de Solanes-Puchol et al. (2008). Se emplearon los programas SPSS y AMOS 26.0 para el análisis de datos, realizando un análisis descriptivo para analizar la relación entre variables y se elaboró un modelo de ecuaciones estructurales para profundizar en las relaciones causales de las variables. Se identificaron correlaciones significativamente positivas entre las habilidades sociales

y las competencias profesionales genéricas. Inversamente, se observaron correlaciones negativas entre la inteligencia emocional y ambas variables. Los resultados indicaron un efecto negativo de la inteligencia emocional sobre las competencias, mientras que las habilidades sociales influyeron positivamente. También se observó una relación negativa significativa entre la inteligencia emocional y las habilidades sociales. El estudio confirma la importancia de las habilidades sociales como predictor del desarrollo competencial. Sin embargo, la inteligencia emocional mostró una relación negativa con las competencias, lo que contradice estudios previos. Esto sugiere que una mayor inteligencia emocional no siempre se traduce en mayores competencias profesionales, abriendo nuevas líneas de investigación sobre esta interacción.

Palabras clave: inteligencia emocional, habilidades sociales, competencias, estudiantes universitarios

INTRODUCTION

Universities provide a conducive environment for the development of diverse skills that prepare students for both professional and personal success. Therefore, the university stage is a decisive period in the student's academic and personal development, where young people specialise and face various academic challenges (Javier-Napa et al., 2019; Martínez-Rodríguez & Ferreira, 2023; Merlin & Soubramanian, 2024).

Furthermore, higher education must address the demands and needs of students, equipping them for a modern world where soft skills have become indispensable, while transversal competencies underscore their importance for employability. These skills are particularly important for young people entering the labour market. Consequently, the ability to develop professional, social, and emotional competencies becomes vital for students' successful integration into the labour market and society (Alt et al., 2023; Calero-López & Rodríguez-López, 2020; Javier-Napa et al., 2019; Kostikova et al., 2021).

Building on these considerations, it becomes essential to examine how emotional intelligence, social skills, and professional competencies interact within an increasingly complex and demanding university environment. The link between emotional well-being and academic performance helps students realise their full academic and personal potential. Emotional well-being relies on the development of emotional intelligence, which fosters interpersonal relationships and personal growth, helping students become competent and highly skilled professionals (Barrera-Gálvez et al., 2019; Perpiñà-Martí et al., 2022; Sánchez-Bolívar et al., 2023).

Although the development of emotional intelligence begins in early childhood, the educational context plays a significant role in shaping this process. Therefore,

learning about emotions and their self-regulation is crucial in education. Emotional competence facilitates critical thinking, collaboration, self-regulated learning, and problem-solving, all of which contribute to the development of social skills and emotional intelligence (Grijalba-Quiroz et al., 2021; Imjai et al., 2024; Kim & Shin, 2021; Nakajima et al., 2020; Vázquez et al., 2024).

In this context, active and collaborative learning is particularly important for the development of social skills. Within the university setting, social skills contribute to well-being, enabling successful relationships among students. Their integral development depends on behavioural, personal, and situational factors, meaning that social behaviours are influenced by expected actions in diverse contexts or interpersonal demands, such as the person's gender orientation, environmental agents or cultural patterns (Cajas-Bravo et al., 2020; Gómez-Jiménez, 2022; Masadis et al., 2019; Sánchez-Bolívar et al., 2022; Virtanen & Tynjala, 2022).

Moreover, a conducive study environment enhances the development of socio-affective skills, improving interpersonal relationships. This, in turn, fosters academic performance since a better classroom environment allows teachers to meet teaching objectives, facilitates students' integral development, and promotes social and personal growth (Fernández-Leyva et al., 2021; Frogner et al., 2022; Rahman et al., 2024).

In a labour market where HR managers increasingly prioritise soft skills, a paradigm shift is underway that emphasises the importance of socio-emotional competencies for professional success (Bedoya-Guerrero et al., 2024; Kostikova et al., 2021; Santos-Rego et al., 2021).

It is within this context that the need arises to investigate in greater detail how these variables interact and predict the competence profiles of university students. By gaining a better understanding of these interrelations, more effective educational strategies can be designed to promote students' integral development and optimally prepare them for the professional challenges they will face in their careers, forming part of the so-called soft skills (Brudevold-Newman & Ubfal, 2024).

This research adopts an interpretative-causal paradigm to analyse the relationship between university students' sociodemographic profiles, psychosocial variables, social skills, and emotional intelligence as predictors of their competencies.

METHOD

Design

This study employs a non-experimental (ex post facto), quantitative, descriptive, exploratory, and causal cross-sectional design. It aims to analyse sociodemographic variables, including access routes, completion of labour formation and guidance-related subjects, and attendance at career guidance services, alongside emotional intelligence, social skills, and competencies among university students.

Another objective is to determine the relationship between emotional intelligence and social skills as predictors of generic professional competencies among university students.

Participants

The sample, selected through stratified random sampling, consisted of 423 university students with a mean age of 22.50 years (± 5.26), enrolled at the cross-border campuses of Ceuta and Melilla (Spain), with 78.90% ($N=344$) being female and 21.10% ($N=92$) being male. The sample selection criteria included students enrolled at the University of Granada, within the multicultural environments of Ceuta and Melilla, excluding students from other universities. Additionally, participants were required to be enrolled in undergraduate degree programmes, excluding postgraduate students (master's and doctorate). A margin of error of 4% was assumed.

Furthermore, students from diverse religious backgrounds were represented, with the majority identifying as Christian (49.10%; $N=214$) and Muslim (26.60%; $N=116$). Representative samples were also drawn from each degree programme offered at these campuses.

Variables and instruments

Sociodemographic variables were assessed using an ad hoc questionnaire, capturing age, gender, religion, university degree programme, access route, completion of career guidance subjects (VECG), and attendance at career guidance services (CGS).

Social skills were measured using the Social Skills Scale (SSS) by Gismero (2002). This scale comprises 33 items measuring six dimensions: self-expression in social situations, expression of anger or disagreement, saying no and cutting off interactions, making requests, and initiating positive interactions with the opposite sex. Twenty-eight items indicate a lack of assertion or social skill deficits, while five are positively framed. Each item consists of four response options, ranging from 1 (Not at all like me) to 4 (Very much like me). The scale's overall

reliability index, measured by Cronbach's alpha and McDonald's omega, was $\alpha=0.910$ and $\Omega=0.916$.

Emotional intelligence was measured and assessed using the Spanish version of the Trait Meta-Mood Scale (TMMS-24; Fernández-Berrocal et al., 2004). This version contains 24 items rated on a 5-point Likert scale (measuring three dimensions: emotional awareness -items 1 to 7-, emotional clarity -items 9 to 16- and emotional repair -items 17 to 24-), which provides a self-assessment of the individual's ability to manage emotions and feelings. The overall reliability index was $\alpha=0.871$ and $\Omega=0.863$, measured by Cronbach's alpha and McDonald's Omega.

Finally, generic professional competencies were assessed using the validated Generic Competencies Questionnaire for University Students (CECGEU) by Solanes-Puchol et al. (2022). This questionnaire consists of a total of 45 items rated on a 1–6 Likert scale (where 1 is always, 2 is very often, 3 is frequently, 4 is usually, 5 is occasionally and 6 is rarely), measuring six basic professional competencies, through six dimensions: job performance, management skills, leadership, work motivation, learning capacity, and interpersonal relationships and teamwork. The global reliability index was $\alpha=0.968$ and $\Omega=0.968$.

Procedure

Initially, programme coordinators and faculty members teaching mandatory or core courses were contacted to recruit participants for the study. After receiving approval, data collection sessions were scheduled to administer the instruments to participating groups.

During data collection sessions, students were informed that participation was entirely anonymous and voluntary, and that they could withdraw at any time. It was also ensured that at least one researcher was present to address any questions concerning the instruments.

Following data collection, the questionnaires were coded, and all data were entered into the SPSS database. During this process, three questionnaires were discarded because they were incomplete and contained gaps in the information relevant to the analysis of the variables under study.

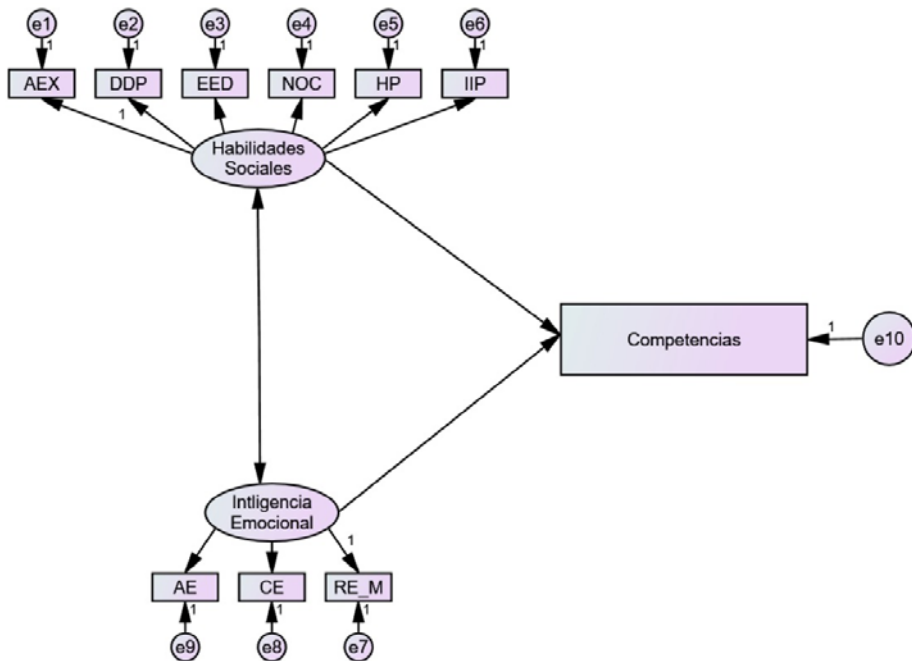
It should be noted that this research adhered to the ethical guidelines established by the Declaration of Helsinki and the Human Research Ethics Committee of the University of Granada (reference number: 2950/CEIH/2022).

Data analysis

To analyse the sociodemographic profiles of university students, frequencies, means, and standard deviations were calculated using SPSS statistical software (IBM Corp., Armonk, NY, USA). To establish the relationship between variables, after checking the normality of the sample with Shapiro-Wilk test, the student's t-test was used for binomial variables and one-way ANOVA was employed for polytomous variables. Pearson's bivariate correlation analysis was conducted to explore relationships between variables.

To develop the structural equation model, IBM SPSS AMOS version 26.0 (IBM Corp., Armonk, NY, USA) statistical programme was used to study the effects of the variables on each other. The theoretical model (Figure 1) illustrates the hypothesised direction of effects among variables and was confirmed using path analysis of observable variables.

Figure 1
Theoretical model of the study



Note. Emotional Awareness (AE); Emotional Clarity (CE); Emotional Repair (RE_M); Emotional Intelligence (IE); Self-Expression (AEX); Making Requests (HP); Expression of Anger Or Disagreement (EED); Saying No And Cutting Off Interactions (NOC); Initiating Positive Interactions With The Opposite Sex (IIP). Social Skills (Habilidades Sociales); Emotional Intelligence (Inteligencia Emocional); Competencies (Competencias).

The proposed theoretical model consists of 15 endogenous variables and 2 exogenous variables. Causal explanations were developed for the endogenous variables based on observed associations among the indicators and the reliability of measurements, which were demonstrated and accepted.

In reference to the direction of the arrows, unidirectional arrows indicate lines of influence among latent variables, interpreted through regression weights. Pearson's Chi-Square test was used to assess statistical significance, with the significance level set at $p \leq 0.05$ and $p \leq 0.001$.

Model fit was assessed following the principles established by Kyriazos (2018) and Maydeu-Olivares (2017). A non-significant Chi-Square value indicated good fit (Maydeu-Olivares, 2017). Additionally, specific fit indices were required to have values above 0.900 for the Incremental Fit Index (IFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) (Kyriazos, 2018.) Furthermore, the fit of the Root Mean Square Error of Approximation (RMSEA) was also assessed, with values below 0.100 indicating a good fit (Bentler, 1990). Lastly, the Tucker Lewis Index (TLI) was also considered, accounting for sample size and sensitivity (Tenenbaum & Eklund, 2007).

The model fit showed a good fit for the Chi-Square test, as well as for the IFI, CFI, NFI, TLI and RMSEA indices. The Chi-Square test produced a non-significant p-value ($\chi^2 = 97.900$; $df = 33$; $p = 0.000$). The values obtained for NFI, RMSEA, TLI, IFI and CFI were 0.933, 0.067, 0.937, 0.954 and 0.954, respectively.

RESULTS

As shown in Table 1, the sample was predominantly female and of Christian faith. Most participants were enrolled in Nursing, representing 48.9% ($N = 213$) of the sample. Regarding access pathways, 56% ($N = 244$) of participants entered via the Baccalaureate, and 39.4% ($N = 172$) through vocational education programmes.

Table 1
Basic description of the sample

		n	%			n	%
Genre	Male	92	21.1	Bachelor's Degree	Nursery	61	14.0
	Female	344	78.9		Primary Education	6	1.4
Religion	Christian	214	49.1		Social Education	67	15.4
	Muslim	118	27.1		Computer Science	2	0.5
	Otra	16	3.7		BA	87	20.0
	Atheist	88	20.2		Nursing	213	48.9

		n	%			n	%
Access pathway	Baccalaureate	244	56.0	VECG	Yes	176	40.4
	Higher Vocational Training	172	39.4		No	260	59.6
	>25	10	2.3	CGS	Yes	80	18.3
	Any other undergraduate degree	10	2.3		No	356	81.7

Of the sample, 40.40% (N=176) had completed courses on Vocational Education and Career Guidance (VECG) and 18.30% (N=80) had attended Career Guidance Services (CGS).

In relation to the above, as shown in Table 2, statistically significant differences ($p<0.05$) were identified between “Using Career Guidance Services” and “Emotional Control” ($p=0.036$), where students who used these services ($M=3.65$; $SD=0.82$) exhibited a higher level of emotional control than those who have not used them. ($M=3.43$; $SD=0.81$).

Table 2

Differences in score between CGS, VECG, and social skills, emotional intelligence and student competencies

	Attending Career Guidance Services					Previously taking Guidance subjects				
	CGS	N	Mean	DT	p	VECG	N	Mean	SD	p
Self-expression	Yes	80	2.54	0.81	.826	Yes	176	2.53	0.74	.887
	No	356	2.52	0.73		No	260	2.52	0.75	
Asserting own rights	Yes	80	2.71	0.69	.231	Yes	176	2.65	0.67	.481
	No	356	2.60	0.66		No	260	2.60	0.66	
Expressing anger or disagreement	Yes	80	2.54	0.86	.597	Yes	176	2.50	0.82	.937
	No	356	2.48	0.81		No	260	2.49	0.82	
Saying no and cutting interactions	Yes	80	2.60	0.80	.205	Yes	176	2.55	0.80	.299
	No	356	2.48	0.79		No	260	2.47	0.79	
Making requests	Yes	80	2.77	0.54	.160	Yes	176	2.72	0.52	.359
	No	356	2.68	0.52		No	260	2.67	0.53	

	Attending Career Guidance Services					Previously taking Guidance subjects				
	CGS	N	Mean	DT	<i>p</i>	VECG	N	Mean	SD	<i>p</i>
Initiating positive interactions	Yes	80	2.53	0.69	.126	Yes	176	2.42	0.70	.918
	No	356	2.40	0.68		No	260	2.42	0.68	
Job performance	Yes	80	2.69	0.96	.592	Yes	176	2.67	0.87	.163
	No	356	2.75	0.84		No	260	2.79	0.86	
Management skills	Yes	80	2.55	0.93	.901	Yes	176	2.50	0.88	.208
	No	356	2.57	0.92		No	260	2.61	0.95	
Leadership	Yes	80	2.93	1.01	.948	Yes	176	2.87	0.89	.303
	No	356	2.92	0.84		No	260	2.96	0.85	
Job motivation	Yes	80	2.57	0.97	.678	Yes	176	2.58	0.91	.488
	No	356	2.62	0.87		No	260	2.64	0.88	
Learning capacity	Yes	80	2.54	0.97	.910	Yes	176	2.52	0.92	.598
	No	356	2.55	0.95		No	260	2.57	0.97	
Interpersonal relationships and teamwork	Yes	80	2.25	1.28	.906	Yes	176	2.16	1.12	.234
	No	356	2.23	1.10		No	260	2.29	1.14	
Emotional awareness	Yes	80	3.67	0.90	.427	Yes	176	3.66	0.84	.123
	No	356	3.75	0.77		No	260	3.79	0.76	
Emotional control	Yes	80	3.65	0.82	.036	Yes	176	3.57	0.83	.040
	No	356	3.43	0.81		No	260	3.40	0.81	
Emotional repair	Yes	80	3.77	0.80	.046	Yes	176	3.64	0.77	.553
	No	356	3.57	0.77		No	260	3.59	0.79	

Likewise, statistically significant differences ($p<0.05$) were found between having attended a counselling service and 'Emotional Repair' ($p=0.046$), with students who had attended ($M=3.77$; $SD=0.80$) these services showing higher values for this dimension than students who had not ($M=3.57$; $SD=0.77$).

Similarly, statistically significant differences ($p<0.05$) were identified between taking subjects related to vocational education and career guidance and 'Emotional Control' ($p=0.040$), reflecting higher levels of emotional control in students who

have taken related subjects ($M=3.57$; $SD=0.83$) compared to those who have not ($M=3.40$; $SD=0.81$).

Table 3

Differences in scores between the Access Pathway and students' Social Skills, Emotional Intelligence, and Competencies

		M	SD	p			M	SD	p
Job Performance	Baccalaureate	2.77	0.85	.015	Self-expression	Baccalaureate	2.48	0.72	.058
	HVE	2.71	0.84			HVE	2.60	0.75	
	>25	2.45	0.76			>25	2.45	0.93	
	AOUD	2.43	0.88			AOUD	2.44	0.83	
Management Skills	Baccalaureate	2.58	0.94	.072	Defence of own rights	Baccalaureate	2.56	0.67	.121
	HVE	2.55	0.87			HVE	2.67	0.65	
	>25	2.27	0.74			>25	2.86	0.56	
	AOUD	2.34	0.92			AOUD	2.86	0.64	
Leadership	Baccalaureate	2.92	0.86	.056	Expressing Anger or Disagreement	Baccalaureate	2.48	0.81	.155
	HVE	2.92	0.85			HVE	2.50	0.83	
	>25	2.89	0.84			>25	2.71	0.88	
	AOUD	2.69	1.08			AOUD	2.35	0.81	
Job Motivation	Baccalaureate	2.61	0.89	.022	Saying no and cutting interactions	Baccalaureate	2.43	0.76	.005
	HVE	2.61	0.85			HVE	2.60	0.81	
	>25	2.27	0.74			>25	2.48	0.85	
	AOUD	2.51	1.09			AOUD	2.30	0.88	
Learning Ability	Baccalaureate	2.57	0.99	.012	Making requests	Baccalaureate	2.67	0.51	.335
	HVE	2.50	0.86			HVE	2.72	0.55	
	>25	2.75	0.58			>25	2.71	0.30	
	AOUD	2.40	0.86			AOUD	2.62	0.55	

		M	SD	p			M	SD	p
Interpersonal Relations and Teamwork	Baccalaureate	2.27	1.15	.013	Initiating positive interactions	Baccalaureate	2.40	0.67	.027
	HVE	2.19	1.06			HVE	2.45	0.70	
	>25	1.49	0.47			>25	2.17	0.45	
	AOUD	2.34	1.11			AOUD	2.36	0.66	
Emotional Awareness	Baccalaureate	3.81	0.73	.276	Emotional repair	Baccalaureate	3.58	0.79	.244
	HVE	3.65	0.88			HVE	3.61	0.77	
	>25	4.13	0.77			>25	3.91	0.52	
	AOUD	3.56	0.75			AOUD	3.60	0.67	
Emotional Control	Baccalaureate	3.43	0.80	.440					
	HVE	3.49	0.85						
	>25	3.63	0.62						
	AOUD	3.46	0.72						

Note. Any other undergraduate degree (AOUD).

With respect to the relationship between the access pathway and the constructs, Table 3 illustrates statistically significant differences ($p < 0.05$) found between the pathway and job performance ($p = 0.015$), with students coming from the Baccalaureate pathway achieving higher mean values compared to the other groups.

However, statistically significant differences ($p < 0.05$) were found between the access pathway and job motivation ($p = 0.022$), with students from the Baccalaureate pathway ($M = 2.61$; $SD = 0.89$) and those from Higher Vocational Education ($M = 2.61$; $SD = 0.85$) showing identical values, both higher than those of students from other curricular pathways (Table 3).

Notwithstanding, Table 3 illustrates statistically significant differences ($p < 0.05$) between the pathway and learning ability ($p = 0.012$), with students entering through the over 25s access test ($M = 2.75$; $SD = 0.58$) presenting higher mean scores compared to the other options.

In terms of social skills, statistically significant differences ($p < 0.05$) were observed between the access pathway and the ability to say no and cut interactions ($p = 0.005$) and initiate positive interactions ($p = 0.027$). Students from Higher Vocational Education exhibited higher mean values compared to students from other pathways (Table 3).

Table 4
Matrix of correlations of the constructs

	DDT	HG	L	MT	CAP	RIE	AE	CE	RE_M	AEX	DDP	EED	NOC	HP	IIP
DDT	1	.833**	.804**	.829**	.764**	.735**	-.001	-.280**	-.243**	.203**	.153**	.178**	.165**	.035	.180**
HG		1	.744**	.838**	.750**	.748**	.019	-.206**	-.215**	.220**	.186**	.193**	.162**	.051	.184**
L			1	.728**	.669**	.698**	-.028	-.271**	-.220**	.169**	.119*	.130**	.118*	-.007	.220**
MT				1	.773**	.761**	-.006	-.210**	-.175**	.178**	.160**	.145**	.133**	.042	.155**
CAP					1	.748**	.017	-.188**	-.165**	.186**	.131**	.125**	.145**	.053	.194**
RIE						1	-.049	-.148**	-.122*	.228**	.169**	.167**	.137**	.046	.210**
AE							1	.195**	.054	-.078	-.130**	-.057	-.096*	-.016	-0.066
CE								1	.498**	-.121*	-.029	-.134**	-.114*	.127**	-0.086
RE_M									1	-.041	-.019	-.104*	-.054	.147**	-0.020
AEX										1	.579**	.701**	.695**	.318**	.592**
DDP											1	.562**	.642**	.347**	.415**
EED												1	.681**	.247**	.462**
NOC													1	.396**	.521**
HP														1	.314**
IIP															1

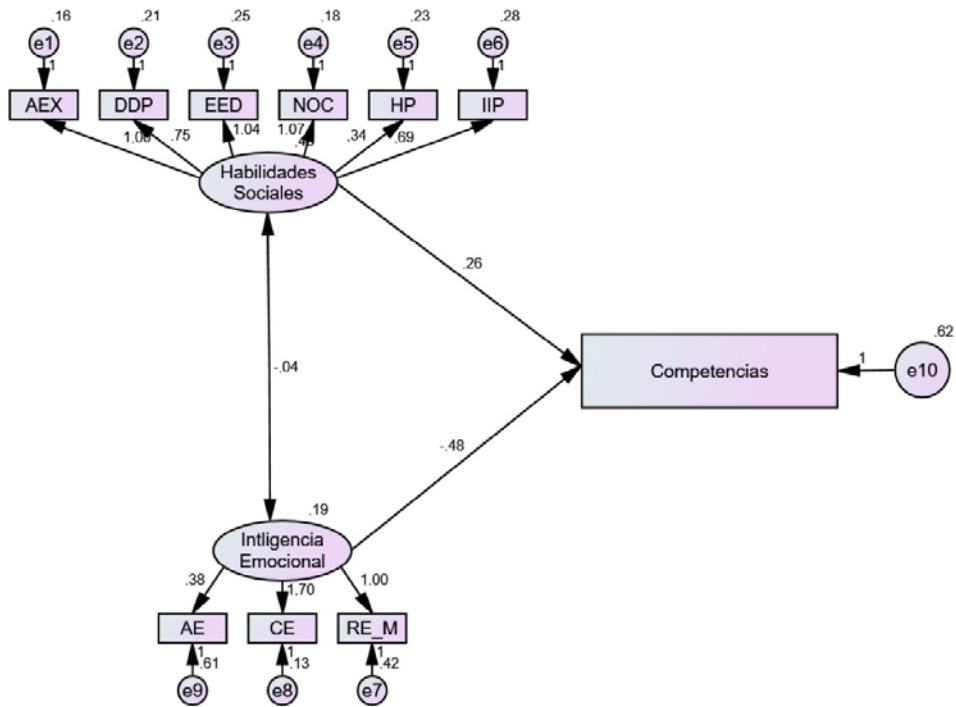
**. The correlation is significant at the 0.01 level (two-sided).

*. The correlation is significant at the 0.05 level (two-sided).

Note. job performance (DDT); management skills (HG); leadership(L); work motivation (MT); learning capacity (CAP); interpersonal relationships and teamwork (RIE); Emotional Awareness (AE); Emotional Clarity (CE); Emotional Repair (RE_M); Emotional Intelligence (IE); Self-Expression (AEX); Making Requests (HP); Expression Of Anger Or Disagreement (EED); Saying No And Cutting Off Interactions (NOC); Initiating Positive Interactions With The Opposite Sex (IIP).

Relating to the relationship between the analysed constructs, significantly positive correlations were found between the dimensions of social skills, both among themselves and with the dimensions of generic professional competencies. Conversely, significantly negative correlations were found between the dimensions of emotional intelligence and social skills and competencies (see Table 4).

Figure 2
Structural equation model



As shown in Figure 2, the theoretical model has been confirmed by the data, which demonstrate a good fit, with the effects reflected in Table 5.

Table 4 presents the results of the effects obtained. A negative effect of emotional intelligence on competencies was found ($\beta = -0.247$; $p \leq 0.001$). Similarly, a positive effect of social skills on competencies was observed ($\beta = 0.199$; $p \leq 0.001$). Additionally, a reciprocal and significant negative effect ($p < 0.05$) between emotional intelligence and social skills was identified ($\beta = -0.136$).

Relating to the effect of emotional intelligence on the sub-variables, a positive effect was found on emotional Awareness, emotional control, and emotional repair ($\beta = 0.204$, $p \leq 0.001$; $\beta = 0.898$, $p \leq 0.001$; $\beta = 0.555$, $p \leq 0.001$). Focusing on social skills, a positive effect of this variable was evident on self-expression, defence of own rights, expressing anger and disagreement, saying no, making requests, and initiating positive interactions ($\beta = 0.848$, $p \leq 0.001$; $\beta = 0.714$, $p \leq 0.001$; $\beta = 0.797$, $p \leq 0.001$; $\beta = 0.846$, $p \leq 0.001$; $\beta = 0.409$, $p \leq 0.001$; $\beta = 0.635$, $p \leq 0.001$).

Table 5
Effects of variables

Direction of the effect	R.W.			S.R.W.	
	Estimates	S.E.	C.R.	<i>p</i>	Effect
AEX \leftarrow SS	1,000			***	.848
DDP \leftarrow SS	.750	.046	16.195	***	.714
EED \leftarrow SS	1.037	.053	19.416	***	.797
NOC \leftarrow SS	1.066	.053	20.229	***	.846
HP \leftarrow SS	.341	.041	8.386	***	.409
IIP \leftarrow SS	.691	.048	14.338	***	.635
RE_M \leftarrow IE	1.000				.555
CE \leftarrow IE	1.696	.400	4.236	***	.898
AE \leftarrow IE	.376	.107	3.533	***	.204
Competencias \leftarrow SS	.264	.066	4.006	***	.199
Competencias \leftarrow IE	-.479	.105	-4.542	***	-.247
IE \leftarrow SS	-.037	.017	-2.161	.031	-.136

Note. Social Skills (SS); job performance (DDT); Self-Expression (AEX); Expression of Anger Or Disagreement (EED); Saying No And Cutting Off Interactions (NOC); Making Requests (HP); Initiating Positive Interactions With The Opposite Sex (IIP); Emotional Intelligence (IE); Emotional Repair (RE_M); Emotional Awareness (AE); Emotional Clarity (CE); Competencias (Competencies).

DISCUSSION AND CONCLUSIONS

Emotional intelligence is a critical skill that evolves throughout life. As revealed by this study, students who have attended Career Guidance Services or taken a Vocational Education and Career Guidance course tend to exhibit better emotional control. As Molina-Dávila (2022) suggests, this may be because educational guidance is crucial for socio-emotional development throughout life, equipping individuals with tools to explore their skills, set goals and manage emotions effectively. Furthermore, studies by Bedoya-Guerrero et al. (2024), Peng et al. (2021), and Wang et al. (2021) highlight the importance of employability-oriented education, which fosters the development of technical and professional skills among students.

With respect to university access pathways, it was found that students from the Baccalaureate pathway had a better perception of their job performance. In contrast, students from both vocational education and the Baccalaureate pathway demonstrated high motivation for work. This aligns with the findings of Mareque-Álvarez-Santullano et al. (2018), who found that employers considered apprentices to be highly competent. On the other hand, students entering university via the over 25 entrance exams stood out for their higher learning capacity. This may be since their educational shortcomings require them to learn more quickly to match their knowledge with that of their peers, or because, as LeMire (2024) suggests, adult learners can better understand and retain knowledge when it is presented in a format suited to them.

In contrast, students from vocational education exhibited a greater capacity to manage the type of interactions they engage in. As Sánchez-Bolívar and Escalante González (2020) propose, students from higher vocational education cycles possess a higher level of social and labour skills compared to those accessing from other pathways. This may be related to the fact that VE students undergo a longer process, which allows them to develop the social skills necessary to work in a company and interact with colleagues and clients. This, in turn, fosters the development of professional competencies, as established by Sarceda-Gorgoso and Barreira-Cerqueiras (2021).

A relationship has been demonstrated between social skills and the level of professional competencies among university students, in line with research by Sánchez-Bolívar et al. (2019) and Sanchis-Giménez et al. (2023), who identified key social skills such as cooperation, empathy, and the ability to cope with risky situations as fundamental competencies for success in the workplace, and therefore, crucial for securing employment.

In this regard, Jitaru et al. (2023) emphasise the importance of training for the personal development of students in social and emotional competencies, highlighting their significance for effective adaptation in both work and social environments.

Additionally, it is important to note that a negative relationship was found between emotional intelligence and professional competencies, which contradicts findings by Sanchis et al. (2023), who considered emotional intelligence an integral part of professional competencies.

Conversely, contrary to Azpiazu et al. (2015), who established a positive correlation between emotional intelligence and social skills, the results of this study indicate a negative relationship between these variables. This may be due to the development of social skills being used as a protective mechanism to address various emotional regulation issues.

On this point, this study has confirmed that emotional intelligence and social skills are predictor variables of professional competencies. The results revealed a negative effect between emotional intelligence and professional competencies, which, according to Valenzuela-Aparicio et al. (2023) and Cebollero-Salinas et al. (2022), means that a high level of emotional intelligence does not necessarily translate into a high level of competencies. This is because emotional intelligence is associated with an internal and personal locus, while competencies are framed as a social manifestation with an external locus.

In line with the above, social skills have been established as a strong predictor of professional competencies. As noted by Wesley et al. (2017), social skills are indispensable for achieving successful professional performance in a dynamic business world, particularly since both variables share a significant external psychological component. While emotional intelligence requires introspective analysis, social skills, and competencies necessitate an external contextual analysis that examines socio-professional performance.

According to the results of this study, career guidance, both personal guidance and courses, is a key factor in helping university students develop greater emotional resources. Students who receive this type of support show a greater capacity to manage and control their emotions, which can have significant implications for their well-being and academic performance.

Concerning university access pathways, there is a clear difference in the perception of competencies. Students entering through Vocational Education or the Baccalaureate perceive themselves as having greater professional competencies, particularly in their preparation for the labour market. In contrast, students who access university at an older age or with previous educational gaps tend to place more value on their learning competencies, suggesting that these groups develop a stronger motivation and focus on learning.

A relevant finding is the positive correlation between social skills and perceived competencies. Social skills emerge as a reliable predictor of competency levels, highlighting the importance of fostering these abilities in training programmes to enhance students' integration and performance in both university and work environment.

Finally, a noteworthy aspect is the complex relationship between emotional intelligence and professional competencies. Although emotional intelligence is often perceived as a positive resource, this study finds a negative correlation with professional competencies. Furthermore, emotional intelligence acts as a negative predictor of these competencies, which could indicate that students with higher emotional intelligence may prioritise emotional management over skills directly related to the work environment.

This study highlights the need for further research on these relationships, including studies on mediation between variables to better understand the mechanisms underlying this correlation.

Among the limitations of the study, the use of self-reports stands out, as it may introduce bias, as participants could overreport or underreport their emotional and social skills. The use of the TMMS self-report tool only measures intrapersonal skills and does not assess the interpersonal dimension of the emotional intelligence model, which other questionnaires do. Therefore, it would be interesting to include this dimension in future research. Additionally, the cross-sectional nature of this study limits the ability to establish causal relationships, so employing longitudinal or triangulated designs with observational sources could offer valuable insights for future research.

This study underscores the importance of implementing educational and career guidance programmes that promote a balanced development of social skills and emotional intelligence within the university setting.

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Agentic engagement: the predictive effect of teaching quality and basic psychological needs

La implicación agencial: el efecto predictivo de la calidad y las necesidades psicológicas básicas

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ABSTRACT

The way in which undergraduate students become agenticly involved in the classroom requires clarification, since this is an evolutionary moment characterized by the risk of suffering motivationally due to the increase in academic demands. Therefore, the aim of this study is to test a theoretical model according to which teaching quality (teaching for relevance and participation encouragement) predicts agentic engagement through the satisfaction of the basic psychological needs of autonomy, competence and relatedness. This study involved 485 students aged 17-34 years ($M = 20.19$; $SD = 2.05$) of whom 161 were male (33.2%), 320 female (66%) and 4 non-binary (0.8%). The Teaching Quality Questionnaire, the Basic Psychological Needs Satisfaction Scale and the Classroom Engagement Scale were used to assess the variables included in this study. The results show that teaching for relevance directly predicts basic psychological needs and indirectly, agentic engagement through the satisfaction of these psychological needs. On the other hand, the absence of predictive capacity of fostering participation on basic psychological needs and agentic engagement was found. This study shows the significance of basic psychological needs on agentic engagement and reveals that certain teaching quality strategies may not be directly linked to student agency in the higher education classroom. Consequently, it is observed that there is still much to be researched, and it is necessary to identify crucial and effective educational practices that foster such engagement in order to optimize the university teaching-learning process.

Keywords: agentic engagement, teaching quality, basic psychological needs, structural equation models, higher education

RESUMEN

La manera en que el alumnado universitario se implica de forma agéntica en el aula requiere de esclarecimiento, ya que se trata de un momento evolutivo caracterizado por el riesgo de sufrir motivacionalmente debido al aumento de las exigencias académicas. Por tanto, el objetivo de este estudio es someter a prueba un modelo teórico según el cual, la calidad docente (relevancia del aprendizaje y fomento de la participación) predice la implicación agencial a través de la satisfacción de las necesidades psicológicas básicas de autonomía, competencia y relación. En este estudio participaron 485 estudiantes de edades comprendidas entre los 17 y los 34 años ($M = 20.19$; $DT = 2.05$) de entre los cuales 161 eran hombres (33.2%), 320 mujeres (66%) y 4 personas no binarias (0.8%). Se utilizó el Cuestionario de Calidad Docente, la Escala de Satisfacción de las Necesidades Psicológicas Básicas y el Classroom Engagement Scale para evaluar las variables incluidas en este estudio. Los resultados muestran que la promoción de la utilidad y el interés predice directamente las necesidades psicológicas básicas e indirectamente, la implicación agencial a través de la satisfacción de dichas necesidades psicológicas. En cambio, se constata la ausencia de capacidad predictiva del fomento de la participación sobre las necesidades psicológicas básicas y la implicación agencial. Este estudio muestra la relevancia que tienen

las necesidades psicológicas básicas sobre la implicación agencial y pone de manifiesto que ciertas estrategias de la calidad docente podrían no estar directamente vinculadas a la agencia del alumnado en el aula de educación superior. En consecuencia, se observa que aún hay mucho por seguir investigando, siendo preciso identificar prácticas educativas cruciales y eficaces que fomenten dicho compromiso a fin de optimizar el proceso de enseñanza-aprendizaje universitario.

Palabras clave: implicación agencial, calidad docente, necesidades psicológicas básicas, modelos de ecuaciones estructurales, educación superior

INTRODUCTION

Many theories have emerged over the years to try and explain how teaching can help train students to learn independently, with most highlighting the importance of student agency in this process (Naidu, 2024). In higher education, agency is considered both a means for learning and a learning aim in its own right (Marginson, 2024). The present study focuses on agency as a dimension of school engagement.

Engagement, understood as students' degree of active participation in their own learning, or as 'energy in action' (Skinner & Raine, 2022), is one of the factors that most influence learning, academic success (Wong & Liem, 2022) and student wellbeing (Chaudhry et al., 2024). However, engagement processes linked to aspects other than the cognitive, affective and emotional dimensions, such as agency, for example, have received much less attention in studies on student engagement (Wong & Liem, 2022), even though agentic engagement may be considered the most important type of engagement for students in the 21st century (Reeve & Jang, 2022).

Agentic engagement

Agentic engagement refers to 'students' active contribution into the flow of instruction they receive to enrich the instruction for themselves and their peers' (Patall, 2024) and includes actions such as stating opinions, expressing preferences, finding interesting activities to do, asking for resources and learning opportunities, finding solutions to questions and requesting clarification (Reeve & Jang, 2022). In other words, agentic engagement is a way for students to become involved in their own learning in a proactive, planned and collaborative manner, enabling them to customise and enrich both the contents they must learn and the circumstances in which they must do so by making suggestions, expressing preferences and/or sharing their internal motivations (Reeve & Shin, 2020). This

in turn results in stronger motivation, since they can participate and contribute to their instruction throughout their opinions and assessments (Gómez-Carrasco et al., 2021). Agentically-engaged students feel that the activities they carry out are more interesting and that they have more material and social resources at their disposal; this in turn enhances their motivational satisfaction, positive development and academic progress (Reeve & Jang, 2022). It is important to note that, like other higher-order capacities, agentic engagement does not just emerge out of nowhere. Rather, as Vygotsky argues, it is constructed and developed through collaborative practices occurring in a social context (Singh, 2024). In other words, agency refers to students' active engagement in and mobilisation of the resources available in their environment, which in turn gives rise to constantly evolving interactions that enhance their development and learning (Singh, 2024).

This type of agency is particularly important in the transition to university, a period which requires students to simultaneously adapt to numerous new demands in different areas of their life: cultural, social and academic (Chaudhry et al., 2024). Undergraduate degrees can prove challenging for students, due to the new material they must learn, the new problems and situations they must face, the skills they must hone and the tasks they must complete in short spaces of time (Reeve et al., 2020). These obstacles may weaken students' motivation, which is why one of the principal challenges facing higher education in the 21st century is how to maintain adequate student engagement (Skinner et al., 2014). It is therefore important to identify possible facilitators of agentic engagement, such as teaching quality and students' basic psychological needs.

Teaching quality: highlighting the relevance of what is being learned and fostering participation

The study of teaching quality, understood as the set of specific teacher behaviours that have been shown to have a positive impact on student learning (Christ et al., 2022), has attracted growing interest recently among the educational community (Christ et al., 2022; Núñez & León, 2019), due to its impact on positive academic outcomes (Christ et al., 2022), including emotional, behavioural (Quin et al., 2017) and global engagement (Wong et al., 2017). Despite this, however, few studies in this field have focused on agentic engagement, probably because this dimension of engagement has received less attention than the behavioural, cognitive and emotional ones (Jiang & Zhang, 2021).

In other words, there is, at yet, no clear consensus regarding what high-quality teaching entails (Murtonen et al., 2024) and the concept is still insufficiently defined and its dimensions not yet fully identified (León et al., 2017). Two key dimensions that have received little attention to date in the scientific literature

(Quin et al., 2017) are: (1) the relevance of what is being learned, or in other words, the degree of usefulness and interest the student perceives in the content and activities presented and carried out in class; and (2) fostering participation, referring to the degree to which teachers encourage students to take part in class by asking them questions and eliciting their opinion. One way in which teachers can ensure high-quality teaching is by demonstrating the usefulness or personal benefits of a specific learning activity or content (Reeve & Shin, 2020); they can also ask students what they want, listen to what they say and respond to their suggestions, since this may help foster their interest and motivation (Reeve & Shin, 2020). These specific behaviours may help students feel more motivated and encouraged to participate in the instruction process, thereby demonstrating more agentic engagement, although this association requires further empirical verification.

Basic psychological needs: autonomy, competence and relatedness

According to León et al. (2017) and Vansteenkiste et al. (2020), high-quality teacher behaviours should be aimed at satisfying students' basic psychological needs. In other words, they should be designed to respond to the innate needs that must be satisfied in order to guarantee good functioning, psychological health and psychosocial adjustment (Ryan & Deci, 2017). There are three basic psychological needs: (1) autonomy, or feelings of self-determination and of not being controlled; a sense of willingness and disposition; (2) competence, or feelings of efficacy and mastery; feeling secure in one's social interactions; and (3) relatedness, or feelings of warmth, connection and of being cared for and supported by the significant others in one's life. Little attention has been paid to date to analysing the way in which teachers can satisfy these needs through their teaching (Santana-Monagas & Núñez, 2022), fostering greater commitment and engagement among students (Núñez & León, 2019; Leo et al., 2022).

Previous research has shown that relevant and interesting activities are, in themselves, activities that support autonomy (Reeve & Cheon, 2021), since these types of exercise encourage students to participate voluntarily, enabling them to make the most of their vitality to self-regulate their actions (Krpanec et al., 2024; Ryan et al., 2021). Indeed, the extant literature shows that active interest and self-perceived willingness to learn not only result in high levels of perceived autonomy (Ryan & Deci, 2017), but also in high levels of perceived competence (Khuram et al., 2021) and relatedness (DeLay et al., 2016). In terms of fostering participation, the use of active methodologies (designed to encourage students to play a more active role in class) has been found to improve relational aspects such as empathy and group responsibility (Bohórquez & Checa, 2019), along with teamwork,

engagement, responsibility, veracity, loyalty and respect (Palazuelos et al., 2018), all of which contribute to satisfying students' need for relatedness. Moreover, this type of methodology, in which students participate in the active construction of their knowledge, has been found to help foster autonomy and commitment (Albarrán-Torres & Díaz-Larenas, 2021), since it promotes deep, active, self-regulated and collaborative learning (Murtonen et al., 2024).

Teaching quality, basic psychological needs and agentic engagement

The few studies that have analysed the impact of teaching quality on school engagement suggest that this variable and, in particular, the relevance of what is being learned and teachers' efforts to foster participation, influence agentic engagement through the three inherent, motivational and universal psychological variables mentioned above; in other words, teaching quality influences agentic engagement through students' three basic psychological needs: autonomy, competence and relatedness. According to Self-determination Theory (Ryan & Deci, 2020), high-quality teaching that supports students' autonomy, competence and relatedness (Jiang & Zhang, 2021; Krpanec et al., 2024) fosters a stronger commitment to academic activities (Núñez & León, 2019).

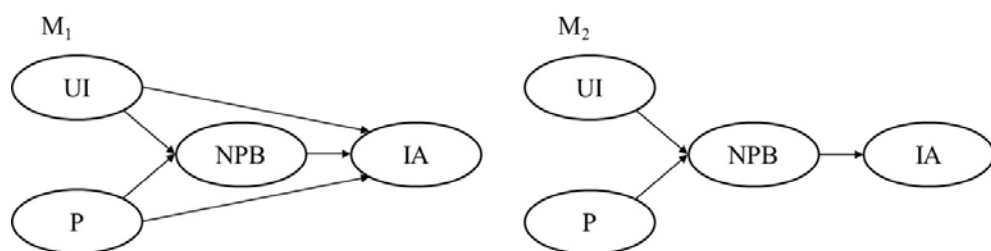
The present study

In sum, the interest and relevance of what is being learned and teachers' efforts to foster students' participation in the classroom may be associated with students' basic psychological needs, which in turn are associated with greater school engagement (Leo et al., 2022) and foster greater agentic engagement (Molinari & Mameli, 2018). Previous studies suggest that the association is a staggered one (Christ et al., 2022; Leo et al., 2022), although it has yet to be determined whether it is fully or partially mediated by the satisfaction of basic psychological needs. To the best of our knowledge, very few multivariate studies exist that analyse the dynamics generated by all these associations and further exploration is required to determine how these variables relate to one another.

The aim of the present study is therefore to analyse a theoretical model based on the results of previous research in order to explore possible associations between teaching quality (relevance of what is being learned and fostering of participation), basic psychological needs (autonomy, competence and relatedness) and agentic engagement in a developmental stage characterised by the risk of decreased motivation in the classroom due to increased academic demands (Skinner et al., 2014). To this end, we tested two structural models (Figure 1) to determine whether

satisfaction of basic psychological needs partially (M_1) or fully (M_2) mediates between teaching quality and agentic engagement. The following associations were hypothesised: (H1) promoting the usefulness and interest of what is being learned and fostering participation predict agentic engagement directly and indirectly through basic psychological needs (M_1); (H2) promoting the usefulness and interest of what is being learned and fostering participation predict agentic engagement indirectly through basic psychological needs (M_2).

Figure 1
Hypothesised theoretical models



Note. UI = promoting usefulness and interest, P = fostering participation, BPN = basic psychological needs, AE = agentic engagement.

METHOD

Participants

Participants were 485 students at the University of the Basque Country/Euskal Herriko Unibertsitatea (UPV/EHU), aged between 17 and 34 years ($M = 20.19$; $SD = 2.05$). All were undergraduates on the Preschool Education (195 students, 40.2%) and Primary Education (290 students, 59.8%) degree courses. In terms of gender, 161 were men (33.2%), 320 were women (66%) and 4 identified as non-binary individuals. Just over one third (167 students, 34.4%) were in the first year of their degree, 132 (27.2%) were in their second year, 132 (27.2%) were third-year students and 54 (11.1%) were fourth years (the number of fourth-year students was lower because at the time of recruitment they were engaged in teaching practice). An incidental sampling method was used.

Measurement instruments

To measure teaching quality, we used the *Cuestionario de Calidad Docente* - Teaching Quality Questionnaire (León et al., 2017), which comprises 53 items rated on a 7-point Likert-type scale ranging from 1 = *totally disagree* to 7 = *totally agree*. The instrument measures a total of 9 factors. In the present study, we used only the '*promotion of usefulness and interest*' and '*fostering participation in class*' scales, both of which were found to have good reliability indexes for the sample used (Cronbach's $\alpha = .91$, McDonald's $\omega = .91$ and Average Variance Extracted = .54 in the first scale and $\alpha = .87$, $\omega = .87$ and AVE = .59 in the second).

To determine the degree to which each basic psychological need (autonomy, competence and relatedness) was satisfied, we used the *Escala de Satisfacción de las Necesidades Psicológicas Básicas* - Basic Psychological Need Satisfaction Scale (León et al., 2011), which comprises 5 items rated on a 7-point Likert-type scale (1 = *totally disagree* to 7 = *totally agree*). In the present study, the overall scale was found to have good reliability values: $\alpha = .89$, $\omega = .94$ and AVE = .52, as were the subscales for the three dimensions: *autonomy* ($\alpha = .80$, $\omega = .81$ and AVE = .47), *competence* ($\alpha = .86$, $\omega = .86$ and AVE = .55) and *relatedness* ($\alpha = .84$, $\omega = .85$ and AVE = .53).

Agentic engagement was assessed using the 3-item subscale of the Classroom Engagement Scale by Jang et al. (2012), translated into Spanish and validated by Nuñez and León (2019). Responses are given on a 7-point Likert-type scale. In the present study, the scale was found to have good reliability values ($\alpha = .74$, $\omega = .76$ and AVE = .55).

Procedure

The study followed a cross-sectional, ex post facto (meaning that the hypotheses were validated - in this case the pathways of the structural model were tested - once the phenomenon had already occurred), retrospective, single-group design, the aim of which was to analyse possible associations between the following variables: *promoting usefulness and interest*, *fostering participation in class*, the satisfaction of *basic psychological needs* and the *agentic engagement* of university undergraduate students.

First, the study was designed in accordance with the ethical principles outlined in the Declaration of Helsinki and approval was gained from the UPV/EHU (M10_2020_208) Ethics Committee for research with Human Beings. Next, we asked lecturers teaching all groups and courses on the Preschool and Primary Education undergraduate degrees run by the Faculty of Education and Sport at the University

of the Basque Country (UPV/EHU) to help us access students, present the research project and encourage participation. The research team visited the different groups to explain the purpose of the study and encourage them to take part, emphasising that participation was both voluntary and anonymous. Students who agreed to participate completed the instruments in the form of an online questionnaire.

Data analysis

Atypical values ($n = 22$, 4.34% of the sample) were eliminated using the SAS software package. To calculate the descriptive data and correlation coefficients, we used the SPSS 25 statistical program, and to check the structural regression models, we used EQS v.6.1.

To verify the hypotheses, we analysed the structural equations models (SEMs). It is important to note that these analyses were carried out using the maximum likelihood procedure with robust standard errors (MLR), due to the deviation of the multinormal data (all normalised Mardia coefficients > 5 , $p < .01$). Diverse indexes were used to determine the goodness of fit of the models (Hair et al., 2018): the Satorra-Bentler chi-squared statistic ($Sb\chi^2$) and the consecutive $Sb\chi^2/df$ ratio, for which values of 2.00-3.00 or lower are considered indicative of good fit; the CFI, TLI and IFI comparative fit indexes, for which values of over .90 are deemed to indicate good fit; and the RMSEA and SRMR error measures, for which values lower than .08 are considered indicative of a plausible model. To compare nested models, we calculated and compared the Chi-squared statistics.

RESULTS

1. Descriptive statistics and correlations between the study variables

Prior to analysing the measurement model, a Pearson correlation analysis was conducted, along with an analysis of the means and standard deviations. The results are shown in Table 1.

Table 1*Bivariate correlations, means and standard deviations of the study variables*

Variables	1	2	3	4	5	6
1. Promoting usefulness and interest	1	.662*	.583*	.433*	.261*	.380*
2. Fostering participation		1	.432*	.383*	.247*	.266*
3. Autonomy			1	.637*	.375*	.508*
4. Competence				1	.502*	.257*
5. Relatedness					1	.480*
6. Agentic engagement						1
Mean	4.40	5.35	4.41	4.83	5.67	4.23
SD	1.02	1.05	1.12	.88	1.01	1.28

Note. * $p < .01$.

2. Measurement model

The measurement model included four latent variables. In the case of the variables *promoting usefulness and interest*, *fostering participation* and *agentic engagement*, the indicators were the items of the questionnaires administered. In the case of satisfaction of basic psychological needs (*autonomy*, *competence* and *relatedness*), the indicators were the parcels of the different scales. The analysis of the measurement model revealed acceptable indexes: $SB\chi^2[df] = 415.48[164]$, $SB\chi^2/df = 2.53$, $TLI = .932$, $CFI = .941$, $IFI = .942$, $SRMR = .060$, $RMSEA[CI] = .056[.050-.063]$. All factor loadings of the indicators pertaining to the latent variables were significant ($p < .05$), implying that all latent factors were correctly represented by their corresponding indicators, which in turn confirms the theoretical structural equations models.

3. Comparison of the proposed structural equations models

The goodness of fit analyses of the proposed models (M_1 and M_2) returned acceptable results (Table 2).

Table 2

Comparison of the hypothesised partial and full mediation models

Model	SB $\chi^2_{(gl)}$	SB χ^2/gl	TLI	CFI	IFI	SRMR	RMSEA _(IC)
M _{1 partial}	312.28 ₍₁₄₅₎	2.15	.951	.958	.959	.053	.049 _(.041-.066)
M _{2 full}	348.42 ₍₁₄₈₎	2.35	.942	.950	.950	.059	.053 _(.046-.060)
$\Delta M_2 - M_1$	36.14 ₍₃₎						

The χ^2 test to detect discrepancies between the two nested models ($\Delta S\chi^2 = 36.14$, $p > .05$) was not statistically significant, indicating a high degree of similarity. Consequently, the full mediation model (M₂) was accepted, since it was the most parsimonious. This result fails to support H1, which proposed a partial mediation, and suggests that the relationship between the variables is fully mediated, as proposed in model M₂.

4. Standardised regression coefficients

The individual analysis of the regression coefficients of the first-choice model (M₂) revealed that most of the pathways proposed had a significance level of $p < .05$, with the exception of *fostering participation-basic psychological needs* ($\beta = .042$, $p > .05$) and *fostering participation-agentic engagement* ($\beta = -.026$, $p > .05$) (Table 3).

Table 3

Standardised regression coefficients

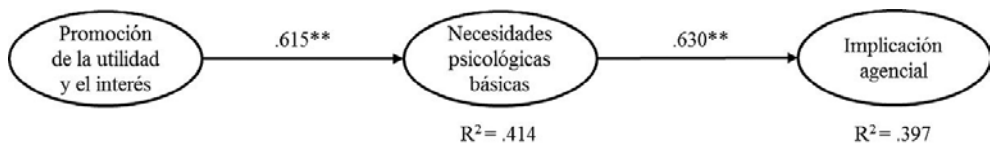
Direct effects	β
Promoting usefulness and interest → Basic psychological needs	.615**
Fostering participation → Basic psychological needs	.042
Basic psychological needs → Agentic engagement	.630**
Indirect effects	β
Promoting usefulness and interest → Agentic engagement	.388**
Fostering participation → Agentic engagement	.026

Note. * $p < .001$. R^2 (basic psychological needs) = .414; R^2 (agentic engagement) = .397.

The results partly support H2, confirming the predictive association between *promoting usefulness and interest* and the satisfaction of *basic psychological needs*, but providing no evidence that *fostering participation* is a significant predictor of these same needs. Specifically, *promoting usefulness and interest* was found to have a predictive capacity of 41.4% in relation to satisfaction of *basic psychological needs*, whereas together, *promoting usefulness and interest* and satisfaction of *basic psychological needs* were found to have a predictive capacity of 39.7% in relation to *agentic engagement*. The variable *promoting usefulness and interest* indirectly determined *agentic engagement*, and satisfaction of *basic psychological needs* was found to fully mediate the association between *promoting usefulness and interest* and *agentic engagement*. The final structural model with its regression coefficients is shown in Figure 2.

Figure 2

Final structural model



DISCUSSION AND CONCLUSIONS

University students are immersed in an important developmental moment in which they are required to adapt to many simultaneous changes in different areas of their life (Chaudhry et al., 2024). They are also faced with new tasks and challenges in the academic field (Reeve et al., 2020), which may lead to a drop in motivation during their time at university (Skinner et al., 2014). Agentic engagement has attracted growing interest as one of the factors that most influences motivation and learning in higher education (Marginson, 2024; Naidu, 2024). It is considered the most important type of engagement for students in the 21st century (Reeve & Jang, 2022). The aim of the present study was to analyse a theoretical model based on previous research, to explore associations between two dimensions of teaching quality (promoting the usefulness and interest of what is being learned and fostering participation in the classroom), basic psychological needs (autonomy, competence and relatedness) and agentic engagement among university undergraduates.

In broad terms, the results revealed that the teaching dimension promoting usefulness and interest directly predicted the basic psychological needs autonomy (Reeve & Cheon, 2021; Ryan & Deci, 2017), competence (Khuram et al., 2021)

and relatedness (DeLay et al., 2016), and indirectly predicted agentic engagement through the satisfaction of these needs. A staggered association was therefore observed, as previous research results had suggested (Christ et al., 2022; Leo et al., 2022), although it was not clear whether this association was fully or partially mediated by basic psychological needs. Indeed, one key finding of the present study is that satisfaction of basic psychological needs fully mediates the relationship between promoting usefulness and interest and agentic engagement. This is a novel finding (mainly because very few studies in the extant literature have analysed these associations in a multivariate manner) that contradicts H1, which postulated that the two dimensions of teaching quality would directly predict agentic engagement. In other words, the results of the present study reveal that the relevance of what is being learned predicts (with medium to moderate coefficients) the satisfaction of basic psychological needs. This partially supports H2, but does not enable its full confirmation, since the hypothesis also postulated that fostering participation would predict the satisfaction of students' basic psychological needs, which was not the case.

It therefore seems that when teachers focus on different topics in the classroom, set exercises and assignments differently, ask students what they think in order to set more entertaining classroom tasks and find practical applications for the content being taught, they make students feel they are able to make their own decisions (autonomy) and foster feelings of competence and the ability to respond to the demands of the subject syllabus (Khuram et al., 2021; Reeve & Cheon, 2021; Ryan & Deci, 2017). It also seems that teachers who promote the usefulness and interest of the subject they teach help university students feel more appreciated and valued by the people with whom they interact (Bohórquez & Checa, 2019; Palazuelos et al., 2018), which helps satisfy their need for relatedness.

Nevertheless, in contrast to the relevance of what is being learned, the results of the present study did not indicate any significant predictive power of fostering participation on satisfaction of basic psychological needs. Previous studies have highlighted a possible controversy in relation to this issue, since when teachers ask students questions, this can, on occasions, be interpreted as forced participation or self-imposed or obligatory participation (Rocca, 2010). The characteristics of higher education may explain the lack of significance found in our study, since the university setting is often seen as an environment in which students should be autonomous and in control of their own behaviour (Granero-Gallegos et al., 2022). Consequently, this type of encouragement to participate by teachers could be interpreted as undermining students' autonomy, or even as a way of checking their understanding of the content being taught and ability to respond correctly (Granero-Gallegos et al., 2021). In other words, it could be seen as a means of assessing performance, which would do nothing to satisfy students' basic need for autonomy, competence

and relatedness. This finding is particularly interesting, since it may indicate that asking questions or encouraging students to contribute to classroom sessions does little to make them feel that their need for competence and autonomy is met; it may also make them feel intimidated, thereby interfering with their need for relatedness (Cohen et al., 2020). Contributions that demonstrate a high level of motivation in the classroom are proactive in nature and are the result of the student's own initiative. Examples include asking questions, answering questions, suggesting options, requesting clarification and communicating ideas (Montenegro, 2019). In other words, it is a type of participation that stems from the student's intrinsic motivation and interest, rather than being elicited by the instructor (Cook-Sather et al., 2021).

This is probably one of the reasons for our failure to observe a direct predictive relationship between fostering participation and agentic engagement, since the type of participation that teachers would need to foster in order to have an impact on this kind of engagement would require deep listening on their part, in order to generate a climate conducive to student contributions, coupled with a willingness to be open to the proposals received and to adjust their teaching accordingly. In other words, students' agency is constructed during their interactions with their social environment, which includes their instructor, who must respect the point at which their students currently find themselves, and the resources available to them, and be willing to allow students themselves to mobilise them, thereby enhancing their development and learning in an ongoing manner (Singh, 2024). According to Fletcher (2024), agency mainly emerges in the proximal development zone, a factor that should be taken into consideration in future studies, since this concept implies an optimal level of challenge for students. Teachers' encouragement of participation should be calibrated to fall into this zone, in which students are able to develop new skills with the required support. This suggests that the efficacy of fostering participation may depend on how well it adjusts to students' current capacities and potential. Participation that is located outside the proximal development zone, because it is either too simple or too complex, may make no significant contribution to increasing students' agentic engagement.

The present study also found that the satisfaction of students' basic psychological needs significantly predicts agentic engagement, mediating between the relevance of what is being learned and this motivation-related variable. These findings suggest that the perceived usefulness of what is being learned helps university students feel that the task or content at hand is something they choose to engage in or something they want to do or learn; this also makes them feel more competent (Reeve et al., 2020), which, from a motivational point of view, results in greater commitment to participating in classroom activities, during which students develop agentic beliefs and behaviours (Patall et al., 2022). In other words, it seems that students who

perceive themselves as highly autonomous and competent, and moreover have the feeling that what they are learning is relevant, are more disposed to ask questions and express preferences and opinions in class and, in general, demonstrate more interest in the tasks at hand (Molinari et al., 2018; Patall et al., 2022; Reeve et al., 2020).

The present study, however, did not analyse the effect of each specific basic need on agentic engagement. This may be of great interest, since previous studies carried out at other educational levels, at which teachers, from a relational perspective, have greater presence and relevance than at university, seem to suggest that satisfying students' basic psychological need for relatedness is not associated with agentic engagement (Conesa et al., 2022). This may seem surprising, since one might assume that feeling cared for by the significant others in their life would encourage students to engage proactively in the teaching flow (Molinari et al., 2018)). However, other studies have indeed reported an absence of any significant association between the satisfaction of this need and other variables, such as academic performance, at the university level, even though significant relationships were found in the case of autonomy and competence (Chacón-Cuberos et al., 2021).

Limitations

The present study has certain limitations that should be taken into consideration when interpreting the results. First, the possible influence of students' sex or the size of the class group were not taken into consideration, even though differences in contributions demonstrating agentic engagement have been observed in accordance with these factors (Montenegro, 2019). It is also important to point out that the results pertain to a cross-sectional study carried out with a specific sample of young people from the Autonomous Community of the Basque Country, recruited using incidental sampling. This limits the representativeness of the sample and the generalisation of the results to other contexts or populations. Some strategies for overcoming this limitation would be: (1) to recruit broader and more diverse samples that are representative of different sociocultural contexts and regions; (2) to conduct longitudinal studies to enable more robust conclusions to be drawn regarding the causality of the variables; and (3) to replicate the study in other educational and cultural environments to verify the consistency of the findings. These strategies would not only enable the validation of the results reported here but would also explore possible variations in the associations observed in accordance with contextual and time-related factors.

Future avenues of research

One aspect that was not considered here was the possible effect of other contextual variables or variables mediating the association between basic psychological needs and agentic engagement. It would be interesting to include other contextual (e.g., school climate) or personal variables (e.g., emotional intelligence or self-concept) in the model (Harrison et al., 2025). Also, given the importance of social interaction in the development of agentic engagement (Singh, 2024), and bearing in mind the absence of any predictive effect of fostering participation on the variables analysed and the findings reported by Fletcher (2024), it would be interesting for future studies to explore how different forms of fostering participation interact with students' proximal development zone, and how this affects their agentic engagement and the satisfaction of their basic psychological needs in a higher education setting. This may provide valuable insight into the impact of teaching quality in higher education on students' agentic engagement, enabling the development of more effective participation strategies that truly foster students' agency and help ensure their comprehensive development during their time at university.

Conclusions

We can conclude that the predictive capacity of teaching quality and the differential satisfaction of basic psychological needs on students' engagement is still an important field of study, since the results reported in the extant literature are contradictory and inconclusive (Conesa et al., 2022). The present study demonstrates the importance of basic psychological needs in fostering agentic engagement, revealing also that certain teaching strategies may not be directly linked to fostering agency in university classrooms. Further research is still required in the field of teaching quality (Murtonen et al., 2024) and fostering student agency (Naidu, 2024), and it is important to identify effective key educational practices that promote agentic engagement in order to optimise the university teaching-learning process.

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