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# Editorial

# Reviewers wanted

Peer review is surely the most important process in the editorial management of manuscripts received by a scientific journal. Not only does the future of the manuscript depend on it, but also the time that authors must wait to know the evaluations of their papers by the colleagues who kindly revbiew them. The peer review process begins after pre-evaluation by the editorial team and with the selection of reviewers who are experts in the topic addressed in each manuscript. These people review the paper and send the editorial team a report with their impressions, recommendations and their judgement on whether the article is publishable in the journal in question according to their criteria (Levkoe et al., 2019).

## ORIGIN AND EVOLUTION OF THE PEER REVIEW PROCEDURE

The practice of peer review was first documented in Syria in the 9th century, as a method to evaluate the care of recovering patients by physicians (Burnham, 1990). In the 17th century the procedure underwent a resurgence as a method of discussion and validation of scientific findings (Fitzpatrick, 2009), which was consolidated a century later with the publication of the journal Medical Essays and Observations launched by the Royal Society of Edinburgh from 1743, which promoted peer review as a method of evaluating articles prior to publication (Kronick, 1990). However, it was not until the mid-20th century that it became established as a standard practice in scientific journals (Benos et al., 2007).

Peer review has evolved over time and, in many cases, the adoption of one form or another depends on the area of knowledge involved. Traditionally, in natural science research, the so-called single-blind procedure has been used: the reviewers know the identity of the authors, but the authors do not know the identity of the reviewers. However, in the context of educational research, the most common procedure is the double-blind review, in which none of the parties involved know who the others are (Patel, 2014).

## BENEFITS AND CRITICISMS OF PEER REVIEW

The benefits of peer review are evident and its use by journals is not only more than justified but also constitutes a quality criterion when they are evaluated. Overall, this system acts as a mechanism to maintain the integrity and credibility of scientific publications (McNair, 2019). The reports sent to the journal by the reviewers not only serve to assess whether the manuscript is viable for publication

or not, but more importantly, the authors of the manuscript receive information that can be very valuable for improving the work before publication or sending it to another journal if necessary (Benos et al., 2007; Levkoe et al., 2019). Finally, the peer review process provides the opportunity to complement the authors' perspective with those of the people who have reviewed the work, which can help to minimise possible personal biases (Ab-Rahman et al., 2015).

Despite these advantages, peer review also has its critics. One of the most frequent is its subjective nature, which inevitably leads to biases and inconsistencies in assessments (Gupta, 2017; Levkoe, 2019). Indeed, there are studies showing that inter-reviewer agreement is only slightly above what would be expected by chance (Kravitz et al., 2010; Marcoci et al, 2022). Moreover, biases of a different nature have been found, such as gender bias in male and female editors, the effects of which are increased by the lower representation of women in editorial teams (Marcoci et al., 2022). Other types of biases have also been detected, such as institutional partialities, in which manuscripts from prestigious institutions receive better reviews (Guida, 2018), or racial biases, when it comes to the selection of reviewers (Cooke et al., 2024). In fact, the issue is so complex that there have been some proposals pointing to the need to train and specialise reviewers (Patel, 2014). Although peer review is intended to promote fair publication, situations have been encountered in which reviewers make unsubstantiated, biased and/or aggressively biased assessments, which, not surprisingly, also present a problem in the editorial process (Farias et al., 2023). Finally, the literature has highlighted that the lack of incentives for manuscript reviewers is also a problem (Armstrong, 1997).

## OPEN PEER REVIEW AS AN ALTERNATIVE

In response to the weaknesses that have been found in peer review, a wide variety of alternatives have been suggested, which have been grouped together under the term Open Peer Review (OPR). This umbrella includes all those forms of review that are aligned with Open Science, which includes the identities of reviewers and the reports they issue being made public, facilitating greater community participation in the manuscript review process (Ross-Hellauer et al., 2017). This review modality has some advantages over the traditional style, but also some disadvantages (Ross-Hellauer, 2017). Among the advantages, these new procedures are expected to have a positive impact on the quality and accuracy of review reports. In addition, open participation could help the editorial process by reducing the level of mediation by journals to find reviewers. Finally, the fact that reviewers' identities are known makes it easier for them to get recognition for their contributions to the final version of the paper. This same philosophy may have disadvantages, such as the fact that some people find it difficult to be critical of higher status colleagues or that reviewers are

reluctant to have their reports made public. In addition, since this scheme suggests a greater degree of interaction between reviewers and authors, review times may increase and the likelihood of reviewers with a conflict of interest may increase.

## WHY REVIEW MANUSCRIPTS?

Reviewing manuscripts is a duty to the scientific community. When we submit our own work for consideration by a journal, we value very highly that the response times are short and that the reports we receive are as complete as possible. This is also what our colleagues expect when we receive an invitation to review a paper (Borja & Elliott, 2024). However, in addition to the undeniable commitment to the community, reviewing a manuscript allows us to receive a few benefits, such as the fact that reviewing other people's work allows us to improve our own writing skills, our analytical thinking and communication skills, among others (August & Brouwer, 2024). In addition, reviewing articles allows us to be continuously updated on new lines of research and emerging methodologies that can enrich our own work (Mbuagbaw et al, 2013). In parallel, some previous research has highlighted the benefits for young researchers (McNair, 2019) and, indeed, co-reviewing manuscripts between PhD supervisors and their doctoral students has been shown to have benefits for both the latter (Garbati, & Brockett, 2018) and their PhD supervisors (Burmeister, 2015).

## AN INVITATION TO PARTICIPATE

The selection of reviewers for a manuscript is undoubtedly the bottleneck in the management process of a scientific journal. The high number of articles published each year worldwide means that more people are needed to review papers submitted to journals, reaching very unsustainable levels (Helmer et al., 2020). Besides, some studies have shown that review workload accumulates for some people, which has even led to the coining of the term 'reviewer fatigue' (Waltman et al., 2023). For example, in the context of biomedical publications, 20% of researchers carry out between 69% and 94% of reviews (Kovanis et al., 2016). Indeed, whereas fifteen years ago, the average number of invitations that needed to be sent from journals to engage reviewers for an article was 6 (Donaldson et al., 2010), more recent studies have found that it can now take up to 15 invitations on average (Fiialka et al., 2020).

In this complex context, at Educación XX1 we can do nothing, only thank our reviewers for the work they do. Their contributions to the editorial process are extremely valuable and, as we said at the beginning of this editorial, help to ensure

the quality of the works published. We hope that, in addition, these review papers will help them to deepen their research and learn from the community. We would also like to encourage other researchers to join our community by contributing future manuscript reviews. From our journal, we are confident that their efforts will be of benefit to us all.

Diego Ardura
*Editor in Chief*
*Educación XX1*

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# Studies

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# Cooperative classroom as a protective factor for mental health-externalizing problems in Primary Education

## *Aulas cooperativas como factor protector de salud mental-problemas externalizantes en Educación Primaria*

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## ABSTRACT

Cooperative learning is used in the classroom to promote teamwork, interaction with peers, and improve academic performance. On the other hand, behavioral and emotional problems, related to disruptive behaviors in the classroom, hyperactivity, or attention deficit, translate into behaviors related to aggression, opposition to social patterns, low tolerance to frustration, which occur during childhood and adolescence and have a negative impact on personal, social, and family development, affecting school results. The objective of this study is to establish a relationship between cooperative learning in the classroom and externalizing problems in primary school students. A total of 490 students from 5th and 6th grade of primary schools from 28 classrooms participated, 56.3% of whom were women, with an average age of 10.56 years. A multi-level analysis was carried out using an ANOVA random effects model, and a regression analysis which would allow us to verify how certain variables studied at the classroom level related to the components of cooperative learning are going to affect externalizing problems.

The results indicate that there are statistically significant differences in externalizing problems, based on, firstly, overall cooperation in the classroom, and secondly, social skills and responsibility. This allows us to conclude that the methodology based on cooperative learning in the classroom is effective in directing the behavior of students with externalizing problems, positively affecting psychological and emotional well-being, the exchange of social support, the development of responsibility and social skills, as well as the reduction of anxiety and stress


**Keywords:** cooperative learning, mental health, hyperactivity, externalizing problems, primary education, multi-level analysis


## RESUMEN

El aprendizaje cooperativo es utilizado en las aulas con la finalidad de favorecer el trabajo en equipo, la interacción con los compañeros y mejorar el rendimiento académico. Por otro lado, los problemas comportamentales y emocionales, referidos a conductas disruptivas en el aula, hiperactividad, o déficit de atención, se traducen en comportamientos relacionados con la agresión, oposición a pautas sociales, baja tolerancia a la frustración, que ocurren durante la infancia y adolescencia e inciden negativamente en el desarrollo personal, social y familiar, repercutiendo en los resultados escolares. El objetivo de este estudio es establecer una relación entre el aprendizaje cooperativo en el aula y problemas externalizantes en estudiantes de Educación Primaria. Para ello participaron un total de 490 estudiantes de 5º y 6º de Primaria, pertenecientes a 28 aulas, siendo el 56,3% mujeres, con una media de edad de 10,56 años. Se llevó a cabo un análisis multinivel apoyándose en un modelo ANOVA de efectos aleatorios, así como un análisis de regresión que nos permitiría comprobar cómo ciertas variables estudiadas del nivel aula relativas a los componentes del aprendizaje cooperativo van a incidir en los problemas externalizantes. Los resultados indican que existen diferencias estadísticamente significativas de los problemas externalizantes en función por

una parte, de la cooperación global en el aula, y por otro lado, de las habilidades sociales y responsabilidad. Ello nos permite concluir que la metodología basada en el aprendizaje cooperativo en el aula resulta eficaz para dirigir el comportamiento del estudiante con problemas externalizantes, incidiendo positivamente en el bienestar psicológico y emocional, el intercambio de apoyo social, el desarrollo de la responsabilidad y de las habilidades sociales, así como en la reducción de ansiedad y estrés.

**Palabras clave**: aprendizaje cooperativo, salud mental, hiperactividad, problemas externalizantes, educación primaria, análisis multinivel

## INTRODUCTION

Cooperative learning (CL), collaborative learning and other types of group learning are increasingly used in the classroom with the aim of encouraging teamwork among students, enhancing their performance and learning and allowing them to learn to work as part of a team and develop their interpersonal skills (Bermejo et al., 2021; León-del-Barco et al., 2019).

Taking into account the numerous research about this learning methodology, we can define CL as a teaching-learning model through which students divide in small groups, ideally heterogeneous, sharing efforts and resources in order to achieve optimal learning results (León-del-Barco et al., 2023; Johnson et al., 2014; Rivera-Pérez et al., 2021).

According to Johnson & Johnson (2009), CL groups are based on a positive interdependence between group members. Objectives are structured in such a way that students take an interest in their own efforts and the performance of others. There is clear individual accountability, whereby each student's mastery of the assigned content is evaluated. The group is given information about each member's progress so that they know who needs help. Leadership and responsibility for learning are shared by all group members. Finally, the aim is to enable every group member to learn as much as possible. In summary, CL comprises five key characteristics: positive interdependence, in which group members depend on one another to achieve the results; interaction, which implies providing help and support among group members; individual commitment or responsibility, where each group member assumes the need of performing the task; teaching of interpersonal and social skills, referring the efficient communication between members for the right development of the activity; and quality of group processes, or knowing how to reflect on the performed activities, elaborating both positive and negative criticism. With these elements, each group member achieves their objective only if the other members also achieve theirs. Besides, the individual's rewards or reinforcements are directly proportional to the quality of the group's work.

Some of the cooperative techniques applied in the classrooms taking into account the said elements include, for example, the jigsaw (Aronson & Osherow, 1980), which eases the understanding of a topic divided in different parts so all members learn something about it; the Teams-Games-Tournaments (Slavin, 2012), which aims at mastering a topic in order to get rewards after the inter-team lecture, and it is also based on individual learning; cooperative tables, based in concept identification (León-del-Barco et al., 2017); or 1-2-4 structure by Kagan (1994), a dynamics that starts with individual work and ends as a team task.

Cooperative learning has been the subject of numerous research studies, starting in lab studies about cooperation issues. Some studies have focused on comparing three types of interaction and organization: cooperative, competitive and individual (Johnson & Johnson, 1990; Ovejero, 2018), concluding that cooperative situations are better in both academic and social terms. Most research has focused on analysing the results and outcomes of CL techniques in relation to academic, social and affective variables (León-del Barco et al., 2023). With regard to academic variables, one of the last revisions carried out by Jonhnson & Johnson (2018) of a meta-analysis studying the relation between CL and academic performance showed that cooperation is superior to competition and individualism when it comes to the performance and productivity of all participants, dedicating more time to task performance and fostering a greater level of cognitive development. According to Gillies (2016), there is strong evidence of the effectiveness of CL for learning and performance.

Cooperative learning also influences affective and social variables. In affective terms, CL techniques affect motivation, self-esteem, and emotion control (Mamani, 2019; Sharifi-Shayan et al.,2020). In social terms, a cooperative environment and work in cooperative groups fosters acceptance among peers and makes a significant contribution to the development and enhancement of social skills (Camacho-Minuche et al., 2021; Mendo-Lázaro et al., 2018). Some research has confirmed that cooperative learning in the classroom improves the students' prosocial behavior (Manzano-Sánchez et al., 2021; Navarro-Patón et al., 2019; Van Ryzin et al., 2020).

Based on a meta-analysis of 177 studies on CL, Johnson & Johnson (1990) conclude that CL promotes greater interpersonal attraction between students and leads to more positive attitudes towards those who are different. In Spain, Boix & Ortega (2020) conducted a review of the scientific literature to identify the benefits of CL in the core subject areas at primary level as an alternative to traditional, competitive educational methods. The benefits identified by the authors were primarily affective and social, with a positive influence on classroom relationships and environment CL is also an effective way to reduce school bullying and social

exclusion, as well as alcohol and tobacco consumption (Polo-del-Río et al., 2017; Van Ryzin et al., 2020).

Mental health analysis of children and adolescents at risk of emotional disorders or behavioral problems has become a globally significant research topic and a priority issue in public health policy (Houweling et al., 2022). Emotional and behavioral problems in children and adolescents raise major social concern due to their association with disability, suffering, functional impairment, and significant economic costs to public health systems worldwide. Among the emotional and behavioural problems observed in childhood and adolescence, two broad categories can be identified: internalizing behaviours, which refer to emotional problems, and externalizing behaviours, which refer to behavioural problems. Both categories are prevalent during the school-age years and interfere with personal, social, and academic development, affecting adaptation to family, social, and educational environments, as well as the development of socioemotional skills (Hand & Lonigan, 2022; Sorcher et al., 2022).

Externalizing problems refer to a range of behaviours including aggression, classroom disruptions, hyperactivity, impulsivity, and attention deficits (Fonseca-Pedrero et al., 2020; Sorcher et al., 2022; Sullivan et al., 2022). These problems manifest in various forms such as exaggerated and inappropriate expressions of anger, defiance, low frustration tolerance, poor impulse control, excessive tantrums, and aggressive or violent behaviour. They are associated with poor academic performance, difficulties in managing peer conflict, social problems, substance abuse, delinquency, inappropriate use of digital media, and even psychopathology in childhood, adolescence, and beyond (Danneel et al., 2019; García-Gil et al., 2022; Salavera & Usan, 2019). If these problems persist beyond childhood, they may negatively impact long-term mental health and are considered precursors of more severe externalizing disorders, such as conduct disorder, oppositional defiant disorder, and antisocial personality disorder (Martin-Herz et al., 2022). Similarly, when externalizing problems are intense and persistent, they may evolve during child development into Attention-Deficit/Hyperactivity Disorder (ADHD), one of the most common psychopathological conditions during school age (Sampaio & Flores, 2018).

Externalizing problems are thus among the most observable characteristics of ADHD. In this disorder, clearly identifiable externalizing behaviours include hyperactivity, impulsivity, and psychomotor restlessness, which impact school functioning, academic performance, family interactions, and peer relationships (Andrade & Tannock, 2014). Specifically, at the behavioural level, students with ADHD tend to exhibit socially negative behaviours more frequently than their peers, such as aggression and provocative social responses, making them more likely to experience social isolation in the classroom (Mikami & Lorenzi, 2011).

Since individuals are not born with a predetermined social repertoire but rather acquire it from childhood and throughout the different stages of development, the process of acquiring social competence equips them with the tools needed for successful social interaction. Some studies link externalizing problems with poor social competence, as these issues may inhibit children's ability to form and maintain successful social relationships (Albrecht & Karabenick, 2018).

According to Wang and Liu (2021), students with deficits in social competence may behave aggressively, which in turn predicts peer rejection. This rejection can trigger negatively biased cognitive processing, such as interpreting others' intentions as hostile, thereby fuelling a cycle of aggression. Additionally, students with poor social competence may have difficulties initiating and maintaining positive peer interactions. Peer rejection may further increase the likelihood of affiliating with others who also exhibit low social competence, reinforcing aggressive tendencies and making it even more difficult to learn socially adaptive behaviours.

Cooperative behaviours are also not innate but learned and developed throughout different stages of growth. Cooperative classroom work is considered one of the most effective educational strategies for guiding and managing the behaviour of students with externalizing problems in the school context, promoting more satisfying social interactions and minimizing such problems. Research highlights the importance of implementing carefully planned cooperative methodologies, mediated by teachers, aimed at improving social skills and peer acceptance in classrooms with students displaying externalizing behaviours, especially those with ADHD. These methods also contribute to the improvement of personal factors such as self-esteem and emotional intelligence (Andrade & Tannock, 2014; González-Moreno & Molero-Jurado, 2022; Mendo-Lázaro et al., 2018; Tacca-Huamán et al., 2020; Trigueros et al., 2020).

Due to the limited number of studies linking cooperative learning and externalizing mental health problems, the aim of this study is to explore associations between cooperative learning in the classroom and externalizing problems in primary school children. This research seeks to analyse how classroom-level contextual variables, related to cooperative environments, influence externalizing behaviours to varying degrees. The students participating in our study are grouped in different classrooms which, due to factors such as class size, classroom management styles, and different teaching staff, may influence the dependent variable under investigation. The need to control for the potential relationship between students and the classroom environment in which they engage in learning activities leads us to apply multivariate regression models that are suitable for nested or hierarchical data structures.

## METHODOLOGY

A cross-sectional ex post facto research design was followed, studying a phenomenon that occurred at a specific point in time, without continuity over time and without manipulation of the variables under study. The data collection was carried out using a questionnaire-based methodology.

### Participants

The participants were selected using multi-stage cluster sampling and random selection of classes at schools with several groups in Years 5 and 6 at primary level. Cluster sampling was carried out by selecting 14 public educational institutions in Extremadura at random. 75% of the institutions were public and the rest were private with public funding. 65% of them were located in rural areas. For the random selection of class groups, all classes at the schools were assigned a number and random numbers were generated by a computer.

The sample, considering a trust interval of 95% and error margin of ±5, was made up of 490 primary school students in Years 5 (222) and 6 (268). The average age was 10.56 years old (SD= .497, range 10-11); 56.3% (n=276) were female and 43.7% (n=214) were male. A total of 28 classes participated in the study.

### Instruments

*Cooperative Learning Questionnaire, CAC* (Fernández-Río et al., 2017). This short instrument evaluates the key components of CL in the classroom. It is made up of 20 items divided into five factors or dimensions: 1. Interpersonal skills, e.g., items such as "We work on discussing, debating and listening to others" and "We reach agreements within the group to make decisions". 2. Group processing, e.g., items such as "We talk to each other to make sure that everyone in the group knows what is being done" and "Groupmates debate ideas and opinions". 3. Positive interdependence, e.g., items such as "We cannot finish the tasks without the groupmates' contributions" and "The better each group member completes his/her task, the better it is for the group". 4. Promotive interaction, e.g., items such as "Groupmates relate with each other and interact during the tasks" and "Interaction among groupmates is necessary to complete the tasks". 5. Individual accountability, e.g., items such as "Every group member has to participate in the group's tasks" and "Every group member must strive to try hard in the group's activities".

Each of these dimensions is evaluated through four items. The response format used is a five-point Likert-type scale (1= Completely disagree to 5= Completely

agree). The CAC provides a global cooperation factor, which is determined by the five factors.

In this study, the reliability indices for the different factors were: global cooperation factor, Cronbach's α = .91, McDonald's Ω = .91; interpersonal skills factor (α = .70, Ω = .71); group processing factor (α = .70, Ω = .71); positive interdependence factor (α = .65, Ω = .66); promotive interaction factor (α =.67, Ω =.68); individual accountability factor (α = .87, Ω = .88).

To determine whether the model found in the original validation study (Fernández-Rio et al., 2017) is a suitable fit for our data, we used the goodness of fit indices shown in Table 1. As the table indicates, the fit indices are close to desirable values and show evidence of validity for the generalization of our findings.

**Table 1**

*Goodness of fit indices for the proposed model, Cooperative Learning Questionnaire (CAC)*

| Model | $\chi^2$ | $\chi^2/df$ | GFI | IFI | TLI | CFI | RMSR | RMSEA |
|---|---|---|---|---|---|---|---|---|
| 5 factors | 356.829 | 5.025 | 0.974 | 0.891 | 0.860 | 0.900 | 0.091 | 0.058 |

*Strengths and Difficulties Questionnaire (SDQ), self-report version by Goodman (1997).* The self-report version of the SDQ is a short instrument with excellent internal consistency in all its scales in both the international and the Spanish version. It comprises 25 items divided into five dimensions or subscales (1. Emotional Symptoms, 2. Conduct Problems, 3. Peer Relationship Problems, 4. Hyperactivity and 5. Prosocial Behaviour). Each of the subscales is assessed via five items. The response format used is a three-point Likert-type scale (0= No, not at all, 1= Sometimes and 2= Yes, always).

For community samples, it is advisable to group the items from the Behavioural Problems subscale and the items from the Hyperactivity subscale into a new scale called Externalizing Problems. This scale was used in the present study to assess the "externalizing problems" variable. Example items include: "I am restless, hyperactive, I can't stay still for long", "When I am upset, I get really angry and lose control", "I often get in fights, I manipulate people".

Regarding the overall reliability of the scale, it obtained Cronbach's α = .76 and McDonald's Ω = .76, while the Externalizing Problems scale obtained α= .73 and Ω= .73. To determine whether the Externalizing Problems scale is a suitable fit for our data, we used the goodness of fit indices shown in Table 2. As the table indicates, the fit indices are close to desirable values and show evidence of validity for the generalization of our findings.

**Table 2**
*Goodness of fit indices for the Prosocial Behaviour scale of the Strengths and Difficulties Questionnaire (SDQ), self-report version*

| Model | $\chi^2$ | $\chi^2/df$ | GFI | IFI | TLI | CFI | RMSR | RMSEA |
|---|---|---|---|---|---|---|---|---|
| 1 factor | 175.861 | 5.172 | 0.988 | 0.821 | 0.760 | 0.819 | 0.063 | 0.079 |

## Procedure

We followed the ethical guidelines established by the American Psychological Association (2010) with regard to informed consent from parents, as all participants were underage. Firstly, we contacted the schools to explain the study objectives and request authorization to complete the questionnaires and obtain access to grades. The questionnaire was then administered by class group. Besides, the anonymity of the responses, the confidentiality of the data obtained and the exclusive use of this data for research purposes were guaranteed. The questionnaires were administered during school hours, taking around 20 minutes in an appropriate setting without distractions.

## Data analysis

First of all, a reliability analysis was performed on the instruments and a confirmatory analysis was carried out. Then, given the hierarchical nature of the data, a multilevel analysis was conducted. The statistical adjustment process began with a random effects ANOVA model, which is known as the unconditional or null model. Once this first step was complete, two means as outcomes models A) and B) were fitted using regression analysis (RMR) in order to analyse how the explanatory or contextual study variables at the class level have a greater or lesser influence on externalizing problems.

Firstly, Model A was fitted to ascertain the extent to which the global cooperation factor in the class explained and predicted prosocial behaviour. Then, Model B was used to analyse the degree to which the five key components of CL (group processing, interpersonal skills, promotive interaction, positive interdependence and individual accountability) explain and predict externalizing problems among students.

In these analysis, the dependent variable was prosocial behaviour. Global fit statistics (-2LL deviation, Akaike information criterion (AIC) and Bayesian information criterion (BIC)) were calculated to determine the extent to which the proposed model can represent the variability observed in the data; the lower the value of the global fit statistics, the better the model fits the data.

Statistical analysis was carried out using the SPSS 26.0 package for PC and JASP Free.

## RESULTS

Table 3 contains descriptive statistics for the study variables. The dependent variable was Externalizing Problems and the predictor or explanatory variables for level 2 (class level) were Global Cooperation within the class, Interpersonal Skills, Group Processing, Positive Interdependence, Promotive Interaction and Accountability. The number of participants was n= 490 and the level 2 n= 28 classes.

**Table 3**
*Descriptive statistics for the study variables*

| Dependent variable (N=490) | M | DT | Minimum | Maximum |
|---|---|---|---|---|
| Externalizing Problems (EP) | 15.824 | 3.560 | 10 | 27 |
| Variables Nivel 2, aula (N=28) | M | DT | Minimum | Maximum |
| Global Cooperation Factor (GCF) | 3.874 | 0.562 | 1.65 | 5 |
| Interpersonal Skills (IS) | 3.441 | 0.835 | 1 | 5 |
| Group Processing (GP) | 3.585 | 0.805 | 1 | 5 |
| Positive Interdependence (PI) | 3.991 | 0.687 | 1 | 5 |
| Promotive Interaction (PRI) | 4.028 | 0.671 | 1 | 5 |
| Accountability (A) | 4.325 | 0.657 | 1 | 5 |

The students participating in our study are grouped into different classes, whose characteristics may influence the dependent study variable: classroom management style, teacher, etc. The need to control this possible relationship between students and the class in which their learning activities take place prompted us to apply

multivariate regression models for nested or hierarchical data. Hierarchical or multilevel linear models were designed to analyze data when some of the study variables are nested or grouped into higher level variables; in our study, students are nested in classes with their respective teachers. These models presuppose that students in the same class will tend to display similar behaviors.

Initially, an unconditional or null model was examined to estimate the variance between classes (level 2 variability) and within classes (level 1 variability). This model was calculated without level 2 (class) explanatory or contextual variables and serves as a reference point for evaluating the goodness of fit of the alternative models, in which explanatory or contextual variables at the class level are gradually incorporated. It is important to bear in mind that our objective in this study was to identify an explanatory model for prosocial behavior using only level 2 (class) predictors.

To do this, we applied a random effects ANOVA (null model) to the data. Table 4 shows the results obtained, indicating that the estimate of the constant or intersection, the only fixed effects parameter in the model, was found to be different from zero. In other words, the estimated value ($\beta$=15.785) of the Externalizing Problems variable in the 28 classes that participated in the study was not zero ($p < .001$). Meanwhile, we observed the covariance parameter estimates, which are estimates of the parameters associated with the random effects of the model, and found statistically significant differences ($p< .001$). The variance of the factor (classes $\beta = 1.101$) indicates the extent to which externalizing problems varies between classes and the residual variance (residual $\beta$ =11.722) indicates the extent to which externalizing problems varies within each class.

To interpret these values and calculate the variability between different classes in comparison with the variability between students in the same class, the intraclass correlation coefficient (ICC) was obtained. In our study, we found a value of 0.086; otherwise put, 8.6% of the total variability of prosocial behavior corresponds to differences between class means. These significant differences between class means constitute the level 2 variability.

Once the presence of differences between class means was confirmed, the next step was to identify any variables explaining these differences. To do so, two means as outcomes models were fitted using Regression Analysis (RMR).

**Table 4**

*Interrelations between Prosocial Behavior and Cooperative Elements in the Classroom (Null model: one-factor random effects ANOVA; Models A and B: means as outcomes, regression analysis RMR)*

| | **Null Model** | **Model A** | **Model B** |
|---|---|---|---|
| **Fixed effects** | β (SE) | β (SE) | β (SE) |
| Intercept: classes | 15.785**(.26) | 17.945**(.99) | 19.217**(1.07) |
| Global Cooperation Factor (GCF) | | **-.0302* (.01)** | |
| Interpersonal Skills (IS) | | | **-.202**(0.06)** |
| Group Processing (GP) | | | .035 (0.07) |
| Positive Interdependence (PI) | | | .044 (0.06) |
| Promotive Interaction (PRI) | | | .062 (0.06) |
| Accountability (A) | | | -.152** (0.05) |
| **Random effects** | β (SE) | β (SE) | β (SE) |
| Residual | 11.722**(0.77) | 11.515**(0.76) | 11.115**(0.73) |
| Classes | 1.101*(0.53) | 1.447*(0.65) | 2.095**(0.86) |
| | | | |
| ICC | 0.086 | 0.112 | 0.160 |
| | | | |
| **Explained variance ($R^2$)** | | **31%** | **90%** |
| | | | |
| **Fit statistics** | *Value* | *Value* | *Value* |
| Deviation (-2LL) | 2622.924 | 2624.920 | 2623.594 |
| AIC criterion | 2626.924 | 2628.920 | 2627.594 |
| BIC criterion | 2635.309 | 2637.301 | 2635.958 |

*p>.05
**p<.01;
SE= standard error
ICC = intraclass correlation coefficient
Deviation= minus two times the logarithm of the maximum likelihood function
AIC= Akaike information criterion
BIC= Bayesian information criterion

Model A was fitted to ascertain the extent to which the Global Cooperation Factor variable explained externalizing problems. The results show significant differences in the externalizing problems variable according to the Global Cooperation Factor for the class (β=-0.0302; p<.05). The ICC rose from 8.6% to 11.2%. The proportion of explained variance at level 2 was 0.310 [(1.101-1.447) /1.101]. In other words, 31% of the differences in prosocial behaviour observed between classes are attributed to the level 2 variable, Global Cooperation.

Model B was fitted, replacing the Global Cooperation Factor from the previous model with the five key components of CL to analyse the extent to which they each predict externalizing problems among students. The data show significant differences in externalizing problems for the variables Interpersonal Skills (β=-0.202; p<.01) and Accountability (β=-0.152; p<.01). The ICC was 16%. Meanwhile, the proportion of explained variance at level 2 was 0.90 [(1.101-2.095) /1.101]. In other words, 90% of the differences in externalizing problems observed between classes can be attributed to the level 2 variables Interpersonal Skills and Accountability.

Model B is a better fit for the data, with lower values (-2LL deviation, AIC and BIC). The higher ICC values in models A and B compared to the null model suggest the possibility of a traditional and standard data analysis.

## DISCUSSION AND CONCLUSIONS

In this study, we aimed to analyse how classroom-level contextual variables related to a cooperative environment influence the prevalence of externalizing problems in primary school students. The data reveal significant differences in externalizing problems based on Global Cooperation and the variables Social Skills and Responsibility. The model that best fits the data is Model B, in which the Global Cooperation Factor was replaced with the five essential elements of cooperative learning. This model shows that 90% of the observed differences between classrooms in terms of externalizing problems are attributed to the variables Social Skills and Responsibility.

Preventing the development of emotional and behavioural problems involves identifying both risk and protective factors. Our findings confirm that the more a classroom operates under a cooperative approach, the lower the incidence of externalizing problems among students. Since students with externalizing problems tend to exhibit more disruptive behaviours, engage in fewer activities, participate in more solitary play, and more frequently display socially negative behaviours such as aggression and provocative social responses (Fonseca-Pedrero et al., 2020; Sullivan et al., 2022), implementing a cooperative learning methodology may serve as a protective factor against behavioral issues. In classrooms where cooperative learning is more prevalent, helping behaviours, social support, and emotionally

comforting interactions among peers are promoted and developed, as indicated by Navarro-Patón et al. (2019).

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Cooperative learning in the classroom has positive effects not only on academic performance (Bermejo et al., 2021; Gillies, 2016) but also on affective and social variables that influence externalizing problems. Cooperative learning increases self-esteem, group cohesion, participation, and social support (Camacho-Minuche et al., 2021; Mamani, 2019; Mendo-Lázaro et al., 2018; Van Ryzin et al., 2020). According to Ovejero (2018), cooperative learning situations are effective tools for giving and receiving social support, offering students trustworthy peers from whom they can receive both material and emotional help.

Cooperative learning fosters greater interpersonal attraction among students and leads to more positive attitudes and emotions toward peers (Johnson & Johnson, 1990). Students feel more loved, supported, and accepted by others, in line with Boix and Ortega (2020), who identified a link between affective and social relationships and the classroom climate, which, in turn, reduces the likelihood of inappropriate behaviour inside and outside the classroom (Van Ryzin et al., 2020). More recent studies have found positive relationships between the level of cooperation in the classroom and emotions such as trust, pride, enjoyment, and calmness (León-del-Barco et al., 2023). In this regard, a study by Sharifi-Shayan et al. (2020) aimed at determining the effectiveness of cooperative learning on emotional control in children with behavioural problems found that using this methodology can improve their academic motivation and help them regulate their emotions by fostering a sense of cooperation and usefulness.

Our results show that social skills and responsibility in a cooperative classroom are the elements of cooperative learning most closely associated with a lower incidence of externalizing problems among students, with social skills having a greater influence. This is consistent with the ideas of Andrade and Tannock (2014) and Mendo-Lázaro et al. (2018), who advocate for the incorporation of cooperative

learning-based teaching techniques to reduce behavioural and mental health problems.

Regarding responsibility, in cooperative learning situations, each team member is committed to completing their portion of the work and is held accountable for meeting the goals. Cooperative situations grant students greater responsibility and control over their learning, promoting autonomy and independence from the teacher. Based on our data, we agree with León-del-Barco et al. (2019) that through participation in cooperative situations, students learn to be responsible—an essential factor in increased commitment, improved academic outcomes, and enhanced mood. We also align with Manzano-Sánchez et al. (2021), who found that fostering responsibility is associated with improved resilience, prosocial behaviour, and classroom climate. Responsibility strengthens relationships among students and enhances their personal, emotional, and social development, thereby reducing classroom behavioural issues.

In terms of social skills, we found that cooperative learning groups function as training grounds for these abilities. As Camacho-Minuche et al. (2021) state, a cooperative environment promotes peer acceptance and contributes to the development of new social skills. By working cooperatively, students imitate peers (modelling), practice social and communication skills (role-playing, behavioural rehearsal), receive immediate feedback from peers, and apply what they learn in other contexts.

Considering Wang and Liu's (2021) assertion that students with behavioural problems often have deficits in social competence, making it difficult to initiate and maintain positive peer interactions and leading to disruptive behaviour, we agree with Ovejero (2018) that cooperative learning techniques strongly contribute to the improvement of social competence through the development of social skills. Cooperative classrooms foster student communication and interaction. These social interactions enhance trust and social competence, reducing social stress and anxiety. Social skills serve as protective factors in adolescents' lives. As González-Moreno and Molero-Jurado (2022) state, social skills are associated with engagement in healthy lifestyle activities such as physical, musical, and artistic pursuits. They are also linked to emotional intelligence, self-esteem, self-concept, reduced involvement in school violence, and resilience as a key factor in improving mental health (Tacca-Huamán et al., 2020; Trigueros et al., 2020).

This study has some limitations, the most significant being the use of self-report measures for data collection. Regarding self-reports to assess cooperation in the classroom and externalizing problems, as they are informed by students' temporary, subjective perceptions. In future studies, additional instruments that

assess cooperative learning—such as teacher-based tools evaluating cooperative learning management—could complement student reports.

Other limitations stem from the cross-sectional design, which makes it difficult to establish stronger inferences about the relationships between the variables. Future research using quasi-experimental designs could implement cooperative learning interventions in the classroom and analyse their impact on behavioural problems. Finally, it would be ideal to replicate the study with a broader, nationally and internationally representative sample. It would also be valuable to include information on teacher practices, such as their teaching experience and familiarity with cooperative learning methodologies, as well as students' actual use of this educational approach.

To conclude, the analysis of children and adolescents' mental health in relation to the risk of emotional disorders or behavioural problems has become a topic of global research interest and a priority for public health policy. We are aware that behavioural problems in children and adolescents are a significant social concern due to their association with disability, suffering, functional impairment, and the high economic cost they represent for public health systems worldwide.

This study makes important contributions by showing how behavioural problems can be prevented within the classroom. Our findings demonstrate that a cooperative classroom approach is an effective educational response for guiding and managing the behaviour of students with externalizing problems. A cooperative classroom can significantly contribute to students' emotional and psychological well-being. It serves as a powerful tool for giving and receiving social support, providing students with trusted peers who can offer material and emotional assistance. A cooperative classroom fosters responsibility and social skills, which increase confidence and social competence while reducing social stress and anxiety. Therefore, it is essential to promote and motivate teachers to apply this methodology in their classrooms. Implementing, mastering, and dedicating sufficient time to cooperative learning is highly rewarding and generates significant positive outcomes for students.

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# Creativity and wellbeing in the classroom: a systematic review of intervention programs

## *Creatividad y bienestar en las aulas: una revisión sistemática de programas de intervención*

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## ABSTRACT

Creativity and well-being are aspects that are increasingly gaining presence in the educational landscape. In this regard, the objective of this study is to analyse interventions or programs that have been implemented over the last 15 years in the areas of creativity and well-being across various educational stages is emphasized. A bibliographic-analytical method is followed, based on the PRISMA Statement, where the characteristics of studies aimed at improving students' well-being and/or creativity are explored and analysed. Additionally, for the methodological review, the JBI Critical Appraisal Tools were employed. A total of 34 studies were obtained, which explored variables through educational interventions using pretest-post-test designs, control groups, or action research. A high percentage of studies focusing on the promotion of creativity from a general domain, particularly in Early Childhood and Secondary Education, was highlighted as a result. In the realm of creativity, verbal creativity was found to be the specific domain with the greatest presence. The interventions examined show a wide range of approaches, incorporating techniques such as creative problem-solving, arts or movement-based approaches, computational thinking techniques or creative reading and writing activities. Regarding the instruments, the Torrance Test was identified as one of the most recurrent due to its characteristics and widespread use. Finally, the need to continue promoting creative interventions that explore this skill from specific domains and contribute to improving well-being is discussed.


**Keywords:** creativity, creative thinking, school programs, well-being, positive attitudes


## RESUMEN

Tanto la creatividad como el bienestar individual son aspectos que están teniendo una presencia cada vez mayor en el panorama educativo. En ese sentido, se destaca la importancia de analizar las intervenciones o programas que se han llevado a cabo a lo largo de los últimos 15 años en materia de creatividad y bienestar en las distintas etapas educativas. Se sigue un método bibliográfico-analítico basado en la Declaración PRISMA, donde se exploran y se analizan las características de los estudios que han tenido como objetivo la mejora del bienestar y/o de la creatividad del alumnado. Además, para la revisión metodológica se han empleado las herramientas de JBI Critical Appraisal Tools hasta obtener un total de 34 estudios donde se exploran las variables mediante intervenciones educativas. Los artículos siguen diseños de pretest-posttest, grupo control o Investigación-acción. Se obtuvo un alto porcentaje de estudios basados en la promoción de la creatividad desde su dominio general, especialmente en Infantil y en Secundaria. En cuanto a los dominios específicos de la creatividad, la creatividad verbal obtuvo una mayor presencia. Las intervenciones examinadas muestran multitud de enfoques donde incorporar técnicas basadas en la resolución creativa de problemas, en las artes, en el movimiento, en el fomento del pensamiento computacional o en el fomento de la lectura y escritura creativa. Con respecto a los instrumentos empleados, se identifica el Test de Torrance como uno de los más recurrentes debido a sus características y a la extensión de su uso. Finalmente, se

discute la necesidad de continuar promoviendo intervenciones creativas donde explorar dicha habilidad desde dominios específicos y donde contribuir a la mejora del bienestar del alumnado.

**Palabras clave:** creatividad, pensamiento creativo, programas escolares, bienestar, actitudes positivas

## INTRODUCTION

Creativity and wellbeing importance in the educational field has risen recently. According to the Organization for Cooperation and Economic Development (OCED, 2023), each student should be able to practice with their creative ability along different learning stages due to its relevance on cognitive, metacognitive, attitudinal or emotional skills (Corazza et al. 2022; Goleman et al., 2023; Klimenko, 2008; Ros, 2019). The concept of creativity has evolved significantly throughout years, and, among different definitions, they establish a common ground in terms of answering with originality and novelty. Indeed, this ability has been traditionally associated with huge cultural and scientific transformation (BigC), while daily life creativity (little-c) has been overlooked (Kaufman & Beghetto, 2009; Qian et al., 2019).

Moreover, creative experiences are crucial as an environmental determinant of creative development within the educational field. Indeed, "creativity as a process, a personal quality and an ability is aligned with social and creative working and it can only exist in a specific society and culture" (Vyacheslavovna et al., 2016, p. 11715, own translation). The educational sector expresses concern regarding the design of learning situations for developing the creative process (e.g. preparation, incubation, insight, evaluation, verification) through tasks, techniques or resources among different areas, especially due to the artificial intelligence growth whose use could influence on the acquisition of competences (Kurtis, 2021; Goleman et al., 2023; Vicente-Yagüe et al., 2023).

Additionally, Positive Psychology emerges as an approach for the individual well-being study from three fundamental pillars: positive emotions, institutions and traits. Traits theory is encouraged by individual strengths where creativity is included within the virtue of knowledge (Seligman & Csikszentmihalyi, 2014). Furthermore, the role of emotions is key in the educational design of learning situations, especially in the creative ones (Amabile, 2005; Darfler & Kalantari, 2022; Sayalı et al., 2023; Subero & Esteban-Guitart, 2023). Likewise, the concept of flow is attributed to this paradigm as another intersection between creativity and well-being. Flow is defined as a state of concentration and optimal enjoyment where challenge and skill are balanced, hence its presence is beneficial in creative tasks (Csikszentmihalyi, 2018; Isham &

Jackson, 2023). Finally, positive institutions influence creative development due to the promotion of experimentation and lateral thinking provided within a positive climate (Williams, 2020). Therefore, the environment or the context includes, next to emotions and individual traits, a determinant factor to the holistic and creative development of future adults (Sternberg & Lubart, 1991; Valero-Esteban et al., 2024). Nevertheless, how are these aspects promoted in the educational setting?

Agenda 2030 proposes quality education and individual wellbeing from the Sustainable Developmental Goals 3 and 4. In this context, positive education as a branch of Positive Psychology attempts to reach both goals (Adler, 2017; Naciones Unidas, s.f.). Moreover, positive education in the classroom is possible through educational practices not only for well-being promotion but also for creative potential development where idea generation and problem-solving abilities involves the use of conative, cognitive and contextual resources (Sternberg & Lubart, 1991; Lubart et al., 2019).

Therefore, educational programs aimed to attend well-being or creativity (either general or domain-specific) could be analysed to diagnose the presence and the practice of these variables within different stages, areas in educational centres (Goleman et al., 2023). Nevertheless, which program or interventions have been implemented in different educational stages, among the last 15 years, whose aim is to improve well-being and creativity?

## METHOD

The general objective of this research is to analyse the nature of creativity and well-being promotion programs published between 2010 and 2024, from Early Childhood to Secondary education.

The research follows an analytic-bibliographic design based on the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) where experience and effectiveness of educational programs are examined (Munn et al., 2018; Page et al., 2021). The search strategy begins with articles from the Scopus, Web of Science and Eric databases based on research about creativity and well-being through educational programs through Early Childhood, Primary and Secondary education.

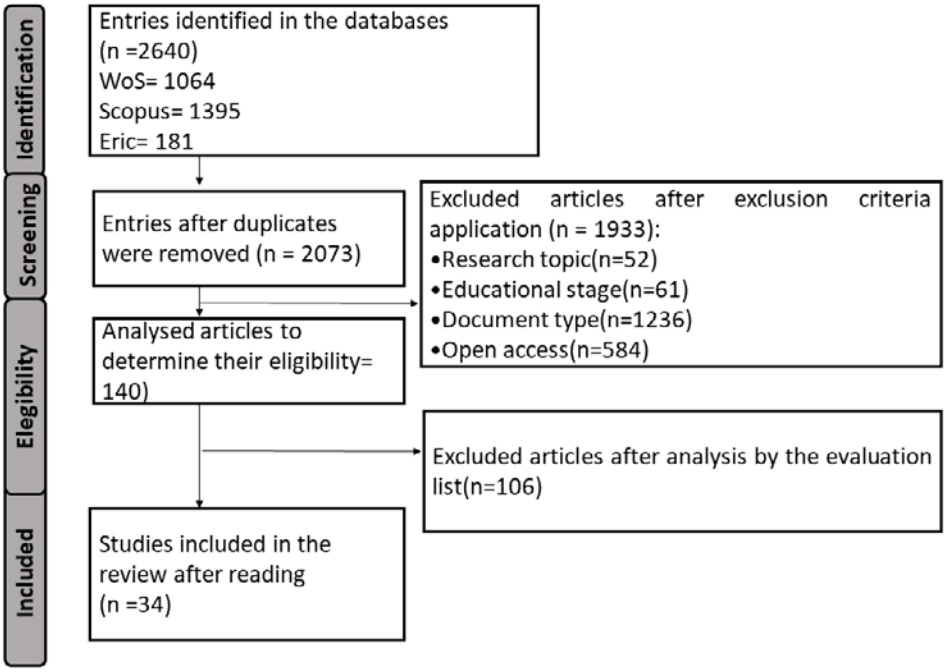
Moreover, filters were applied to refine the selection of articles based on time frame, document type, and keywords aligned with the PICOS framework (Sánchez Meca, 2022): “kindergarden” OR “primary education” OR “secondary education” for participants, “wellbeing” OR “creativ*” OR “insight” OR “creative thinking” OR “imagination” OR “creative ability” OR “divergent thinking” for variables of result; “intervention” OR “program” OR “project” OR “article” for intervention. The comparison aspect is not relevant for this analysis.

**Table 1**
*Inclusion and exclusion criteria*

| | | |
|---|---|---|
| Inclusion criteria | Participants | Early Childhood, Primary and Secondary Education (3-16 years old) |
| | Intervention | Educational programs related to search terms/ research objective (well-being and creativity). Articles based on pretest-posttest, control/ experimental group designs, action research or questionnaires. |
| | Publication year | From 2010 January until 2024 May |
| | Document type | Articles (scientific journals) |
| | Language | English/Spanish |
| | Access | Open |
| Exclusion criteria | Relevance | It is not relevant for the research objective |

We obtained a sample of articles that allowed to answer the research question, and we developed its analysis with an evaluation criteria list for quasiexperimental and qualitative research articles to evaluate the bias risk from the articles (Barker et al., 2023; Lockwood et al., 2015). As Figure 1 shows, the procedure of article selection divided into different stages.

**Figure 1**
*PRISMA flow diagram for systematic review*




We developed a database to synthesize information about researched educational programs based on the educational stages, participants, methodological design, studied variables and results (Table 2). Furthermore, we analysed the techniques from the intervention's programs and the assessment or data collection instruments used in the included articles.

**Table 2**
*Preselected analysis categories*

| Category | Definition | Subcategory | Subcategory definition |
|---|---|---|---|
| Stage | Educational period where the teaching practice occurs | Early Childhood Education | 0 - 5 year<br>6 - 12 year<br>12 - 16 year |
| Participants | Number of students who participate in the research | | |
| Research method | Methodological techniques used | Control/ Experimental group | Evaluation through comparison between participants performance (control/experimental group). The experimental group participates in the intervention while the control group does not receive the intervention. |
| | | Pretest-post-test | Variable evaluation before (pretest) and after (post-test) the intervention. |
| | | Action research | Program evaluation based on the process or product analysis. |
| | | Opinion questionnaires or interviews | Program evaluation through opinion of involved agents (students and/or educators) |
| Variable | Subject of study in the program and the article | Creativity | The creativity is researched through its general or specific domain (verbal, mathematical, motor or kinesics, musical…). |
| | | Well-being | It mentions the contribution to accomplishing a well-being state through the educational intervention (emotions, resilience, self-esteem, enjoyment, flow, motivation...) |

| Categoría | Definición | Subcategoría | Definición de la subcategoría |
|---|---|---|---|
| Result | Information obtained through the article | Differences/ No differences between groups | Result evaluation based on the comparison between groups |
| | | Improvement/ No improvement after the program | Evaluation of the program impact on students |
| | | Contribution of the program | Contribution to the variable's improvement through the analysis of the developed tasks or opinions. |

We followed an analysis of the data through the informatic programs SPSS 28.0.1.1(14) and Microsoft Excel using descriptive statistics (frequency and percentage) and an analysis of the qualitative information regarding techniques and evaluation instruments based on the previously established categories.

## RESULTS

In the process of analysis of each article, we found that 64.7% of the research articles included a control group along with a prestest-posttest design, followed by 17.6% of studies that employ only the pretest-post-test design, against 5.9% that use only a control group. Moreover, action research studies represent 11.8% of the total articles. We obtained a total of seven subcategories that describe the educational programs depending on the nature of the creativity or well-being variables explored in the research (Table 3).

**Table 3**
*Subcategories for variables*

| Subcategory | Definition | Percentage |
|---|---|---|
| Verbal creativity | Creativity from the verbal perspective (language use). Programs aimed to foster the ability to interpret, analyse, understand or produce written or oral text creatively and critically. | 14.7 |

| Subcategory | Definition | Percentage |
|---|---|---|
| Motor creativity | Related to creativity from the kinesics domain (movement and corporal coordination). | 2.9 |
| Mathematic creativity | Creativity from the domain of logical-mathematical. | 2.9 |
| Musical creativity | Creativity from the musical domain. | 0 |
| General creativity | Related to creativity from a general perspective. Programs aimed to foster the general creative ability to find different solutions to complex problems. | 29.4 |
| Well-being | It is related to the emotional component in terms of regulation and improvement in the inter- and intrapersonal regulations. | 11.8 |
| Variables combination | It refers to the combination of different aspects, previously mentioned, whose program aims to be fostered simultaneously. | 38.2 |

Table 3 shows the percentage of each subcategory in terms of programs nature. There is a highest percentage of variable's combination, followed by general creativity one. We highlighted the following combinations: well-being and general creativity (11.4%); well-being and verbal creativity (2.9%); verbal and graphic creativity (2.9%); mathematical and musical creativity (2.9%); well-being and motor creativity (5.7%); well-being and musical creativity (2.9%); well-being, musical and motor creativity (2.9%); well-being, verbal and graphic creativity (2.9%) and well-being, musical and graphic creativity (2.9%). Nevertheless, creativity from different domains represents the lowest percentages: verbal (14.3%), motor (2.9%) or mathematical (2.9%).

Moreover, the tendency or interest of each variable should be highlighted according to the educational stage where they are present. Table 4 shows the frequency and percentage for each stage and variable promoted in the studied programs.

**Table 4**
*Educational stage and studied variables in the research articles*

| Educational stage | Variables | Frequency | Percentage |
|---|---|---|---|
| Early Childhood Education | Verbal creativity | 2 | 28.6 |
| | General creativity | 3 | 42.9 |
| | Well-being | 1 | 14.3 |
| | Combination of variables | 1 | 14.3 |
| | Total | 7 | 100 |
| Primary Education | Verbal creativity | 2 | 12.5 |
| | General creativity | 3 | 18.8 |
| | Well-being | 3 | 18.8 |
| | Mathematical creativity | 1 | 6.3 |
| | Combination of variables | 7 | 43.8 |
| | Total | 16 | 100 |
| Secondary Education | General creativity | 3 | 42.9 |
| | Motor creativity | 1 | 14.3 |
| | Combination of variables | 3 | 42.9 |
| | Total | 7 | 100 |
| Primary and Secondary Education | Verbal creativity | 1 | 50 |
| | Combination of variables | 1 | 50 |
| | Total | 2 | 100 |
| All stages presence | General creativity | 1 | 50 |
| | Combination of variables | 1 | 50 |
| | Total | 2 | 100 |

As Table 4 shows, there is a prominence presence of studies where creativity is analysed in its general domain through diverse educational programs aimed towards Early Childhood Education, followed by the presence of verbal domain creativity. Nevertheless, in Primary Education stage, there is a highest percentage of studies with a combination between multiple variables where the more frequent combinations are general or specific domain creativity alongside well-being. Moreover, there is also a

considerable presence of general creativity and well-being independently, specially for the improvement of motivation, self-esteem, interpersonal relationships and physical activity through different educational programs. In Secondary Education, we found the lowest quantity of studies and programs, but general creativity was the highest studied variable. The less studied variables were well-being in Early Childhood Education, mathematic creativity in Primary Education and motor creativity in Secondary Education.

In the case of variable combinations, verbal and graphic creativity are present in Early Childhood Education. In Primary Education there are two programs related to well-being and motor creativity and one program per these combinations: well-being and general creativity; well-being and verbal creativity; musical and mathematic creativity; well-being, musical and motor creativity; and well-being, musical and graphic creativity. Finally, in Secondary Education, we found the combination of general creativity and well-being.

For studies where different educational stages were involved, there are one program based on well-being, verbal and graphic creativity in Primary and Secondary Education. For the category of every educational stage there is one combination of musical creativity and well-being.

Table 5 shows an analysis of empirical studies regarding the explanation of interventions proposed in the articles, evaluation instruments and description about results and interpretations.

**Table 5**
*Empirical studies Analysis*

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Hui et al. (2020) | 78 students (4 and 5 years old) | Dialogic reading group. Sequence: Prompt-Evaluate-Expand-Repeat. 5 questions technique (Completion, Recall, Open-ended, Wh-words, Distancing). EMPATHICS elements (Empathy, Meaning and Motivation, Perseverance, Time, Habits of Mind, Intelligences, Character Strengths, and Self Factors). | The Peabody Picture Vocabulary Test IV, Edmonton Narrative Norms Instrument Y Storytelling task | Significant difference between groups in the syntactic structures and best results after using the reading material proposed in the program. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Muñoz-Repiso and Caballero-González (2019) | 131 students (from 3 to 6 years old) | Computational thinking exploration with the program called: TangibleK. Use of the robot called *Bee-bot*, sequence creation, action-instruction correspondence and debugging through error detection. Ludic challenges of programming. | "SSS" rubric | Improvement and difference between groups in general creativity related to the problem-solving strategies and computational thinking. |
| Garaigordobil and Berrueco (2011) | 86 students (5-6 years old) | Sessions divided in three stages: opening phase (game objectives), development phase (games for verbal, graphic, dramatic and plastic creativity through cooperative interaction), closing stage (reflection). | *Torrance Test of Creative Thinking* (TTCT), behaviours and personality traits scale. | Difference between groups and improvement in verbal and graphic creativity. Significant improvement in the creative behaviour. No difference among genres. |
| Bai et al. (2020) | 155 students (3-6 years old) | *Thinking Ability Structure Model* program based in three dimensions: content (materials knowledge), method (thinking strategies) and thinking quality (fluency, flexibility, critical evaluation, depth and originality). | TTCT | Improvement in the general creativity, especially in originality and elaboration indicators. Nevertheless, some participants improved in fluency. |
| Özgenel et al. (2019) | 129 participants (48-60 months) | Arts and music enrichment with materials and techniques. | TTCT (figurative) | Creativity improvement for each indicator in 81 participants. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Piñero Ruiz et al. (2017) | 52 Early Childhood Education students | Yoga, tales reading, painting, clay working and Chinese play activities. | Family drawing test (Corman, 1967) | Well-being improvement (virtues and strengths from Positive Psychology). |
| Skibbe and Foster (2019) | 2428 Early Childhood Education partici-pants | Program based on distribution of literary materials among families of participants. | *Phonological Awareness Literacy Screening-kindergarten* and questionnaires | Reading improvements (better results in phonological awareness). No differences among orthographical tasks. Families' satisfaction with the program. |
| Vicol et al. (2024) | 146 fourth grade parti-cipants | Sessions based on creative writing skills (narrative voice, characterization, setting, language, dialogues, image, scenery and plot). | *Creative writing skill assessment grid* | Difference between groups and improvement on verbal creativity. |
| Azaryahu et al. (2024) | 86 fourth grade students | Fractions, rhythmic patterns and creative thinking learning intervention. Music and mathematic combination. | Mathematic and musical test; creative task. | Significant difference between groups (highest score in the experimental group) on the mathematic and musical creativity. |
| Domínguez Cacho and Castillo Vera (2017) | 91 students (45 in fifth grade and 46 in sixth grade of Primary Education) | Free-creative dance program in the Physical Education area along with self-esteem on physical abilities, expression, emotional regulation, interpersonal relationships and self-awareness of the body. | Multimedia y Multilenguaje de Evaluación de la Autoestima (CMMEA) questionnaire (multimedia and multilingual self-esteem evaluation) | Well-being improvement (self-concept and emotional regulation) through motor creativity practice. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Kobsiripat (2015) | 60 participants in scholar age | Use of Scratch for programming and creation of digital media. | TTCT | General creativity improvement through the computational thinking skills development. |
| Akdal and Sahin (2014) | 42 participants of fifth grade of Primary Education | Intervention based on intertextual reading approach. | *Creative Writing Rubric* | Verbal creativity improvement. Originality and vocabulary richness scored the highest in the experimental group. |
| Ginman et al. (2022) | 59 participants (10-11 years old) | Music and movement use. Listening, singing, collaborative writing, creative dance combined activities. | *Social Interaction Test* | Well-being improvements from the social perspective through motor and musical creativity. |
| Gu et al. (2019) | 172 participants (7-12 years old) | Training program based on "Inclination, ideation, Interaction, Identification and Inspiration" (Gu et al., 2019, p. 93-94) | Alternative use, drawing and guessing tasks | General creativity improvement on proposed tasks. All creative indicators improved except flexibility. |
| Sarria-Martínez et al. (2023) | 55 participants (8-13 years old) | Emotional Intelligence development through artistic and musical activities. | TMMS-24 questionnaire | Well-being improvement (emotional dimensions) through graphic and musical creativity. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Castillo Viera et al. (2021) | 294 sixth grade participants | Dramatization techniques (week lessons). Spontaneity, symbolic game, improvisation... Three elements from the dramatic act (presentation, climax and ending). | CMMEA | Well-being improvement. Significant improvement on motivation and emotional expression (especially on the feminine gender). |
| Hugerat et al. (2020) | 188 participants from two Primary Education schools. | Lessons based on science curriculum using didactic games. | Motivation, environment and achievement instruments and interviews. | Well-being improvement (motivation to learn science and the classroom atmosphere perception) |
| Theocharidou et al. (2018) | 32 participants (10 y 12 years old) | Program based on the guided discovery and the divergent production. Movement Laban theory is used for creative dance. | Kidscreen-52 (Kidscreen Group Europe, 2006). | No significant difference in the general well-being variable. There is only an improvement on the mental state and on the learning after the intervention about motor creativity. |
| Ndiung et al. (2019) | 101 fifth grade participants | Intervention based on the creative learning Treffinger model phases and the RME (realist mathematic education) principles. | Assessment rubric, creative thinking ability test, numeric ability test. | Significant difference on creativity between groups (highest score on the mathematic model learning). |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Ponce-Delgado et al. (2024) | 200 participants (9 - 11 years old) | Program based on the creative problem-solving methodology (workshop collaboration with Museo Nacional de Ciencias Naturales and el Jardín Botánico Real from Madrid). | *Children's Creativity Test* | General creativity improvement (collaboration among social agents, problem solving, ludic and fantasy improvement activities) |
| Patan and Kucuk (2022) | 15 participants (13 years old average) | Creativity and imagination improvement activities from the science area. | *Nature of Science Student Questionnaire y semi-structured interviews* | Improvement on creative self-concept and the role it plays on the problem-solving strategies. |
| Kijima et al. (2021) | 103 participants (13 - 18 years old) (feminine genre) | Design thinking workshops through problem solving activities (prototypes creations with recycled materials). | Questionnaires based on the interest towards diverse subjects, creative self-confidence, professional plans, growth mindset, failure perception, STEM aspirations and the prosocial construct. Interviews were also used. | Program contribution to verbal creativity and well-being. Improvement on self-confidence creativity, prosocial attitudes and empathy. |
| Ozkan and Umdu Topsakal (2019) | 74 participants (13-14 years old) | STEAM-based program (strength and energy contents) | TTCT | Significant difference on general creativity (verbal and figurative) between groups. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Zhan et al. (2023) | 94 participants (13-16 years) | STEAM-based courses based on the design of two projects (masks and 3D glasses) divided into four phases. | Creative thinking test, Williams's creativity aptitude test (WCAT), Basic Empathy Scale (BES) | Creativity and well-being improvement. Creative thinking and aptitude improvement. There was no significant difference on general empathy against the significant difference for the cognitive empathy. |
| Salinas-López et al. (2015) | 26 participants (8-9 years old) | Didactic unit based on motor creativity. Lessons are structured in pairs, trios or group working tasks. | Creative thinking on action and movement test. | Motor creativity improvement (significant improvement on originality and fluency). Non-significant improvement on imagination. |
| Morelato et al. (2019) | 95 participants (9- 14 years old) | 3 phases intervention: emotional identification; associative creativity through images and rhymes; resilience development. | Resilience questionnaire, Problem solving in vulnerability familiar situations (Solución de problemas en Situaciones de Vulnerabilidad Familiar - SPVF), Graphic Creativity Test and Unusual use Test. | Verbal creativity and well-being improvement. Improvement on emotional identification (reduced group), alternative generation to situations and fluency, flexibility and originality indicators. There were no changes on resilience and graphic creativity. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Jenaro-Río et al. (2018) | 32 participants (from 4 to 14 years old) | Group or individual tasks through artistic techniques (painting on canvas, three-dimensional work, recycled-based tasks, illustrated tale creation or stop motion film creation. | PIC-N: Prueba de imaginación creativa en niños (Creative Imagination test in children | General creativity improvement. Flexibility improvement. Significant difference in narrative and general creativity after intervention (experimental group). |
| Vyacheslavovna et al. (2016) | 10 participants (Primary Education and Secondary education) | Artistic technique uses for the expression of students (psychodrama, dance movements, drawing, role modelling). The aim is to activate creative potential and to prepare participants for the workforce. | *"Who am I?" test, "Self-esteem ladder",* questionnaires, action-based analysis, *Vishnyakova's "Creativity" test* | Program contribution to creativity and well-being. Creative self-confidence and motivation improvement in the development of creative tasks. There was an increase of 20% in fifth and sixth grade (11-12 years old). |
| Litvinova et al. (2020) | 65 participants in scholar age | Art-therapy lessons through artistic activities. | *Ilyin tapping test y Heckhausen motivation test* | Well-being improvement. Symmetry of movement improvement. Masculine genre obtained an increase on self-efficacy, strength and lability of nervous system. Expectation of success increased, and the sense of personal inadequacy decreased in the feminine participants. It concludes with the need for gender separation in the creative activities. |

| Study | Participants | Intervention techniques in the program | Instruments | Results and interpretations |
|---|---|---|---|---|
| Ruiz Gómez (2021) | 20 participants (11 - 13 years old) | Reading workshop through different text types (audiobook, kamishibai theatre and video stories). Reading and writing based activities. Creation and publishing of a collaborative literary result. | Performance analysis and interviews | Verbal creativity and well-being contribution. Lack of reading habits is because of the lack of motivation towards it. |
| Hyungsook (2015) | 26 Primary Education participants (scholar violence victims) | Community use of artistic education for encouraging resilience through expression (stories and video creations through art) | Performance analysis and interviews | Contribution to creativity and well-being (enjoyment, self-esteem and flexible thinking development). |
| Özer and Doğan (2024) | 218 Secondary Education participants | Intervention based on problem solving and creativity tasks alongside scientific literacy | *Views about Scientific Inquiry Questionnaire (VASI)* | Creativity improvement (problem solving process) |
| Roig Telo and Hofman, (2021) | 359 Primary and Secondary Education participants | Intervention with storytelling as a creative technique in the classroom and with a boardgame enhancing the literary and fictional co-creation. | Performance analysis | Verbal creativity contribution. |
| Jeanneret and Brown, 2012 | 160 participants (3 - 13 years old) | Musical experiences through the contact with professional musicians. | Opinion questionnaires | Musical creativity and well-being contribution. |

The empirical studies analysis establishes that programs or interventions obtained a favourable result regarding verbal and well-being variables. Additionally, the aim of every intervention analysed in the articles is to promote

well-being, creativity or both variables, but there is a conceptual distance among these studies because of the diverse techniques, activities, tools and strategies used and the different evaluation instruments to evaluate the effectiveness. We found creativity assessment tools such as TTCT (Torrance, 1974) or other more domain-specific as creative writing tests (e.g. Bai et al., 2020; Akdal y Sahin, 2014), while for well-being assessment there are tests like Dibujo de la familia (Family Drawing test by Corman, 1967), KidScreen52 (Kidscreen Group Europe, 2006). Indeed, programs are also evaluated through performance and tasks analysis developed by participants.

Didactic program description is based on the development of modules, workshops, lessons or didactic units based on the area or variable to be explored. Verbal creativity is promoted through techniques such as storytelling, *interactive reading*, story creation, rhyme creation, didactic games or family participation (Hofman, 2021; Hui et al., 2020; Morelato et al., 2019; Ruiz Gómez, 2021; Skibbe & Foster, 2019; Vicol et al., 2024); graphic creativity is present through artistic techniques (Jenaro-Río et al., 2018; Litvinova et al., 2020; Morelato et al., 2019; Sarria-Martínez et al., 2023); musical creativity is promoted through dance and contact with *professional musicians* (Domínguez Cacho & Castillo Vera, 2017; Neryl & Brown, 2012). For general creativity, there is an inclusion of problem-solving strategies, creative process teaching or technology and science projects (Bai et al., 2020; Gu et al., 2019; Kijima et al., 2021; Kobsiripat, 2015; Muñóz-Repiso & Caballero-González, 2019; Patan & Kucuk, 2022; Ponce-Delgado et al., 2024; Ozkan & Umdu, 2019; Zhan et al., 2023). The combination of different creative domains is also present like mathematical and musical (Azaryahu et al., 2024) or motor and musical (Ginman et al., 2022; Theocharidou et al., 2018).

Enjoyment, motivation, resilience, interpersonal relationships, emotional awareness or the self-awareness and self-esteem are aspects from intervention whose studied variable is well-being either direct or indirectly (Domínguez Cacho & Castillo Vera, 2017; Hugerat et al., 2020; Hui et al., 2020; Morelato et al., 2019; Sarria-Martínez et al., 2023).

## CONCLUSION AND DISCUSSION

The present research article establishes the necessity to analyse the current situation regarding the educational field and its practical programs based on creativity and well-being development. This analysis has the objective to acknowledge didactical practices throughout different educational stages from early childhood to secondary education. Results shows that educational interventions were evaluated through pretest-post-test and control group design, and they also were aimed to evaluate emotional or creative ability. Nevertheless, there are research articles

whose instrument for gathering information was the current program, as proposed by Alves-Oliveira et al. (2022). These publications, in which evaluation is based on the analysis of creative process tasks and final product, represented the lowest percentage of the total studies analysed. This is likely due to the high scientific rigor and complexity that imply the assessment of creative process. (D'Souza, 2021).

There was a high presence of general creativity because of the general domain perspective and the little-c description of creativity (Kaufman & Beghetto, 2009; Qian et al., 2019), as explained in Alves-Oliveira et al. (2022) whose research reviews different creative programs without establishing the specific domain of creativity in any of them. Nevertheless, creative potential is also present in the linguistic domain as expressed in the third category with the highest percentage of studies and the highest present domain. D'Souza (2021) had already proposed verbal creativity through the evaluation of written tasks and its analysis based on narrative characteristic. Furthermore, verbal creativity is encouraged through different methods based on reading and writing skills, aligned with the reading and linguistic competency development (Hui et al., 2020; Piñero Ruiz et al., 2017; Ramamurthy et al., 2024; Ruiz, 2021; Skibbe & Foster, 2019).

PIRLS (*Progress in International Reading Literacy Study*) identifies that reading comprehension process requires the encouragement of cognitive resources to interpret a text, and it involves the use of creativity from the verbal domain (Mullis & Martin, 2019; Jiménez-Pérez, 2024). Hence, literature field proposes the example to enrich the general perspective of creativity by opening a space for specific-domain creative analysis where language and literature complexities are acknowledged (Goleman et al., 2023). Furthermore, literature field propose a contribution to well-being through strategies or techniques like the dialogic reading, debate groups, workshops or intertextual practices where incorporate emotional self-awareness, empathy development of resilience reinforcement (Akdan & Sahin, 2014; Hui et al., 2020; Ramamurthy et al., 2024; Vargas-García et al., 2020).

Results also establish the presence of individual creative and well-being development where both variables are fostered and analysed together. Therefore, this result also supports the existence of well-being and creativity interaction proposed by the Positive Psychology framework where positive traits theory, the flow theory, the positive emotions and institutions are present (Isham & Jackson, 2023; Zhang & Wang, 2024). Indeed, it aligns with Lubart et al. (2019) perspective regarding the role of the emotional condition and experiences as ingredients to encourage creative potential.

Additionally, well-being is present independently in didactic programs interventions through aspects such as motivation, emotional awareness, self-esteem interpersonal relationships, empathy, resilience or virtues and strengths (Losada-Puente et al., 2022). Thus, it supports the idea that emotional, cognitive

and motivational states are key for the learning development and for their future adult life (Darfler & Kalantari, 2022; Valero-Esteban et al., 2024; Sayalı et al., 2023; Subero & Esteban-Guitart, 2023).

For the difference in each educational stage, there is a high presence of research articles based on general creativity in Early Childhood and Secondary Education and it aligns with what Zhang et al. (2024) found in the case of Early Childhood stage as this educational phase is crucial for the individual creative development. In Primary Education stage there is a high percentage of articles based on the variable combination where well-being is noticeable. This result is supported by OECD (2019) proposal regarding the importance of attending the well-being. However, our current research has only found presence in the psychological, social and physical fields against the cognitive and material absence. Moreover, there are few interventions focused on mathematical creativity in primary education, as highlighted by Leikin and Sriraman (2022). Their findings showed high presence of mathematical creative programs based on multiple solutions, open answer, problem proposals and the encouragement of the creative insight.

In Secondary Education stage, the creative presence might be justified by the growing interest by PISA framework (*Programme for International Student Assessment*) on creative thinking evaluation from different fields and, therefore, from its general domain (Palomino & Flores, 2021; OCDE, 2024). Nevertheless, there is a decrease on the number of programs based on well-being compared to Early Childhood and Primary Education stages. This decrease may be attributed to the increasing emphasis on knowledge at the expense of the emotional aspects as students' progress through educational stages (González-Moreno & Molero-Jurado, 2022).

Additionally, Table 5 showed programs that involved an improvement, a significant difference or a contribution to well-being or creativity variables. This finding aligns with Samaniego et al. (2024)'s perspective regarding the need of proposing different pedagogical perspectives to encourage the creative possibilities where we highlight STEAM practices, cooperative project working or challenges from the analysed (Hyungsook, 2015; Kijima et al., 2021; Muñoz-Repiso & Caballero-González, 2019; Ozkan & Topsakal, 2019). In that sense, there will be a holistic improvement on the creative and well-being potential through different innovative experiences that encourage interdisciplinary approaches (Samaniego et al., 2024; Lubart et al., 2019). Nevertheless, Iglesias-Díaz & Romero-Pérez (2021) found that teaching competences are key to create a positive environment in the classroom that contributes to individual and general well-being through participation, cooperation, respect and trust, as expressed in some of the analysed articles (e.g., Castillo Vera et al., 2021; Hugerat at al., 2020; Kijima et al., 2021; Vyacheslavovna et al., 2016; Zhan et al., 2023).

Moreover, general domain creativity is present in research articles where creative process is taught and implemented in the intervention based on phases like preparation, incubation, insight and verification (Kurtis, 2021). These programs evaluate the creative improvements through evaluation instruments used for the general domain (González-López et al., 2024). Nonetheless, results also showed a lowest percentage for specific domain creativity such as verbal, mathematical, motor or musical (e.g., Azaryahu et al., 2024; Domínguez et al., 2017; Vicol et al., 2024).

It is also crucial to mention the combination of computational thinking and general creativity as established by Sánchez-Camacho & Grané (2023), whose results showed a creative perspective from the programming environment of Scratch by encouraging the use of information and communication technologies (ICT) in the classroom from a creative perspective. Indeed, the inclusion of ICT in the classroom establishes the interest on these resources in the educational field due to its current development (e.g. artificial intelligence). Therefore, its incorporation is key for the critical, holistic and creative learning process (Fiallos López et al., 2023; Huang et al., 2023; Murtiningsih et al., 2024; Vicente-Yagüe et al., 2023). Nevertheless, human factor represents a crucial role in the development of didactic and optimal experiences because, according to the Positive Psychology framework, positive relationships contribute to individual well-being within the scholar environment (Peña Julca, 2021). Indeed, interpersonal relationships are identified as an essential element in some of the analysed programs where the combination between creativity and well-being also highlights the connection with positive environment and institutions (Hyungsook, 2015; Ponce-Delgado et al., 2024; Skibbe & Foster, 2019; Williams, 2020).

In the case of well-being factors, González-Moreno y Molero-Jurado (2022) showed the relationship between self-esteem and creativity in different research articles and this result aligns with the current research findings regarding the presence of the well-being through didactic practices based on general or specific domain creativity like creative dance, reading and writing, collaborative or artistic tasks (e.g. Domínguez Cacho & Castillo Vera, 2017; Litvinova et al., 2020; Piñero Ruiz et al., 2017; Sarria-Martínez et al., 2023). In this regard, Ramamurthy et al. (2024) highlighted the importance of promoting reading experiences to reinforce students' resilience and, in the same way, their well-being.

Regarding limitations in this research article, the methodological diversity among the analysed articles might be considered because of the difficulties on comparison and contribution measures. Moreover, due to the conceptual variety in terms of the studied variables, the diversity among evaluation instruments might hinder the comparison between studies results. Additionally, the eligibility criteria exclude documents such as thesis, book chapters or even books as

well as the didactic practice that are analysed from a theoretical perspective. Furthermore, there is no verification of the effect of the programs after the end of the research process and the research publication, so there is no evidence on long-term benefits or drawbacks that these educational programs could have on participants.

In any case, according to the general objective of this research study based on developing a systematic review on creative and well-being programs within 2010 and 2024 from Early Childhood to Primary Education stages, we conclude that there is a need to continue proposing different didactic experiences that encourage creative and well-being development along different stages. Indeed, there is evidence of programs that combine well-being and creativity to answer to the transversal conception promoted within the educational field. This seeks to attend quality in education as proposed in the SDG. Nevertheless, we have established that there is a moderate promotion of creativity from specific areas of knowledge. Hence, the principal implication of this research article for educational practice, regardless of its limitations, is to continue the creation of learning situations based on the creative and emotional development from different areas and different techniques, strategies or tools. This article seeks to be used as a reference not for evidence weaknesses in the scholar field, but to highlight the importance of the educator role and to foster its work towards the design of experiences that foster creativity and well-being in the classroom to highlight opportunities in the quality and positive education field.

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# FOURCHAT: intervention aimed at promoting the critical use of ChatGPT in university

## *FOURCHAT: intervención orientada a promover el uso crítico de ChatGPT en la universidad*

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## ABSTRACT

This study evaluates the effectiveness of FOURCHAT (FOrmación Universitaria en uso Responsable de CHATgpt), an educational intervention designed to promote the critical and responsible use of ChatGPT among university students. The research, which included 150 students of three different degrees (111 in the experimental group and 39 in the control group), analyzed changes in trust towards ChatGPT results and information verification behaviors, also examining the relationship of these variables with digital responsibility and critical thinking. For this, pre- and post-intervention measures were performed, comparing both groups through factorial ANOVAS and linear regressions. The results show that the intervention was effective, especially in increasing verification behaviors in the experimental group, while these decreased in the control group. Likewise, digital responsibility showed a significant relationship with reduced trust and increased post-intervention verification behaviors. In conclusion, this work highlights the importance of training students in the ethical use of artificial intelligence tools to favor their academic development and promote optimal inclusion of these technologies in higher education.


**Keywords:** artificial intelligence, ethics of technology, digitalization, responsibility (education), critical thinking, higher education


## RESUMEN

Este estudio evalúa la efectividad de FOURCHAT (FOrmación Universitaria en uso Responsable de CHATgpt), una intervención educativa diseñada para promover el uso crítico y responsable de ChatGPT entre estudiantes universitarios. La investigación, que contó con 150 estudiantes de tres grados diferentes (111 en grupo experimental y 39 en control), analizó los cambios en la confianza hacia los resultados de ChatGPT y las conductas de comprobación de la información, examinando además la relación de estas variables con la responsabilidad digital y el pensamiento crítico. Para esto, se realizaron medidas pre y post intervención, comparando ambos grupos a través de ANOVAS factoriales y regresiones lineales. Los resultados muestran que la intervención fue efectiva, especialmente en el incremento de conductas de comprobación en el grupo experimental, mientras que estas disminuyeron en el grupo control. Asimismo, la responsabilidad digital mostró una relación significativa con la disminución de la confianza y el aumento de las conductas de comprobación post-intervención. En conclusión, este trabajo destaca la importancia de formar al estudiantado en el uso ético de las herramientas de inteligencia artificial para favorecer su desarrollo académico y fomentar una inclusión óptima de estas tecnologías en la educación superior.


**Palabras clave:** inteligencia artificial, ética de la tecnología, digitalización, responsabilidad (educación), pensamiento crítico, educación superior

## INTRODUCTION

In recent years, the unstoppable advance of Artificial Intelligence (AI) has revolutionized multiple sectors, from medicine to entertainment. However, its most significant influence has been felt in the academic field, where AI has emerged as a transformative tool (Zawacki-Richter et al., 2019). This revolution has intensified with the arrival of generative AI tools, such as ChatGPT (OpenAI, 2023).

On one hand, ChatGPT offers significant benefits, such as the ability to analyze and synthesize large volumes of information (Zawacki-Richter et al., 2019) or provide quick and, generally, coherent responses to user queries (OpenAI, 2023). However, it also presents important limitations, such as the difficulty in establishing effective filters and restrictions (Bond et al., 2024), the existence of significant biases in training data (Lim et al., 2023), or the tendency to generate false or invented information, including non-existent citations, authors, or facts (Bond et al., 2024).

This has generated concern in the educational community, which faces the challenge of integrating these tools appropriately and ethically into teaching-learning processes. Unfortunately, in many cases, improper use of AI in academic work has been observed, manifesting in practices such as plagiarism or text manipulation to try to avoid detection (de Frutos et al., 2024; Sallam, 2023; Segarra et al., 2024). Although work is being done on regulations to make explicit when AI is used in an academic text, and there are tools that can help detect when a text has been generated or modified with AI, these have significant limitations, and, moreover, the development of new applications capable of evading these controls also advances at a dizzying pace (Grace et al., 2023).

Faced with this situation, some institutions have opted to establish protocols or even prohibitions in an attempt to regulate their use, measures that require time for implementation and that are not always effective given the accelerated pace with which AI is incorporated into our daily lives (García-Peñalvo et al., 2024); therefore, it has been pointed out that prohibiting or developing restrictive protocols will hardly manage to regulate the responsible use of AI or guarantee its adequate use (García-Peñalvo, 2023).

Considering all of this, it is evident that a possible viable and effective solution is to accept its use and integrate it in the best possible way in the academic context (García-Peñalvo et al., 2024; López et al., 2023). This would mean that, instead of adopting a defensive or rejecting stance, educational institutions would assume a proactive and constructive approach, focused on training the academic community for ethical, responsible, and critical use of AI (Floridi et al., 2018; Murtaza et al., 2022). Implementing this would imply, on one hand, providing faculty with the training and resources necessary to integrate these tools into their teaching practice effectively and pedagogically (Ocaña-Fernández et al., 2019); and, on the

other hand, it would involve implementing training programs aimed at developing students' digital competencies, critical thinking, and ethical awareness, harnessing the potential of AI while being aware of its limitations and risks (Bond et al., 2024; Vega et al., 2023). Only from this perspective, based on realistic acceptance and responsible integration of AI in the academic context, could it be possible to successfully face the challenges posed by this technological transformation and turn it into an opportunity to enrich and improve educational processes (UNESCO, 2021; Chen et al., 2020).

It is in this framework where the importance of the educational community facing the challenge of integrating generative AI in teaching-learning processes emerges. This integration must be both in the cognitive aspects of learning (that is, related to the mental processes of students; Sternberg & Sternberg, 1996), as well as in the behavioral ones (which refer to observable behaviors of students; Schunk, 2012). Cognitive processes in students involve the acquisition, processing, and application of information, while behavioral processes are manifested in active participation, interaction with others, and the performance of tasks (Zimmerman and Schunk, 2011). Therefore, it is important that this integration of AI is both in how students think, as well as in how they act (Mayer, 2002).

Additionally, systematic reviews such as that of Batista et al. (2024) regarding the integration of AI in academic work indicate the need to generate clear guidelines to ensure compliance with academic standards and promote conscious use of these tools. This need is supported by research such as that of Wang et al. (2024) in 104 American universities, which reveals a growing trend towards the implementation of pedagogical strategies specifically designed to develop students' critical thinking. Empirical evidence suggests, therefore, that the integration of generative AI in academic contexts should be based on two essential pillars: digital responsibility and the development of critical thinking. These pillars will be detailed below.

## Digital Responsibility

Digital responsibility refers to the capacity to use digital tools consciously, taking into account the ethical and legal implications of online activity (Jara and Ochoa, 2020). This concept is closely related to digital ethics, which refers to the set of principles and values that should guide the behavior of individuals in the digital environment, promoting responsible, respectful, and conscious use of technologies (Floridi et al., 2018).

Currently, the European Union is legislating about the ethical and responsible use of AI, seeking to make systems and platforms transparent with their results, including the disclosure of when content is generated by AI and the prevention of illegal and/or copyrighted content (Madiega, 2024). However, much of the ethical

and responsible use remains in the hands of the end user, who must internalize that AI should be used consciously.

In the specific context of using ChatGPT, this implies avoiding practices such as plagiarism or improper appropriation of texts through the simple action of "copy and paste" (Jara and Ochoa, 2020). Likewise, it entails assuming an active and committed role in the management of AI tools, which translates into the need to properly identify and cite the sources of information used by the model to generate its responses (Baidoo-Anu and Ansah, 2023).

This practice is not only fundamental for recognizing the work of the original authors and avoiding plagiarism, but it also allows the user to assess the quality and reliability of the sources used by the AI, a key aspect for determining the confidence that can be placed in the results obtained (Lim et al., 2023). Additionally, digital responsibility implies understanding that the output generated by ChatGPT is not a final product, but raw material that requires review, editing, and elaboration by the user, to adapt it to their specific needs and the academic context in which it is framed (Bond et al., 2024).

## Critical Thinking

Critical thinking is another fundamental competence that acquires special relevance in the context of using AI tools. It is a mental process that involves analyzing, evaluating, and questioning information in a reflective and well-founded manner, to form reasoned judgments and make informed decisions (Dwyer et al., 2014). In the specific case of interaction with ChatGPT, it means adopting an active and inquiring stance towards the results generated by the tool, avoiding accepting them immediately or placing blind trust in them (Vega et al., 2023).

This implies, on one hand, being aware of the potential limitations and biases of AI, and understanding that, although it can offer coherent and apparently well-founded answers, these are not always complete, accurate, or impartial (Lim et al., 2023). On the other hand, critical thinking in relation to ChatGPT entails assuming the responsibility of verifying and contrasting the information obtained, resorting to reliable external sources and contrasting the data and arguments presented by the AI with prior knowledge and with other opinions or theories on the topic (Bond et al., 2024). This prior knowledge can come, for example, from sessions with teachers or from the user's own experience.

This attitude of constant questioning and checking is essential to develop a realistic trust in the tool, based on the understanding of its strengths and weaknesses (Baidoo-Anu and Ansah, 2023). Likewise, critical thinking involves reflecting on the intentionality and context in which AI responses are framed and assessing their adequacy and relevance in relation to the specific objectives and needs of the

user in each situation (Parra-Sánchez, 2022). In fact, interventions with students such as that of Liu and Wang (2024) and research such as that of Ruiz-Rojas et al. (2024) indicate that the use of generative AI tools even increases critical thinking behaviors in students, due to the need to evaluate and synthesize the large amount of information these tools provide.

## FOURCHAT: Training in Digital Responsibility and Critical Thinking

As we can see, digital responsibility and critical thinking are essential competencies that every student must develop. In an educational context increasingly permeated by digital technologies, and, in particular, by generative AI tools like ChatGPT, the acquisition of these skills is fundamental to ensure an adequate, reflective, and responsible use of these resources (UNESCO, 2021). For this reason, it is very important that these learnings are developed preferably at the beginning of their academic training, as this will not only lay the foundations for them to be trained as competent and reliable professionals, but will also contribute to their integral development as citizens, preparing them to face the challenges of an increasingly digitized world (Murtaza et al., 2022).

Recent interventions in the academic world demonstrate a growing interest in integrating digital responsibility and critical thinking in higher education. For example, in Norway, Styve et al. (2024) implemented a framework to develop critical thinking practices intertwined with the use of generative AI in an introductory programming course, obtaining positive results in fostering students' critical awareness. In turn, in the United States, Wood and Moss (2024) integrated the responsible use of generative AI in master's subjects, finding that structured teaching of good use of these tools can improve the understanding of their ethical implications. In Nigeria, Yusuf et al. (2024) implemented a program to improve critical thinking skills in the synthesis behaviors of AI-generated texts, demonstrating its effectiveness in graduate students.

However, there is a need to document more intervention experiences that specifically integrate these two dimensions—digital responsibility and critical thinking—in the university context, especially in Spain. As a result of this, a pioneering training with university students has been developed, focused on developing digital responsibility and critical thinking regarding the use of ChatGPT: FOURCHAT (*FOrmación Universitaria en el uso Responsable de ChatGPT* - University Training in the Responsible Use of ChatGPT).

FOURCHAT is a theoretical-practical training, in which the students themselves can interact directly with ChatGPT and verify for themselves the need for critical and reflective human intervention in working with generative AI (Lim et al., 2023). Likewise, this training helps to demystify the technology and develop a grounded

relationship of trust with it, based on understanding its potentialities and limitations, and on assuming an active and reflective role in its use (Baidoo-Anu and Ansah, 2023).

To evaluate the effects of this intervention, two variables have been considered: the first, at the cognitive level, relates to the degree of trust that students place in the veracity of the texts that AI produces (that is, how much they think that ChatGPT results are credible). The second variable, at the behavioral level, refers to the action of verifying the results that ChatGPT offers them, contrasting with other sources available for consultation. In this way, it can be evaluated if the intervention has been beneficial and effective, both in the way students think and in the way they act towards AI.

Therefore, the general objective of this research work is to evaluate the impact of the FOURCHAT intervention on the critical use of ChatGPT by university students, analyzing the changes in trust placed in the results, information verification behaviors, and examining the relationship of digital responsibility and critical thinking with these behaviors. This general objective consists of the following specific objectives: (a) to analyze the impact of FOURCHAT training on the trust that students place in the results offered by ChatGPT; (b) to analyze the impact of FOURCHAT training on the verification behaviors that students perform on the information offered by ChatGPT; (c) to analyze the relationship between digital responsibility with the level of trust and verification of students in relation to the results offered by ChatGPT; (d) to analyze the relationship between critical thinking with the level of trust and verification of students in relation to the results offered by ChatGPT.

Likewise, the one-directional hypotheses proposed are: ($H_1$) After the intervention, the experimental group trusts ChatGPT results less; ($H_2$) After the intervention, the experimental group verifies ChatGPT results more; ($H_3$) Digital responsibility is associated, negatively, with trust in ChatGPT results ($H_{3.1}$), and positively with verification of results ($H_{3.2}$); ($H_4$) Critical thinking is associated, negatively, with trust in ChatGPT results ($H_{4.1}$), and positively with verification of results ($H_{4.2}$).

## METHODS

### Design

The FOURCHAT intervention program was born from an educational innovation project recognized and funded by the university. For its creation, implementation, and evaluation, both professors and doctoral students and undergraduate students have participated. The study methodology was mixed, as qualitative methodology

(through a focus group) and quantitative (questionnaire) were used following positivist and interpretative paradigms. Likewise, the design was pretest-posttest with a control group, which allowed to compare observed changes between groups and times.

## Participants

The initial sample consisted of 221 undergraduate students. Of those 221, 168 were assigned to the FOURCHAT experimental group and 53 to the control group. The students come from first and second year of three degrees from the same university: psychology, labor relations, and tourism, although only in the groups where the responsible professors taught. The study population consisted of all the students where the involved professors taught (5 professors). The sampling was non-probabilistic, as the entire population was invited to participate; however, not all students attended class because participation was voluntary. It should be noted that, given that the variables of interest of this research study focus on the use that students make or made of ChatGPT (e.g., to what degree they verify the results they obtain through ChatGPT), a filter question about previous use of ChatGPT was added to the pretest questionnaire (i.e., "Have you ever used ChatGPT?"). Those students who had not previously used it were not considered for this research.

Therefore, the final sample consisted of a total of 150 students (111 from the experimental group and 39 from the control group). Regarding demographic characteristics, the mean age of the experimental group was 19.05 years, with a standard deviation of 1.87. This group was composed of 21 people of male gender, 89 of female gender, and one non-binary person. On the other hand, the mean age of the control group was 21.33 years, with a standard deviation of 1.75. This group was composed of 13 people of male gender and 26 of female gender.

## Procedure

The intervention is composed of the following phases:

*Phase 1 - Focus group on the use of ChatGPT*: During the first phase (2023-2024 academic year), all students were invited to participate in a focus group on ChatGPT. The call was made without providing additional information to avoid biases in the responses, and five female students volunteered to participate. Analysis of the focus group discussions revealed three main axes:

First, participants expressed concern about how ChatGPT could encourage avoidance of cognitive effort and deterioration of fundamental skills. As one

participant noted: "*[...] it's creating lazy people. 20 years ago, people read that 20-40 page report, now they don't [...] we're going to become very lazy"* (Student D). This concern is reinforced by another observation from the participants: *"it's very easy to succumb to laziness. Oh well, if I copy in this work it doesn't matter, in the next one I'll..."* (Student D).

Second, a particular concern emerged about the use of ChatGPT in educational levels prior to university and its possible consequences. One student highlighted: *"if you don't learn at that moment, when you get to university you won't know how to do it either"* (Student B), referring specifically to basic skills such as making summaries or text commentaries. This point relates to the observation of the same participant, related to *"it's true that in high school people are using it much more because in the end they are much easier topics that don't have the complexity of a university work, and in the end the chat has more than enough to make you a high school work"* (Student B).

Finally, the participants agreed that prohibition is not the appropriate solution, advocating for a more proactive educational approach. As one of them expressed: *"instead of demonizing ChatGPT, what the educational field should do is take a step forward and teach children and adults who are also studying to make good use and use it as an ally"* (Student C). This perspective is reinforced by the pragmatic observation of another participant: *"the question is to assume that people are going to use it. Whether they say yes or no, they will use it. Since they are going to use it, at least make it useful for something"* (Student B) and complemented by a second participant: "it would be better 'learn to use it well', not 'don't use it'" (Student A).

This proposal from the participants emphasized the importance of implementing specialized training programs in higher education that not only promote the responsible use of ChatGPT, but also contribute to the development of digital, ethical, and critical thinking skills among students. Thus, although the initial objective of the focus group was to gather information about the use of ChatGPT, the results pointed to a clear path towards the need for structured training by the faculty.

*Phase 2 - Development of training material and questionnaires*: The next phase consisted of developing the training material and questionnaires to measure the effectiveness of the intervention. The training material included aspects such as a brief introduction to AI, advantages, disadvantages, and risks of AI, the development of good prompts, ethical and legal aspects, and many examples of biases and/or errors in ChatGPT results obtained from the experience of academics and students. This material was developed by two professors with previous experience on AI in the academic world and served to implement phase 5 of the project (see Figure 1)

**Figure 1**
*Extract from the teaching material developed for FOURCHAT training*


For the preparation of the questionnaires, scales were sought to measure the use made of ChatGPT in terms of its reliability, ethical use, verification of results, among others. Specific information in this regard can be found in the measures section.

*Phase 3 - Teacher training*: The next stage of the intervention began with a series of meetings with the faculty in charge of implementing the project. The objective of these sessions was to train them in the necessary competencies to deliver the intervention contemplated in the FOURCHAT program and to jointly resolve any possible doubts that might arise. Therefore, the two professors who developed the teaching material explained to the rest of the professors involved (3 professors) how to use the material developed, standardizing the training and ensuring that everyone was on the same page in the explanation to the students.

*Phase 4 - Group preparation and pretest*: The students were randomly divided into an experimental group and a control group from the groups where the 5 professors had teaching duties. The assignment between the experimental group and the control group was done by lottery. There was no division within the groups, so all students in the same group (within their degree and subject) entered the control or experimental group. The experimental group carried out the entire FOURCHAT intervention, while the control group only carried out the pretest, a distractor activity, and the posttest. It should be noted that, for ethical-moral reasons and so that they would have the same learning opportunities as the rest of

their peers, once the entire intervention process was completed, the intervention for the experimental group was replicated for the control group.

*Phase 5 - Expository training (class and expert talk)*: In this phase, only the students from the FOURCHAT experimental groups actively participated. First, a session was held where the professors presented the previously prepared information on the good use of ChatGPT. As already mentioned, this training was the same for all students in the experimental groups.

Subsequently, a talk was given with an AI expert external to the university, where students could learn in a more practical way the ethical implications that its misuse could have in the work world. In this space, they could reflect on the ethical aspects of managing AI tools and how this impacts their future employability. This talk was recorded with the aim of reproducing the recording for all experimental groups.

*Phase 6 - Experiential activity with ChatGPT*: In this phase, both the experimental and control groups participated, although with different instructions.

In the experimental group, an activity was carried out where, following the subject's theme, they could test ChatGPT. First, they had to ask for scientific references on some topic of the subject, to see if they really existed; second, they had to test ChatGPT's answer on a topic of their choice and verify to what extent it offered ethical responses or presented biases or errors. The idea was for them to interact with the tool in order to verify all the answers that ChatGPT offered to detect its flaws.

In the control group, a distractor activity was carried out, where they only were asked to search for academic information on a topic of interest.

*Phase 7 - Posttest*: The last phase of the intervention corresponded to the response to the posttest survey, both for the experimental group and the control group. The variables were the same as in the pretest, although some questions were added about the satisfaction of having participated in the project and about the perceived effectiveness of the training program.

*Final results day*: As a first result of the intervention, the research team organized a presentation day of results, where all students were invited to send their class work. The research team selected those that had higher quality and presented more interesting results. The day functioned as a scientific congress: there was a first part of a small presentation on AI in the university environment and, subsequently, the selected student groups presented their work orally.

All these phases were carried out during the first semester of the 23-24 academic year. Therefore, the intervention lasted three months (from October to December), with 5 hours divided into 7 different days throughout the semester.

Student participation in the entire process was voluntary and completely anonymous. The questionnaires (pre and post) were answered through the

LimeSurvey platform, online. During classes, students had the link or QR available to access the questionnaire and fill it out at the time.

## Measures

The measures used in the study were as follows:

a) *Digital responsibility and critical thinking*: to measure these two variables, the questionnaire on the development of digital and socio-civic competence (DIGISOC) (Peart 2020; 2022) was used. Specifically, the dimensions of digital responsibility (5 items) and critical thinking (4 items) were used. The scale was a 5-point Likert-type anchoring (1=not at all agree; 5=strongly agree). Some examples of items are: *"Before performing a digital activity, I usually think about the possible consequences"* (for digital responsibility) and *"I am a person who is critical of the information that reaches me"* (for critical thinking). In the validation carried out by Peart et al. (2020), the general scale presented high reliability (α=.904).

b) *Trust:* To measure trust in the answers provided by ChatGPT, the following item was used: *"To what degree do you trust the information you obtain through ChatGPT?".* It was measured with a Likert-type scale with 5 anchor points (1=never trust; 5=completely trust).

c) *Verification:* An item was used to measure the degree to which students verify the results that ChatGPT gives them. The item was *"Do you usually check the veracity of the information you obtain through ChatGPT?"* This item was measured with a 5-point Likert-type scale (1=never check; 5=always check).

## Analysis

Different analyses were carried out with the IBM SPSS v.28 software. (IBM Corp., 2021). Central tendency descriptive statistics (means, standard deviations, kurtosis, and skewness), 2x2 factorial ANOVAs (time: pretest and posttest; group: experimental and control) were calculated and, finally, linear regression analyses were performed to evaluate the proposed hypotheses. These regressions separated by group and time allow us to examine whether the intervention strengthened the associations between the promoted competencies (digital responsibility and critical thinking) and specific behaviors (trust and verification), especially in the experimental group.

## RESULTS

### Descriptives

Table 1 shows the means of the different variables studied, distinguishing between the experimental and control groups, as well as between the pretest and posttest measures for each of the groups. Due to the importance of ensuring the adequacy of the data to a normal distribution, normality was evaluated considering the kurtosis and skewness values. These values, being within the range of -2 to +2, indicated a satisfactory fit of the data to a normal distribution (Ryu, 2011).

**Table 1**
*Descriptives of the studied variables*

| Variable | Time | Group | Mean | S.D | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Trust | Pretest | Experimental | 3.36 | .79 | -.52 | .39 |
| | | Control | 3.28 | .80 | -.15 | -.56 |
| | Postest | Experimental | 3.01 | .82 | -.09 | -.59 |
| | | Control | 3.04 | .76 | -.61 | .45 |
| Verification | Pretest | Experimental | 3.01 | 1.20 | -.05 | -.82 |
| | | Control | 3.36 | 1.44 | -.23 | -1.30 |
| | Postest | Experimental | 3.16 | 1.11 | -.10 | -.48 |
| | | Control | 3.02 | 1.20 | -.04 | -.91 |
| Digital responsibility | Pretest | Experimental | 4.13 | .55 | -.66 | .11 |
| | | Control | 3.91 | .56 | -.46 | .27 |
| | Postest | Experimental | 4.13 | .63 | -.76 | .27 |
| | | Control | 3.96 | .55 | -.44 | .29 |
| Critical thinking | Pretest | Experimental | 4.09 | .59 | -.59 | .11 |
| | | Control | 4.08 | .61 | -.39 | .07 |
| | Postest | Experimental | 4.13 | .58 | -.57 | .02 |
| | | Control | 4.02 | .63 | -.63 | .89 |

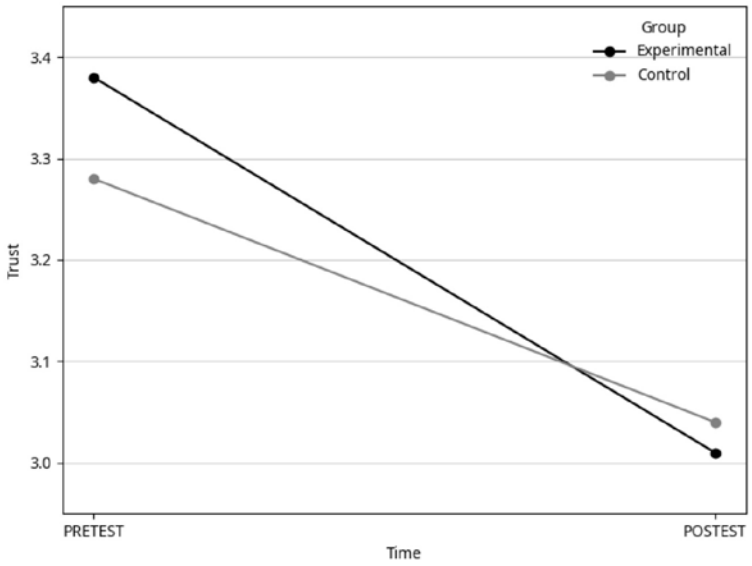
## Results of the FOURCHAT intervention: changes in trust and verification

First, when analyzing the impact of FOURCHAT training on the degree of trust that students have in ChatGPT results, it can be seen that, after the intervention, it decreased in both groups. However, this decrease was more pronounced in the experimental group, where trust decreased by .32 points, while in the control group it decreased by only .24 points.

When comparing the two groups through ANOVA, the difference was not significant and the effect size was extremely small ($F(1, 346) = .311$, $p = .29$, $\eta^2p = .001$), so hypothesis 1 must be rejected from a statistical point of view. Despite this, direct observation of the data suggests that the intervention implemented in the experimental group had a more notable impact on the decrease in trust compared to the control group. In Figure 2, it is highlighted that the slope of the line representing the experimental group is more pronounced than that of the control group, indicating a faster reduction in this first group.

**Figure 2**

*Pre and post trust levels according to group (experimental versus control)*

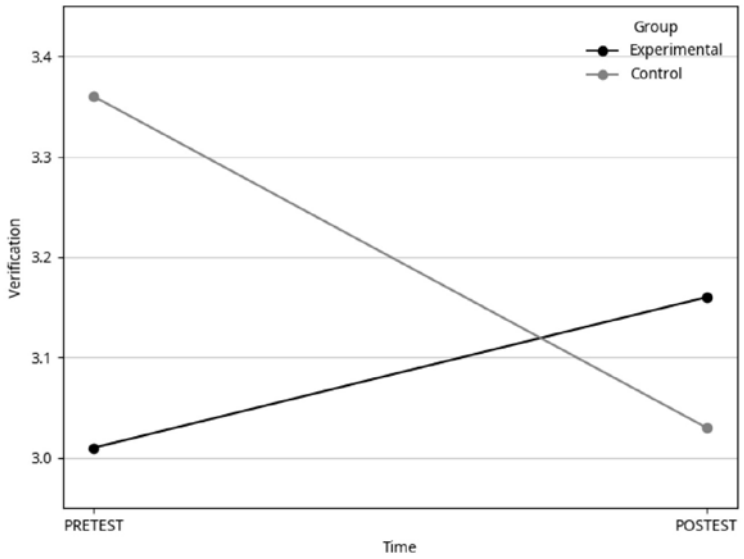



Regarding the effect of the FOURCHAT intervention on the level of verification of the responses obtained through ChatGPT, the results of the ANOVA support hypothesis 2. A significant difference was found in the changes between pre and posttest in the verification of results by students in the experimental group

compared to the control group ($F(1, 345) = 2.80$, $p < .05$ one-tailed), although the effect size was small ($\eta^2p = .01$). The mean verification level of the experimental group increased from 3.01 in the pretest to 3.16 in the posttest. In contrast, the control group showed a decrease in verification of results, with a mean that fell from 3.36 in the pretest to 3.02 in the posttest. Therefore, while the rate of change was greater in the control group, this occurs in the inverse direction of the experimental group. The results are visualized in Figure 3.

**Figure 3**

*Levels of pre- and post-testing by group (experimental versus control)*




In summary, while the intervention could generate changes in both variables (trust and verification), FOURCHAT had a significant effect on the change in verification behaviors, where the experimental group showed an increase in these actions after the implementation of the program.

## Results of regression analysis: digital responsibility and critical thinking as antecedents of trust and verification

As the next stage of our research, and to respond to our hypotheses 3 and 4, we sought to determine if the two variables that our FOURCHAT training promotes—digital responsibility and critical thinking—have a significant influence on trust in ChatGPT results and verification behaviors of students.

First, when analyzing the effect of digital responsibility and critical thinking on students' trust in ChatGPT, the regression analyses revealed a significant and negative relationship between digital responsibility and trust only in the experimental group during the posttest (see Table 2). In the pretest, neither digital responsibility nor critical thinking showed an association with levels of trust in either group; however, after the intervention, and in line with hypothesis 3.1, students in the experimental group who showed greater digital responsibility also showed less trust in ChatGPT responses (standardized β = -.23; p < .05 one-tailed), a relationship that was not observed in the control group. The emergence of this association exclusively in the experimental group after the intervention suggests that the FOURCHAT intervention, designed to develop digital responsibility, succeeded in activating the relationship between these variables. On the other hand, regarding hypothesis 4.1, no significant effects of critical thinking on trust were found in the posttest for any group.

**Table 2**

*Regression of digital responsibility and critical thinking for trust*

| | | **Pretest** | | | | **Postest** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Group** | **Predictor** | β | **S.E** | β (std) | **Sig. (one-tailed)** | **β** | S.E | **β (std)** | **Sig. (one-tailed)** |
| Experimental | Digital responsibility | -.15 | .14 | -.11 | .13 | **-.30** | **.12** | **-.23** | **.01*** |
| | Critical thinking | -.17 | .13 | -.13 | .10 | -.16 | .13 | -.11 | .11 |
| Control | Digital responsibility | -.03 | .24 | -.02 | .45 | -.18 | .21 | -.13 | .19 |
| | Critical thinking | -.01 | .22 | -.01 | .50 | .01 | .18 | .01 | .47 |

* $p < .05$.

Regarding verification as a dependent variable (Table 3), the analyses also revealed differentiated results for each predictor. As with trust, digital responsibility showed a significant relationship with verification, only in the posttest of the experimental group (standardized β = .18; p < .05 one-tailed), supporting hypothesis 3.2 and suggesting that FOURCHAT activated the positive effect of this variable. On the other hand, in line with hypothesis 4.2, critical thinking was positively associated with verification of ChatGPT responses in the

experimental group, both in the pretest (standardized β = .21; p < .05 one-tailed) and in the posttest (standardized β = .20; p < .05 one-tailed). The similarity of these coefficients suggests that the FOURCHAT intervention only contributed to maintaining this relationship. On the other hand, none of these associations was significant in the control group.

**Table 3**

*Regression of digital responsibility and critical thinking for verification*

| | | Pretest | | | | Postest | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Group** | **Predictor** | **β** | **S.E** | **β (std)** | **Sig. (one-tailed)** | **β** | **S.E** | **β (std)** | **Sig. (one-tailed)** |
| Experimental | Digital responsibility | .32 | .20 | .15 | .06 | **.32** | **.16** | **.18** | **.02*** |
| | Critical thinking | **.44** | **.19** | **.21** | **.01*** | **.39** | **.17** | **.20** | **.01*** |
| Control | Digital responsibility | -.10 | .45 | -.04 | .41 | .07 | .33 | .03 | .41 |
| | Critical thinking | .30 | .41 | .13 | .27 | .22 | .28 | .12 | .22 |

* $p < .05$.

In summary, it could be seen that FOURCHAT generates greater changes in the digital responsibility of students, as it relates positively to the development of trust and verification, a phenomenon that is not visualized in the control group and that our intervention also enhances.

## DISCUSSION

This research focused on four main objectives: 1) to analyze how FOURCHAT (FOrmación Universitaria en uso Responsable del CHATgpt) training affected students' trust in ChatGPT results; 2) to analyze whether this training influenced whether students verify the information they obtain from ChatGPT; 3) to analyze the relationship between digital responsibility and said degree of trust and verification of students; and 4) to analyze the relationship between critical thinking with the level of trust and verification of students in relation to the results offered by ChatGPT. In other words, our research aimed to verify whether teaching students about digital responsibility and critical thinking could help them use ChatGPT more adequately and reflectively.

The results demonstrate the effectiveness of the intervention, evidenced by the changes observed in the experimental group. Although very slight improvements were observed in the level of trust towards ChatGPT results, the most notable change occurred in the increase in verification behaviors among students who participated in FOURCHAT. This suggests that the training succeeded in developing greater critical awareness in the participants, motivating them to verify more frequently the answers obtained from ChatGPT. Likewise, these findings coincide with experiences documented in other countries, where teacher training oriented to the appropriate use of generative artificial intelligence has shown significant effects on the way students use these platforms within the academic context (Styve et al., 2024; Wood and Moss, 2024).

This contrast is especially significant when compared to the control group, where these behaviors even decreased during the second measurement. The decrease in verification in the control group could be explained by an unwanted adverse reaction: the fact that university professors dedicated time to question the use of ChatGPT through questionnaires could have activated alarm signals that led students to interpret that they should not use the tool, instead of learning to use it critically. By not receiving specific training on how to leverage the tool responsibly, they may have opted to reduce its use, which could decrease their verification behaviors.

On the other hand, we found that in students of the experimental group, digital responsibility was significantly related to both the decrease in trust in the tool and the increase in verification behaviors. This indicates that when students become aware of their active role regarding AI results and understand the origin of their training sources (Baidoo-Anu and Ansah, 2023), both cognitive changes (greater skepticism towards the veracity of the results) and behavioral changes (greater verification of the reliability of the sources) occur. However, a slight decrease was observed in the measure of digital responsibility during the posttest, possibly because students developed a more critical view of their own responsibility in the use of these tools.

Finally, regarding critical thinking, it does not show a significant relationship with trust towards the results produced by AI. In turn, it was observed that it already exerted an important positive influence on verification behaviors of the experimental group both before and after the intervention, unlike the control group. This could be explained by a previous development of critical thinking in the experimental group—possibly acquired in other subjects or previous educational experiences—that could enhance the effect of FOURCHAT training. Likewise, these results find support in studies such as that of Bond et al. (2024) and interventions such as that of Yusuf et al. (2024) that relate the promotion of critical thinking with a more conscious use of artificial intelligence.

## Theoretical and practical implications

From our FOURCHAT intervention experience, a series of implications are derived, which are indicated below:

First, its implementation at the university level can be highly beneficial for students and the academic community in general. It is necessary to demonstrate that ChatGPT is a tool available to optimize academic activities and that it can be a valuable aid for their tasks, if it is used with responsibility and critical thinking. In addition, its scope could also be expanded to other educational levels.

Second, the integration of the promotion of digital responsibility and critical thinking in teaching processes is crucial to ensure an adequate use of ChatGPT and other AI tools. Only in this way can we transition from an approach centered on "pursuing the student to detect plagiarism by AI use," which can be considered a lost battle, to one oriented towards developing students' competencies in AI use for good use of this valuable tool. To achieve this, it is proposed to integrate the FOURCHAT intervention in the different aspects of learning, according to Bloom's taxonomy (Anderson and Krathwohl, 2001) with contributions from Mas et al. (2023):

- Remember: Students should keep in mind what ChatGPT consists of and how AI is fed. Likewise, they should identify which tool is the most appropriate to use within the wide range of available AIs (Mas et al., 2023).
- Understand: It is important that students understand that ChatGPT can yield erroneous or inaccurate results. For this, according to Mas et al. (2023), it is important that they learn to define precisely what is indicated in the prompts that are introduced into the tool.
- Apply: Students must know how to communicate with ChatGPT (for example, creation of prompts) for the responsible and ethical use of ChatGPT in different situations. For example, they could practice formulating clear and specific questions or instructions to obtain more precise and relevant answers from the tool.
- Analyze: It is necessary for students to develop skills to discriminate what information or results from ChatGPT really serve to do academic work. To do this, they could be provided with practical exercises in which they have to evaluate the quality and relevance of different responses generated by ChatGPT, contrasting them with other sources and justifying their assessments (Mas et al., 2023).
- Evaluate: Students must be able to evaluate the quality of the information that ChatGPT yields. An interesting activity would be to ask them to contrast the tool's responses with other reliable sources of information, identifying possible discrepancies or errors.

– Create: Students must learn to generate their own texts from the ideas that ChatGPT can provide. To promote this, they could be proposed to use the tool as a starting point to develop an essay or report, incorporating their own reflections, arguments, and additional references. In this phase, they can also be urged to try new applications and uses of this tool, as well as combine instructions and results (Mas et al., 2023)

Finally, it is important to highlight the need to improve these initiatives through co-creative and participatory processes with students and technological referents, allowing to keep training updated in a constantly evolving field. This collaborative approach, which could be implemented through project-based learning (Bell, 2010), ensures a better understanding of student needs and emerging ethical challenges.

## Limitations and future studies

The study presents some limitations that deserve consideration. The sample in the control group is relatively small compared to the experimental group, and the focus is exclusively on ChatGPT, although there are other relevant AI tools. Given its preliminary nature, efforts are being made to expand the sample, which could allow the formulation of new hypotheses and research objectives. Likewise, FOURCHAT training has the potential to be refined and applied in various educational levels and national and international academic institutions.

## Conclusion

Based on the results obtained in our study, we conclude that the intervention carried out with university students is effective for them to make more responsible and ethical use of ChatGPT, increasing their critical thinking and information verification with respect to the results provided by it. This sharply affects the teaching-learning process, reaching higher levels of Bloom's taxonomy such as analyzing, evaluating, and creating. We believe that, by training university students in these matters, not only is their academic development favored, but a better inclusion of AI in higher education is also promoted.

In summary, this study makes a relevant and original contribution to knowledge about the responsible and ethical use of AI in the educational field, providing empirical evidence on the effectiveness of a pioneering training intervention in this field.

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# Influence of academic expectations on reasons for dropout intentions among students at an ecuadorian university

## *Influencia de las expectativas académicas sobre los motivos de intención de abandono en estudiantes de una universidad ecuatoriana*

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## ABSTRACT

Academic expectations are defined as predictions made by individuals concerning their performance in contextualised scenarios, such as those found within educational settings. A discrepancy between these expectations and their actual experiences during their university education has been associated with intention to dropout. The aim of this research is to determine the influence of academic expectations on the reasons for the intention to drop out of studies, and previously to determine whether on these expectations are influenced by career choice and parents' level of education. The study used a quantitative and explanatory research approach, where 601 students from four field of knowledge in an Ecuadorian public university were selected by a stratified probabilistic method. The Academic Expectations Questionnaire and the Reasons to Drop Out Intentions scale were used to gather data. The data were analysed with descriptive statistics and structural equations using the Robust Weighted Least Squares estimator. The findings indicated that career options exert influence on three dimensions: personal and social development, social pressure and political and citizenship involvement. Additionally, the paternal educational attainment was found to be a significant predictor of heightened expectations concerning political and citizenship involvement, while the maternal educational attainment was found to be a significant predictor of elevated expectations in social interactions. The findings further demonstrate that political and citizenship involvement expectations primarily influence intentions to drop out, particularly in terms of organisation, life management and professional aspects. In conclusion, both career choice and parental educational level exert a significant influence on academic expectations, although in distinct ways and to varying degrees. While political involvement and citizenship have been identified as the most significant factors influencing academic expectations, it is important to note that these factors exert a differentiated influence on individuals' career intentions to dropout.


**Keywords:** academic expectations, dropout, higher education, career choice, university students


## RESUMEN

Las expectativas académicas son predicciones que hacen las personas sobre su actuación en situaciones contextualizadas, como el entorno educativo. Una discrepancia entre estas expectativas y lo que encuentran realmente en la universidad, podría contribuir a la intención de abandono de los estudios. El objetivo principal del trabajo es determinar la influencia de las expectativas académicas sobre los motivos de intención de abandono y, previamente, si sobre estas expectativas influyen la opción de carrera y el nivel educativo de los progenitores. El estudio es de tipo cuantitativo explicativo, en el que participaron 601 estudiantes de las cuatro ramas de conocimiento de una universidad pública ecuatoriana seleccionados mediante muestreo probabilístico estratificado. Para la obtención de información se utilizaron el cuestionario de Expectativas Académicas y la Escala de Motivos de Intención de Abandono. Los datos se analizaron con estadística descriptiva

y ecuaciones estructurales empleando el estimador Mínimos Cuadrados Ponderados Robustos. Los resultados revelan que la opción de carrera impacta en las dimensiones de desarrollo personal y social, presión social e implicación política y ciudadanía. Además, un mayor nivel educativo paterno determina mayores expectativas en la implicación política y ciudadanía; mientras que un mayor nivel educativo materno determina mayores expectativas en la interacción social. Las expectativas sobre la implicación política y ciudadanía influyen principalmente en los motivos de intención de abandono relacionados con la organización, la LIFEMión de vida y los aspectos profesionales. En conclusión, tanto la opción de carrera como el nivel educativo de los progenitores influyen en las expectativas académicas, pero de manera diferente y con intensidad variable. En cuanto a las expectativas académicas, aunque la influencia más notoria recaiga en la implicación política y ciudadanía, se puede concluir que estas tienen una influencia diferenciada sobre los motivos de intención de abandono de la carrera.

**Palabras clave:** expectativas académicas, abandono de estudios, educación superior, elección de profesión, estudiantes universitarios

## INTRODUCTION

The high demand for university access has, in recent decades, become a common feature across all higher education systems. In the specific case of Latin America and the Caribbean, this demand has a particular interpretation, as it is an indicator of the great economic and social value that higher education represents for both individuals and the state (United Nations Educational, Scientific and Cultural Organization [UNESCO] and Economic Commission for Latin America and the Caribbean [ECLAC], 2022).

According to UNESCO and ECLAC (2022), the expansion of higher education in the region is globally significant, but it shows substantial differences and an uneven pace among countries. At the same time, it reveals a considerable increase in access gaps and disparities in the expansion of higher education. The UNESCO regional report highlights that opportunities for access and success in higher education are shaped much earlier and are determined by the quality of primary and secondary education systems, as well as by social and economic factors.

Therefore, access to and persistence in higher education do not depend solely on individual merit, talent, or dedication.

Seminara (2021) indicates that even before the COVID-19 pandemic, Latin America already had high dropout and grade repetition rates, along with low graduation rates in higher education, with marked differences among various socioeconomic groups. Although government policies attempt to mitigate the gaps in persistence and graduation, university dropout rates remain a global concern (Gutiérrez et al., 2021). In the Latin American region, the dropout problem has

prompted reflection on the effectiveness of educational policies implemented since the expansion of coverage (Urbina & Ovalles, 2016). In Ecuador, the regulations support a high-quality and excellent higher education system that prioritizes principles such as interculturality, universal access, retention, mobility, and non-discriminatory graduation, along with free tuition in public institutions (Organic Law of Higher Education [LOES], 2018). Nevertheless, data from the Secretariat of Higher Education, Science, Technology and Innovation (Senescyt) reveal a different reality. The gross university enrollment rate stood at 39.56% in 2021 and 40.88% in 2022. Regarding access, there is a significant gap between the number of enrolled students and the available seats. For example, in the second period of 2022, there were 270,745 enrolled applicants and only 129,583 seats offered in public Higher Education Institutions (HEIs). In 2021, 35,910 people graduated from higher education (Senescyt, 2023), and the dropout rate in public universities reached 18.35% (Senescyt, 2024).

In this context, the university represents an opportunity for improved quality of life and social mobility for students. However, dropout rates indicate that access, persistence, and graduation are influenced by several limiting factors. Among these are academic expectations, which are anticipations of what will occur during university life. This anticipation may influence students' reasons for intending to drop out, which can vary in nature and may ultimately lead to actual dropout.

Given this situation, it is appropriate to approach the issue from the students' perspective. This approach will allow for the exploration of the influence of two factors (career choice and parents' educational level) on students' academic expectations and how these expectations affect their intention to drop out of university. The resulting information will be useful for designing institutional strategies that support student retention. Developing such measures is essential, as both gross enrollment rates and terminal efficiency indicators are key elements in measuring the educational quality of HEIs (UNESCO & ECLAC, 2022).

## Academic Expectations

Adaptation and academic progress at the university level are complex, multidimensional processes involving both interpersonal and contextual factors (Esteban et al., 2017). Furthermore, the universalization of access to higher education has transformed university classrooms, resulting in greater diversity in students' personal, familial, social, and academic backgrounds. This diversity implies that students' academic expectations regarding their performance and university trajectory can also vary considerably. University life carries high expectations for academic challenges, which is why the literature pays special attention to academic

expectations, especially during the early years of study (Besa-Gutiérrez & Gil-Flores, 2021; Gomes & Soares, 2013; Soares et al., 2018).

Students begin their university studies with expectations that are often influenced by fantasy and idealization. Expectations are what we anticipate will happen, which means the actions we choose and our responses to new experiences are not random. Rather, they are connected to an internal accumulation of knowledge and beliefs we have formed throughout life (Howard, 2005). Gomes and Soares (2013) define expectations as predictions people make about their performance with the goal of satisfying their own needs and those of others in specific contexts.

Kuh et al. (2005) propose two perspectives on expectations. The first sees them as a filter, a selection mechanism through which students evaluate and make sense of the information presented to them, as well as their experiences inside and outside the classroom. The second perspective views expectations as a psychological catalyst that can dissuade certain behaviours, thereby shaping experiences. These authors draw on self-efficacy theory, expectancy theory, and motivation theory to explain how expectations influence students' decisions, time management at university, and overall performance both in and outside the classroom.

This study adopts the classification of academic expectations proposed by Deaño et al. (2015):

a) Personal and social development, which reflects expectations focused on personal growth through academic experiences and includes elements such as autonomy, self-confidence, and critical thinking.
b) Student mobility, related to students' willingness to participate in international exchange programs.
c) Political involvement and citizenship, which reflects students' desire to engage in discussions about political, economic, and social issues.
d) Social pressure, which captures students' desire to meet external expectations (from family, peers, or professors).
e) Social interaction, referring to expectations of engaging in social activities outside regular class hours and interacting with peers.
f) Training for employment, referring to expectations regarding the training conditions that lead to better employment opportunities or smoother entry into the labor market.

## Factors influencing academic expectations

Considering that academic expectations are based on prior knowledge and experiences; it is to be expected that the factors influencing their formation are diverse. This study focuses on two: career choice and the educational level of parents.

In Ecuador, the university admission process seeks to ensure equal opportunities for applicants, as reflected in the implementation of mechanisms to evaluate students and allocate placements. However, this process has faced criticism, as it has prevented many students from gaining access to their preferred degree programs (Guerrero et al., 2018). Thus, career choice refers to whether a student is enrolled in their preferred program or in one that was their second or third option.

Moreno and Soares (2014) assert that students' expectations depend on the career choice they make. When they are unable to access their preferred program, they opt for related degrees that might allow them to enter their desired field in the future. Expectations regarding interpersonal relationships are also determined by satisfaction with and adaptation to the chosen field of study and institution (Soares et al., 2018). Wang and Houston (2023) emphasize the influence of preconceived ideas, expectations, and values on students' identity and views of their future profession. Generally, when the chosen career path aligns with students' vocational interests, academic success is more likely (Almeida et al., 2004).

Parents' educational level is also a significant factor in students' expectations and success at university. Mishra (2020) states that parents' educational qualifications are closely linked to their children's enrollment in and completion of higher education. Parents' academic achievements constitute a form of social capital related to information—students benefit from their parents' personal experiences and knowledge. However, a low level of parental education does not prevent the development of expectations related to pursuing a university degree. In fact, parents with limited formal education may still hope their children will attain a better quality of life through a university profession (Hernández & Padilla et al., 2019).

According to Bernal et al. (2023), academic expectations tend to be lower when parents have low levels of education. Moreover, the influence of parental education on expectations varies for instance, the mother's education level positively predicts students' expectations regarding social interaction, while the father's education level negatively predicts expectations related to training for employment and political involvement and citizenship (Alfonso Gil et al., 2014).

López-Aguilar et al. (2022) suggest that universities should make concerted efforts to ensure that students are well-guided, capable of making informed decisions, and, ultimately, able to establish clear expectations and build future projects on solid foundations.

## Academic Expectations and Reasons for Intent to Drop Out

Before addressing the relationship between these two variables, it is important to clarify that the intent to drop out is conceived as a cognitive process in which

students consider the possibility of leaving their studies, even though this has not yet materialized and, therefore, can be reversed. It refers to a situation in which students have not yet made the decision to withdraw from their degree program but express the intention to do so. Hence, it is essential to distinguish between dropout as a decision-making process and dropout as the actual outcome of that decision (Cervero, 2020).

The intent to drop out can be explained by a wide range of factors that vary considerably. While Palacio et al. (2020) propose socioeconomic, academic, psychological, or demographic factors, Olmos and Garín (2022) suggest that dropout intentions are associated with personal challenges, family circumstances, social relationships, institutional characteristics, and structural factors.

These variables are reflected in the model proposed by Ambiel (2015), which classifies the reasons for dropout intentions. The first component, institutional reasons, includes aspects related to the quality of teaching staff, services, or infrastructure. The second, personal reasons, includes issues related to career choice and family matters. The third, reasons related to lack of support, involves situations that hinder academic persistence, mainly due to the lack of financial resources. The fourth, career-related reasons, encompasses concerns about future professional activities and labor market conditions. The fifth, academic performance-related reasons, refers to difficulties in students' academic performance. The sixth, interpersonal reasons, addresses problems or challenges in relationships with peers. Lastly, the seventh component, reasons related to autonomy, is associated with the challenges of living away from home while studying. Based on this classification, Ferreira et al. (2019) adapted these components into four dimensions: organizational, life management, professional, and relational.

The close connection between academic expectations and dropout intention is noted in studies such as that of Elías (2008), who proposes typologies of dropout motives that include, among other variables, students' motivations and expectations. In fact, Elías explicitly states that false expectations are one of the reasons for dropout, encompassing students who were unclear about what they wanted to study or whose expectations did not match what they encountered in their degree programs. More specific findings link students' expectations with definitive or permanent dropout, suggesting that some students leave or change degrees because their academic program does not meet their expected career or financial outcomes (Canales & Ríos, 2007).

Aina et al. (2022) found that the risk of dropping out increases when students' high expectations for university performance are not met. According to Suberviola et al. (2024), functional expectations and effort expectations have the strongest influence on dropout intentions, as students who fail to envision a better future or sufficient recognition are more likely to drop out.

Bernardo et al. (2018) demonstrate that individual commitment, the strength of expectations, institutional support, and a sense of community are predictors of students' persistence in their studies. Consequently, academic expectations emerge as one of the most important variables for predicting dropout intent, highlighting the need to better manage expectations as a protective factor against dropping out (Galve-González et al., 2022).

Casanova et al. (2018) argue that the presence of dropout intentions raises questions about students' transition and adaptation processes, showing that many students enter university without a clear personal or professional project, without having explored other options, or because they were admitted into programs that did not match their preferences due to university admission systems and rules. In any case, understanding students' intention to drop out can provide greater insight into the overall dropout process (Bean, 1982), especially when considering the individual and institutional consequences of dropping out, which makes preventing it imperative (Bernardo et al., 2018).

Given the variables discussed and the findings of previous studies, a theoretical model of causal relationships was proposed, including the following variables: career choice, parents' educational level, academic expectations, and reasons for intent to drop out. Academic expectations are influenced by both career choice and parental education.

This study aims to test the fit of this theoretical model through the following objectives:

a) To determine the influence of students' chosen field of study and parents' educational level on university students' academic expectations; and
b) To examine the influence of academic expectations on the reasons for intent to drop out of university.

Based on these objectives, the following hypotheses were proposed: H1: Students' chosen field of study influences their academic expectations. H2: Parents' educational level influences students' academic expectations. H3: Academic expectations influence the reasons for intent to drop out of university studies.

## METHODOLOGY

### Design

The study was conducted using a quantitative approach, with a non-experimental design and an explanatory scope, involving measurements from a single group. The research was carried out at the University of Cuenca, a public, secular, and non-profit institution in Ecuador. The university has 12 faculties and

is the first in Ecuador to offer degrees across all fields of knowledge. Its academic offerings include master's degrees, specializations, and doctoral programs (Universidad de Cuenca, 2024).

## Participants

At the time of data collection, the population consisted of 14,576 enrolled undergraduate students across the university's 12 faculties, grouped into four fields of knowledge. To determine the sample size, Cochran's formula (1977), adjusted for finite populations, was used with a 98% confidence level and a 5% margin of error. The recommended sample size was 524 students. An additional 21% was added to compensate for potential data loss, resulting in a total of 635 students invited to participate.

A stratified probabilistic sampling method with proportional allocation was used. The four strata corresponded to the academic fields. Table 1 shows the strata, invited and final sample sizes, and their respective proportions. After data collection, 34 incomplete questionnaires were excluded, resulting in a valid final sample of 601 students. Variations in the relative proportions of the strata were considered when interpreting the results.

**Table 1**
*Sample Size Distribution by Stratum*

| Stratum | Population Proportion (%) | Invited sample | Final Sample | Final Sample Proportion (%) |
|---|---|---|---|---|
| Social Sciences, Journalism, Information, Law, Administration &Services | 25.8 | 164 | 120 | 20 |
| Education, Arts & Humanities | 17.0 | 108 | 121 | 20.1 |
| Engineering, Technology, Architecture & Agricultural Sciences | 29.9 | 190 | 97 | 16.1 |
| Health & Wellbeing | 27.3 | 173 | 263 | 43.8 |
| Total | 100 | 635 | 601 | 100 |

Inclusion criteria were: (1) being enrolled in any undergraduate degree program from the second to the final semester, and (2) having signed the informed consent form. Once institutional permission was granted, the questionnaire link was emailed to students. Prior to answering the questionnaire, participants signed the informed consent form. Data collection was carried out via the QuestionPro platform between September 2022 and February 2023. The study was approved by the Research Ethics Committee of the University of Oviedo.

Participants ranged in age from 18 to 39, with a mean of 21.07 years (SD = 2.55). Of the sample, 31.4% were male, 67.6% female, and 1% did not respond. 38.8% had taken the university entrance exam more than once, and 57.4% had taken additional preparatory courses for the exam.

## Instruments

A form was used to collect sociodemographic data, including gender, age, career choice, and parents' educational level. Career choice was categorized into three levels (first, second, and third choice), and parental education was coded from an open-ended question.

For the variable academic expectations, the short version of the Academic Perceptions Questionnaire (APQ) (Casanova et al., 2019) was used. It assesses university students' perceptions of academic expectations and contains 24 items across six dimensions: Personal and social development (PSD), Student mobility (MOB), Political involvement and citizenship (PIC), Social pressure (SOP), Social interaction (SOI), Training for employment (EMP).

Responses were rated using a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree). The second instrument was the Reasons for Higher Education Dropout Scale (Reasons Dropout) (Ferreira et al., 2019), organized into four dimensions: Organizational (ORG), Life management (LIFEM), Professional (PROF), Relational (RELA).

The 30 items reflect reasons that influence students' decisions to leave their studies. Responses were rated on a 6-point Likert scale (1 = very weak, 6 = very strong).

The internal consistency of both instruments was adequate, as shown by Cronbach's α and McDonald's ω coefficients (Table 2). Confirmatory factor analysis confirmed good model fit indices for both instruments (Table 3).

**Table 2**
*Reliability of the Instruments Used*

| Instrument | α | ω |
|---|---|---|
| Academic Expectations Questionnaire | | |
| Personal and Social Development | .889 | .889 |
| Student Mobility | .707 | .663 |
| Political Involvement and Citizenship | .863 | .858 |
| Social Pressure | .825 | .834 |
| Social Interaction | .839 | .834 |
| Job Training | .874 | .875 |
| Reasons for Higher Education Dropout Scale | | |
| Organizational | .797 | .799 |
| Life Management | .814 | .815 |
| Professional | .888 | .894 |
| Relational | .803 | .805 |

**Table 3**
*Goodness-of-Fit Indices for the Questionnaire*

| Instrument | $\chi^2$ (gl) | RMSEA [90% IC] | SRMR | CFI | TLI |
|---|---|---|---|---|---|
| APQ | 468.882 (215) | 0.054[0.048 0.061] | 0.049 | 0.987 | 0.985 |
| Reasons Dropout | 1064.378 (399) | 0.064[0.060 0.069] | 0.073 | 0.964 | 0.961 |

Note: APQ = Academic Expectations Questionnaire; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index.

## Data Analysis

In the first stage, the structure and psychometric properties of the instruments were analyzed using Confirmatory Factor Analysis (CFA) in RStudio, with the Lavaan

package (Rosseel, 2012; Rosseel et al., 2022). Since the items were ordinal, the Diagonally Weighted Least Squares (DWLS) estimation method was applied. Robust indices (Padgett & Morgan, 2021) and the criteria proposed by Hair et al. (2014) for large samples (n > 250) were used to assess model fit, with the following indicators: Chi-square ($\chi^2$; $p < .05$), Comparative Fit Index (CFI ≥ .90), Tucker–Lewis Index (TLI ≥ .90), Root Mean Square Error of Approximation (RMSEA < .08),Standardized Root Mean Square Residual (SRMR < .08). Reliability was reported using the SemTools package, which calculated Cronbach's Alpha and McDonald's Omega.

For qualitative variables, relative frequencies were used. For quantitative variables, medians and quintiles were calculated. Non-normality was tested using the Shapiro-Wilk test ($p < .05$). Inferential analysis was conducted using Structural Equation Modeling (SEM) via the Weighted Least Squares Mean and Variance adjusted (WLSMV) estimation method, which is appropriate for non-normal variables and is a robust variation of DWLS (Kline, 2023). This allowed the identification and confirmation of relationships among the variables studied. Model fit was evaluated using criteria proposed by Hu and Bentler (1999).

Data processing and analysis were performed in RStudio using the Lavaan package, and visualizations were created with Mplus (Muthén & Muthén, 2017).

## RESULTS

### Preliminary Analyses

This section presents the descriptive analyses of each dimension of the instruments used, as well as values related to career choice and parental education level.

Regarding academic expectations, students report higher expectations concerning the training for employment they will receive throughout their studies, followed by personal and social development, political involvement and citizenship, and social pressure. Below these are expectations related to social interaction, with student mobility expectations ranking the lowest (Table 4).

**Table 4**
*Descriptive statistics of academic expectations by dimension*

| Dimension | Min. | Max | Median | Q1 | Q3 |
|---|---|---|---|---|---|
| Personal and Social Development | 1.25 | 6 | 4.75 | 4.00 | 5.50 |
| Student Mobility | 1 | 6 | 3.50 | 3.00 | 4.25 |
| Political Implication & Citizenship | 1.75 | 6 | 4.75 | 4.00 | 5.50 |
| Social Preasure | 1 | 6 | 4.75 | 3.75 | 5.25 |
| Social Interaction | 1 | 6 | 4.25 | 3.25 | 5.00 |
| Trainnig for Employment | 1 | 6 | 5.00 | 4.25 | 5.75 |

Regarding the reasons for the intention to drop out, the most significant are found in the professional, life management, and organizational dimensions. The least influential reasons are in the relational dimension (Table 5).

**Table 5**
*Descriptive statistics of reasons for the intention to drop out by dimension*

| Dimension | Min | Max | Median | Q1 | Q3 |
|---|---|---|---|---|---|
| Organizational | 1.00 | 5.00 | 3.00 | 2.38 | 3.38 |
| Life Management | 1.00 | 5.00 | 3.29 | 2.57 | 3.86 |
| Professional | 1.00 | 5.00 | 3.25 | 2.50 | 3.88 |
| Relational | 1.00 | 5.00 | 2.43 | 1.86 | 3.00 |

Table 6 shows results related to career choice, which was regrouped into two categories (the third option was grouped with the second due to low frequency). It's worth noting that students had the possibility to apply to three degree programs, and based on their entrance exam scores, they were assigned one. Most students (62.1%) reported that they are currently studying their first-choice program. More than one-third are studying a second- or third-choice program.

**Table 6**
*Frequency of career choice reported by participating students*

| Career Choice | Frequency | Percentage | Valid % |
|---|---|---|---|
| First choice | 373 | 62.1 | 62.1 |
| Second or third choice | 228 | 37.9 | 37.9 |
| Total | 601 | 100 | 100 |

As for parental educational level, the distribution is similar among fathers, with roughly one- third having completed primary school, high school, or university. For mothers, the high school level shows a slightly higher percentage (38.4%), while primary and university levels are around 30% and 31%, respectively.

**Table 7**
*Frequencies of parental education levels*

| Father's Education Level | Frequency | Percentage | Valid % |
|---|---|---|---|
| Primary | 196 | 32.6 | 33.1 |
| High School | 197 | 32.8 | 33.3 |
| University | 199 | 33.1 | 33.6 |
| Total (valid) | 592 | 98.5 | 100 |
| Missing | 9 | 1.5 | |
| Total | 601 | 100. | |
| **Mother's Education Level** | **Frequency** | **Percentage** | **Valid %** |
| Primary | 179 | 29.8 | 29.8 |
| High School | 231 | 38.4 | 38.4 |
| University | 191 | 31.8 | 31.8 |
| Total | 601 | 100 | 100 |

## Explanatory Model Analysis

To determine whether career choice and parents' educational level influence students' academic expectations, a Structural Equation Model (SEM) was used with the WLSMV estimator.

The first model included linear regressions between career choice and both parents' educational level with the six dimensions of academic expectations. However, the goodness-of-fit indices were not satisfactory. A second model was tested, excluding the student mobility dimension due to its weak contribution to the model. The second model showed improved incremental fit indices and a good overall model fit (Table 8).

**Table 8**

*Goodness-of-fit indices for models*

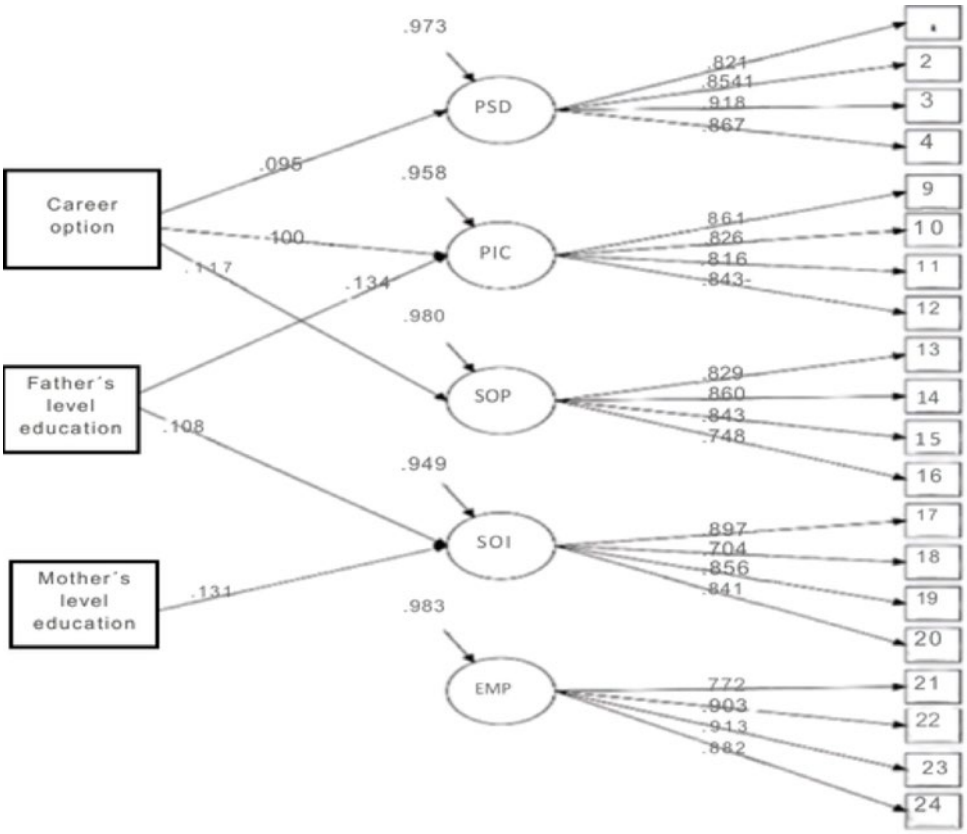
| Model | χ2/gl | p-value | RMSEA [90% CI] | SRMR | CFI | TLI |
|---|---|---|---|---|---|---|
| 1 | 22838.303 [348] | 0.0000 | 0.086[0.082 0.090] | 0.054 | 0.942 | 0.931 |
| 2 | 21038.093 [250] | 0.0000 | 0.069 [0.064 0.074] | 0.035 | 0.972 | 0.965 |

The results reveal a significant relationship between choosing the first-choice degree and three dimensions of academic expectations: Personal and Social Development, Social Pressure, Political Involvement and Citizenship. Students enrolled in their first-choice program show higher expectations in these areas.

Additionally, students whose fathers have higher educational levels exhibit higher expectations in the Political Involvement and Citizenship and Social Interaction dimensions. Students with more highly educated mothers showed higher expectations only in Social Interaction, and indirectly in Training for Employment.

However, neither career choice nor parental education level were significant predictors of expectations related to training for employment (Figure 1).

**Figure 1**
*Final model with standardized coefficients*




Note: The presented model is oblique, not orthogonal. In the figure, error covariances between latent variables are excluded to facilitate graphical interpretation. Numbers 1–24 correspond to the items of the CEA questionnaire.

Two models were tested to examine the influence of academic expectations on the intention to drop out. The first model included all dimensions of academic expectations; however, both the fit indices and the baseline model did not adequately fit the data ($\chi^2$ = 333,867.788, df = 1,432, p < .0000). Therefore, a second model was tested excluding the "student mobility" dimension, and the results showed an acceptable model fit. The chi-square test for the baseline model was significant ($\chi^2$ = 32,340.243, df = 1,225, p < .0000) (Table 9).

**Table 9**
*Model Fit Indices*

| Model | χ2/gl | p | RMSEA [90% CI] | SRMR | CFI | TLI |
|---|---|---|---|---|---|---|
| 1 | 5233.080 [1349] | 0.0000 | 0.069[0.067 0.071] | 0.087 | 0.880 | 0.873 |
| 2 | 2995.118 [1149] | 0.0000 | 0.052[0.049 0.054] | 0.059 | 0.941 | 0.937 |

Figure 2 shows that academic expectations related to *political engagement and citizenship* have a notable influence, with a standardized coefficient of .310, on dropout intention related to *organizational*, *life management*, and *professional* issues.

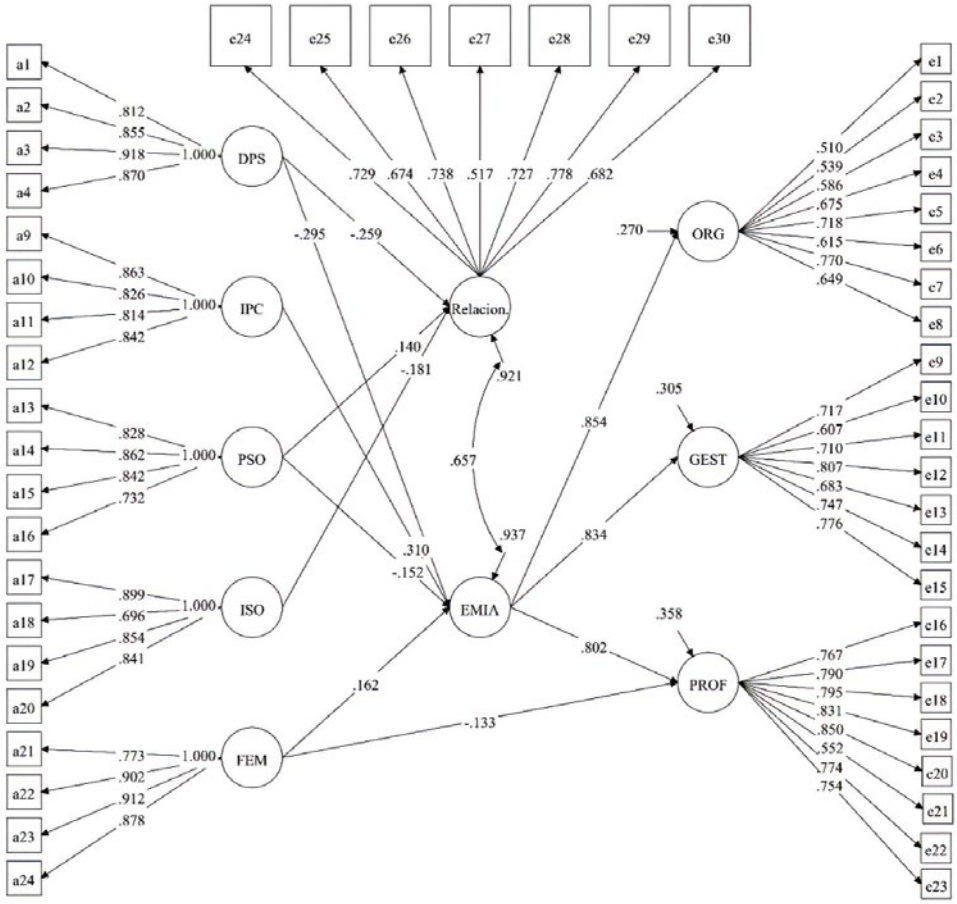
The model suggests that academic expectations around *personal and social development* act as a protective factor (−.295). Thus, if students have high expectations regarding the development of their potential, personality, and autonomy, they are less likely to consider dropping out due to organizational, life management, or professional reasons. The same dimension also acts as a buffer against *relational* dropout motives: when expectations for personal and social development are high, factors such as living alone, having peers with different ways of thinking, or coming from different social backgrounds are less likely to be perceived as reasons to drop out.

Expectations regarding *training for employment* can serve as both a risk and a protective factor, although with relatively low coefficients. It acts as a risk factor (.162) in that high expectations for job-related training are associated with dropout intentions related to organizational and life management challenges. However, there is also an inverse relationship with professional dropout motives (−.133), indicating a potential protective role in that dimension.

A noteworthy feature of the second model is that the *relational* dimension of the dropout intention scale appears as a separate variable from the other three. This dimension assesses whether living alone, failing to make friends, or belonging to a different social class than peers could be motives for leaving university. Its separation in the model does not imply it is an irrelevant factor; on the contrary, it underscores the importance of addressing it in greater depth, as the relational dimension involves other key elements that are critical for academic success.

**Figure 2**

*Final model with standardized coefficients*




Note 1: The presented model is oblique, not orthogonal. Error covariances between latent variables are excluded from the figure to facilitate graphical interpretation.

Note 2: Personal and Social Development = PSD; Political Involvement and Citizenship = PIC; Social Pressure = SOP; Social Interaction = SOI; Training for Employment = EMP. Organizational Dimension = ORG; Life Management Dimension = LIFEM; Professional Dimension = PROF; Relational Dimension = RELA. Labels a1–a24 correspond to items from the APQ questionnaire, and labels e1–e30 correspond to items from the Reasons Dropout questionnaire.

## DISCUSSION AND CONCLUSIONS

The study addressed three hypotheses: the first regarding the influence of career choice on academic expectations; the second regarding the influence of parents' educational level on academic expectations; and the third examining the influence of academic expectations on dropout intentions.

Regarding the first hypothesis, the results confirm that career choice influences students' academic expectations related to personal and social development, political engagement and citizenship, and social pressure. As Peña-Vázquez et al. (2023) mention, studying the desired career could be considered the first expectation fulfilled by university students. Those studying the career that was their first choice generally report high expectations regarding social pressure, meaning students expect to meet the expectations of their families or those who support their education and expect to achieve educational levels similar to or higher than those of their parents. This impact could be explained by the expectations and motivations underlying career choice, as suggested by Boado et al. (2011), who argue that these decisions are strongly influenced by the desire to satisfy family or close environment expectations.

The results highlight that students pursuing their preferred career have higher expectations for political engagement and citizenship, as well as for personal and social development. These high expectations could be due to the students' perception that university represents an opportunity to develop key personal aspects such as identity and autonomy. Furthermore, they expect their education to address social issues, providing them with a broader and more critical view of society (Besa-Gutiérrez, 2020).

In the evaluated model, career choice does not influence expectations related to employment training or social interaction. Descriptive results show that employment training is a highly valued dimension by students, who expect the university to provide them with skills to access better job opportunities, aligning with Alfonso Gil et al. (2013). On the other hand, Soares et al. (2018) suggest that expectations about interpersonal relationships are partly determined by the chosen career, although this influence was not observed in this study.

It is also found that parents' educational level influences students' academic expectations, but not in the same dimensions or with the same intensity. A higher paternal education level influences higher expectations in political engagement and citizenship and social interaction. However, Bernal et al. (2023) suggest that, regardless of parents' educational level, there are no differences in this dimension, while Alfonso Gil et al. (2014) highlight the influence of paternal education on this dimension. Additionally, a higher maternal education level determines higher

academic expectations for social interaction and, indirectly, for employment training, agreeing with Alfonso Gil et al. (2014).

The results conclude, in line with Bernal et al. (2023) and Alfonso Gil et al. (2014), that parents' educational level is a determining factor in what students expect from university and their education. The influence of parents' educational level plays a relevant role in shaping students' academic expectations, as confirmed by Tinto (1975), who explains that students from families with higher education levels are more likely to remain in university. On the other hand, difficulties in adapting to academic habits become more complex when students do not have parents or friends with similar experiences (Aina et al., 2022).

Overall, the academic expectations of the participating students suggest that they seek a university space to develop personal, professional, and civic responsibilities, in line with Gorgodze et al. (2020), who found that students expect the university to focus on skill development and knowledge transfer. Regarding the third hypothesis, the discussion of the results highlights the significant influence of academic expectations on dropout intentions. However, it is important to note that this influence is heterogeneous, as academic expectations interdependently influence different dropout motives with

varying directions and intensity.

Unlike the findings of Alfonso Gil et al. (2013), who show that academic expectations regarding political engagement and citizenship are of lower importance to students, this study demonstrates that political engagement and citizenship notably influence dropout motives related to organizational issues, life management, and professional concerns. This influence can be explained by one perspective on higher education in Latin America, which emphasizes the importance of a more critical and committed education, whose benefits extend to both society and the labor market, as well as personal development (Veugelers et al., 2014). It is likely that attitudes related to education emphasizing responsibility, self-responsibility, and the ethical generation of knowledge (Benjumea & Mesa, 2021) have resonated with the expectations of the participating students.

The set of academic expectations related to personal and social development includes autonomy, self-confidence, critical thinking, and personal improvement (Deaño et al., 2015). According to the results of this study, expectations about personal and social development act as a protective factor against dropout motives, as students would consider fewer reasons for leaving their studies when these expectations are high. These findings partially align with the conclusion of López-Aguilar et al. (2023), which highlights that students with low confidence and a lack of control over their projects are more likely to drop out of their studies.

Preliminary results in this study, showing that expectations about employment training are highly valued by students, are similar to those of Cervero et al. (2021),

who concluded that students' interest in knowledge acquired for their future professional careers influences their decision to remain in university, and those of Alfonso Gil et al. (2013), who found that students expect a lot from employment training.

On the other hand, academic expectations regarding social interaction and social pressure have a low influence on dropout motives related to relational issues. However, it is important to note that high expectations regarding social pressure lead students to consider more reasons for abandoning their studies, while high expectations regarding social interaction reduce the likelihood of dropping

out for relational reasons. Nevertheless, it should be considered that social interaction is an extremely broad construct, which, as noted by other studies, includes individual factors such as personality traits and social class (Vargas et al., 2019). Despite the limited influence of expectations related to social interaction on dropout intentions, it is worth considering that social integration in university plays a buffering role for other variables influencing dropout (Tuero et al., 2018).

Considering the importance of academic expectations in understanding dropout intentions (Galve- González et al., 2022), and the results presented, it is essential to highlight the practical implications of this work. Understanding students' expectations should lead to strengthening orientation programs, both before and during the university admission process, so that the academic expectations students bring with them to university and their development throughout their education reasonably align with what the university and the labor market offer. There should be a stronger focus on training in political engagement and citizenship, as well as personal and social development, so that students solidify the idea that social commitment is not detached from rigorous academic and professional training.

It is important to note that intervention strategies cannot address all the reasons behind dropout intentions. However, Palacio et al. (2020) emphasize that academic conditions are the sole responsibility of universities, which could mitigate this issue by implementing programs and actions aligned with appropriate state policies.

Lastly, it was deemed appropriate to discuss why academic expectations regarding student mobility have not been considered in the previous models. The University of Cuenca has implemented internationalization strategies aimed at increasing student mobility to study at regional or foreign universities (Humala, 2024). In the participating sample, student mobility is seen as a possibility, but no concrete actions are envisioned to materialize this expectation. This may be due to the fact that student mobility in Ecuador and Latin America depends on educational, economic, political-cultural, and language factors.

Moreover, internationalization policies do not depend solely on institutional efforts; they require agreements for regional integration in higher education (Fairlie Reinoso, 2021). Scholarships for student mobility are a valid institutional strategy

to promote academic exchange. However, Camacho (2017) warns that the absence of alternative financing systems or the lack of expanding existing opportunities can lead to the passive exclusion of students who do not have personal funds to participate in international mobility activities.

## Future Lines and Limitations

It seems pertinent to deepen the exploration of the relationships between academic expectations and dropout intentions in Ecuadorian universities, particularly in light of the changes in the university access process since 2023 (Agreement No. SENESCYT-2022-043, Senescyt, 2022). These changes include a differentiated mechanism for career selection and seat allocation, which may have important implications for students' expectations and their eventual intentions to abandon their studies. Further research could investigate how these new policies impact students' perceptions and decisions throughout their academic journey.

Moreover, expanding the study of academic expectations in different local and regional contexts would provide valuable insights into the variation of expectations and dropout intentions based on socio-cultural or institutional factors. Investigating academic expectations in universities with differing socio-economic, cultural, and academic realities could yield important comparative data, particularly with respect to different regions in Ecuador.

Consolidating policies and strategies related to student mobility could also constitute a relevant future line of research. Understanding how student mobility influences academic expectations, retention, and dropout rates is particularly timely, as international exchange programs and global learning opportunities continue to shape higher education. Exploring how these programs intersect with students' motivations and career expectations would contribute significantly to this area of study.

Future studies could include additional mediating variables that were not considered in the current research, such as academic performance, students' university entrance grades, and their previous academic trajectory. These factors may play a pivotal role in shaping students' academic expectations and dropout intentions. Additionally, incorporating data from other universities in Ecuador with different realities would help provide a more comprehensive and generalizable understanding of these dynamics.

Finally, the results of this study should be interpreted with caution. While a stratified random sample was designed, certain strata were overrepresented due to an unequal response rate. This limitation prevented the inclusion of academic field as a predictor variable for academic expectations, despite its inclusion in previous

studies. Future research should strive to address this limitation by ensuring a more balanced representation across different academic fields, which could reveal how students' expectations vary depending on their field of study.

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# The subtle aggression of social exclusion in education: a scale for its measurement among young people

## *La sutil agresión de la exclusión social en la escuela: una escala de medida para adolescentes*

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## ABSTRACT

The scientific literature has extensively addressed the study of social exclusion. However, there are few studies focusing on social exclusion among schoolchildren from the perspective and feelings of its victims, as well as its possible manifestations within the framework of school coexistence. Even fewer investigations have been conducted with this focus on preadolescents and adolescents. Nevertheless, existing literature suggests the presence of two distinct forms of victimization through exclusion among schoolchildren: manifest and subtle. The aim of this study was to describe the nuances of these potential forms of the phenomenon and to design and validate a scale for their measurement. A total of 1013 primary and secondary school students from educational institutions in Córdoba participated in this research. The study was conducted in two phases: the first explored the suitability and structure of an instrument on social exclusion that captures the affective and behavioral nuances related to the victims' feelings regarding different types of exclusion. In the second phase, through a confirmatory factor analysis, the factorial structure of a measurement scale was established, demonstrating strong psychometric properties for evaluating the construct of social exclusion. As a result, a bidimensional scale of social exclusion –manifest exclusion and subtle exclusion- was obtained. The findings are discussed concerning the instrument's suitability, and conclusions are drawn regarding the article's contribution to the understanding of the construct, as well as its potential to support preventive and remedial educational interventions for this type of peer aggression.


**Keywords:** aggression, victimization, scales, social discrimination, adolescents, education


## RESUMEN

La literatura científica ha abordado ampliamente el estudio de la exclusión social. Sin embargo, son escasos los estudios que ponen el foco en la exclusión social entre escolares desde la precepción y sentimientos de sus víctimas y sobre sus posibles formas en el marco de la convivencia escolar. Aun son menos las investigaciones que con este foco se realizan sobre preadolescentes y adolescentes. Aun así, la literatura previa aporta aproximaciones que sustentan la expectativa de que existen dos formas de victimización por exclusión entre escolares: manifiesta y sutil. El objetivo de este trabajo ha sido describir los matices de estas posibles formas del fenómeno y diseñar y validar una escala para su medida. En este trabajo participaron 1013 estudiantes de Educación Primaria y Secundaria de centros educativos de Córdoba. La investigación se desarrolló en dos fases: la primera exploró la idoneidad y la estructura de un instrumento sobre exclusión social que recoge los matices afectivos y conductuales referidos a los sentimientos de la víctima de los diferentes tipos de exclusión. En la segunda, mediante un análisis factorial confirmatorio se establece la estructura factorial de una escala de medida que evidencia buenas cualidades psicométricas para la evaluación del constructo exclusión social. Así se obtiene una escala de dos factores: exclusión manifiesta y exclusión sutil. Se discuten los

resultados en relación con la idoneidad del instrumento y se expresan las conclusiones en orden tanto a la aportación que el articulo hace a la comprensión del constructo como a su virtualidad para favorecer intervenciones educativas preventivas y paliativas de este tipo de agresión entre iguales.

**Palabras clave:** agresión, victimización, escalas, discriminación social, adolescentes, educación

## INTRODUCTION

The desire to create and maintain positive peer relationships is a fundamental and universal human need (Baumeister & Leary, 1995). However, for various reasons, individuals do not always succeed in achieving such relationships in everyday social life. This can lead to distress and anxiety for individuals who feel unsuccessful in their efforts. Numerous studies over the past two decades have shown that episodes of rejection, ostracism, and social exclusion—particularly common in childhood and adolescence—affect well-being and the quality of coexistence and classroom life in various ways (Satici, 2020). Some forms of rejection are included within the broader phenomenon of school bullying, but exclusion also appears as a specific phenomenon beyond unjustified aggression like bullying. Both types of social exclusion have negative effects on victims, such as anxiety, loneliness, low self-esteem, demotivation toward school activities, low academic performance, school dropout, internalizing or externalizing problems, increased aggressive behaviour, and overall reduced emotional well-being, sometimes even leading to severe consequences such as depression or suicide (Arslan, 2018; Chen et al., 2020; Williams, 2001). All forms of peer maltreatment negatively affect personal development and disrupt the socialization process. Peer relationships require the formation of emotional bonds that support balanced social integration and the creation of a sense of belonging to a community. This sense of belonging is essential for developing full citizenship (Rodríguez-Hidalgo & Ortega-Ruiz, 2017). Among all negative interpersonal dynamics caused by peer mistreatment, social exclusion among school-aged peers is perhaps the least studied. This is partly because it often involves subtle forms of aggression with low expressiveness and limited visibility. Marginalizing a peer from direct contact (e.g., social isolation) or seeking their psychological exclusion (e.g., being ignored or told they are not wanted) is not always perceived as a form of aggression by others or even the surrounding environment. It is often not recognized as an intentional act of harm, yet for the victim, it remains painful and can have a profoundly aversive emotional and mental impact, potentially becoming a traumatic experience with severe consequences (Yu et al., 2023; Zadow et al., 2024).

## SOCIAL EXCLUSION AMONG SCHOOLCHILDREN

Social exclusion is a complex phenomenon that can be approached from different perspectives. In recent years, significant contributions have emerged from psychology and pedagogy (e.g., Kaufman & Killen, 2022; Riva & Eck, 2016; Satici, 2020; Vanhalst et al., 2015; Wesselmann et al., 2023; Yu et al., 2023; Zadow et al., 2024). Scientific literature uses different terms to refer to this phenomenon—such as ostracism, rejection, or isolation—which are often used interchangeably with social exclusion. However, important differences among them must be distinguished to better understand the construct (Wesselmann et al., 2023; Williams et al., 2005).

From a psychosocial perspective, social exclusion—often referred to as ostracism (Williams, 2001)—is understood as being physically or emotionally separated from others (Riva & Eck, 2016). Physical separation involves explicit and active interpersonal rejection (Leary, 2005), while emotional exclusion is less evident and includes experiences such as being ignored, feeling unwanted, receiving no attention or affection, or being treated with disrespect (Molden et al., 2009). Riva and Eck (2016) proposed a hierarchical model of the construct that identifies two key experiences: social rejection and ostracism.

Isolation, in contrast to rejection, is defined as a state or situation characterized by the absence of social relationships, lack of contact with others, or exclusion from interactive activities. Self-assessments of isolation are often associated with the density of social relationships (Vanhalst et al., 2015). This suggests that the perception of social isolation can vary by individual interpretation, involving a subjective component that must be considered. Isolation deprives individuals of tangible group benefits, leading to feelings of injustice or deprivation of rights. Emotional processes, along with objective and measurable factors, influence the perception of this situation, making it a complex psychological and educational phenomenon. Unlike rejection or being ignored, isolation is sometimes a state that is desired and actively sought by the individual (Kaufman & Killen, 2022). Even so, self-perception of isolation—whether imposed by others or self-initiated—tends to be experienced as negative and painful (Arslan, 2018). Loneliness represents the final stage of a dynamic process in which the individual becomes aware of living in a socially isolated condition. For most people, this process is distressing, especially in childhood or adolescence, where social interaction is vital (Zadow et al., 2024).

Explicit social rejection, often manifested through verbal expressions, can lead to isolation and encompasses forms of social discrimination that are clearly perceived by the targeted individual as unjust. This perceived social discrimination is particularly impactful during the years of compulsory education, when social

interaction is not optional, but rather normative and part of everyday life. However, most research on this topic has focused on adults (McKenna-Plumley et al., 2023). In recent decades, studies involving youth within educational contexts have offered valuable insights (Satici, 2020; Yu et al., 2023). From this perspective, social exclusion is described as a type of direct relational aggression that occurs within bullying dynamics, involving unjustified, intentional, and repeated behaviors framed in the context of a social power imbalance (Rodríguez-Hidalgo & Ortega-Ruiz, 2017). Statements such as "You can't play with us" or "You're not invited to the party" exemplify how victims may be socially targeted through group-aligned, collective rejection.

An emerging line of research on social aggression focuses on the stigma triggered by certain aspects of ethnic-cultural diversity, sexual orientation, gender identity, socioeconomic status, disability, among others. These factors can result in subtle forms of aggression—such as xenophobia—and may involve rejection or even hate-driven expressions directed at stigmatizing those perceived as different (Wesselmann et al., 2023). Falla and Ortega-Ruiz (2019) highlighted high rates of exclusion and bullying experienced by students with disabilities. Rodríguez-Hidalgo and colleagues (2014) examined ethno-cultural victimization in a large and culturally diverse sample of schoolchildren, finding that both immigrant and Roma students are at high risk of exclusion.

Ultimately, scientific literature increasingly describes social exclusion as a multidimensional construct with specific psychosocial and psychoeducational features. Early detection is crucial to prevent the victim's suffering from escalating into mental health risks during critical developmental periods like preadolescence and adolescence. This construct appears to encompass significant elements of discrimination and rejection (Banki, 2012; Freedman et al., 2016; Wiltgren, 2023). Most of the scientific and educational communities agree on the urgent need to better understand social exclusion among schoolchildren, with the aim of mitigating and preventing it due to its serious consequences.

## TYPES OF SOCIAL EXCLUSION

In the school context, peer social exclusion has often been studied within the broader phenomenon of bullying and, to a lesser extent, as a specific form of unjustified and morally cruel aggression. The element of intentionality in social exclusion has led some researchers to distinguish between various possible forms of exclusion. When social exclusion occurs as part of bullying— clearly involving intentional, repeated behaviour within a power imbalance — it is consistently regarded as aggressive and harmful, both due to its moral implications and its consequences (García-Díaz et al., 2023). However, when exclusion takes place

independently of bullying dynamics, it becomes more difficult to determine whether there is clear intent to harm or unjustly punish the victim. In such cases, the person excluding others and even observers involved may not recognize the behaviour as immoral or unjust (Ortega, 2010). Freedman et al. (2016) suggest that social exclusion sometimes arises because it is not always realistic or possible to include everyone. People often must make elective decisions—for instance, when choosing friends. This involves excluding some peers from a close friendship circle but not necessarily from the larger classroom group. Students organize themselves in various groupings, sometimes task-related, other times based on affinities; and friendship itself is a form of affinity (Bravo et al., 2022). Any decision involving selection may result in exclusion without intent to cause harm. Research shows that in many everyday school situations, exclusion is normalized and even viewed positively—for example, when selecting group members for a task requiring certain skills, or when limiting team size (Kaufman & Killen, 2022). Studies on peer relationships indicate that children justify social exclusion differently depending on age and social identity (Cooley et al., 2019). However, even when peer exclusion is unintentional, the excluded student may still perceive it as painful and feel victimized.

These contributions lead us to view social exclusion as a complex concept with many dimensions (Riva & Eck, 2016). When focusing specifically on exclusion perceived as aggressive or harmful, most studies distinguish between two primary experiences or types. The labels and nuances used to describe these subtypes are not always consistent or conclusive. For example, Prendergast and Schubert (2020) describe a duality of explicit versus implicit social exclusion, without necessarily evaluating that both forms can elicit negative feelings and harmful emotions. Others, such as Wesselmann et al. (2023), distinguish between rejection (direct negative attention suggesting one is unwanted) and ostracism (primarily defined by being ignored). Molden et al. (2009) made a similar distinction when examining how emotions and motivations differ in response to being rejected versus being ignored. These same forms—being rejected and being ignored—were also identified by Arslan (2018) in studies of social exclusion in schools, focusing on students' subjective experiences. On an emotional level, recent studies show that many exclusion scenarios among students are difficult to detect yet cause serious challenges in social integration. Examples include: peers avoiding sitting next to you; refusing to work with you; deliberately hiding information; refusing friendship; discrimination; stigmatization; mocking; spreading rumours; or avoiding eye contact, among others (Banki, 2012; Wiltgren, 2023). Such behaviours—often referred to as microaggressions (Wesselmann et al., 2023)—are frequently experienced by members of minority groups and may be enacted either consciously and explicitly or unconsciously and implicitly (Cooley et al.,

2019). These seemingly harmless social behaviours, often unnoticed by others, can generate deeply harmful feelings in those targeted, who are typically left to face the exclusion on their own.

Despite variation in the definition of its subtypes, the scientific literature provides valuable insights that contribute to advancing the conceptualization of peer social exclusion. It suggests that the phenomenon may occur in two broad forms: one that is more direct, explicit, and overtly aversive; and another more indirect, implicit, and subtle. Accurately measuring these types of exclusion is essential for two key reasons: (1) to capture the full spectrum of peer victimization associated with rejection, discrimination, and ostracism; and (2) to assess the quality of peer social networks, which is a recognized indicator of school climate and, therefore, a foundational component of education quality (Ortega, 2010).

## MEASUREMENT AND ASSESSMENT OF THE CONSTRUCT OF PEER SOCIAL EXCLUSION

The tradition of using sociometric methods has played an important role in distinguishing socially accepted individuals from those who are socially excluded (Cillessen, 2009). However, this method does not capture the emotional experience of being excluded within peer relational contexts during childhood and/or adolescence, nor the various forms of peer exclusion victimization, which is the core construct of the present study. For instance, the Social Inclusion Scale for Adolescents (SIAS; Moyano et al., 2022) was developed to evaluate social inclusion/exclusion among Spanish and foreign adults based on five sociodemographic factors: basic needs, self-efficacy, social support, employment training, and social integration. Also available is the Experiencing Social Exclusion Scale (ESE; Semenova et al., 2022), designed to assess the volume and intensity of social exclusion experiences in romantic and small-group adult relationships. These contributions are valuable but diverge from the specific construct examined in this study. There are other tools that more closely align with the construct in question. For example, the Bull-S Test (Cerezo, 2000) identifies aggression–victimization dynamics related to bullying in school settings through the use of sociograms, but it does not measure perceived exclusion. One of the first instruments specifically targeting social exclusion was the Ostracism Needs Threat Scale by Williams (2001), which explored ostracism experiences in relation to four core psychological needs: belonging, self-esteem, control, and meaningful existence. Later, the Ostracism Experience Scale for Adolescents (OES-A; Gilman et al., 2013)—the first tool designed to evaluate two of the most common ostracism experiences perceived by adolescents: being actively excluded or being ignored within a group—focused on the perception of exclusion, although it did not register

perceived victimization. This instrument was validated among youths aged 17–18, which limits early detection—something that many authors argue is essential to prevent more serious adverse effects (Bravo et al., 2022). Most instruments approximating measures of sociability incorporate weighted indicators of social exclusion. The General Belongingness Scale (GBS; Malone et al., 2012) was used to assess acceptance or rejection across various domains, without addressing how social affinities impact the personalities of those accepted or rejected. Other tools such as the Social Connectedness Scale (Lee & Robbins, 1995) assess group affiliation levels, while the UCLA Loneliness Scale (Russell et al., 1978) is typically used for specific purposes that do not focus on rejection-related victimization. For example, the Classmates Social Isolation Questionnaire (CSIQ; Alivernini & Manganelli, 2016) can be used to register isolation.

Nevertheless, there is currently no specific instrument capable of capturing how adolescents perceive their own experiences of social exclusion by peers—or whether such experiences are perceived with precision, as these perceptions may differently influence the emotional impact of the experience. This absence is especially significant considering the substantial body of evidence documenting the emotional, cognitive, and social harm caused by social exclusion. The importance of contextual conditions, and, in particular, the nuances with which social exclusion is presented to victims (Wesselmann et al., 2023; Williams et al., 2005), underlines the need for measurement tools capable of differentiating these effects and thereby enriching the epistemological framework of the construct.

The present study aims to create a suitable instrument to evaluate peer social exclusion as perceived by preadolescent and adolescent victims. Given that recent literature points to two potential forms of school-based exclusion—one more direct, explicit, and aversive, and the other more indirect, implicit, and subtle (e.g., Arslan, 2018; Molden et al., 2009; Prendergast & Schubert, 2020; Wesselmann et al., 2023)—this study seeks to design and validate a scale that measures peer victimization through both manifest and subtle forms of social exclusion: the Manifest and Subtle Social Exclusion Scale for Preadolescents and Adolescents (ESMASU). The specific objectives are: (1) To identify whether there are distinct types of perceived peer exclusion victimization based on the emotional harm felt by the victim (manifest victimization vs. subtle victimization); and (2) To design and validate the ESMASU Scale with a sample of students aged 10 to 17. The hypothesis under study is: There are two forms of peer social exclusion victimization—manifest and subtle.

## METHOD

### Participants

A total of 1,013 students from 14 primary and secondary education centres located in the provinces of Córdoba and Seville participated in the present study. The sampling procedure was incidental, based on accessibility. The final sample was divided into two subsamples (see Table 1): an exploratory analysis sample composed of 496 students (49%) and a confirmatory analysis sample composed of 517 students (48.7% boys and 51.3% girls), aged between 10 and 17 years (M = 11.86; SD = 1.703).

**Table 1**
*Description of the study sample based on sociodemographic data*

| Stage | Grade | Gender | | Total |
|---|---|---|---|---|
| | | Boys | Girls | |
| Primary | 5th Grade | 171 | 168 | 339 |
| | 6th Grade | 123 | 121 | 244 |
| Secondary | 1st Year | 53 | 53 | 106 |
| | 2nd Year | 46 | 59 | 105 |
| | 3rd Year | 42 | 62 | 104 |
| | 4th Year | 58 | 57 | 115 |
| | Total | 493 | 520 | 1013 |

### Instrumento

An ad hoc questionnaire was developed consisting of 20 items (see Appendix 1), including exploratory questions about possible experiences of social exclusion within participants' reference social groups (school, classroom, classmates, and friends), as well as items related to sociodemographic aspects (e.g., educational centre, grade, gender). Variables related to experiences of social exclusion were measured using a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). All items were written from the victim's point of view and began with prompts such as: "I feel that…" or "My classmates…" (see Appendix 2).

## Procedure and Data Analysis

To initiate the data collection process, a research team from the University of Cordoba first contacted the educational institutions in order to obtain permission to carry out the study. A date was then arranged for administering the questionnaires in the participating schools. During the administration process, researchers distributed the questionnaires in paper format and informed participants about the voluntary, anonymous, and confidential nature of the data. All doubts were addressed by the research team, which also documented any incidents or difficulties encountered by students during completion. The completion time was approximately 15 minutes.

After piloting the instrument, several items were revised or eliminated due to identified difficulties—such as issues with comprehension or grammatical errors involving participant gender (e.g., replacing "compañero" with "compañero/a"). The suitability of the items was confirmed, and the study was conducted in two phases: the first phase involved conducting the Exploratory Factor Analysis (EFA), and the second phase involved a Confirmatory Factor Analysis (CFA).

The EFA was carried out using the responses from the designated subsample, aiming to identify the number of underlying factors or dimensions (using Factor program version 10.9.02). Due to the ordinal nature and non-normality of the data, a polychoric correlation matrix was generated (Flora & Curran, 2004), and the Unweighted Least Squares (ULS) extraction method was used. Promin oblique rotation was applied, which is well-suited for exploratory studies and is recommended by several authors (Ferrando & Lorenzo-Seva, 2014; Lloret et al., 2017). Items from the original 20-item scale were removed during the EFA if their factor loadings were below .40 (Lloret et al., 2017).

In the second phase, the EQS program was used to conduct the Confirmatory Factor Analysis (CFA) with the second study sample. The estimation method used was Robust, given the detection of non-normal distribution indices. To assess model fit, the Satorra-Bentler chi-square ($\chi^2$S-B), chi-square divided by degrees of freedom ($\chi^2$S-B/df)—with values ≤5 considered acceptable and ≤3 considered optimal—were used, along with sample-size independent indices: NNFI (Non-Normed Fit Index), NFI (Normed Fit Index), CFI (Comparative Fit Index), and IFI (Incremental Fit Index). Good model fit was defined by values ≥.95 (Bentler, 1992). For RMSEA (Root Mean Square Error of Approximation), values between .05 and .08 were considered indicative of good fit (Hu & Bentler, 1999).

This study was conducted in accordance with the ethical guidelines outlined in the Declaration of Helsinki. The procedure was approved by the Human Research Ethics Committee (CEIH) of the University of Cordoba (PSI2016-74871-R, April 18, 2018).

## RESULTS

### Exploratory Factor Analysis of the Social Exclusion Scale

The exploratory factor analysis (EFA) indicated a lack of normality in the data (Mardia's coefficient = 379.466). The Kaiser-Meyer-Olkin test measure of sampling adequacy (KMO = .925) and Bartlett's Test of Sphericity (Bartlett's test = 2582.1; $p < .001$) yielded satisfactory values, supporting the suitability of the data for factor analysis and justifying the application of confirmatory factor analysis (CFA). The resulting factorial structure explained 80.2% of the total variance. Simplicity (S index) and loading simplicity (LS index) (Lorenzo-Seva, 2003) showed appropriate values (S = .99; LS = .54), suggesting a simple factor structure in which the items predominantly loaded onto a single dimension. Table 2 displays the factor loadings and the assignment of each item to its corresponding factor. The two resulting factors were labelled as follows: a) F1 or Manifest Exclusion (MEx); and b) F2 or Subtle Exclusion (SEx). The correlation between the factors was .824.

**Table 2**

*Univariate descriptive analysis, factor loadings, and communalities from the EFA*

| Nº | Item | M | SD | Skew. | Kurt. | MEx | SEx | Com. |
|---|---|---|---|---|---|---|---|---|
| Ex1 | I feel like my classmates are sidelining or excluding me | 1.19 | .516 | 3.167 | 11.253 | .901 | | .827 |
| Ex2 | My classmates make me feel different from them | 1.19 | .527 | 3.249 | 11.670 | .931 | | .789 |
| Ex3 | My classmates reject me to make me suffer | 1.41 | .700 | 1.766 | 2.724 | .734 | | .794 |
| Ex4 | I feel that my classmates reject me | 1.29 | .608 | 2.300 | 5.411 | .461 | | .699 |
| Ex5 | My classmates exclude me to hurt me | 1.18 | .492 | 3.326 | 12.444 | .643 | | .773 |
| Ex6 | I feel undervalued by my classmates | 1.29 | .644 | 2.521 | 6.458 | | .681 | .709 |
| Ex7 | I feel odd among my classmates | 1.17 | .491 | 3.551 | 14.254 | | .891 | .757 |

| Nº | Item | M | SD | Skew. | Kurt. | MEx | SEx | Com. |
|---|---|---|---|---|---|---|---|---|
| Ex8 | I feel like I don't have a place in the group of my classmates | 1.18 | .480 | 3.004 | 10.006 | | .991 | .787 |
| Ex9 | I feel like my classmates ignore me | 1.30 | .588 | 2.036 | 4.057 | | .963 | .731 |
| Ex10 | I feel like I´m not welcomed by my classmates | 1.30 | .658 | 2.550 | 6.573 | | .726 | .687 |

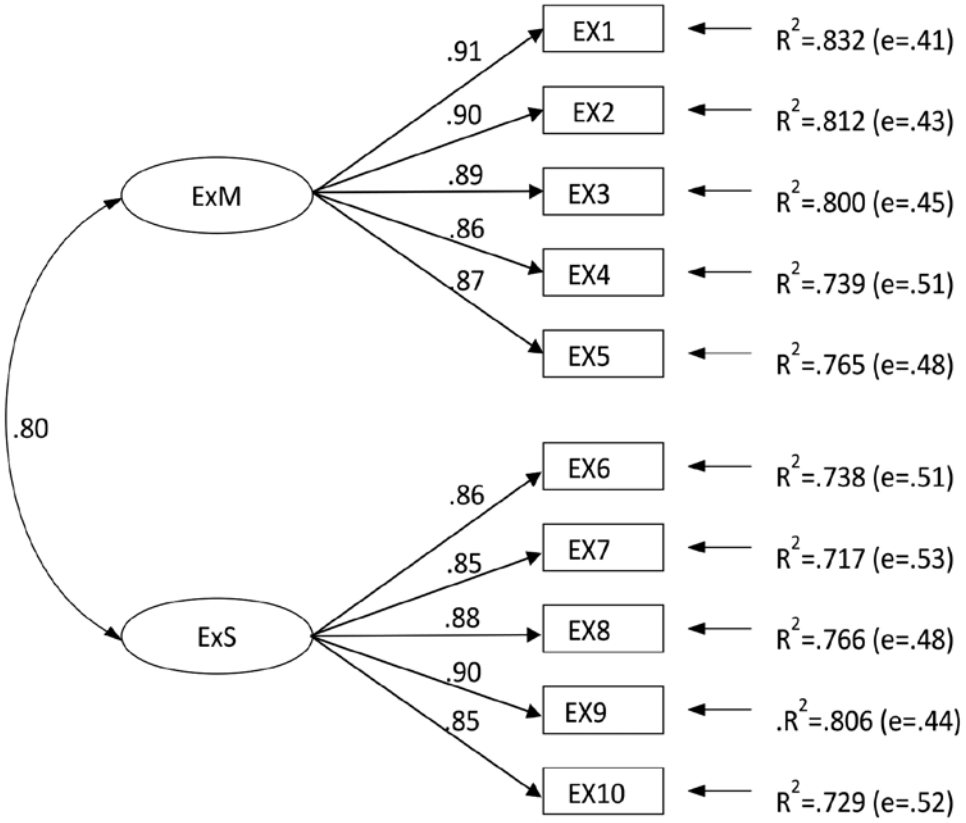
## Confirmatory Factor Analysis of the Social Exclusion Scale

A Confirmatory Factor Analysis (CFA) was conducted to test the hypothesized two-factor structure of the Social Exclusion Scale. Given the non-normal distribution of the data (Mardia's coefficient = 261.3507), robust maximum likelihood estimation was applied.

For the two-factor model, the Satorra-Bentler chi-square was significant ($\chi^2$S-B [34] = 84.94, $p < .001$), and the chi-square to degrees of freedom ratio ($\chi^2$S-B/df) was below 3, indicating an optimal fit (Hu & Bentler, 1999). Goodness-of-fit indices, which are less affected by sample size and assess the relative fit of the model, all exceeded the .95 threshold (NFI = .99; NNFI = .99; CFI = .99; IFI = .99), and the RMSEA value was below .08 (RMSEA = .058), supporting a good model fit. For comparison purposes, the two-factor model was contrasted with a unidimensional item-clustering model, which showed a poorer fit [$\chi^2$S-B (35) = 1030.50; $p < .001$], and a $\chi^2$S-B/df ratio greater than 3, considered acceptable but not optimal (Hu & Bentler, 1999). While the unidimensional model yielded goodness-of-fit indices above .95 (NFI = .99; NNFI = .99; CFI = .99; IFI = .99), the RMSEA value was .08, indicating a poorer fit compared to the two-factor model.

The results revealed a positive correlation between factors (see Figure 1), r = .796. The item-factor correlation scores ranged from .85 (item Ex7: "I feel odd among my classmates") to .91 (item Ex1: "I feel that my classmates want to hurt me").

**Figure 1**
*Model CFA for the Social Exclusion Scale*




The results showed direct polychoric correlations between the items comprising the Social Exclusion Scale (see Table 3), ranging from .58 to .82.

**Table 3**
*Polychoric Correlation Matrix Among Social Exclusion Items*

| | Ex1 | Ex2 | Ex3 | Ex4 | Ex5 | Ex6 | Ex7 | Ex8 | Ex9 | Ex10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ex1** | 1 | | | | | | | | | |
| **Ex2** | .82 | 1 | | | | | | | | |
| **Ex3** | .82 | .81 | 1 | | | | | | | |
| **Ex4** | .78 | .78 | .77 | 1 | | | | | | |
| **Ex5** | .80 | .79 | .78 | .75 | 1 | | | | | |
| **Ex6** | .62 | .62 | .61 | .59 | .60 | 1 | | | | |
| **Ex7** | .62 | .61 | .60 | .58 | .59 | .73 | 1 | | | |
| **Ex8** | .64 | .63 | .62 | .60 | .61 | .75 | .74 | 1 | | |
| **Ex9** | .65 | .64 | .64 | .62 | .63 | .77 | .76 | .79 | 1 | |
| **Ex10** | .62 | .61 | .61 | .58 | .59 | .73 | .72 | .75 | .77 | 1 |

The internal consistency index revealed satisfactory reliability levels for the instrument (α = .932) as well as for each of its dimensions: a) F1 or Manifest Exclusion (MEx): α = .906; and b) F2 or Subtle Exclusion (SEx): α = .896.

## DISCUSSION AND CONCLUSIONS

The first objective of this study was to identify whether two perceived types of social exclusion victimization could be empirically distinguished: manifest and subtle. Results from the exploratory factor analysis (EFA) provide evidence that social exclusion, when observed through the feelings of those who experience it, emerges in two distinct forms: the perception of manifest social exclusion and subtle social exclusion. The latter is also recognized as a form of aggression and unjust discrimination. Based on these results, the second objective of the study was also achieved. A new instrument –ESMASU– has been developed and validated, demonstrating strong psychometric properties for assessing social exclusion across two dimensions: manifest and subtle.

The review of previous literature has contributed to the conceptualization of social exclusion as a dichotomous phenomenon, depending on how it is exercised: one form is more direct, explicit, and aversive, and the other is more indirect, implicit, and less evident (e.g., Arslan, 2018; Molden et al., 2009; Prendergast & Schubert, 2020; Wesselmann et al., 2023). This supported the hypothesis that social exclusion

victimization among peers can occur through both manifest and subtle forms. The findings confirm this hypothesis: one subtle but harmful form and another manifest and equally harmful form—each with distinctive characteristics. In this regard, the victim's perceptions and emotions are crucial in determining the severity of each type of exclusion and in ensuring a comprehensive understanding of the different forms of social exclusion that can occur and be experienced. The newly developed instrument shows suitable psychometric properties, including good model fit, optimal reliability values, and strong internal consistency. According to the results, the instrument is viable for measuring this construct among preadolescent and adolescent students. Several researchers recommend the use of self-report instruments to assess social exclusion, as the construct inherently involves social perception and self-perception (Gilman et al., 2013). Therefore, ESMASU may serve as an excellent complement to traditional sociometric methods of peer evaluation, enabling researchers and educators to more accurately approach the multifaceted construct of social exclusion.

An analysis of how ESMASU items cluster within the two factors reveals key nuances that differentiate the two forms of exclusion. Accordingly, the labels "subtle social exclusion" and "manifest social exclusion" were adopted. Subtle social exclusion is characterized as a type of social aggression, reported by the victim and defined by feelings of being ignored or unappreciated. In contrast, manifest social exclusion is experienced as active rejection, perceived by the victim as intentionally harmful, with a clear aversive intent.

Subtle social exclusion is understood as the victim's subjective perception of being excluded from the reference group. Youth often report feelings such as being different, feeling out of place among classmates, not being listened to, lacking understanding from peers, feeling unappreciated or unwelcome, or experiencing indifference. As a result, the student becomes a victim of subtle social exclusion, although not always perceiving clear intent to harm from the perpetrator—yet still suffering emotional distress. Related items include: "I feel odd among my classmates," "I feel like I don't have a place in the group of classmates," and "I feel like my classmates ignore me." Victims often experience helplessness and vulnerability, realizing that their experience is not easily observable or condemnable, which complicates efforts to reverse the situation (Banki, 2012; Wiltgren, 2023).

In the case of manifest social exclusion, results show that preadolescents and adolescents aged 10 to 17 are capable of perceiving the aggressor's intention to exclude them from the class group, with a clear desire to inflict harm. Items in this dimension include: "I feel my classmates reject me," "My classmates reject me to make me suffer," "My classmates exclude me to hurt me," and "I feel like my classmates are sidelining or excluding me." These responses suggest that victims perceive clear aversion intent from their peers, leading to manifest social

exclusion—a more overt form of exclusion that is easier to identify and, therefore, more likely to prompt intervention from the victim's social environment (Arslan, 2018).

ESMASU, with its two subtypes of exclusion—subtle and manifest—is consistent with categorical approaches in the literature that point to two distinct exclusion experiences (e.g., Gilman et al., 2013; Prendergast & Schubert, 2020). However, ESMASU contributes added value by evaluating adolescents' own feelings about their experiences of social exclusion. The manifest exclusion identified aligns with the notion of explicit rejection (Wesselmann et al., 2023) and direct rejection (Leary, 2005). For example, Freedman et al. (2016) classified social exclusion into explicit rejection, ostracism (being ignored), and ambiguous rejection. The subtle exclusion in this study is related to the ostracism dimension (Freedman et al., 2016), defined as silent treatment without explanation. It also aligns with the recently described concept of "polite exclusion" in classroom settings (Wiltgren, 2022), highlighting the difficulty of detecting such subtle forms. The manifest exclusion found in this research is also consistent with peer bullying, as it represents intentional harm that negatively impacts the victim emotionally and cognitively (Falla & Ortega-Ruiz, 2019; García-Díaz et al., 2023; Ortega, 2010; Williams, 2005).

In conclusion, this study offers valuable contributions. ESMASU stands out for its parsimony and simplicity (10 items) and demonstrates excellent psychometric properties. Importantly, it underscores that social exclusion, independent of bullying, is a distinct phenomenon with aggressive potential that can be harmful for numerous reasons. The scientific study of these subtle and sometimes unintentional forms of exclusion is of great importance for preventing the full range of social exclusion experienced among youth.

Detecting, preventing, and addressing the various forms of social exclusion—especially those subtle behaviors that go unnoticed in school settings but are perceived and suffered by victims—is essential for improving socialization processes and mitigating future mental health issues among adolescents. Instruments such as ESMASU can greatly contribute to this aim.

The development and validation of the ESMASU scale open the door to further research on the different forms of social exclusion based on victimization experiences. Nonetheless, certain limitations must be acknowledged. Expanding the sample to include other populations (e.g., different student groups or regions) would allow for a broader understanding of the prevalence and impact of the phenomenon. Future studies should delve deeper into these perceived types of exclusion to determine whether they lead to different outcomes. Finally, it would be of great scientific interest to explore the developmental trajectory of social exclusion by examining the emotions it elicits in victims across various ages and

educational stages. Conducting longitudinal research will constitute the next step in advancing this line of inquiry.

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## APPENDIX

**Appendix 1**

*Original Ad Hoc Questionnaire: 20 Items on Feelings of Social Exclusion Victimization*

| Code 1st Phase (EFA) | Code 2nd Phase (CFA) | Final Code | Description | Strongly disagree | Disagree | Agree | Strongly |
|---|---|---|---|---|---|---|---|
| Ex18 | - | - | I feel that I have no friends in class. | **SD** | **D** | **A** | **SA** |
| Ex17 | - | - | I feel that my classmates do not listen to me. | **SD** | **D** | **A** | **SA** |
| Ex15 | - | - | I feel different from my peers. | **SD** | **D** | **A** | **SA** |
| Ex13 | - | - | I feel alone during school recess. | **SD** | **D** | **A** | **SA** |
| Ex19 | - | - | I feel that classmates don't care about me. | **SD** | **D** | **A** | **SA** |
| Ex20 | - | - | I feel that my classmates don't understand me. | **SD** | **D** | **A** | **SA** |
| Ex1 | - | - | I feel that my classmates want to hurt me. | **SD** | **D** | **A** | **SA** |
| Ex12 | Ex2 | 1 | My classmates make me feel different from them. | **SD** | **D** | **A** | **SA** |
| Ex16 | - | - | I feel that my classmates want to make me suffer. | **SD** | **D** | **A** | **SA** |
| Ex6 | Ex6 | 2 | I feel undervalued by my classmates. | **SD** | **D** | **A** | **SA** |
| Ex2 | - | - | My classmates avoid being with me in order to make me suffer. | **SD** | **D** | **A** | **SA** |
| Ex7 | Ex7 | 3 | I feel odd among my classmates. | **SD** | **D** | **A** | **SA** |
| Ex14 | Ex4 | 4 | I feel that my classmates reject me. | **SD** | **D** | **A** | **SA** |
| Ex3 | Ex3 | 5 | My classmates exclude me to hurt me. | **SD** | **D** | **A** | **SA** |
| Ex8 | Ex8 | 6 | I feel like I don't have a place in the group of my classmates. | **SD** | **D** | **A** | **SA** |
| Ex4 | - | - | I feel that my classmates hate me. | **SD** | **D** | **A** | **SA** |

| Código 1ª Fase (AFE) | Código 2ª Fase (AFC) | Código definitivo | Descripción | Muy en desacuerdo | En desacuerdo | De acuerdo | Muy de acuerdo |
|---|---|---|---|---|---|---|---|
| Ex5 | Ex5 | 7 | My classmates reject me to make me suffer. | **SD** | **D** | **A** | **SA** |
| Ex9 | Ex9 | 8 | I feel like my classmates ignore me. | **SD** | **D** | **A** | **SA** |
| Ex10 | Ex10 | 9 | I feel like I´m not welcomed by my classmates. | **SD** | **D** | **A** | **SA** |
| Ex11 | Ex1 | 10 | I feel like my classmates are sidelining or excluding me. | **SD** | **D** | **A** | **SA** |

## Appendix 2

*Manifest and Subtle Social Exclusion Scale (ESMASU)*

| Final Code | Description | Strongly disagree | Disagree | Agree | Strongly |
|---|---|---|---|---|---|
| agree | My classmates make me feel different from them. | **SD** | **D** | **A** | **SA** |
| 2 | I feel undervalued by my classmates. | **SD** | **D** | **A** | **SA** |
| 3 | I feel odd among my classmates. | **SD** | **D** | **A** | **SA** |
| 4 | I feel that my classmates are rejecting me. | **SD** | **D** | **A** | **SA** |
| 5 | My classmates reject me to make me suffer. | **SD** | **D** | **A** | **SA** |
| 6 | I feel like I don't have a place in the group of classmates. | **SD** | **D** | **A** | **SA** |
| 7 | My classmates exclude me to hurt me. | **SD** | **D** | **A** | **SA** |
| 8 | I feel like my classmates ignore me. | **SD** | **D** | **A** | **SA** |
| 9 | I feel like I'm not welcomed by my classmates. | **SD** | **D** | **A** | **SA** |
| 10 | I feel like my classmates are sidelining or excluding me. | **SD** | **D** | **A** | **SA** |

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# Social networks and sleep quality of university students: analysis of cognitive and emotional variables

## *Redes sociales y calidad del sueño de los estudiantes universitarios: análisis de variables cognitivas y emocionales*

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## ABSTRACT

The impact of social media and sleep quality of university students in the academic context is a topic of growing interest in educational research. In this sense, its impact hinders the ability to concentrate on all types of academic tasks, so that the university stage plays a crucial role, being a stage full of new challenges and academic demands that students do not always know how to face. Therefore, the study aimed to know and evaluate the relationship between sleep quality, the use of social media, anxiety and executive functions in higher education students. The methodology used is framed within a quantitative design with an associative, descriptive and comparative strategy with a sample of 586 students from the Faculty of Education and Psychology of the University of Extremadura selected from a non-random, non-probabilistic convenience sampling. The Hamilton Anxiety Rating Scale (HARS) and the Scale for Evaluation of Executive Functions in Everyday Contexts (EFECO) were used as instruments for data collection. The results show positive and significant correlations between the dimensions of the two scales, highlighting the influence of social networks and sleep quality on student performance. In addition, significant differences were found based on sex, academic degree and type of residence. Finally, the conclusion is that there is a significant relationship between anxiety and executive functions, highlighting the importance of addressing sleep quality and academic work through specific interventions that improve university education and the general well-being of students pursuing higher education.


**Keywords:** anxiety, sleep quality, college students, executive functions, social networks


## RESUMEN

El impacto de las redes sociales y la calidad del sueño de los estudiantes universitarios en el contexto académico es un tema de creciente interés en la investigación educativa. En este sentido, su impacto dificulta la capacidad de concentración para todo tipo de tareas académicas, de manera que la etapa universitaria juega un papel crucial, al ser una etapa repleta de nuevos retos y demandas académicas que los estudiantes no siempre saben cómo afrontar. Por ello, el estudio tuvo como objetivo conocer y evaluar la relación existente entre la calidad del sueño, el uso de las redes sociales, la ansiedad y las funciones ejecutivas en el alumnado de educación superior. La metodología empleada se enmarca dentro de un diseño cuantitativo con una estrategia asociativa, descriptiva y comparativa con una muestra de 586 estudiantes de la Facultad de Educación y Psicología de la Universidad de Extremadura seleccionada a partir de un muestreo no probabilístico por conveniencia, no aleatorio. Se utilizó como instrumentos la Hamilton Anxiety Rating Scale (HARS) y la Escala de Evaluación de las Funciones Ejecutivas en Contextos Cotidianos (EFECO) para la recolección de datos. Los resultados muestran correlaciones positivas y significativas entre las dimensiones de las dos escalas, destacando la influencia de las redes sociales y la calidad del sueño sobre el desempeño de los estudiantes. Además, se encontraron diferencias significativas en función del sexo, el grado académico y el tipo de residencia. Finalmente, se concluye con la relación

significativa entre la ansiedad y las funciones ejecutivas, subrayando la importancia de abordar la calidad del sueño y el trabajo académico a partir de intervenciones específicas que mejoren su formación universitaria y el bienestar, en general, de los estudiantes que cursan educación superior.

**Palabras clave:** ansiedad, calidad del sueño, estudiantes universitarios, funciones ejecutivas, redes sociales

## INTRODUCTION

Building upon the findings of Ávila-Toscano et al. (2021), university students face a wide range of challenges and stressors throughout their academic journey. Managing diverse tasks and fulfilling multiple roles can significantly impact both their academic performance and psychological well-being. These stressors often lead to various disruptions —mostly autonomous and specific— that must be understood to grasp the academic consequences face by students (Capuozzo et al., 2024; Merchán-Villafuerte et al., 2024). Among these disruptions, anxiety emerges as a common manifestation in both cognitive and behavioral process (Ávila-Toscano et al., 2021; Toh et al., 2024), along with executive functions, defined as a set of high-level cognitive processes responsible for regulating, controlling, and mediating the brains most complex activities (Robles & Ortiz, 2024).

Anxiety can significantly affect both academic outcomes and students' overall quality of life (González et al., 2022; Kessler et al., 2015). It is often triggered by academic overload, social pressure, lifestyle changes, and uncertainty about the future (Ashshawareb et al., 2024; Martínez et al., 2023). Recent studies show that anxiety has a marked impact on academic performance and students' mental health (López et al., 2023).

Anxiety symptoms are common and may present in various forms, including extreme nervousness, excessive worry about academic activities, difficulty concentrating, and trouble falling or staying asleep (Carrión-Pantoja et al., 2022; Estrada-Araoz et al., 2023; Song et al., 2023). These symptoms may be exacerbated by academic stress, constant pressure to achieve high grades, overwhelming workloads, and uncertainty about prospects (Cancino & Terán-Mendoza, 2023; Goselin & Rickert, 2022). Accordingly, addressing these symptoms is essential, as they can negatively impact both academic functioning and mental health. Students must therefore be provided with appropriate resources and support systems to manage anxiety and enhance their wellbeing during university (Díaz et al., 2022; Ramadhan et al., 2024).

Several studies emphasize the detrimental effects of anxiety on academic performance, highlighting that students with high anxiety levels may experience

memory impairments that negatively affect their test performance (Esquivel-Gámez et al., 2020). According to these authors, elevated anxiety levels reduce executive control before, during, and after assessments, requiring increased cognitive effort to achieve comparable performance. Executive control assessed by examining its three core components: the inhibition of inappropriate responses, the activation of appropriate ones, and the ability to switch rules or strategies.

The relationship between anxiety and executive functions is complex and multifaceted. On the one hand, anxiety can hinder executive functioning by causing distractions and reducing students' ability to focus (Fernández-Romero et al., 2023; Ge et al., 2023). On the other hand, executive functions can serve as regulatory mechanisms for emotional responses (Robles & Ortiz, 2024; Živković et al., 2022).

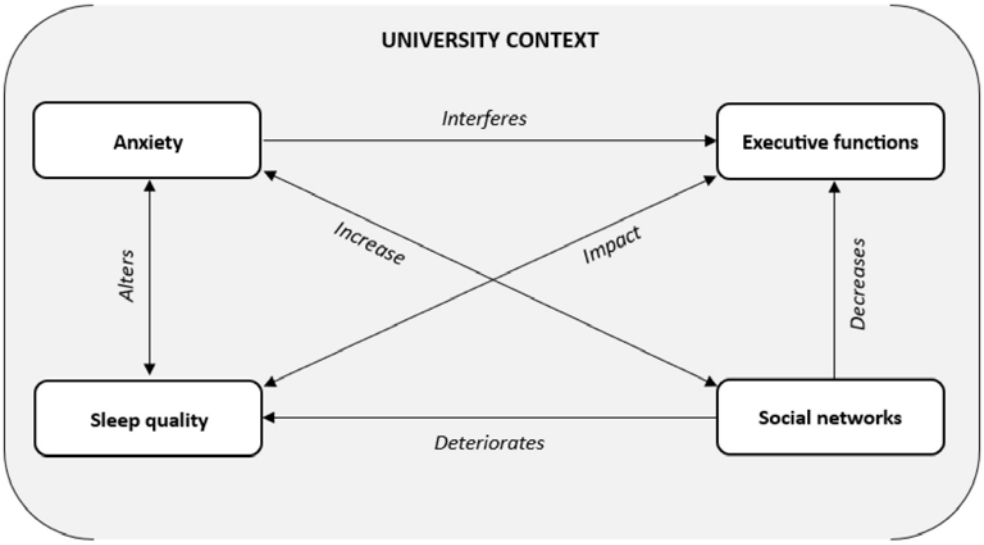
Prior studies have consistently demonstrated a significant association between anxiety symptoms and executive functioning among university students across various disciplines. Elevated anxiety levels have been linked to substantial difficulties in key domains of executive functioning, such as working memory, cognitive flexibility, and inhibitory control (Gutiérrez et al., 2021; Romero et al., 2023; Zhang, 2024). Other research suggests that anxiety can impair theses cognitive domains, thereby reducing students' ability to effectively manage academic tasks and responsibilities (Díaz et al., 2022; Martínez et al., 2023; Robles & Ortiz, 2024). Consequently, anxiety may undermine students' capacity to solve complex problems, reduce cognitive flexibility, and limit their ability to adapts to new situations or generate creative solutions (Garces et al., 2023; Gómez et al., 2023).

Recent literature calls for an integrated approach to studying the link between anxiety and executive functioning in university populations. This includes not only individual analysis of each variable but also an exploration of their interaction and underlying mechanisms. Studies such as García & Pérez (2020) have shown that anxiety can interfere with students' self-regulation and cognitive control, directly affecting executive skills. Similarly, empirical findings indicate that anxiety- related symptoms —such as excessive worry, restlessness, and tension— adversely impact executive functioning (Ge et al., 2023; Wang & Lyu, 2024).

The influence of social media on anxiety and executive functioning in university students has also garnered increasing attention in recent years. Excessive use of theses global digital platforms is associated with heightened anxiety levels (Aryal & Rajbhandari, 2024; Dong, 2024; Yildiz & Cengel, 2023; Zafar & Bin, 2024), detrimental effects on mental health and cognitive abilities (Jie et al., 2024), and impairments in executive functions such as attentional control (Zhu, 2025). In this context, interpersonal sensitivity plays a key mediating role between internet addiction and psychological well-being (Zhu et al., 2024).

Figure 1 shows a theoretical model to determine the relationship between each variable.

**Figure 1**
*Theoretical model that integrates the variables under study*




In summary, the theoretical model suggests a bidirectional relationship between sleep quality and executive functions: good sleep quality supports optimal executive functioning, while poor sleep negatively affects attention, working memory, and decision making (Jiménez, 2025). Conversely, a well- functioning executive process may promote healthy sleep habits. Similarly, sleep quality is bi-directionally linked to anxiety, with poor sleep exacerbating anxiety and vice versa (Armas & Saltos, 2024; Comas et al., 2023). Furthermore, social media usage appears to deteriorate sleep quality, particularly when platforms are accessed before bedtime, potentially worsening mental health outcomes (Aldhawyan et al., 2020).

Scientific evidence also indicates that excessive social media use diminishes executive functioning, especially working memory, sustained attention, and concentration (Ali et al., 2024). Moreover, a unidirectional relationship is observed between social media use and anxiety, as excessive or problematic engagement with digital platforms is associated with increased levels of anxiety, depression, and stress among university students (Cortez et al., 2024).

Anxiety and executive functions interact in a mutually disruptive manner: higher anxiety levels are linked to diminished executive performance, especially in planning, decision-marking, organization, and cognitive flexibility (Conner et al., 2024).

Finally, the academic context is identified as a moderating factor that shapes the relationships among all variables, influencing stress levels, sleep habits, social media use, and cognitive demands faced by students (Jiménez, 2025).

Accordingly, this study aimed to: (1) Analyze anxiety levels in university students; (2) Identify potential correlational patterns among social media use, anxiety, and executive functioning; and (3) Determine the impact of sleep quality on both anxiety and executive functioning.

## METHOD

### Design

Given the nature of the variables under study, this research is situated within the quantitative paradigm, as it addresses the research objectives through inferential data analysis (Ato et al., 2013). In line with this classification, the methodological strategies employed were associative, comparative, and cross- sectional, as the study is non-experimental and aimed at comparing groups and analyzing variable relationships at a single point in time.

### Participants

The sampling method used was non-probabilistic based on convenience and non-random selection. The final sample consisted of 586 students enrolled in the Faculty of Education and Psychology at the University of Extremadura (Badajoz, Spain). Of the participants, 79.4% (n=465) were women and 20.6% (n=121) were men, with a mean age of 21 years (M = 20.60 ± 3.29). Specifically, 43.7% (n=256) were pursuing a degree in Primary Education, 22.4% (n= 131) in Early Childhood Education, 24.7% (n=145) in Psychology, and 9.2% (n=54) were enrolled in master's programs associated with the faculty.

### Instruments

Initially, an ad hoc questionnaire was designed to gather sociodemographic data, including sex, age, degree program, academic year, and other relevant variables. Sleep quality was assessed using a 6-point item with the following response options: (1) Very good; (2) good; (3) Average; (4) Sometimes I have trouble resting; (5) I sleep poorly; and (6) I have serious difficulty sleeping. For analysis purposes, responses 1,2, and 3 were recoded as "adequate sleep quality" while responses 4,5, and 6

were categorized as "poor sleep quality." The following validated instruments were employed to address the study's main research objectives:

### *Hamilton Anxiety Rating Scale (HARS)*

This self- report tool, originally developed by Hamilton (1959) and later adapted into Spanish by Lobo et al. (2002), consists of 14 items assessing the intensity of anxiety symptoms. Examples of items include (1) "Anxious mood: worries, anticipation of the worst, apprehension, irritability" and (2) "Insomnia: difficulty falling asleep, interrupted or unsatisfying sleep, and tiredness upon waking." Responses are rated on a Likert-type scale ranging from 0 (Never) to 4 (Always). Internal consistency for the present sample reached α = .88. In its original version, the scale demonstrated sound psychometric properties, supporting a two- factor structure (psychological and somatic anxiety). In Lobo et al. (2002) study, internal consistency was also high (α = .89), supporting a one- factor structure.

### *Executive Function Assessment Scale in Everyday Contexts (EFECO)*

Developed by García-Gómez (2015), the EFECO is composed of 67 items evaluating executive functions from an ecological perspective, based on self-reported daily behavior. It includes subscales monitoring (e.g., "I make careless mistakes"), inhibition (e.g., "I act without thinking"), cognitive flexibility (e.g., "I have troubles switching from one task to another"), emotional control (e.g., "I get upset when I lose something"), organization of materials (e.g., "I leave my belongings scattered everywhere"), initiative (e.g., "I have difficulty making even simple decisions"). Working memory (e.g.,) I have trouble following instructions"), and planning (e.g., "I find it hard to plan things"). Items are rated on a 4-point Likert scale from 0 (Never) to 3 (very frequently). In the current study, internal consistency values reached up to α = .61. García-Gómez (2015) reported excellent psychometric properties for the full scale, with an overall reliability coefficient of α = .96.

## Procedure

The first step involved selecting the most appropriate instruments to address the study objectives. Afterwards, the final evaluation questionnaire was assembled. A brief description of the study's aims and procedures was included at the beginning of the instrument to ensure informed consent. Ethical approval was obtained from the Bioethics Committee of the University of Extremadura (Approval No.

110/2024). Researchers then contacted faculty members across different degree programs to schedule data collection during class hours, contingent upon receiving consent from instructors and participants. Data collection was conducted in person, with the lead researcher preset to assist participants and ensure compliance with the ethical guidelines outlined in the Declaration of Helsinki (World Medical Association, 2013).

At the time of application, participants were informed that their participation was voluntary and anonymous, by Spain's Organic Law 3/2018, of December 5, on the Protection of Personal Data and Digital Rights. In addition, the purpose of the survey was explained, and it was made clear that the time required to complete it would not exceed 15 minutes. The questionnaire was completed in person, with the principal investigator present at the time of data collection. No students reported difficulties completing the questionnaire, and a 100% response rate was achieved.

### Statistical Analysis

Both descriptive and inferential analyses were conducted. Descriptive statistics included percentages, means, and standard deviations. Inferential analyses were conducted using t-test, one way ANOVA, Pearson's r correlations, and $\chi 2$-test. Additionally, two-way multivariate analyses MANOVA and ANCOVA were applied. Statistical analyses were performed using SPSS 29.0 and Jamovi 2.3.28. The significance level was set at .05. However, for analyses involving 10 simultaneous comparisons, a Bonferroni correction was applied to control for Type I error, adjusting the significance threshold to .005.

## RESULTS

As we can see in table 1, the sample consisted of n = 586 subjects being 79.4% female and 20.6% male. Their average age was 20.60±3.29. Participants pursued a degree in Elementary Education, Early Childhood Education, Psychology and Master in a rate of 43.7%, 22.4%, 24.7% and 9.2%, respectively. 34% of them were students of first curse, 33.4% of second curse, 23.4% of third or fourth and 9.2% of Master. Just 9.9% of them had a job. 7.8% resided in University Hall, 53.2% in shared apartments and 38.9% with their family. 53.4% and 60.2% of subjects acknowledged social networks abuse and bad sleep quality, respectively. Global scores average in EFECO and Hamilton scales were 140.41±13.83 and 11.66±9.5, respectively. Thus, a positive moderate skew was observed in Hamilton scores, although it didn't imply no linear correlations with other variables. Opposite to this, the eight dimensions of EFECO scale fitted well enough to a normal distribution.

**Table 1**

*Descriptive analysis of sample characteristics and scale scores*

| | | ***Frequency (%) / Mean±SD*** |
|---|---|---|
| Gender | Female | 465 (79.4%) |
| | Male | 121 (20.6%) |
| Age | | 20.60±3.29 |
| Academic degree | Elementary Education | 256 (43.7%) |
| | Early Childhood Education | 131 (22.4%) |
| | Psychology | 145 (24.7%) |
| | Master | 54 (9.2%) |
| Academic year | 1º | 199 (34.0%) |
| | 2º | 196 (33.4%) |
| | 3º-4º | 137 (23.4%) |
| | Master | 54 (9.2%) |
| Current job | No | 528 (90.1%) |
| | Yes | 58 (9.9%) |
| Residence | University hall | 46 (7.8%) |
| | Shared apartment | 312 (53.2%) |
| | Family residence | 228 (38.9%) |
| Social networks abuse | No | 273 (46.6%) |
| | Yes | 313 (53.4%) |
| Bad sleep quality | No | 233 (39.8%) |
| | Yes | 353 (60.2%) |
| **EFECO** | **Total** | **140.41±13.83** |
| | Monitoring | 17.07±3.23 |
| | Inhibition | 18.71±3.23 |
| | Cognitive flexibility | 13.06±1.97 |
| | Emotional control | 15.54±2.78 |
| | Planning | 15.92±2.21 |
| | Organization of materials | 19.20±1.90 |
| | Initiative | 20.53±3.17 |
| | Working memory | 20.38±3.00 |
| **Hamilton** | **Total** | **11.66±9.52** |
| | Somatic | 7.39±5.19 |
| | Psychologic | 4.27±4.89 |

*Note*. SD: Standard deviation. EFECO: *Scale for the Evaluation of Executive Functions in Everyday Contexts*.

Table 2 displays Pearson correlation coefficients between the EFECO subscales and Hamilton dimensions. Most correlations were positive and most of them are significant, ever under a conservative Bonferroni correction. The "Organization of Materials" dimension showed the weakest and, in some cases, non-significant correlations. The strongest correlation corresponds to Hamilton dimensions.

**Table 2**

*Pearson's coefficient between EFECO and Hamilton's dimension and Pearson's correlation test*

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Monitoring | .419** | .368** | .438** | .263** | .040 | .443** | .581** | .450** | .351** |
| 2. Inhibition | | .371** | .384** | .323** | .055 | .432** | .378** | .392** | .323** |
| 3. Cognitive flexibility | | | .293** | .224** | .103* | .380** | .398** | .356** | .268** |
| 4. Emotional control | | | | .309** | .067 | .404** | .308** | .503** | .370** |
| 5. Planning | | | | | .249** | .302** | .258** | .317** | .263** |
| 6. Organization of materials | | | | | | .152** | .129** | .073 | .035* |
| 7. Initiative | | | | | | | .362** | .425** | .320** |
| 8. Working memory | | | | | | | | .365** | .281** |
| 9. Hamilton somatic | | | | | | | | | .784** |
| 10. Hamilton psychologic | | | | | | | | | |

*Note.* *$p < .05$; ** $p < .01$

On the other hand, Table 3 shows the results of association study between the rest of socio-demographic variables in terms of p-value. $\chi 2$-test, t-test or one way ANOVA were applied according to the type of variable. Let's point out the most significant results. Gender is related to academic degree since women represent 96.9% of students in Early Childhood Education. Age is correlated with the academic degree since master's students are older and is in the same sense correlated with academic year and current job. Academic degree correlates with academic year and current job because master is considered here as a fifth course. It also correlates with Sleep. Namely, 49.7% of Psychology students found it hard to sleep versus

34.8% of Elementary Education or 33.3% of the masters. Academic degree also correlates with residence since 61.1% of master student lived with their parents versus less than 41% for the grades. This also implies a correlation with Residence and Sleep in the same way. Finally, we observed the association between Residence and Sleep because 63.0% of students in university halls acknowledge bad sleep quality versus 38.8% of those who shared apartment and 36.4% of subjects who lived with their parents.

**Table 3**
*P-values of the association test*

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 1. Gender | .107 | **.001** | .617 | .489 | .346 | .160 | .154 |
| 2. Age | | **.001** | **.001** | **.001** | .641 | .297 | .589 |
| 3. Academic degree | | | **.001** | **.001** | **.001** | .160 | **.022** |
| 4. Academic year | | | | .141 | **.005** | .084 | **.006** |
| 5. Curret job | | | | | .396 | .575 | .266 |
| 6. Residence | | | | | | .805 | **.003** |
| 7. Social network abuse | | | | | | | .348 |
| 8. Bad sleep quality | | | | | | | |

*Note.* Significant results are indicated in bold.

The next step is crossing both types of variables to analyze whether or not variables in Table 3 influence response in EFECO or Hamilton scale. Due to the high dimension of the problem, hardly significant results were considered as possible type I error. Namely, according to a Bonferroni correction, results $p < .005$ were considered significant. The results in terms of Mean±SD are shown in Tables 4 and 8.

In this sense, Age, Academic year and Current job didn't correlate significantly with any of the ten dimensions. However, gender provided significant results for Monitoring ($t[584] = 3.401$, $p < .001$, $d = 0.350$) and Working memory ($t[584] = 4.557$, $p < .001$, $d = 0.471$). Men showed worse results in both variables (see Table 4). Academic degree provided a significant result just for Initiative ($F[3.582] = 8.297$, $p < .001$, $\eta^2 = 0.041$). The worst results after Post Hoc comparison corresponded to Psychology (see Table 5). Residence gave significant results for Monitorization ($F[2.583] = 6.645$, $p < .001$, $\eta^2 = 0.022$), Initiative ($F[3.582] = 8.591$,

$p < .001$, $\eta^2 = 0.029$), Working memory ($F[2.583] = 5.965$, $p = .003$, $\eta^2 = 0.020$) and Hamilton somatic ($F[2.583] = 5.811$, $p = .003$, $\eta^2 = 0.020$). The worst results after Post Hoc comparison corresponded to University hall (see Table 6). Subject who acknowledged social networks abuse showed (Table 7) results significantly worse for Monitoring ($t[584] = 4.361$, $p < .001$, $d = 0.361$), Emotional control ($t[584] = 6.01$, $p < .001$, $d = 0.499$) and Initiative ($t[584] = 3.645$, $p < .001$, $d = 0.302$). Finally, as we can see in Table 8, participants who acknowledged bad sleep quality showed significant worse results for Monitoring ($t[584] = 5.180$, $p < .001$, $d = 0.437$), Inhibition ($t[584] = 3.123$, $p = .002$, $d = 0.264$), Cognitive flexibility ($t[584] = 2.925$, $p = .004$, $d = 0.247$), Emotional control ($t[584] = 4.551$, $p < .001$, $d = 0.381$), Initiative ($t[584] = 3.475$, $p < .001$, d = 0.293), Working memory ($t[584] = 4.197$, $p < .001$, $d = 0.354$), Hamilton somatic ($t[584] = 11.724$, $p < .001$, $d = 0.990$) and Hamilton psychology ($t[584] = 9.176$, $p < .001$, $d = 0.775$).

**Table 4**

*Mean±SD of EFECO and Hamilton dimensions by gender*

| | **Female (n=465)** | **Male (n=121)** | *t* | **d Cohen** | **p-value*** |
|---|---|---|---|---|---|
| 1. Monitoring | 16.84±3.10 | **17.95±3.58** | -3.401 | -0.347 | < .001 |
| 2. Inhibition | 18.59±3.09 | 19.18±3.70 | -1.792 | -0.183 | .074 |
| 3. Cognitive flexibility | 12.95±1.88 | 13.45±2.26 | -2.506 | -0.256 | .012 |
| 4. Emotional control | 15.54±2.84 | 15.58±2.56 | -0.152 | -0.015 | .880 |
| 5. Planning | 15.95±2.22 | 15.79±2.19 | 0.705 | 0.072 | .481 |
| 6. Organization of materials | 19.23±1.91 | 19.07±1.89 | 0.844 | 0.086 | .399 |
| 7. Initiative | 2.51±3.14 | 2.60±3.28 | -0.296 | -0.030 | .767 |
| 8. Working memory | 20.10±2.73 | **21.47±3.70** | -4.557 | -0.465 | < .001 |
| 9. Hamilton somatic | 7.51±5.14 | 6.92±5.37 | 1.127 | 0.115 | .260 |
| 10. Hamilton psychologic | 4.36±4.94 | 3.91±4.69 | 0.911 | 0.093 | .363 |

*Note.* n= sample size; *t*: t-test with $p < .005 = .050/10$ in bold.

**Table 5**

*Mean±SD of EFECO and Hamilton dimensions by academic grade*

| | Elementary Education (n=256) | Early Childhood Education (n=121) | Psychology (n=145) | Master (n=54) | *F* | $\eta^2$ | p-value* |
|---|---|---|---|---|---|---|---|
| 1. Monitoring | 16.91±3.19 | 17.00±2.75 | 17.28±3.60 | 17.41±3.46 | 0.610 | 0.003 | .609 |
| 2. Inhibition | 18.72±3.12 | 18.61±3.18 | 18.83±3.56 | 18.63±3.05 | 0.116 | 0.001 | .951 |
| 3. Cognitive flexibility | 12.98±1.94 | 12.89±1.88 | 13.24±1.96 | 13.31±2.31 | 1.178 | 0.006 | .317 |
| 4. Emotional control | 15.40±2.57 | 15.74±2.93 | 15.65±2.97 | 15.48±2.85 | 0.528 | 0.003 | .663 |
| 5. Planning | 15.86±2.07 | 16.12±2.36 | 15.80±2.37 | 16.06±2.07 | 0.645 | 0.003 | .586 |
| 6. Organization of materials | 19.09±1.83 | 19.11±1.91 | 19.30±1.99 | 19.61±1.96 | 1.357 | 0.007 | .255 |
| 7. Initiative | 20.19±2.85 | 19.86±2.99 | **21.48±3.55** | 21.19±3.30 | 8.297 | 0.041 | .000 |
| 8. Working memory | 2.46±3.08 | 2.18±2.57 | 2.41±3.41 | 2.41±2.50 | 0.250 | 0.001 | .861 |
| 9. Hamilton somatic | 6.91±4.84 | 7.47±5.37 | 8.21±5.70 | 7.30±4.69 | 1.985 | 0.010 | .115 |
| 10. Hamilton psychologic | 3.71±4.70 | 4.55±4.92 | 4.93±5.09 | 4.46±4.97 | 2.185 | 0.011 | .089 |

*Note.* n= sample size; *F*= F-statistic; $\eta^2$: effect size; univariate ANOVA with $p < .005 = .050/10$ in bold.

**Table 6**

*Mean±SD of EFECO and Hamilton dimensions according to residence*

| | University hall (n=46) | Shared apartment Education (n=312) | Family residence (n=228) | *F* | $\eta^2$ | p-value* |
|---|---|---|---|---|---|---|
| 1. Monitoring | **18.61±3.80** | 16.78±3.13 | 17.15±3.17 | 6.645 | 0.022 | .001 |
| 2. Inhibition | 20.00±4.14 | 18.57±3.02 | 18.65±3.27 | 4.038 | 0.014 | .018 |
| 3. Cognitive flexibility | 13.20±2.23 | 12.85±1.94 | 13.32±1.94 | 3.902 | 0.013 | .021 |

| | University hall (n=46) | Shared apartment Education (n=312) | Family residence (n=228) | *F* | $\eta^2$ | p-value* |
|---|---|---|---|---|---|---|
| 4. Emotional control | 15.93±2.74 | 15.50±2.78 | 15.53±2.80 | 0.497 | 0.002 | .608 |
| 5. Planning | 16.11±2.46 | 15.86±2.19 | 15.96±2.20 | 0.332 | 0.001 | .718 |
| 6. Organization of materials | 19.61±2.24 | 19.20±1.91 | 19.11±1.83 | 1.293 | 0.004 | .275 |
| 7. Initiative | **22.35±3.04** | 20.31±3.20 | 20.45±3.03 | 8.591 | 0.029 | .000 |
| 8. Working memory | **21.74±4.42** | 20.13±2.78 | 20.45±2.89 | 5.965 | 0.020 | .003 |
| 9. Hamilton somatic | **9.87±5.88** | 7.22±5.20 | 7.13±4.91 | 5.811 | 0.020 | .003 |
| 10. Hamilton psychologic | 5.89±5.31 | 4.12±4.82 | 4.15±4.85 | 2.768 | 0.009 | .064 |

*Note.* n= sample size; *F*= F-statistic; $\eta^2$: effect size; univariate ANOVA with $p < .005 = .050/10$ in bold.

**Table 7**

*Mean±SD of the EFECO and Hamilton dimensions in relation to social network abuse (yes/no)*

| | Yes (n=313) | No (n=273) | *t* | d Cohen | p-value* |
|---|---|---|---|---|---|
| 1. Monitoring | **17.60±3.38** | 16.45±2.94 | -4.361 | -0.361 | < .001 |
| 2. Inhibition | 19.03±3.16 | 18.36±3.29 | -2.514 | -0.208 | .012 |
| 3. Cognitive flexibility | 13.19±1.95 | 12.90±1.99 | -1.741 | -0.144 | .082 |
| 4. Emotional control | **16.17±2.90** | 14.82±2.45 | -6.031 | -0.499 | < .001 |
| 5. Planning | 15.99±2.30 | 15.84±2.11 | -0.864 | -0.072 | .388 |
| 6. Organization of materials | 19.15±1.87 | 19.25±1.94 | 0.627 | 0.052 | .531 |
| 7. Initiative | **2.97±3.04** | 2.02±3.24 | -3.645 | -0.302 | < .001 |
| 8. Working memory | 2.64±3.04 | 2.08±2.94 | -2.265 | -0.188 | .024 |
| 9. Hamilton somatic | 7.81±5.09 | 6.92±5.27 | -2.076 | -0.172 | .038 |
| 10. Hamilton psychologic | 4.43±4.74 | 4.08±5.05 | -0.874 | -0.072 | .382 |

*Note.* n= sample size; t: t-test with $p < .005 = .050/10$ in bold.

**Table 8**

*Mean±SD of EFECO and Hamilton dimensions related to poor sleep quality (yes/no)*

| | Yes (n=353) | No (n=233) | *t* | d Cohen | p-value* |
|---|---|---|---|---|---|
| 1. Monitoring | **17.90±3.53** | 16.52±2.89 | 5.180 | 0.437 | < .001 |
| 2. Inhibition | **19.22±3.59** | 18.38±2.93 | 3.123 | 0.264 | .002 |
| 3. Cognitive flexibility | **13.35±2.04** | 12.86±1.91 | 2.925 | 0.247 | .004 |
| 4. Emotional control | **16.17±2.77** | 15.13±2.71 | 4.511 | 0.381 | < .001 |
| 5. Planning | 16.22±2.33 | 15.72±2.11 | 2.710 | 0.229 | .007 |
| 6. Organization of materials | 19.27±2.00 | 19.15±1.84 | 0.766 | 0.065 | .444 |
| 7. Initiative | **21.08±3.10** | 20.16±3.16 | 3.475 | 0.293 | < .001 |
| 8. Working memory | **21.01±3.43** | 19.96±2.61 | 4.197 | 0.354 | < .001 |
| 9. Hamilton somatic | **10.18±5.21** | 5.55±4.28 | 11.724 | 0.990 | < .001 |
| 10. Hamilton psychologic | **6.40±5.41** | 2.86±3.92 | 9.176 | 0.775 | < .001 |

*Note.* n= sample size; *t*: t-test with $p < .005 = .050/10$ in bold.

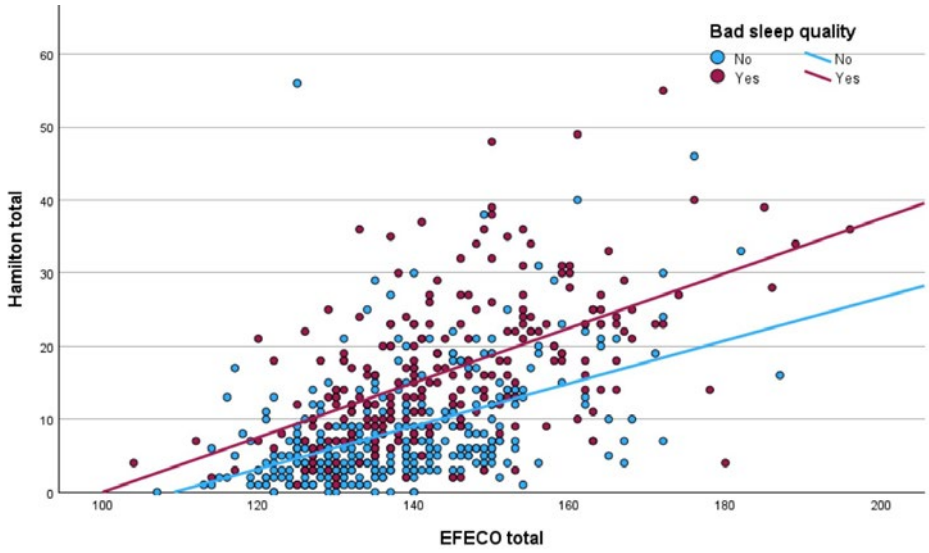
Sleep quality is clearly the factor with strongest influence in EFECO and, specially, in Hamilton' scores. Since Academic degree and Residence correlate significantly with Sleep, we must wonder whether each variable has partial correlation with EFECO or Hamilton controlling Sleep. Again, to control type I probability error a two-way MANOVA (Pillay) was applied for the 10 dimensions. First, we considered as factors Sleep and Academic degree. The result for Academic degree was significant ($F$[30.1713] = 1.579, $p$ = .024). Second, we considered Sleep and Residence with significant result for Residence ($F$[20.1114] = 1.862, $p$ = .012). Therefore, both factors (Academic degree and Residence showed significant impact on EFECO and Hamilton beyond influence due to their correlation with Sleep quality.

The relationship between EFECO and Hamilton dimensions (Table 2) can be summarized as a significant direct correlation between EFECO total and Hamilton total ($t$[584] = 15.966, $p$ < .001, $r$ = 0.551), so that we can associate high scores in EFECO with high scores in anxiety (Figure 2). Considering the importance of sleep quality in anxiety scores, as we stated above, it may be interesting to analyze throughout an ANCOVA the joint influence of EFECO total and sleep quality on Hamilton total. As a result, global model gave $F$[2.583] = 191,368, $p$ < .001, $\eta^2$ =

0.396; partial test for EFECO resulted $F[1.583] = 121.187$, $p < .001$, $\eta^2 = 0.267$, while partial test for Sleep quality gave $F[1.583] = 89.284$, $p < .001$, $\eta^2 = 0.133$. Moreover, 95% CI for slope was 0.286 - 0.376 and 95% CI for interception difference was 4.803 - 7.324. So, as is illustrated in Figure 2, bad sleep quality implies an average increase between 4.8 and 7.3 points in Hamilton's score. This effect is independent of EFECO's level since interaction contrast turned out to be no significant ($F[1.582] = 3.127$, $p = .073$, $\eta^2 = 0.005$).

**Figure 2**

*Total Hamilton by Total EFECO and Poor sleep quality (yes/no)*




## DISCUSSION AND CONCLUSIONS

The main objective of this study was to examine and assess the relationships between sleep quality, social media use, anxiety, and executive functions in higher education students. The results revealed mostly positive and statistically significant correlations, aligning with prior empirical findings (Fernández- Romero et al., 2023; Friedman et al., 2018; Moussa-Chamari et al., 2024). However, some studies have reported less consistent associations between these constructs (López-Vázquez et al., 2024). Notably, the strongest correlation observed was between somatic and psychological anxiety —an association also supported by existing literature (Martínez et al., 2023; Rondang & Ohira, 2024; Zapata & De Lille, 2024).

Regarding the link between anxiety and working memory, students with higher anxiety levels demonstrated poorer performance in tasks requiring this executive function. These results are consistent with previous research that confirms the negative impact of anxiety on working memory (Almarzouki et al., 2022; Esquivel-Gámez et al., 2020; Gutiérrez-Ruiz et al., 2020; Wang et al., 2024). Other variables under investigation in this study also yielded comparable findings in the literature. For instance, Priore & González (2016) indicated that students with better emotional regulation tend to report lower anxiety and adapt more effectively to the university environment. Similarly, Cañas et al. (2022) found that working memory and inhibitory control positively influence academic performance, while cognitive flexibility showed a negative effect. A recent study involving university students found that those with high anxiety levels showed deficits in inhibition and cognitive flexibility, suggesting that anxiety impairs students' capacity to adapt to new situations and manage impulses (Diotaiuti et al., 2024; López et al., 2021). Moral & Pérez (2022) also emphasized the negative influence of anxiety on emotional control, which may lead to increased emotional reactivity and difficulty managing stress.

Following this line of discourse, we can point out that our results showed that there was a relationship between the EFECO and Hamilton dimensions, finding a significant direct correlation between both scales, so that it is possible to associate high scores in EFECO with high scores in anxiety. In contrast to the existing literature, other empirical studies agree with the findings, concluding that students with high levels of anxiety tend to have difficulties in tasks that require executive functions, such as working memory and cognitive flexibility. These deficits can manifest themselves in problems organizing, planning and executing academic tasks, which in turn can increase stress and anxiety levels, creating feedback that affects both their potential performance and the students' overall well-being (Cañas et al., 2022; Gutiérrez et al., 2021; Gutiérrez-Ruiz et al., 2020; Romero et al., 2023; Živković et al., 2022).

Similarly, establishing relationships between socio-demographic variables and the different dimensions of the Hamilton scale and the EFECO underscores that gender provided significant results for Monitoring and Working memory. The study by Niazi & Adil (2021) also showed that working memory was the strongest predictor of academic performance in male college students compared to females. In contrast, other research found no statistically significant differences (Hamza & Helal, 2021).

However, one of the most revealing findings of this research has been the preponderance of sleep quality as the most influential factor in EFECO scores and, especially, in Hamilton scores, highlighting the additive effect it has on the anxiety perceived by the university student. This finding highlights the cumulative impact that sleep quality exerts on the perception of anxiety, finding several empirical

studies where it is observed that poor sleep quality is related to indicators of anxiety in higher education students, since the alteration of sleep patterns has a negative impact on emotional, social and academic performance, so that there is a direct connection between sleep quality and mental health (Almarzouki et al., 2022; Anoosha et al., 2025; Duque, 2022; López et al., 2023; Morales-Sánchez et al., 2024). Likewise, the importance of the quality of sleep and the number of hours dedicated to it favors an improvement in the development of cognitive processes and optimal executive functions (Almarzouki et al., 2022; Duque, 2022; Robles & Ortiz, 2024), hence such factors condition academic performance, encouraging its productivity and the rate of efficiency towards higher performance (Fitzsimmons et al., 2024; Gutiérrez-Ruiz et al., 2020; Rodríguez de Ávila et al., 2023).

In this regard, another aspect to consider with respect to sleep quality is its impact on mental health, since high-quality, restful sleep can help reduce anxiety levels and improve coping capacity in stressful situations (Avila-Toscano et al., 2021; Christodoulou et al., 2024). Lack of adequate sleep can worsen anxiety symptoms and decrease relaxation capacity (Estrada-Araoz et al., 2023). In this regard, a study investigating the relationship between smartphone use, insomnia, stress, and anxiety among college students found that higher scores of addictions on technological devices were significantly associated with higher anxiety and stress scores, as well as higher scores on the insomnia severity index (Al Battashi et al., 2021). This suggests that poor sleep quality, exacerbated by factors such as excessive smartphone use, may lead to increased anxiety.

Finally, we can indicate that this research has been able, not only to analyze the anxiety levels of the surveyed university students, but also to generate a correlation pattern as to how the excessive use of social networks, sleep quality, anxiety and executive functions can influence such students in higher education. In this regard, as well as the findings obtained, scientific literature points to a negative relationship between the excessive use of social networks and both psychological variables, finding studies that support the same empirical evidence (Ramirez et al., 2023). Similarly, the theoretical explanatory model of departure, has allowed us to corroborate another factor that influences students within the university environment, so that, if we consider the study of Tafur & Diaz (2021), we can identify that just over a third of students who always made use of social networks showed worse performance in the teaching-learning process than the rest of the participants. Therefore, uninterrupted and excessive exposure to technological access in digital multiplatform conditions the quality of sleep and rest, thus deteriorating some variables measured in the executive functioning of the population under study. Similarly, a higher level of anxiety also impacts the quality of the student's sleep, so it is a process that the academic context feeds back.

In conclusion, regarding the first specific objective (to analyze anxiety levels in university students), the results revealed that anxiety levels in university students presented a significant proportion in the sample. This is evidenced by the scores obtained, showing a positive correlation with executive functions, which confirms the need to address this problem urgently to improve the emotional well-being and quality of life of this population group not only in the university context but also in their daily lives.

The second objective was to identify correlational patterns among social media use, anxiety, and executive functioning. The results revealed significant associations: students with high anxiety levels experienced more difficulties in key executive domains such as Working memory, Cognitive flexibility, and Inhibitory control. The strongest associations were observed between somatic and psychological anxiety and several EFECO dimensions. Consistently, those students who reported greater use of social networks tended to present higher levels of anxiety and greater difficulties in their executive functions, especially in the ability to concentrate on academic tasks. In this sense, the findings suggest that anxiety may interfere with students' ability to organize, plan, and execute academic tasks, which in turn may increase levels of stress and anxiety, creating a cycle that affects students in all spheres of daily life.

The third and last specific objective was to determine the impact that sleep has on anxiety and executive functioning, appreciating that sleep quality was identified as a crucial factor that significantly influences anxiety levels and executive functioning of university students. The data showed that 60.2% of the participants reported poor sleep quality, presenting a positively increased correlation in anxiety levels and a decrease in executive functions. Specifically, students with poor sleep quality showed worse results in monitoring, inhibition, cognitive flexibility, emotional control, initiative and working memory. These results underscore the importance of sleep quality for mental health in the academic context, suggesting that different interventions aimed at improving sleep patterns could have a positive impact on reducing anxiety and improving executive functions.

In sum, these conclusions enrich the literature in educational psychology and stress the importance of implementing targeted interventions that address both anxiety and executive functioning to foster a healthier, more effective learning environment for university students.

## Limitations, educational implications, and future research direction

One of the primary limitations of this study lies in the sampling method, which was non-probabilistic, and convenience based. This may affect the representativeness of the sample and, consequently, the generalizability of the findings. Furthermore,

since the data were collected using self- report questionnaires, there is a risk of response bias and limited accuracy. Another limitation concerns the demographic composition of the sample, which consisted predominantly of female participants, making it difficult to compare findings across genders. Additionally, certain potentially influential variables —such as socioeconomic status or pre-existing mental health conditions—were not controlled in the analysis.

In terms of educational applications, the findings highlight the need for institutional policies that provide targeted support to university students. This includes the implementation of psychoeducational programs aimed at promoting healthy sleep habits among higher education students, as well as the development of strategic plans thar encourage responsible and balanced use of social media. Moreover, academic institutions should offer structured resources for managing anxiety, ideally integrated within Tutorial Action Plans. At the same time, it is important to raise awareness of these specific needs through teacher training and guidance services, enabling teacher training in the recognition of signs of somatic and psychological anxiety, as well as the academic consequences of sleep quality and executive functions in students.

As for future research directions, the use of probabilistic sampling and larger sample size is strongly recommended to improve the representativeness and generalizability of the results. Implementing longitudinal designs would also be beneficial, as they would allow researchers to explore whether the observed relationships remain stable over time or evolve in different directions. Additionally, future studies should aim for more balanced samples in terms of gender and educational context to ensure broader applicability of findings. Methodologically, incorporating mixed methods approaches that combine quantitative and qualitative techniques could provide a deeper and more holistic understanding of the factor affecting anxiety and executive functioning in university students. On an applied level, future research could include the design and evaluation of specific interventions aimed at reducing anxiety and improving executive functioning. These interventions may involve stress management techniques —such as relaxation therapies, including music therapy, which has been shown to significantly reduce both somatic and psychological anxiety (Cabrera-Díaz et al., 2023; Chunata-Carrasco et al., 2024)—as well as mindfulness-based programs. Such practices, which cultivate present- moment awareness, have proven effective in reducing symptoms of depression, anxiety, and anger among higher education students (Caycho-Rodríguez et al., 2019). Moreover, implementing strategies to enhance sleep quality can significantly improve decision-making and problem-solving skills, which are essential for academic success (Huarca & Cardenas, 2024). Finally, future investigations should examine how different educational environments, and pedagogical practices influence anxiety levels and executive functioning. This

could inform the design of more inclusive and effective learning environments for university students.

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# Primary school teachers' attitudes toward visual block programming: differences by sex and age

## *Actitudes de los docentes de primaria hacia la programación visual por bloques: diferencias por sexo y edad*

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## ABSTRACT

In the current era of artificial intelligence, the teaching of programming has become more relevant in the primary school primary curriculum, especially through Visual Block Programming as a tool for developing Computational Thinking. This study analyses the attitudes of primary school teachers towards Visual Block Programming and examines possible differences according to sex and age. The research adopted a non-experimental cross-sectional design with a quantitative approach. A scale with three dimensions (Self-efficacy, Relevance, and Interest) was applied, and its structure was confirmed through a Confirmatory Factor Analysis. The sample consisted of 492 primary school teachers in Spain. Descriptive analyses and statistical tests such as Student's t-test, one-way ANOVA and Pearson's correlation were used, using IBM SPSS and Jamovi for data processing. When parametric assumptions were not met, non-parametric methods were applied. The results indicate that primary school teachers show a moderate overall attitude towards Visual Block Programming (3.18), with high perceived relevance (3.65) and interest (3.33), but low self-efficacy (2.54). Male teachers have significantly higher self-efficacy than their female counterparts, although both sexes share the perception of the educational value of Visual Block Programming. In addition, younger teachers (22-30 years) show greater confidence in their ability to teach it, while age does not influence relevance and interest. These findings underline the need to implement differentiated training programmes that reinforce self-efficacy in older teachers and reduce the sex gap, promoting a more inclusive and effective integration of Visual Block Programming in primary education.


**Keywords:** teacher attitudes, elementary school teachers, programming, computational thinking, gender differences, age differences


## RESUMEN

En la era actual de la inteligencia artificial, la enseñanza de la programación ha cobrado una mayor relevancia en el currículo educativo de Primaria, especialmente a través de la Programación Visual por Bloques como herramienta para desarrollar el Pensamiento Computacional. Este estudio analiza las actitudes de los docentes de Primaria hacia la Programación Visual por Bloques y examina posibles diferencias según sexo y edad. La investigación adoptó un diseño transversal no experimental con enfoque cuantitativo. Se aplicó una escala con tres dimensiones (Autoeficacia, Relevancia e Interés), cuya estructura fue confirmada mediante un análisis factorial confirmatorio. La muestra estuvo compuesta por 492 docentes de Educación Primaria en España. Se emplearon análisis descriptivos y pruebas estadísticas como t de Student, ANOVA unidireccional y correlación de Pearson, utilizando IBM SPSS y Jamovi para el procesamiento de datos. Cuando no se cumplieron los supuestos paramétricos, se aplicaron métodos no paramétricos. Los resultados indican que los docentes de Primaria muestran una actitud total moderada hacia la Programación Visual por Bloques (3.18), con alta percepción de relevancia (3.65) e interés (3.33), pero baja autoeficacia (2.54). Los docentes varones presentan una autoeficacia significativamente

mayor que sus compañeras, aunque ambos sexos comparten la percepción del valor educativo de la Programación Visual por Bloques. Además, los docentes más jóvenes (22-30 años) muestran mayor confianza en su capacidad para enseñarla, mientras que la edad no influye en la relevancia e interés. Estos hallazgos subrayan la necesidad de implementar programas de formación diferenciados que refuercen la autoeficacia en docentes mayores y reduzcan la brecha de sexo, promoviendo una integración más inclusiva y efectiva de la Programación Visual por Bloques en la Educación Primaria.

**Palabras clave:** actitud del profesor, enseñanza primaria, programación, pensamiento computacional, diferencia de sexo, diferencia de edad

## INTRODUCTION

In the current era of artificial intelligence, programming education has gained increasing attention. It has been gradually integrated into the educational curriculum (Bocconi et al., 2022) to develop students' computational thinking (CT) skills.

CT, popularised by Wing (2006) and initially developed by Papert (1980), is the cognitive skill that occurs when formulating and searching for a solution to a problem, such that both a person and a machine can understand and execute the problem.

The most commonly used strategies to develop CT in Primary Education are Visual Block Programming (VBP) and robotics (Jiang & Li, 2021; Kiliç, 2022; Ortuño & Serrano, 2024). VBP allows students to get started in computing in a simple way, using a programming language that uses graphical elements, which is much more intuitive than professional programming languages. In VBP, programs are created by choosing, dragging and arranging graphical blocks in a window representing basic code structures, facilitating an intuitive understanding of computational concepts. This tool develops CT, which involves logical analysis, data organisation, modelling and identifying solutions to complex problems (Román-González et al., 2017).

The relevance of CT and programming in the educational sphere has prompted various research projects focused on their integration from the earliest stages of education. Countries such as Finland, the United States, South Korea and China have implemented advanced policies to integrate CT and programming into their educational curricula, obtaining significant results in students' cognitive development and teacher training (Acosta, 2021; Sun & Zhou, 2023).

For example, Finland is a leader in integrating CT into its national curriculum (Finnish National Agency of Education, 2016). Since 2016, programming and CT have been an integral part of basic education, including them as cross-curricular elements in all subjects. On the other hand, in the United States, formal and informal programming education has been widely promoted from age 5 to 18 (K-12 Computer Science Framework, 2016). On the other hand, South Korea has promoted

the use of robotic technologies in various sectors, including education, as part of its technology development strategy (Jung et al., 2023). In China, implementing VBP, such as Scratch and educational robotics, has improved students' collaborative and cognitive skills (Sun & Zhou, 2023). Similarly, programmes such as Code.org are effective in fostering skills such as critical reasoning and problem solving from the early school years, while helping to reduce gender gaps in programming (Sun & Liu, 2024).

In the national context, studies have been conducted that address the competences and educational strategies necessary for their development with a focus on gender equity (Espino & González, 2015). In addition, the study by Román-González et al. (2017), which was conducted with primary and secondary students, showed statistically significant correlations between CT and logical reasoning, spatial ability, and complex problem solving. These experiences highlight how CT and programming foster skills such as logical reasoning, problem solving and creativity from an early age, aspects that the Organic Law for the Modification of the Organic Law on Education (LOMLOE) also seeks to promote in Spain (BOE, 2020).

Effective programming education that develops students' CT requires teachers to be well prepared, not only in terms of technical skills, but also in their willingness and attitude towards these competencies (Sun & Zhou, 2023). Attitudes towards programming and CT are complex and multidimensional constructs, the theoretical delineation of which has not yet reached a consensus on its constituent elements. This lack of agreement has led to multiple definitions and approaches that reflect the variability of dimensions that make up these attitudes. Different studies have examined attitudes towards programming and CT considering various dimensions, such as self-efficacy, interest, usefulness, relevance, or value beliefs in teaching programming, among others (Rich et al., 2020; Sun & Zhou, 2023; Sun & Liu, 2024). The scale used in this study has three dimensions: self-efficacy, relevance, and interest, which were chosen after the validation process explained in the method section.

## Self-efficacy towards programming

Self-efficacy is defined as 'each individual's judgments about his or her abilities, based on which he or she will organise and execute his or her actions in such a way as to achieve the desired performance' (Bandura, 1987, p. 416). In the field of programming, self-efficacy refers to the teacher's confidence in his or her ability to teach fundamental programming concepts, resolve students' doubts, correct errors and learn autonomously about the subject matter (Authors, 2024).

According to the study by Wijnen et al. (2024), teacher self-efficacy is a determining factor in adopting new technologies in the classroom. Those with higher self-efficacy are more willing to use them, while those with less confidence tend to avoid their integration. Although the study does not focus specifically on VBP, these findings could be extrapolated to different technological tools used in teaching.

Low self-efficacy generates significant levels of anxiety and distrust in teachers in relation to teaching programming, thus affecting educational quality (Jaipal-Jamani & Angeli, 2017; Rich et al., 2019). This problem highlights the need to implement teacher training programmes aimed at strengthening self-efficacy through practical experiences and the application of active methodologies, which would improve teachers' confidence and their ability to integrate programming into the classroom effectively (Mason & Rich, 2019).

### Relevance towards programming

While teacher self-efficacy plays a key role in implementing scheduling in the classroom, perceived relevance is equally crucial. While self-efficacy refers to a teacher's confidence in his or her ability to teach programming, perceived relevance relates to the subjective valuation teachers give to programming regarding its impact on CT development and student motivation (Fang, 1996; Rich et al., 2020). As Rich et al. (2020) point out, a teacher may recognise the importance of teaching programming without necessarily feeling empowered to do so effectively.

According to Fang (1996), teachers' beliefs about the importance of a subject influence their decisions and how they teach it. This suggests that teachers who perceive programming as relevant to student learning will be more inclined to integrate it into their teaching practices.

Several studies have shown that relevance significantly influences teachers' willingness to implement scheduling in the classroom (Mason & Rich, 2019).

### Interest in programming

Teacher interest in VBP is a determining factor for its successful implementation in the classroom. It is related to the teacher's willingness to explore, learn and apply VBP in their educational practice. According to Bandura (1987), interest influences commitment to learning challenges and persistence in difficulties.

Several studies have indicated that teacher interest is related to self-efficacy and perceived relevance (García-Ruiz et al., 2023). Teachers with a high level of interest tend to adopt innovative methodologies and seek professional development

opportunities (Hestness et al., 2018; Marcelino et al., 2018). However, lack of time and lack of accessible training resources can be barriers to teachers' interest (Bocconi et al., 2022).

## Influence of gender and age on attitudes towards VBP

Different studies have identified that personal factors, such as gender and age, influence teachers' attitudes towards programming. Pérez-Calderon et al. (2021) concluded that digital competence was higher in younger teachers or students in education degrees than older ones. Similarly, Sun and Zhou (2023) highlight that male teachers and those under 30 have more positive attitudes towards programming than their older or female colleagues. These results suggest that gender and age differences are relevant when analysing how new educational technologies are adopted in the classroom, highlighting the importance of understanding these variables in primary school teachers.

In this sense, Kiliç (2022) identified gender as a determining factor in developing CT-related skills, observing a general tendency for men to have more favourable attitudes. This phenomenon can be explained by cultural, family and educational factors that affect women's motivation towards programming. These factors include the lack of female role models in the technological field, gender stereotypes and socio-cultural expectations, as well as differences in perceived self-efficacy and the influence of teachers in their early stages of training (Liu et al., 2021; UNESCO, 2019).

However, the literature is inconclusive on the relationship between gender and age with teaching programming. Negrini (2020) and Piedade (2021) found no significant differences in some educational contexts, highlighting the need for more specific studies in Primary Education. The paucity of empirical evidence on these variables limits the implementation of effective teacher education strategies. It leaves the question of the extent to which they influence the adoption of VBP.

Given that the teaching of scheduling depends not only on technical factors, but also on teachers' self-efficacy, relevance and interest, it is crucial to explore how these aspects vary according to the demographic profile of teachers (Liu et al., 2021; García-Ruiz et al., 2023). Analysing these relationships will enable the design of more effective training programmes tailored to teacher characteristics, facilitating a more equitable and effective implementation of CT and programming in the classroom.

To meet the requirements proposed by the LOMLOE (BOE, 2020) for Primary Education regarding the development of CT, it has been decided to measure attitudes towards VBP, as it is the most widely used strategy according to the systematic

review by Ortuño and Serrano (2024). The study aims to determine whether primary school teachers show significant variations in their attitudes towards VBP according to gender and age. The following hypotheses are proposed:

Hypothesis 1: There are significant differences in attitudes towards VBP and its dimensions according to teachers' gender.

Hypothesis 2: There are significant differences in attitudes towards VBP and its dimensions according to teachers' age groups.

Hypothesis 3: There are significant differences in attitudes towards VBP and teachers' self-efficacy due to the interaction effect between gender and age.

## METHOD

The research was carried out using a non-experimental cross-sectional design, with a quantitative methodology consistent with the objective and hypotheses stated. This approach is suitable for describing and comparing attitudes towards VBP between different groups (gender and age), prioritising the analysis of differences rather than the establishment of causal relationships.

### Participants

Prior to this research, and with the aim of validating the scale designed to measure primary school teachers' attitudes towards VBP as a resource for developing CT, the scale was applied to two different samples of primary school teachers in Spain at two different times. The first sample, composed of 202 teachers, was used to perform the Exploratory Factor Analysis (EFA). In contrast, the second, composed of 492 primary school teachers in Spain, was used to apply the Confirmatory Factor Analysis (CFA). For this study, the analyses were performed with the data from the second sample presented in Table 1 due to methodological criteria of representativeness and generalisable validity of the results, since it was with this sample that the CFA was applied. This approach ensures that the interpretations are supported by data obtained after debugging and validation of the instrument. It makes it possible to test the hypotheses generated in the CFA, improving external validity and minimising the risk of overfitting the results.

**Table 1**
*Sample characteristics*

| Sex | | Age | | | | Years of teaching experience | | | Type of school | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Men | Women | M | SD | Min | Max | 0-10 | 11-25 | >de 25 | Public | Semi-private | Private |
| 31.3% | 68.1% | 39.8 | 10.6 | 22 | 66 | 44.1% | 39.6% | 16.3% | 13.8% | 74.2% | 12.0% |

A Note. % up to 100% in sex correspond to "I prefer not to answer".
B Note. The gender distribution in the sample reflects the general trend of the study population, according to the Ministry of Education, Vocational Training and Sports (MEFD, 2024), where in the 2020-21 academic year, 82.2% of primary school teachers were female. However, this study's proportion of female participants (68.1%) is lower, possibly due to sampling and voluntary participation.

## Instruments

For this research, a scale on attitudes towards VBP in primary school teachers was designed and validated using multiple validation strategies. The literature review identified a previous scale for this context (Rich et al., 2020), which did not cover all relevant aspects, justifying the development of a new instrument.

Content validity was ensured using the Delphi method (Authors, 2024). Items that met at least four criteria were eliminated after two consecutive rounds: mean less than 4, standard deviation greater than 1.5, coefficient of variation greater than 25%, Aiken's V value less than .70, or request for exclusion by two or more experts. Subsequently, an AFE was performed, which revealed a three-dimensional structure: Self-efficacy, Relevance, and Interest. Then, a CFA confirmed this structure, showing satisfactory fit indices (CFI = .964, TLI = .955, SRMR = .0721, RMSEA = .0748).

The final version of the scale consists of 14 items (Annexe 1) and presents high internal consistency (Cronbach's Alpha = .916; McDonald's Omega = .921), which supports its reliability and validity as an instrument to assess attitudes toward VBP.

The scale is a five-point Likert-type scale, ranging from "Strongly Disagree" to "Strongly Agree." The final instrument included, in addition to this scale, questions on sociodemographic data (sex, age, teaching experience and type of school) and a question on the perception of the level of knowledge of VBP.

## Procedure

The study followed the ethical principles established by the Declaration of Helsinki (2017) and the Organic Law 3/2018 on Personal Data Protection and

Guarantee of Digital Rights (BOE, 2018). Participants were informed about the study's aims, and their informed consent was requested. Responses were collected anonymously, ensuring the confidentiality of their identity.

The sample was selected by non-probability convenience sampling, using networks of schools known to the research team, thus facilitating the recruitment of primary school teachers. Social networks such as Facebook and LinkedIn were also used. Schools were contacted directly to distribute the questionnaire among their teaching staff and individual primary school teachers.

The questionnaire application process was implemented through Microsoft Forms, facilitating efficient and secure data collection.

### Data Analysis

The data were processed statistically with the IBM SPSS for Windows version 28.0.1.1 and Jamovi 2.3.28. The descriptive analysis of attitudes towards the VBP and each of the dimensions was carried out using frequency distributions, where the mean (M), standard deviation (SD), minimum and maximum were calculated. Using Student's t test statistics for independent samples and one-way Analysis of Variance (one-way ANOVA), the differences between Primary School teachers' attitudes towards VBP and its three dimensions were evaluated according to personal factors (gender and age). In cases where parametric assumptions were not met, non-parametric methods were calculated. In the ANOVA analyses, Scheffé's post-hoc test was used, since the samples were unequal (different N) and because this method is more conservative. To calculate differences in the interaction of gender and age variables on attitudes and self-efficacy, a univariate factorial ANOVA was calculated. In addition to descriptive and differential analyses, Pearson's correlation coefficient was calculated to explore the relationship between the variables.

## RESULTS

### Descriptive analysis of teachers' attitudes towards VBP

The results obtained with the sample of 492 teachers are shown in Table 2.

The mean score on primary school teachers' total attitude towards VBP is 3.18 on a scale of 1 to 5. Since the scale's midpoint is 3, this value reflects a moderate attitude towards VBP. In addition, the mean scores on the three dimensions of the scale are: Self-efficacy 2.54, Relevance 3.65 and Interest 3.33. These scores indicate a low level of self-efficacy, a moderate-high level of relevance and a moderate level of interest in VBP. The low level of self-efficacy reflects a limited confidence

in VBP and its teaching at the primary level. This result is associated with teachers' perception of their knowledge of VBP, which was assessed by an external question to the scale 'What is the level of knowledge towards VBP?' In this question, teachers indicated their perception of their level of knowledge on a scale of 1 to 5 (M=2.28). Furthermore, the relationship between self-efficacy and perceived level of knowledge is positive and significant (Pearson's R = .665, p < .001). This analysis reinforces the interpretation that higher perceived knowledge in VBP is related to higher perceived self-efficacy.

**Table 2**
*Descriptive analysis of attitudes towards VBP and its dimensions*

| Dimensions | Min | Max | M | SD |
|---|---|---|---|---|
| Total Attitude | 1.29 | 5.00 | 3.18 | 0.74 |
| Relevance | 1.17 | 5.00 | 3.65 | 0.78 |
| Self-efficacy | 1.00 | 5.00 | 2.54 | 1.11 |
| Interest | 1.00 | 5.00 | 3.33 | 0.91 |

After collecting the survey data, the data were analysed to test the hypotheses developed.

## Gender effect on attitudes towards VBP and its dimensions

Hypothesis 1: There are significant differences in attitudes towards VBP and its dimensions according to teachers' gender.

The results obtained in this sample, see Table 3, indicate that male teachers (M = 2.83, SD = 1.16) score significantly higher than female teachers (M = 2.41, SD = 1.06) on Self-efficacy (t = 4.02, p < .01), the effect size between the two groups being substantial (Cohen's d = 1.09). However, for Total Attitude (Mann-Whitney U = 22974.5, p = .052) and the dimensions of Relevance (Mann-Whitney U = 25926.5, p = .927) and Interest (Mann-Whitney U = 25401, p = .785), no significant differences are found between males and females, despite large effect sizes.

**Table 3**
*Gender Differences in Attitudes towards VBP and its dimensions*

| | Gender | N | M | DT | Contrast statistic | d |
|---|---|---|---|---|---|---|
| Total Attitude | Men | 154 | 3.29 | 0.84 | 22974.5 | 0.74 |
| | Women | 335 | 3.14 | 0.70 | | |
| Relevance | Men | 154 | 3.66 | 0.86 | 25401 | 0.79 |
| | Women | 335 | 3.65 | 0.75 | | |
| Self-efficacy | Men | 154 | 2.84 | 1.16 | 4.02** | 1.09 |
| | Women | 335 | 2.41 | 1.06 | | |
| Interest | Men | 154 | 3.33 | 1.02 | 25926.5 | 0.91 |
| | Women | 335 | 3.33 | 0.86 | | |

a Note. Since the results of Levene's test indicate that the assumptions of equality of variances are not met (p<.05) for the variables (Attitude, Relevance and Interest), the Mann-Whitney U was calculated as an alternative to Student's t-test.
b Note. *p < .05; **p < .01.

## Age effect on attitudes towards VBP and its dimensions

Hypothesis 2: There are significant differences in attitudes towards VBP and its dimensions as a function of teachers' age.

A weak and statistically significant negative relationship exists between age and attitudes towards VBP (Pearson's R = -.135, p = .003). Table 4 shows that this finding is consistent with the analyses conducted, evidencing statistically significant differences between age groups (F = 3.36, p = .019), with a small effect size ($\eta^2$ = 0.02). The results show that teachers below 30 have significantly higher attitudes towards VBP than teachers between 41 and 50, with means of 3.34 and 3.07, respectively.

Similarly, when examining differences by age in the three dimensions of the scale, significant differences are found in Self-efficacy (F = 4.691, p = .003), with younger teachers (22-30 years) having higher self-efficacy towards VBP (M = 2.8) than teachers aged 41-50 years (M = 2.36) and those over 50 years (M = 2.34). However, in Relevance and Interest, no significant differences are found according to the age of the teachers.

**Table 4**
*Age Differences in Attitudes towards VBP and its dimensions*

| Dimensions | Age | N | M | SD | F | Eta squared |
|---|---|---|---|---|---|---|
| Total Attitude | 22-30 | 116 | 3.34 | 0.74 | 3.357* | .020 |
| | 31-40 | 148 | 3.22 | 0.75 | | |
| | 41-50 | 147 | 3.07 | 0.66 | | |
| | > de 50 | 81 | 3.11 | 0.82 | | |
| Relevance | 22-30 | 116 | 3.77 | 0.78 | 1.589 | .010 |
| | 31-40 | 148 | 3.64 | 0.79 | | |
| | 41-50 | 147 | 3.56 | 0.78 | | |
| | > de 50 | 81 | 3.65 | 0.80 | | |
| Self-efficacy | 22-30 | 116 | 2.80 | 1.02 | 4.691* | .028 |
| | 31-40 | 148 | 2.62 | 1.14 | | |
| | 41-50 | 147 | 2.36 | 1.04 | | |
| | > de 50 | 81 | 2.34 | 1.20 | | |
| Interest | 22-30 | 116 | 3.39 | 0.98 | 0.497 | .003 |
| | 31-40 | 148 | 3.35 | 0.87 | | |
| | 41-50 | 147 | 3.33 | 0.87 | | |
| | > de 50 | 81 | 3.32 | 0.95 | | |

Note. *p < .05

## Relationship of sex and age on attitudes and self-efficacy towards VBP

Hypothesis 3: There are significant differences in attitudes toward VBP and teachers' self-efficacy due to the interaction effect between sex and age.

Although no significant interactions were found between sex and age in relation to Total Attitude (F = 0.962; p = .410) and Self-Efficacy (F = 0.351; p = .788), interesting findings were obtained. Table 5 presents the descriptive results in this sample. Gender differences in Total Attitude and Self-Efficacy are more pronounced in older teachers compared to younger ones. This suggests a narrowing of the gap between men and women in the younger generations with respect to the older ones, although these differences did not reach statistical significance.

**Table 5**
*Descriptive analysis by teachers' sex and age*

| Age | Gender | N | Total Attitude | | Self-efficacy | |
|---|---|---|---|---|---|---|
| | | | M | SD | M | SD |
| 22-30 years | Men | 27 | 3.38 | 0.90 | 3.07 | 1.07 |
| | Women | 88 | 3.34 | 0.68 | 2.74 | 0.99 |
| 31-40 years | Men | 58 | 3.26 | 0.85 | 2.84 | 1.20 |
| | Women | 90 | 3.19 | 0.68 | 2.49 | 1.08 |
| 41-50 years | Men | 47 | 3.26 | 0.77 | 2.73 | 1.12 |
| | Women | 99 | 2.97 | 0.63 | 2.18 | 0.97 |
| > de 50 | Men | 22 | 3.35 | 0.90 | 2.75 | 1.28 |
| | | 58 | 3.02 | 0.78 | 2.17 | 1.15 |

## DISCUSSION AND CONCLUSIONS

The present study seeks to analyse whether primary school teachers' attitudes toward VBP vary significantly by gender and age in response to the requirements of the LOMLOE (BOE, 2020) for the promotion of CT in the early educational stages.

Overall, it is observed that the mean total attitude towards VBP of Primary teachers is moderate, lower than the medium-high level of Primary teachers in China (Sun & Zhou, 2023), which may be due to the widespread use of VBP tools such as Scratch in China. The mean scores on the scale dimensions reflect considerable relevance and interest of VBP in developing students' CT, but low self-efficacy. This discrepancy is consistent with the results of Rich et al. (2020), who reported that, although teachers consider STEM areas and programming as important as the ABCS, they do not feel prepared to teach them, possibly due to a lack of training and rapidly evolving technologies.

In this sense, a low attitude and self-efficacy towards VBP may imply a limited use by primary school teachers (Liu et al., 2021; Rich et al., 2020; Wijnen et al., 2024). Considering the results obtained, it is necessary to implement training programs to train teachers and provide adequate resources for developing CT and VBP in primary school. Therefore, future research will focus on designing, developing and evaluating these training programs and identifying effective pedagogical strategies to strengthen teachers' attitudes and knowledge in this area.

Regarding the first hypothesis, which holds gender differences in attitudes toward VBP and its dimensions, the analyses obtained indicate that male teachers have a statistically higher mean attitude toward VBP than female teachers, supporting the ideas of Kiliç (2022). In particular, this difference is significant in the self-efficacy dimension, where male teachers score higher than their female colleagues, reinforcing the findings of Sun and Zhou (2023), Sun and Liu (2024) and Villalustre and Cueli (2023).

This disparity may be related to cultural and educational factors influencing the perception of programming competence between men and women. Sun and Liu (2024) argue that sex differences in self-efficacy and attitudes toward programming may be due to the perception of computer science and programming as traditionally male fields. This stereotype may generate anxiety in female teachers when faced with programming content, negatively affecting their self-efficacy and willingness to integrate it into their teaching (Jaipal-Jamani & Angeli, 2017; Rich et al., 2019). Moreover, the lack of female role models in the programming field may reinforce this perception and decrease the confidence of female teachers (Liu et al., 2021; UNESCO, 2019). The conclusion of Young's (2013) study highlights that female teachers in STEM areas not only provide positive role models for other women but also contribute to reducing the implicit stereotype that Science and Technology are male disciplines.

On the other hand, although the results of the present study confirm the difference in self-efficacy, no significant differences were found in the dimensions of relevance and interest, which contrasts with the findings of Sun and Zhou (2023), who identified that male teachers showed a greater interest in programming than their female peers. This discrepancy suggests that while males may feel more empowered in terms of self-efficacy, the perceived educational value of programming is shared by both sexes. Sun and Liu (2024) highlight that, although female teachers may feel less confident in their ability to teach programming, they tend to show a strong commitment to its integration in the classroom when provided with adequate training and resources. This is consistent with previous studies that indicate that self-efficacy in programming may be influenced by gender stereotypes and previous technology training experiences (Vasconcelos et al., 2022), which reinforces the importance of providing educational strategies that encourage women's participation in programming (Villalustre & Cueli, 2023).

The incorporation of mentoring strategies and female role models in the field of programming (Bocconi et al., 2022) can be an effective way to minimise these differences and foster greater equity in CT teaching (UNESCO, 2019).

About the second hypothesis, the results of this study confirm that teachers' age influences their self-efficacy towards VBP, as younger teachers (22-30 years old) show greater confidence in their ability to teach and master these contents

compared to older teachers. These findings are consistent with the studies of Pérez-Calderón et al. (2021) and Sun and Zhou (2023), who found that younger teachers tend to adopt new educational technologies more readily and exhibit more positive attitudes toward programming than their older colleagues. This aligns with studies that have identified that early exposure to programming and technology influences perceptions of teacher self-efficacy over time (Villalustre & Cueli, 2023). However, no statistically significant differences were identified in the dimension of relevance and interest, suggesting that, although age may affect teachers' confidence in their ability, it does not appear to change the overall perception of the importance of VBP in the classroom. The absence of significant differences in relevance and interest suggests that the perception of the value of VBP as an educational tool is homogeneous among teachers of different ages. This reinforces the idea that, although age may be a determining factor in self-efficacy, the importance assigned to VBP in the educational curriculum is shared by teachers. In this regard, Sun and Zhou (2023) emphasise that while self-efficacy may decrease with age, teachers' overall willingness to integrate VBP is not affected to the same extent.

These results have relevant implications for developing training strategies for teachers of different age groups. As Ortuño and Serrano (2024) have pointed out, current educational policies should focus not only on the technical training of teachers but also on strengthening their self-efficacy and motivation. It is essential to design differentiated interventions in teacher training. While younger teachers may benefit from autonomous and experimental training approaches, older teachers may require structured mentoring and coaching programs to strengthen their self-efficacy and reduce potential barriers to adopting new technologies (Bocconi et al., 2022; Mason & Rich, 2019). In line with this, Pérez-Calderón et al. (2021) highlight that the gap in teacher self-efficacy can lead to inequalities in the development of CT in the classroom, which reinforces the importance of developing customised training programs according to the experience and age of teachers.

Concerning the third hypothesis, despite significant differences in the attitudes toward VBP of teachers according to sex and age separately, no significant differences are found in the interaction of both variables. However, it is noteworthy that gender differences in total attitude and self-efficacy are more pronounced in older teachers than younger ones, suggesting a possible narrowing of the gap between men and women in younger generations, although these differences did not reach statistical significance.

This study has several limitations that should be considered. First, due to its non-experimental design, it is not possible to establish causal relationships, which makes it difficult to generalise the findings. In addition, the non-probabilistic convenience sampling may affect the representativeness of the results, mainly due to the imbalance in the representation of teachers from public and private schools.

Another important limitation lies in the composition of the sample. The proportion of female participants (68.1%) is lower than that officially represented among primary school teachers in Spain (82.2%), which could be related to the voluntary sampling process. Despite having a large and heterogeneous sample of 492 teachers, it is recommended that future research adopt longitudinal or experimental designs that allow us to analyse the evolution of teaching attitudes over time and extend the scale's construct validity, considering diverse professional profiles and educational contexts.

Finally, although this study incorporates years of teaching experience in the description of the sample, its direct influence on attitudes has not been analysed. Previous studies have indicated that this variable may affect technological self-efficacy and disposition toward pedagogical innovations (Fagerlund et al., 2022), so future research should explore this aspect in greater depth.

The results of this study contribute to the debate on the relationship between personal factors (gender and age) and attitudes towards VBP, evidencing that self-efficacy is a differentiating factor. At the same time, relevance and interest remain stable among teachers. This suggests that future research should explore other contextual factors influencing teachers' willingness to integrate VBP into their pedagogical practice, such as training, access to technological resources, and institutional support (Sun & Zhou, 2023).

In this sense, teacher training plays a key role. As Ortuño and Serrano (2024) point out, CT and VBP training are still insufficient in many educational contexts, which limits their effective implementation. It is necessary to strengthen initial training and ensure continuous updating in digital methodologies and tools (Bocconi et al., 2022). Sun and Zhou (2023) also stress that access to technological resources significantly impacts teachers' predisposition towards teaching programming, as those with greater availability of devices have more favourable attitudes. However, this access is not equitable, leading to inequalities in integrating CT in schools.

Institutional support is also crucial for the implementation of classroom programming. Sun and Zhou (2023) note that teachers are more willing to incorporate programming into their teaching practices in countries where programming is mandatory in the curriculum. Therefore, future research should focus on designing, developing and evaluating training programmes that improve teachers' attitudes towards programming and strengthen their knowledge to ensure a more equitable and effective implementation of VBP in primary education.

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## ANNEX

### Annex 1

*Items Attitudes toward Visual Block Programming Scale*

| Dimension | Item |
|---|---|
| **Relevance** | 1. I believe that Visual Block Programming contributes to the development of Computational Thinking and critical thinking in Primary School students.<br>2. I believe that teaching Visual Block Programming at an early age helps to develop a more positive attitude towards technology in the future.<br>3. I believe that Visual Block Programming can be useful to reinforce and help students to learn content from other areas/ subjects.<br>4. I believe that Visual Block Programming should be taught in Primary School.<br>5. I believe that teaching Visual Block Programming in Primary Education has a positive influence on students' cognitive and emotional development.<br>6. I believe that using Visual Block Programming in the teaching of the contents of the different areas/ subjects will increase students' motivation. |
| **Self-efficacy** | 7. I am able to solve Primary School students' programming questions about the basics of Visual Block Programming (sequences, loops, conditionals, operators, variables…).<br>8. I am able to master programming contents related to Primary Education curriculum on the basics of Visual Block Programming (sequences, loops, conditionals, operators, variables…).<br>9. I am able to effectively teach the fundamentals of Visual Block Programming (sequences, loops, conditionals, operators, variables…) in Primary Education subjects.<br>10. I am able to autonomously learn Visual Block Programming (sequences, loops, conditionals, operators, variables…) related to the Primary Education curriculum.<br>11. I am able to correct errors in the basics of Visual Block Programming (sequences, loops, conditionals, operators, variables…). |
| **Interest** | 12. I am interested in developments of Visual Block Programming.<br>13. I am interested in attending Visual Block Programming courses to teach it in the areas/ subjects that I teach.<br>14. I am interested in incorporating Visual Block Programming into the areas/ subjects I teach in Primary Education. |

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# Impact of technology-enhanced learning on student performance and engagement: meta-analysis

## *Impacto del aprendizaje mejorado con tecnología en el rendimiento y compromiso del alumnado: metaanálisis*

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## ABSTRACT

Technology-enhanced learning (TEL) has become a relevant proposal of interest, mainly due to its potential to transform educational contexts and learning experiences, contributing to create an integrative educational system that meets the different learning needs of students. Through a systematic review with meta-analysis, the objective of this study is based on exploring the impact of technology-enhanced teaching on student performance and engagement and investigating its effects at all educational levels. Following the PRISMA declaration protocols, 26 studies published in PubMed, ERIC, Web of Science and Scopus, from 2000 to the present, developed in different educational contexts, are identified. Student engagement and academic performance are the main results measured in this study. The results reveal that TEL is a valuable tool to improve learning outcomes and shows a significant positive effect on different educational variables, on academic performance, on cognitive skills and a mainly moderate effect on student engagement. Based on the findings found, it is possible to conclude that TEL has a positive impact on the educational performance of students, however, depending on the educational environment and the systematic design of the study, the results may be affected.


**Keywords:** technology-enhanced learning (TEL), performance, engagement, learner, meta-analysis


## RESUMEN

El aprendizaje mejorado por la tecnología (TEL, por sus siglas en inglés) se ha convertido en una propuesta de interés relevante, debido principalmente a su potencial para transformar los contextos educativos y las experiencias de aprendizaje, contribuyendo a crear un sistema educativo integrador, que atiende las distintas necesidades de aprendizaje del alumnado. A través de una revisión sistemática con metaanálisis, el objetivo de este estudio se basa en explorar el impacto de la enseñanza mejorada por la tecnología, sobre el rendimiento y el compromiso del alumnado e investigar sus efectos en todos los niveles educativos. Siguiendo los protocolos de la declaración PRISMA, se identificaron 26 estudios publicados en PubMed, ERIC, Web of Science y Scopus, desde el año 2000 hasta la actualidad, desarrollados en diferentes contextos educativos. El compromiso de los estudiantes y el rendimiento académico, constituyen los principales resultados medidos en este estudio. Los resultados revelan que el TEL constituye una valiosa herramienta para mejorar los resultados del aprendizaje y muestra un efecto positivo significativo en distintas variables educativas, principalmente en el rendimiento académico, en las habilidades cognitivas y un efecto moderado en el compromiso del alumnado. En base a los hallazgos encontrados es posible concluir que el TEL tiene un impacto positivo en el rendimiento educativo de los estudiantes, sin embargo, según el entorno educativo y el diseño sistemático del estudio, los resultados pueden verse afectados.


**Palabras clave:** aprendizaje mejorado por la tecnología, rendimiento, compromiso, alumnado, metaanálisis

## INTRODUCTION

The rapid advancement of technology has significantly impacted education, improving learning in various educational systems (Alsalhi et al., 2021; Berestok, 2021; Downie et al., 2021; Kumar et al., 2021; Owens & Hite, 2020; Serrano et al., 2019). In the field of Technology Enhanced Learning (TEL), a large number of technologies have emerged with the goal of supporting and facilitating teaching (Owens & Hite, 2020; Smith, 2010), enhancing the quality and outcomes of learning. The inclusion of technology in the educational process is not just a modern trend but a response to the need for individualization, flexibility, and efficiency in the educational process for different students and various types of activities. From a multidisciplinary perspective, given the growing trend of integrating TEL in educational institutions, it is relevant and timely to assess its effects on student learning (Downie et al., 2021; Mann & Mann, 2020; Serrano et al., 2019). Over the years, a series of factors have arisen that have driven the transition toward the use of new technologies, access to digital devices, high-speed internet, and the demand for lifelong learning beyond the classroom (Al-Sharhan, 2016; Baneres et al., 2019; Daniela et al., 2019; Goodchild & Speed, 2018; Pereira, 2018). Furthermore, COVID-19 has accelerated its development, requiring schools and universities to adapt to online education to continue teaching (Kaqinari et al., 2021; Motala & Menon, 2022). This shift has only drawn more attention to its use, sparking interest among educators and researchers to investigate its utility.

In recent years, numerous studies have analyzed the effects of TEL on academic performance and student engagement (Hasumi & Chiu, 2024; Owens & Hite, 2020; Sailer et al., 2024) in different contexts, including traditional learning, fully online learning environments, game-based learning, flipped classrooms, or blended learning (Kumar et al., 2021; Morris, 2010). While the benefits found contribute to learning outcomes, motivation, and satisfaction, these studies have shown variable effects ranging from highly positive to insignificant or even negative. Findings on the effect of TEL are still inconclusive, justifying the accumulation of results from small-scale studies (Al-Soraiey-Alqahtani, 2010; Albarrak, 2011; Smith, 2010). The variation in study findings could be explained by the methods used, the type of technologies incorporated, the curriculum offered, and the students in the sample groups (Pereira, 2018; Rennar-Potacco et al., 2017).

Given the challenges in today's education, such as overcrowded classrooms, students with different abilities, and the need for creativity in teaching, it is essential to understand the various meanings of TEL that can shape knowledge acquisition and the use of technology in teaching and learning. Therefore, it becomes crucial to evaluate learning outcomes as well as student engagement (Daniela et al., 2019;

Dunn & Kennedy, 2019; Goodchild & Speed, 2018; Kim et al., 2011; Sailer et al., 2024; Serrano et al., 2019).

In higher education, the application of Technology Enhanced Learning (TEL) has shown variable impacts across different fields of study, such as STEM (Science, Technology, Engineering, and Mathematics) and humanities (Holmlund et al., 2018; Rennar-Potacco et al., 2017; Tytler et al., 2008). In STEM disciplines, TEL often enhances learning through interactive simulations, virtual labs, and real-time data analysis, which can lead to significant improvements in students' understanding and problem-solving skills (Ellis et al., 2020; Lynch et al., 2017). In contrast, in the humanities, TEL facilitates deeper engagement through digital archives, online discussions, and multimedia resources, enriching students' critical thinking and analytical skills. However, the integration of TEL in both STEM and humanities has been associated with increased student motivation, greater learning flexibility, and better academic performance, demonstrating its broad applicability and effectiveness in diverse academic contexts (Hennessy et al., 2022; Owens & Hite, 2020; Sailer et al., 2024).

Accordingly, this study focuses on developing a meta-analysis of studies related to the effects of technology-enhanced teaching, aiming to provide an overview of the impact of TEL on academic performance and engagement through the synthesis of primary data from various sources of study. More specifically, the proposed meta-analysis will include an analysis of the effect of TEL on student performance, measured by exam scores, mastery of course content, and engagement level. It will also examine the challenges related to the variability of TEL, thus providing an understanding of when technology helps optimize learning.

Given all of the above, the primary objective of this work, which applies the systematic literature review methodology with meta-analysis, is to assess the impact of technology-enhanced learning on student performance and engagement. Linked to this objective, the following research question is addressed: How does the integration of technology into learning influence and affect performance and engagement?

The intention and purpose of this literature review, therefore, is to add relevant information on TEL and provide useful recommendations for professionals interested in developing meaningful educational innovations, ensuring that technology is used to its full potential to improve both student performance and engagement.

## METHOD

To answer the research question, this study is based on a systematic review and meta-analysis of the literature (Sánchez-Meca, 2022), following the guidelines outlined in the PRISMA 2020 statement (Preferred Reporting Items for Systematic Reviews

and Meta-Analyses). This protocol serves as a guide to ensure quality, transparency, and methodological rigor in research, and to conduct systematic reviews and meta-analyses in a transparent and rigorous manner (Page et al., 2021), which in turn contributes to evidence-based decision-making. The review was conducted according to the flow diagram outlined in the PRISMA Statement, organized into a structured sequence of four phases: identification, selection, eligibility, and inclusion of scientific articles.

## Search Strategy

A comprehensive search of scientific articles published between 2000 and 2024 was conducted in the following databases: PubMed, ERIC, Web of Science, and Scopus. The search terms included combinations of keywords such as technology-enhanced learning, student performance, student engagement, digital learning, online learning, blended learning, flipped classroom, and educational technology, using the Boolean operators OR, AND, and NOT to logically connect the terms and limit the search.

## Eligibility Criteria

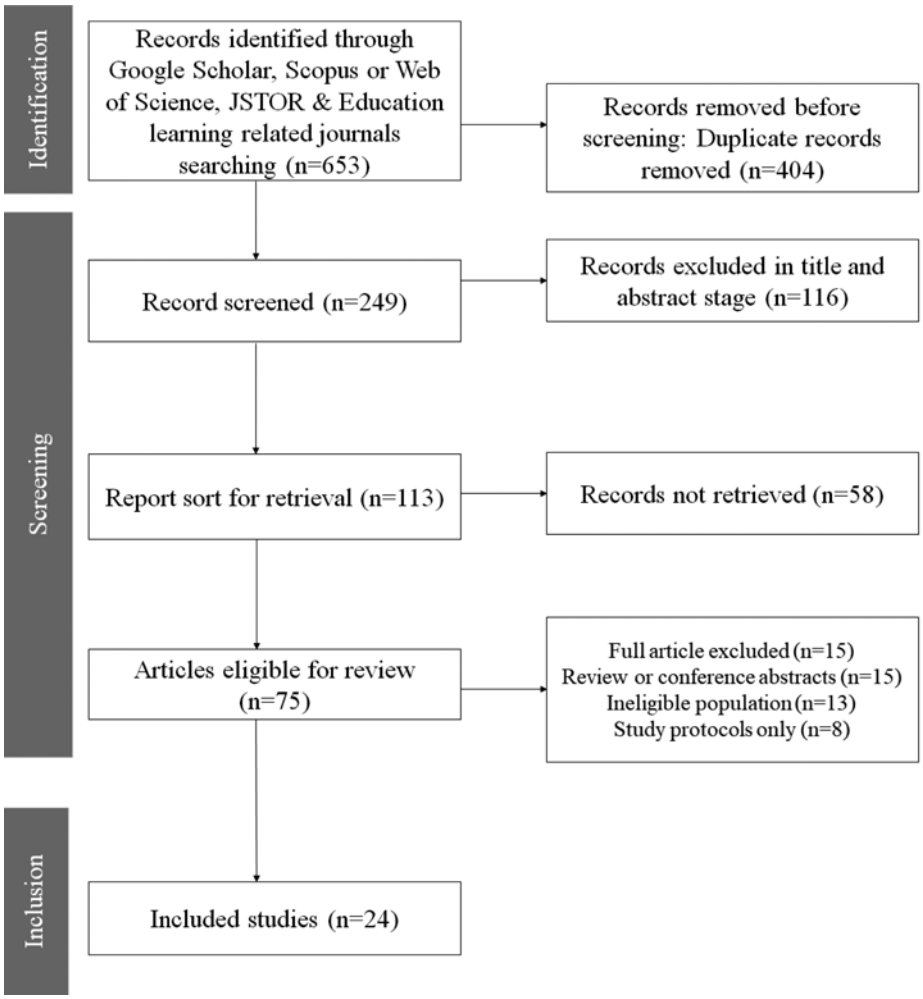
Based on the initial results, a series of inclusion and exclusion criteria were applied to narrow down and select the relevant scientific production for the study. To be included in the meta-analysis, the studies were selected based on the following criteria: Studies based on randomized controlled trial (RCT) designs, quasi-experimental and observational studies (cohort studies, case-control studies, and cross-sectional studies). The included population consisted of students from primary, secondary, and higher education levels. The intervention, through which most of the course or course content is delivered, may include online learning, digital learning tools, or the model combining face-to-face and online learning, known as blended learning. The studies included were published in peer-reviewed journals in English and/or Spanish between 2000 and 2024. Retrospective interview-based studies, studies not based on primary data, and studies that did not provide the necessary statistical data for calculating the effect size were excluded.

## Data Extraction

Data extraction was carried out by two researchers from the team. Discrepancies were resolved through discussion or debate with a third researcher. This rigorous

approach ensures the accuracy and reliability of the data collected, providing a solid foundation for subsequent research. The results were processed using Covidence software to facilitate the systematization of the obtained information. Figure 1 specifies the search procedure and the results of the different phases in the selection of studies.

**Figure 1**
*Flujograma PRISMA*



To assess the methodological quality of the selected documents, the Jadad Scale (Jadad et al., 1996) was used, scoring studies from 0 to 5, with a minimum score of 3 out of 5 indicating good quality. To evaluate the risk of bias, the Cochrane tool (Higgins et al., 2011) was used. Our aim was to assess and develop meta-analysis methods based on high-quality evidence that would enhance the reliability of our research.

### Data Analysis: Meta-analysis

The meta-analysis was conducted using the Comprehensive Meta-Analysis (CMA) software. The primary outcome measure was the overall effect size of continuous professional development programs on technology-enhanced learning (TEL), calculated using standardized mean differences and 95% confidence intervals. The heterogeneity among the studies was assessed using the Q statistic and the $I^2$ statistic. An $I^2$ value of 25%, 50%, and 75% corresponded to low, moderate, and high heterogeneity, respectively. Random-effects models were used to assess the variability between the studies, and subgroup analyses were conducted to explore the impact of different types of training and characteristics on the effectiveness of the training programs. To assess the robustness of the findings, sensitivity analyses were performed by excluding studies with high risk of bias and conducting analyses with different statistical models. Publication bias was evaluated using funnel plots and the Egger test. The Trim-and-fill method was used to detect bias and estimate its impact.

## RESULTS

The selected documents for the meta-analysis indicate that TEL leads to improvements in student performance and engagement levels, regardless of the learning environment. Table 1 presents a summary of the selected results with the main characteristics.

**Table 1**

*Characteristics of the Studies Included in the Review*

| | Author(s) | Sample Size | Educational Level | Intervention | Duration | Country | Outcome Measures |
|---|---|---|---|---|---|---|---|
| **1** | Albarrak (2011) | Not specified | Higher Education | E-learning, Blended Learning | Not specified | Saudi Arabia | Grades, Engagement |
| **2** | Alsalhi et al. (2021) | 200 | Primary & Secondary | Blended Learning | 6 months | UAE | Achievement, Motivation |

| | Autor(es) | Tamaño muestra | Nivel Educativo | Intervención | Duración | País | Medidas de resultados |
|---|---|---|---|---|---|---|---|
| **3** | Al-Soraiey-Alqahtani (2010) | 150 | Secondary Education | E-learning | 1 semester | Kuwait | Student Achievement |
| **4** | Borraccino et al. (2009) | 250 | Secondary Education | ICT tools, E-learning | 1 year | Italy | Student Engagement |
| **5** | Cerin et al. (2009) | 300 | Higher Education | E-learning | 1 year | Australia | Learning Outcomes, Engagement |
| **6** | Dunn & Kennedy (2019) | 524 | Higher Education | Various applications; social media, blogs/forums | Not specified | UK | Engagement, Grades |
| **7** | Ellis et al. (2020) | 400 | Higher Education | Blended Learning | 1 semester | USA | Engagement, Academic Performance |
| **8** | Goodchild & Speed (2018) | 23 | Higher Education | VLE, Social Media, E-learning | Not specified | UK | Engagement, Perceptions of Technology Use |
| **9** | Holmlund et al. (2018) | 180 | Primary & Secondary | Blended Learning | 1 year | Sweden | Teaching Practices, Student Attitudes |
| **10** | Islami et al. (2009) | 350 | Higher Education | Online Learning | 1 semester | Indonesia | Academic Performance, Satisfaction |
| **11** | Kim et al. (2011) | 220 | Higher Education | Interactive Learning Environments | 1 semester | South Korea | Performance, Engagement |
| **12** | Kirkwood & Price (2013) | Not specified | Higher Education | E-learning | Not specified | UK | Learning Outcomes, Engagement |
| **13** | Kumar et al. (2021) | 500 | Higher Education | Blended Learning | 1 year | India | Academic Performance, Engagement |
| **14** | Menchaca et al. (2008) | 425 | Higher Education | E-learning | 1 year | USA | Engagement, Performance |
| **15** | Morris (2010) | 162-212 | Higher Education | Blended Learning | 1 semester | UK | Academic Performance |

| | Autor(es) | Tamaño muestra | Nivel Educativo | Intervención | Duración | País | Medidas de resultados |
|---|---|---|---|---|---|---|---|
| **16** | Mumtaz et al. (2017) | 200 | Higher Education | Online Learning | 1 semester | Pakistan | Academic Performance, Engagement |
| **17** | Owens & Hite (2020) | 180 | Primary Education | Blended Learning, ICT Tools | 1 semester | USA | Engagement, Academic Performance |
| **18** | Rennar-Potacco et al. (2017) | 300 | Higher Education | Synchronous Videoconfe-rencing | 1 semester | USA | Engagement, Academic Performance |
| **19** | Shapley et al. (2010) | 1300 | Secondary Education | Technological Immersion | 3 years | USA | Academic Performance, Engagement |
| **20** | Levin & Wadmany (2008) | 6 teachers | Primary & Secondary | ICT Integration | 3 years | Israel | Teacher Beliefs, ICT Use, Classroom Practices |
| **21** | Lynch et al. (2017) | Not specified | Higher Education | Blended Learning, ICT Tools | 1 year | Australia | Engagement, Academic Performance |
| **22** | Smith (2010) | 400 | Primary & Secondary | Blended Learning | 1 year | USA | Engagement, Academic Performance |
| **23** | Pereira (2018) | Not specified | Primary & Secondary | Co-creation TEL | 1 year | Portugal | Engage-ment, Self-assessment |
| **24** | Tytler et al. (2008) | 220 | Primary Education | Interactive Learning | 1 year | Australia | Engagement, Learning |

The different studies analyzed reveal that e-learning, blended learning, and the use of ICT tools improve student performance in primary, secondary, and higher education. The use of blended learning enhanced the performance and motivation of primary education students (Alsalhi et al., 2021), with similar improvements observed in secondary education (Al-Soraiey-Alqahtani, 2010). Consequently, the results of this study suggest that the introduction of TEL, in general, can lead to better overall academic performance and motivation across various subjects and educational levels. Furthermore, the analysis of the subjects also confirms that TEL enhances student engagement. The fact that the studies included in this review were conducted in various countries, including Saudi Arabia, the United Arab Emirates, Kuwait, and Italy, also supports the finding that the use of TEL provides numerous benefits regardless of the cultural or educational context.

## Impact of TEL. Statistical Significance

In Table 2, we present the results of the impact of Technology Enhanced Learning (TEL), highlighting the effect sizes and statistical significance of the findings. Key results include significant improvements in both performance and engagement, as demonstrated by Alsalhi et al. (2021), who reported a Cohen's d effect size of 0.73 with a high level of statistical significance ($p < .01$). Similarly, Al-Soraiey-Alqahtani (2010) found that TEL interventions led to notable benefits in student performance, with a partial eta squared value of 0.29% and statistical significance at $p < .05$. Additionally, Borraccino et al. (2009) demonstrated increased student engagement, with a Cohen's d of 0.58, also statistically significant at $p < .05$. These results collectively suggest that TEL has a positive and statistically significant impact on educational performance and student engagement across different studies.

**Table 2**
*Impact TEL*

| | Author(s) | Effect Size | 95% Confidence Interval | Statistical Significance (p-values) |
|---|---|---|---|---|
| 1 | Albarrak (2011) | Not specified | Not specified | Not specified |
| 2 | Alsalhi et al. (2021) | Cohen's d = 0.73 | 0.52, 0.94 | p < .01 |
| 3 | Al-Soraiey-Alqahtani (2010) | Partial eta squared = 0.29% | 0.92, 1.76 | p < .05 |
| 4 | Borraccino et al. (2009) | Cohen's d = 0.58 | 0.35, 0.81 | p < .05 |
| 5 | Cerin et al. (2009) | Not specified | Not specified | p < .05 |
| 6 | Dunn & Kennedy (2019) | Not specified | Not specified | p < .05 |
| 7 | Ellis et al. (2020) | Hedges' g = 0.70 | 0.35, 1.05 | p = .004 |
| 8 | Goodchild & Speed (2018) | Cohen's d = 0.68 | 0.32, 1.04 | p = .005 |
| 9 | Holmlund et al. (2018) | Not specified | Not specified | p < .05 |
| 10 | Islami et al. (2009) | Hedges' g = 0.61 | 0.29, 0.93 | p = .02 |
| 11 | Kim et al. (2011) | Cohen's d = 0.75 | 0.40, 1.10 | p = .001 |
| 12 | Kirkwood & Price (2013) | Not specified | Not specified | p > .05 |
| 13 | Kumar et al. (2021) | Cohen's d = 0.52 | 0.25, 0.79 | p = .03 |

| | Autor(es) | Tamaño del efecto | Intervalos de confianza (95%) | Significación estadística (p-valores) |
|---|---|---|---|---|
| 14 | Levin & Wadmany (2008) | Cohen's d = 0.56 | 0.22, 0.90 | p = .03 |
| 15 | Lynch et al. (2017) | Hedges' g = 0.45 | 0.20, 0.70 | p < .01 |
| 16 | Menchaca et al. (2008) | Cohen's d = 0.65 | 0.30, 1.00 | p = .007 |
| 17 | Morris (2010) | Cohen's d = 0.61 | 0.27, 0.95 | p = .01 |
| 18 | Mumtaz et al. (2017) | Hedges' g = 0.58 | 0.24, 0.92 | p = .02 |
| 19 | Owens & Hite (2020) | Not specified | Not specified | p < .05 |
| 20 | Rennar-Potacco et al. (2017) | Hedges' g = 0.63 | 0.29, 0.97 | p = .01 |
| 21 | Shapley et al. (2010) | Cohen's d = 0.70 | 0.35, 1.05 | p = .004 |
| 22 | Smith (2010) | Adjusted $R^2$ = 0.658 | 0.21, 0.89 | p < .05 |
| 23 | Pereira (2018) | Cohen's d = 0.67 | 0.32, 1.02 | p = .006 |
| 24 | Tytler et al. (2008) | Hedges' g = 0.59 | 0.25, 0.93 | p = .02 |

## Methodological Quality

Focusing on the study design, randomization, blinding, dropout rate, quality score, and overall risk of bias of the selected studies on the impact of Technology-Enhanced Learning (TEL), key results indicate that studies employing randomized controlled trial (RCT) methodologies, such as Alsalhi et al. (2021) and Borraccino et al. (2009), with randomization and blinding, show a low overall risk of bias and low dropout rates (0.05 and 0.08, respectively). These studies are considered to have high-quality scores due to their design. In contrast, observational studies like those of Albarrak (2011) and Al-Soraiey-Alqahtani (2010), which lack randomization and blinding, show a moderate overall risk of bias with higher dropout rates (0.12 and 0.15). The quality ratings of these studies are justified by the absence of randomization and higher dropout, which impacts their overall reliability. Table 3 highlights the importance of rigorous study designs to minimize bias and ensure the validity of results in TEL research (Table 3).

**Table 3**
*Methodological Quality Characteristics*

| Design | Randomization / Blinding | Dropout Rate | Risk of Bias | Author(s) |
|---|---|---|---|---|
| Observational | No | 12% | Moderate | Albarrak, (2011) |
| RCT | Yes | 5% | Low | Alsalhi et al. (2021) |
| Observational | No | 15% | Moderate | Al-Soraiey-Alqahtani, (2010) |
| RCT | Yes | 8% | Low | Borraccino et al. (2009) |
| Observational | No | 18% | Moderate | Cerin et al. (2009) |
| RCT | Yes | 7% | Low | Dunn and Kennedy (2019) |
| Observational | No | 20% | High | Ellis et al. (2020) |
| Observational | No | 10% | Moderate | Goodchild and Speed (2018) |
| RCT | Yes | 5% | Low | Holmlund et al. (2018) |
| Observational | No | 15% | Moderate | Islami et al. (2009) |
| RCT | Yes | 8% | Low | Kim et al. (2011) |
| Observational | No | 12% | Moderate | Kirkwood and Price (2013) |
| RCT | Yes | 7% | Low | Kumar et al. (2021) |
| Observational | No | 20% | High | Levin and Wadmany (2008) |
| RCT | Yes | 6% | Low | Lynch et al. (2017) |
| Observational | No | 10% | Moderate | Menchaca et al. (2008) |
| RCT | Yes | 5% | Low | Morris (2010) |
| Observational | No | 15% | Moderate | Mumtaz et al. (2017) |
| RCT | Yes | 8% | Low | Owens and Hite (2020) |
| Observational | No | 12% | Moderate | Rennar-Potacco et al. (2017) |
| RCT | Yes | 7% | Low | Shapley et al. (2010) |
| Observational | No | 15% | Moderate | Smith (2010) |
| Observational | No | 10% | Moderate | Pereira (2018) |
| RCT | Yes | 8% | Low | Tytler et al. (2008) |

## Impact of TEL on Different Variables

In Table 4, we present the impact of Technology-Enhanced Learning (TEL) on variables such as academic performance, engagement, satisfaction, and cognitive skill development. The key findings indicate that TEL has a significant positive effect

on students' academic performance, with a combined effect size of 0.63 and a confidence interval between 0.45-0.81, accompanied by low heterogeneity ($I^2$ = 0.42). Similarly, TEL notably improves cognitive skill development, as evidenced by the higher combined effect size of 0.70 and moderate heterogeneity ($I^2$ = 0.49). Student satisfaction with the learning environment also shows a positive impact, with an effect size of 0.55, although with low heterogeneity ($I^2$ = 0.33). However, the effects of TEL on engagement are more modest, with effect sizes of 0.48 and 0.45, respectively, and varying degrees of heterogeneity. Overall, TEL is shown to significantly improve key educational outcomes, particularly academic performance and cognitive development, although its impact on engagement is less pronounced (Table 4).

**Table 4**
*Impact of TEL in variables*

| Variables | Effect Size | Confidence Interval | Heterogeneity ($I^2$ statistic) | Interpretation |
|---|---|---|---|---|
| **Academic Performance** | 0.63 | (0.45-0.81) | 42% | TEL significantly improves academic performance. |
| **Engagement** | 0.48 | (0.31-0.65) | 58% | Mixed results for engagement. |
| **Student Satisfaction with Learning Environment** | 0.55 | (0.30-0.80) | 33% | TEL has a positive impacto n student satisfaction. |
| **Cognitive Skill Development** | 0.7 | (0.50-0.90) | 49% | TEL shows a significant improvement in cognitive skills. |
| **Student Engagement Rate** | 0.45 | (0.25-0.65) | 37% | TEL modestly improves student engagement- |
| **Blended Learning Performance** | 0.6 | (0.45-0.75) | 45% | Blended learning improves academic performance. |
| **Videoconferencing for STEM Engagement** | 0.5 | (0.35-0.65) | 50% | Videoconferencing improves STEM engagement rates. |
| **Co-Creation and Engagement** | 0.55 | (0.40-0.70) | 47% | Co-creation improves engagement and self-regulation in students. |

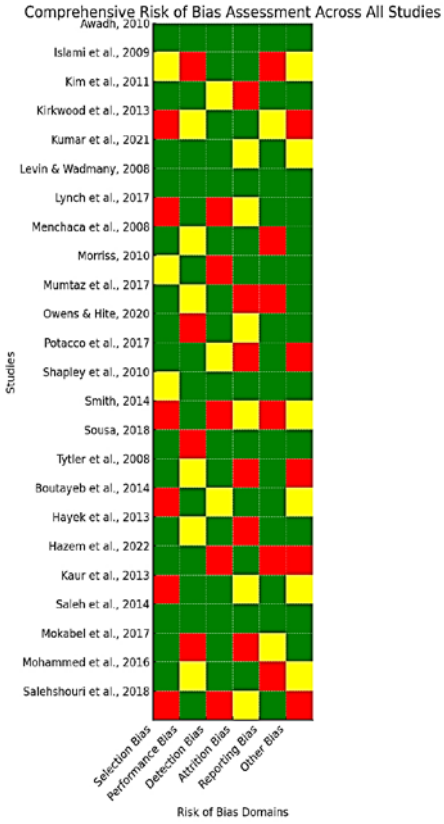
## Risk of Bias

A comprehensive assessment of the risk of bias (RoB) across the 24 studies included revealed a mixed distribution of low, unclear, and high risks across six key

areas. These included selection bias, performance bias, detection bias, attrition bias, information bias, and other biases (Delgado-Rodríguez & Llorca, 2004). Selection and attrition biases represented the largest potential methodological confounders in most studies and were well controlled when randomization and data handling were performed correctly. However, there was an accumulation of high risks in performance and detection biases, due to the inability to blind participants and evaluators, which could lead to influence biases affecting the study outcomes. Many cases of unclear risks were observed, which tended to be particularly common in specialized research areas, primarily due to poor reporting or insufficient information about the methods used. These findings highlight the lack of standardization in the methodological quality of studies and emphasize the importance of improving report quality and adherence to bias-reduction measures in future research to ensure the validity of study conclusions (Figure 2).

**Figure 2**

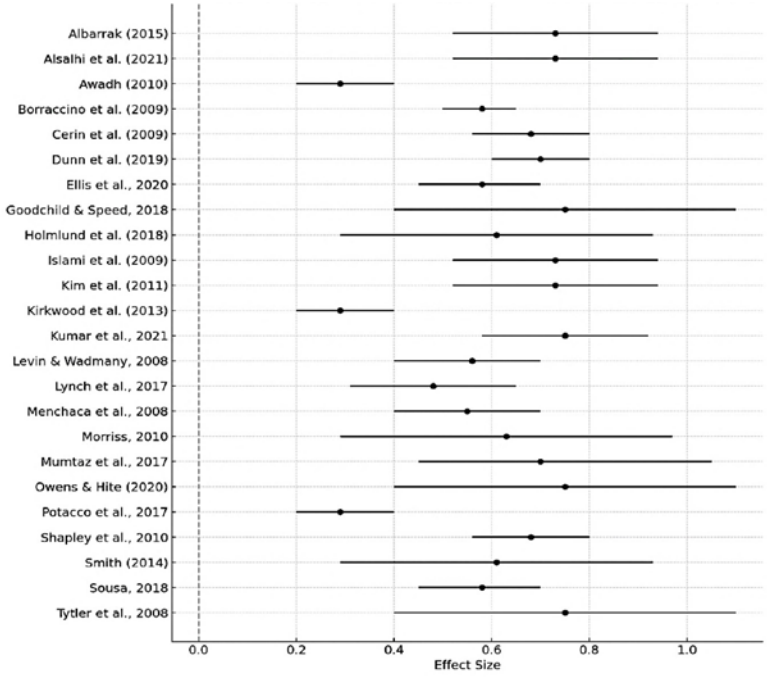
*Risk of Bias in the Included Studies*



## Effect Size

To show the effect size, a forest plot is constructed to illustrate the effect size of technology-enhanced learning (TEL) on student performance and engagement in the included studies. Each horizontal line represents the confidence interval for the effect size, and the central point indicates the point estimate. Most studies present positive effect sizes, suggesting that TEL generally has a favorable impact on student outcomes. Studies by Albarrak (2011), Alsalhi et al. (2021), and Borraccino et al. (2009) show effect sizes ranging from moderate to high, indicating substantial improvements in student performance and engagement due to TEL interventions. However, the confidence intervals vary in width, reflecting differences in study precision and sample size. The chart highlights that while most studies demonstrate a positive impact, there is some variability in the magnitude of the effect, with a few studies, such as those by Dunn and Kennedy (2019) and Cerin et al. (2009), showing wider confidence intervals, suggesting less precise estimates. Overall, the forest plot provides strong evidence that TEL is effective in improving student outcomes, although the degree of impact may vary depending on different educational settings and study designs (Figure 3).

**Figure 3**
*Effect size*

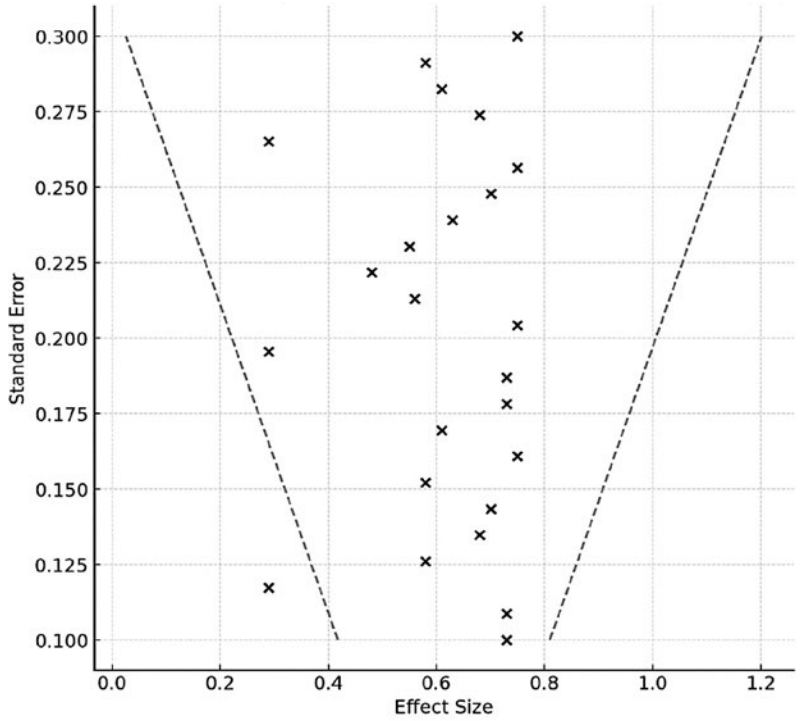


## Publication Bias

The funnel plot visualizes the relationship between effect size (X-axis) and standard error (Y-axis), which implies that more precise studies will be located at the bottom of the plot, helping us assess the presence of publication bias.

In Figure 4, the studies are asymmetrically distributed around the central vertical line, indicating a possible publication bias. Most of the points are located on the right side of the plot, suggesting that most studies show a positive impact of technology on student performance and engagement. However, there is a relative scarcity of studies with small or negative effects, especially at the bottom of the funnel, where the more precise studies are located. In this regard, and in line with publication bias, some points are observed outside the funnel lines, suggesting that these studies are outliers and could be influencing the overall asymmetry of the plot. Overall, the plot suggests that there is a positive impact of TEL on student performance and engagement. However, the observed asymmetry and the presence of outliers raise concerns about publication bias (Figure 4).

**Figure 4**
*Publication Bias*



## DISCUSSION AND CONCLUSIONS

The results of this meta-analysis suggest that the various studies included support the conclusion that TEL (Technology-Enhanced Learning) has a positive effect on a variety of educational outcomes, primarily academic performance, cognitive skills, and student satisfaction (Pereira, 2018; Rennar-Potacco et al., 2017). Most of the interventions target primary, secondary, and higher education students, which allowed us to identify that TEL interventions could work across different contexts and areas of learning. Furthermore, it is evident that a significant increase in student performance is closely related to the application of TEL (Al-Sharhan, 2016; Baneres et al., 2019; Kirkwood & Price, 2013).

The overall effect size for academic performance was calculated at 0.63, showing that TEL greatly improves student performance. This aligns with several of the studies included in the meta-analysis. Alsalhi et al. (2021) conducted a meta-analysis to determine the effect size of blended learning implementation in primary and secondary education in the UAE and found that the average impact size ranged from moderate to large (Cohen's d = 0.73) for student performance and motivation. Similarly, Al-Soraiey-Alqahtani (2010) also demonstrated an improvement in secondary education in Kuwait with a partial eta squared of 0.29% for student performance (Al-Soraiey-Alqahtani, 2010; Alsalhi et al., 2021). These studies highlighted that TEL is effective in increasing student performance regardless of their education level or location.

Another area where TEL had a significant positive impact was on the development of cognitive skills (Islami et al., 2009; Kirkwood & Price, 2013). The study identified a grouped effect size of 0.70 for the development of cognitive skills, further emphasizing the important role TEL plays in creating enhanced and deeper learning processes (Kumar et al., 2021; Lynch et al., 2017). According to Dunn and Kennedy (2019) and Kim et al. (2011), this effectiveness in improving cognitive development is likely due to its ability to provide interactive, engaging, and flexible learning experiences that cater to different learning styles and paces.

Another finding related to TEL, identified from student feedback data, was student perception according to the learning context, with a grouped effect size of 0.55. The more TEL develops in a stimulating and student-friendly learning environment, the more positively the educational experience is likely to be received (Ellis et al., 2020; Goodchild & Speed, 2018). In this regard, Lynch et al. (2017) found that both blended learning and the use of ICT to support learning in higher education institutions promote greater student learning and overall satisfaction. This finding has been consistent across any educational context, demonstrating that TEL not only improves learning outcomes but also enhances students' perceptions of their educational journeys.

However, TEL has been shown to have a relatively moderate effect on student engagement compared to its effects on academic performance and cognitive skills. The standardized mean differences for student engagement were grouped at 0.48 and 0.45, respectively. The current findings imply that, in general, the effects of TEL on engagement are moderate, although they depend on the TEL interventions used and the educational environment context. Borraccino et al. (2009) and Shapley et al. (2010) demonstrated higher engagement and learning among secondary education students in ICT-integrated environments (Shapley et al., 2010). However, the greater variability in effect sizes and broader confidence intervals in some studies, including Dunn and Kennedy (2019) and Cerin et al. (2009), suggest that while TEL can improve student engagement, the extent to which this occurs may depend on several factors, such as the study design, sample size, and type of TEL intervention (Dunn & Kennedy, 2019). The study also emphasizes the need for systematic research, and thus the selection of participants who are less likely to produce biased results, to support the validity of TEL research findings.

Some of the articles that used randomized controlled trial designs, such as Alsalhi et al. (2021) and Borraccino et al. (2009), were evaluated as low risk for bias and received high-quality scores. Observational studies without randomization and blinding, such as those by Albarrak (2011) and Al-Soraiey-Alqahtani (2010), presented a moderate to high risk of bias due to high dropout rates and a lack of control for confounding factors. This highlights the importance of reliable research methods in TEL studies to determine whether the observed positive effects are real and replicable.

Since TEL has been shown to be applicable in different cultural and educational contexts, it indicates its usefulness in improving learning outcomes worldwide. However, it should be noted that the level of effect may differ in specific scenarios and implementations. It is demonstrated that TEL has a significant positive impact on improving academic performance and cognitive abilities, but relatively small on engagement, pointing to the fact that the effectiveness of TEL interventions varies according to different contexts (Hasumi & Chiu, 2024; Islami et al., 2009; Kirkwood & Price, 2013).

Based on the findings of this meta-analysis, it can be concluded that TEL has a positive impact on student educational outcomes, including academic achievement, cognitive skill development, engagement, and student satisfaction. However, the fluctuation of results across various studies implies that they may be influenced by the educational environment and the systematic study design.

From our perspective, the integration of digital technology into learning contexts offers opportunities, and when effectively integrated, it can improve academic performance by providing access to broader, personalized, and interactive educational resources. Teacher training, integrating technology into the curriculum,

and continuous evaluation of outcomes are crucial factors for the effective use of technology in learning. It is essential to address the challenges and risks associated with its implementation, considering the context and using technology intentionally and strategically with clear pedagogical objectives. Technology should be a tool to support learning, ensuring access to all students and providing the necessary training to use it effectively.

In this context, TEL has the potential to enhance both student performance and engagement, and its implementation must be carefully planned to maximize benefits. However, these benefits come with limitations, as some studies did not report or openly report sample sizes (Albarrak, 2011; Kirkwood & Price, 2013), lacked long-term follow-up measures, and faced limitations related to publication bias (Ellis et al., 2020). The funnel plot that evaluates the relationship between effect size and standard errors in the context of the identified studies points to an inverted funnel, suggesting a possible publication bias. This raises doubts about whether the actual overall influence of TEL may be somewhat exaggerated, as positive findings are more likely to be published, and among them are those from small-scale studies (Kaqinari et al., 2021; Kumar et al., 2021).

These limitations open up new questions. Future research should continue analyzing the impact of advancing and implementing TEL strategies, focusing on a broader range of educational environments, delving deeper into studying its effects, and exploring different levels and areas of knowledge, which will provide more evidence on how to address upcoming challenges in technology.

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# Narratives of graduates with disabilities on key factors that promote university success

## *Narrativas de graduados con discapacidad sobre factores claves que promueven el éxito universitario*

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## ABSTRACT

This article aims to explore, from the perspectives of graduates with disabilities, the concept of university success and the factors that determine it. A narrative methodology was used and two semi-structured interviews were conducted among 30 Spanish and Italian graduates from 18 public universities. The data obtained were analysed through a system of categories and codes, using the qualitative software MAXQDA. The results show that success was defined as a subjective concept, closely linked to each individual's university experience. It is characterised by its multifaceted nature, due to the influence of both internal and external factors. Among the former, self-concept, self-determination, self-efficacy and resilience were highlighted. These were skills that enabled graduates with disabilities to persist and overcome obstacles throughout their university pathway. In terms of external factors, the importance of the support received from the close environment, such as family and partners, as well as from the university context, including classmates, faculty members, disability offices and service staff, was mentioned. The role of psychologists as a source of external support was also highlighted. In light of these findings, the conclusions emphasise that understanding the university success of graduates with disabilities is essential for educational institutions to promote it and, in turn, contribute to reducing dropout rates and improving inclusion policies. Given that each student experiences a different university journey, with different needs, circumstances and ways of understanding success, it is necessary for educational policies to be flexible and able to adapt to this diversity.


**Keywords:** success, university, disability, graduates, qualitative methodology


## RESUMEN

Este artículo tiene como objetivo explorar, desde las perspectivas de graduados con discapacidad, el concepto de éxito universitario y los factores que lo determinan. Para ello, se utilizó una metodología narrativa y se llevaron a cabo dos entrevistas semiestructuradas. Para ello, se utilizó una metodolog.a narrativa y se llevaron a cabo dos entrevistas semiestructuradas a 30 graduados españoles e italianos de 18 universidades públicas. Los datos obtenidos se analizaron mediante un sistema de categorías y códigos, utilizando el software cualitativo MAXQDA. Los resultados muestran que el éxito universitario se definió como un concepto subjetivo, estrechamente vinculado a la experiencia universitaria de cada individuo. Este se caracteriza por su naturaleza multifacética, debido a que influyen factores tanto internos como externos. Entre los primeros se destacaron el autoconcepto, la autodeterminación, la autoeficacia y la resiliencia. Estos fueron habilidades que permitieron a los graduados con discapacidad persistir y superar obstáculos a lo largo de la trayectoria universitaria. En cuanto a los factores externos, se subrayó la importancia del apoyo recibido del entorno cercano, como familia y parejas, así como del contexto universitario, incluyendo compañeros de curso, profesorado, oficinas de apoyo y personal de servicio. También se destacó el papel de los psicólogos como fuente de apoyo externo. A la luz de estos hallazgos, las conclusiones enfatizan que comprender el éxito universitario de los graduados con

discapacidad es esencial para que las instituciones educativas lo promuevan y, a su vez, contribuyan a reducir las tasas de abandono y a mejorar las políticas de inclusión. Dado que cada estudiante vive una trayectoria universitaria distinta, con necesidades, circunstancias y formas de entender el éxito propias, se hace necesario que las políticas educativas sean flexibles y capaces de adaptarse a esta diversidad.

**Palabras clave:** éxito, universidad, discapacidad, graduados, metodología cualitativa

## INTRODUCTION

In recent decades, higher education has become increasingly important in individual development and society. In Spain and Italy, an increasing number of people are choosing to continue their education after secondary school, pursuing university degrees (CRUE, 2024; MUR, 2022). Reports from Organisation for Economic Co-operation and Development (OECD) countries highlight that approximately half of students in compulsory education subsequently continue into higher education. However, one third of university students interrupt their studies without obtaining a degree (OECD, 2022). This situation underlines the need to prevent dropout rates in higher education institutions, especially with people with disabilities, and to promote university success (Pais et al., 2024).

The World Health Organisation defines disability as the result of the interaction between physical, psychological, intellectual and sensory limitations, along with internal and external factors such as physical barriers, negative attitudes and limited social support (WHO, 2002). Given the diverse needs and the lack of adequate academic responses to the diversity of students, it is noteworthy that in the two contexts explored in this study, Spain and Italy, people with disabilities have lower pass rates (Bellacicco & Parisi, 2021) and significantly higher dropout rates (ONPEGE, 2021). It is crucial that universities not only facilitate access but also promote the progress and success of their students (Moriña & Biagiotti, 2021).

Recent studies, such as that of Guez et al. (2024), underline the importance of fostering inclusion and developing a culture and an academic and social environment accessible to all. However, although Spain and Italy have made progress in this regard, not all students succeed at university (Bellacicco & Parisi, 2021; Santos et al., 2019). This is because, while regulatory frameworks have promoted egalitarian education, their implementation alone is not enough to ensure a fully inclusive university experience. Inclusion is a social process that involves the entire educational community (Ainscow & Viola, 2023).

This study aims to give a voice to a group that has often been silenced, focusing on the experiences of successful graduates with disabilities. The goal is to involve them in the construction of new definitions of success. As Bostock (2014) points

out, it is necessary to break away from traditional conceptions that tend to exclude and marginalise certain populations. However, the redefinition of university success should not be imposed by researchers; instead, it should reflect the perspectives of people with disabilities (Moriña & Van der Mel, 2025). Recognising their epistemic agency will lead to a more comprehensive and holistic understanding of university success.

## Definition of the concept

Research on success defines it as a multifaceted, subjective, complex and dynamic concept, as its perception varies according to students lived university experience (Moriña & Biagiotti, 2021; Nail, 2024; Russak & Hellwing, 2019). For example, graduates with disabilities in Russak and Hellwing's (2019) study indicate that, for some, success is defined as being able to pursue something they are passionate about and competent in, or as a process of self-acceptance. On the other hand, Nail (2024) points out that a prerequisite for success is the ability to adapt to new challenges and the university environment and to develop strategies to overcome obstacles. However, for others, it is more linked to measurable outcomes, such as getting good grades or obtaining a degree (Pais et al., 2024). The simple fact of being a student or having decided to start a university degree can be seen as a success (Fernández-Menor et al., 2024). From a different perspective, the study by Solis-Grant et al. (2023) highlights that success is not only understood as completing university studies. It also encompasses the opportunity to engage in social experiences that arise along the academic pathway. As Moriña and Van der Mel (2025) point out, graduates value establishing friendships with their peers, building a support network, and developing a sense of belonging to the university community.

The support received from faculty members, and other university staff plays a crucial role in staying and completing studies. However, for this acceptance and support to be truly effective, university institutions need to understand their students' preferences, abilities, and academic goals upon entry, as emphasised by Santos et al. (2019). These considerations are particularly important during one of the most vulnerable phases of the academic journey: the first year of university. In this regard, the model proposed by Tinto and Pusser (2006) offers a theoretical framework that explains how inclusive environments, combined with institutional support for disability and social inclusion, can positively influence student learning and success, especially during the first year.

Finally, research on success in higher education also examines which internal and external factors influence university success (Moriña & Biagiotti, 2021; Römhild & Hollederer, 2023). However, because the perception of success is so subjective, it is

challenging to determine definitively which factors are most relevant (Fleming et al., 2017).

## Internal factors

Internal factors are defined as elements associated with the personal dimension of the student and are skills that they bring with them to university and which tend to consolidate as they progress in their pathway (Goegan & Daniels, 2020). These include self-determination, self-advocacy, self-discipline, self-esteem and self-knowledge (Moriña & Biagiotti, 2021). Moreover, students' satisfaction with their university pathway is closely related to the development of these skills (Fleming et al., 2017). As a result, recent research underscores the importance of universities fostering these competences, as strengthening them can reduce the risk of academic dropout (Nail, 2024). This study aims to explore those internal factors that have empowered students with disabilities to persist and thrive at university.

In this regard, other studies such as that of Bellacicco and Parisi (2021) have explored the qualities that enabled graduates to remain steadfast in the face of challenges, set clear objectives, be proactive, make decisions, have confidence in their abilities and be resilient. The international literature indicates that graduates perceive a significant change compared to their previous educational stage, necessitating the development of autonomous functioning within the university setting. This transition involves learning to advocate for oneself and developing effective strategies for requesting services that respond to their specific needs arising from their disability (Malinovskiy et al., 2023). This perception is also reflected in the study by Moriña and Martins (2024), which demonstrates that it is precisely at university that students are most required to take greater responsibility for managing their time and tasks while also seeking support.

In summary, the university experience is framed as an opportunity for growth that extends beyond academics, facilitating the holistic development of the individual (Nail, 2024).

## External factors

External factors play a crucial role in the support networks that students with disabilities develop within their immediate environment. These networks encompass family, partners, friends, peers, faculty members, disability offices, and professionals outside the university (Hazan-Liran & Walter, 2024; McKinney & Swartz, 2022). This perspective finds support with Bronfenbrenner's (1979) ecological model, which illustrates how human development is influenced by the

interaction between individuals and their surroundings. This article demonstrates that student success depends not only on their capabilities but also on their ability to engage with their environment and develop a supportive and understanding social network that enhances their inclusion and well-being (Römhild & Hollederer, 2023).

Students with disabilities recognise that support from family and partners is essential in that they offer four types of support: academic, financial, moral and social (McKinney & Swartz, 2022). This disability support mustn't limit the person's autonomy as they must learn to make their own decisions and develop their independence (Boughton et al., 2023). Although family support meets most needs, students also seek support from their peers, as they want to experience social participation and inclusion inside and outside the university (Vaccaro et al., 2015). Peers play a significant role in this regard and are noted for their help in setting academic goals and accessing study material. Friends, on the other hand, offer them moral support, encouraging them and being willing to listen and advise them (Vaccaro et al., 2015).

In other cases, students with disabilities have reported that faculty, disability offices and service staff have provided them with support, accommodations, understanding and have acted to help them succeed (Hazan-Liran & Walter, 2024). However, as Moriña and Martins (2024) warn, having these services available is not enough if students do not have the knowledge and capacity to request them promptly. Furthermore, the support of psychologists is crucial, as it provides students with strategies to become aware of their disability and overcome challenges in the academic environment (Kain et al., 2019).

Considering the aforementioned points, this study aims to answer the following research questions:

1. What does it mean for graduates with disabilities to be successful at university?
2. What are the internal factors that favour university success for graduates with disabilities?
3. What are the external factors that favour university success for graduates with disabilities?

## INSTITUTIONAL CONTEXT OF HIGHER EDUCATION IN ITALY AND SPAIN

Italy and Spain have followed a similar development in terms of educational inclusion at university level (see Italy: Law 104/1992, Law 17/1999 and Law 170/2010; Spain: Organic Law 6/2001 on Universities, Royal Legislative Decree 1/2013).

Despite these regulatory frameworks, enrolment rates of students with disabilities remain relatively low in both countries. In 2021, Italy registered a total of 45,592 students with disabilities in its universities (ANVUR, 2022), while in Spain the figure amounted to 22,156 (INE, 2014). In 2019, 3,585 students with disabilities graduated in Italy (ANVUR, 2022) and 2,346 in Spain (INE, 2014). These figures reflect that, while access has improved, challenges remain in terms of retention and university success.

In terms of university structure, both countries have similar configurations, as all universities have disability offices. In Italy, beyond having a specific office, legislation requires that the office is supervised by a faculty member appointed by the Rector. This person coordinates, supervises and supports all initiatives related to the inclusion (CNUDD, 2024).

## METHOD

A qualitative methodology, grounded in a phenomenological approach, has facilitated an in-depth analysis of the university experiences of graduates with disabilities (Van Manen, 2016). As noted by Moriña (2021), a key characteristic of this approach is its emphasis on amplifying the voices of participants. This has enabled a dialogical process between the researcher and the participants, allowing for the reconstruction of the meaning they attribute to their academic experiences.

### Participants

The study involved 30 graduates with disability (15 Italian and 15 Spanish), who completed their studies in 18 public universities. The selection of participants was carried out using purposive criteria-based sampling, following the methodology outlined by Patton (1999) and Johnson and Christensen (2017). Participants had to meet the following characteristics: be graduates with a disability from universities in Italy and Spain, have completed their studies in the 2016-2017 academic year at the latest, have a recognised disability before starting university, and come from any subject area.

Participants were recruited in three ways. Firstly, contact was made with the staff of the disability offices at several universities, to whom the aim of the research was explained and who were asked to collaborate in contacting people who met the study's inclusion criteria. Secondly, an Instagram profile was created to promote the project, and Italian and Spanish disability associations were contacted. Finally, new participants were found through the snowball methodology (Cohen et al., 2000).

Of the participants, 18 were women (54%) and 12 men (46%), aged between 23 and 54, with an average age of 28. In terms of fields of knowledge, nine participants studied Social and Legal Sciences, eight Arts and Humanities, eight Health Sciences and five Engineering and Architecture. The most common type of disability among the participants was physical (*n* = 17), followed by visual disability (*n* = 6), hearing disability (*n* = 5), mental disability (*n* = 1) and multiple disabilities (hearing and visual, *n* = 1). Almost half of the participants continued their education beyond undergraduate level (37%), and it took an average of five years to obtain their first university degree, while just over half of the sample was employed at the time of the present study (57%).

## Data collection strategies

Semi-structured individual interviews were used for data collection. To ensure that the interviews were relevant to the purpose of the study, an ad hoc process of constructing the instrument was carried out in several phases. Initially, two teams were set up to work independently, and then joint meetings were convened to review and refine the questions. To work on the script, the team drew on previous literature on university success and disability, mainly Moriña and Biagiotti (2021) and Russak and Hellwing (2019). During these sessions, it was discussed whether the questions covered all relevant aspects to be investigated. As a result of these meetings, some questions were discarded and reformulated, and the total number was reduced. In a second step, there was validation through expert judgement with faculty members with expertise in inclusive education, others with disabilities and professionals from the disability offices. The aim was to ensure the relevance, clarity, interest and appropriateness of the questions to the purpose of the research. The two question scripts were ultimately piloted with graduates who were not participants in the study. This step aimed to estimate response times and ensure that the questions were clear and straightforward to answer. Some of the guiding questions for the interviews included: What does it mean to be successful at university? Why is that important? Who supported you in staying and completing your studies? What factors were crucial to your ability to persist and finish your studies? Additionally, what were the key elements that contributed to your success in this regard?

Each interview lasted an average of 90 minutes and consisted of one-on-one interviews, and most of them (88%) were online via platforms such as Blackboard and Google Meet, while only four were face-to-face (12%). Each interview was recorded, transcribed and returned to the study participants, allowing them to revise, add or delete information.

## Procedure of the study

In the first contact with the study participants, they were informed of the purpose of the research, the voluntary nature of their participation and the commitment required to start the interviews. In addition, they were given an informed consent form indicating the objectives and procedures of the study and, by signing it, they expressed their agreement and authorised the collection of the data. The team undertook to remove and maintain the confidentiality of the information if someone decided not to continue participating. Anonymity was guaranteed by assigning a number preceded by PS for Spain and PI for Italy instead of their name.

The study considered and respected the principles of ethics and process practice (Moriña, 2021) as well as those of the State Research Agency (AEI). The study was also approved by the Ethics Committee of the University-Region where the project is led (protocol number: 156/2021).

## Data analysis

Data analysis began with the design of a coding system that was modified and complemented by structural and narrative analysis of the data so that the narratives of the research protagonists could be organised and understood in depth. This system facilitated the analysis of the large amount of information collected, ensuring that no essential data was lost (Kuckartz & Rädiker, 2019). In addition, it provided security, coherence, order, clarity and effectiveness, ensuring an accurate response aligned with the stated objectives (Patton, 1999).

The analysis was carried out in two phases: in the first phase, coding consisted of a system of categories and codes, combining an inductive and deductive approach. The former was applied in creating categories from the analysis of recurrent themes in the interviews, while the latter was used in comparing these themes with the existing international literature on the topic of study. The system of categories and codes was developed by applying rigorous and systematic data collection procedures and by cross-checking and validating sources during fieldwork. After this initial process of categorisation, a second analysis was conducted by the whole research team. This allowed questionable information to be discussed as objectively as possible, to give quality and credibility to the study. In addition, the consistency between the analyses carried out by the researchers was calculated to establish the validity and reliability of the analysis of patterns and themes (Patton, 1999). At the end of this phase, this coding system was imported into the MAXQDA qualitative software.

Table 1 presents the system of categories and codes used, indicating the number of Spanish (PS) and Italian (PI) participants who mentioned each code.

**Table 1**
*System of categories and codes*

| Categories | Codes | Participants |
|---|---|---|
| 1. Definition of success | 1.1 Obtain a degree | PE: 11 PI:4 |
| | 1.2 Achieving goals | PE: 5 PI:6 |
| | 1.3 Overcoming barriers | PE:5 PI:4 |
| | 1.4 Learning | PE:5 PI: 3 |
| | 1.5 Getting good grades | PE: 1 PI: 6 |
| | 1.6 Make friends | PE: 3 PI: 4 |
| 2. Internal factors | 2.1 Self-awareness | PE: 15 PI:15 |
| | 2.2 Resilience | PE: 15 PI: 11 |
| | 2.3 Self-determination | PE:9 PI: 10 |
| | 2.4 Self-efficacy | PE: 9 PI: 10 |
| 3. External factors | 3.1 Classmates | PE: 11 PI: 12 |
| | 3.2 Family | PE: 12 PI: 9 |
| | 3.3 Disability office | PE: 11 PI: 9 |
| | 3.4 Faculty members | PE: 8 PI: 11 |
| | 3.5 Friends | PE: 6 PI: 7 |
| | 3.6 Service Staff | PE: 2 PI: 3 |
| | 3.7 Partner | PE: 1 PI: 4 |
| | 3.8 Psychologist | PE: 4 PI: 6 |

## RESULTS

### What does it mean for graduates with disabilities to succeed at university?

The concept of success for graduates with disability is a subjective and dynamic concept that varies according to individual experiences (Figure 1). Half of the participants (*n* = 15), mostly Spanish, indicated that success for them meant having finished their university degree. As one of them stated: “Finishing is a success, because not everyone decides and manages to study at university” (PS8). It was also evident that graduates needed to achieve goals (*n* = 11) to feel successful. Indeed, one participant described it as “something you set internally, i.e. knowing how to meet your goals in the time and in the way you need to” (PS10). The graduates realised that, despite their own pace, they could achieve their goals just like their non-disabled peers, “being successful means achieving my goals and graduating

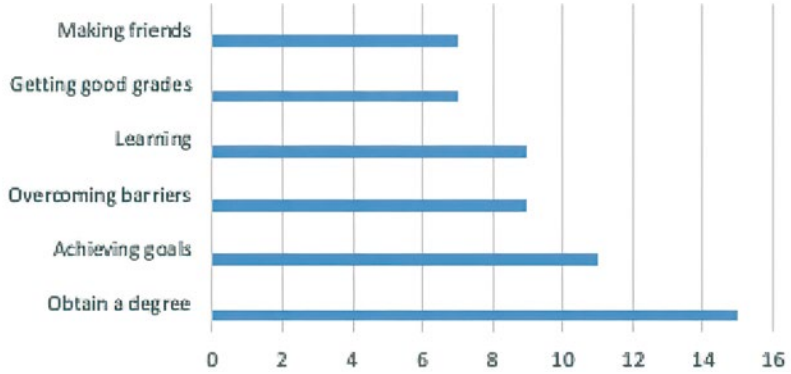
like everyone else, despite encountering more difficulties" (PI18). This excerpt underlines how the trajectories of students with and without disabilities may differ because the former face greater obstacles. Hence, other graduates (*n* = 9) defined success as the ability to overcome various barriers. One of them evidenced that success "is more than an achievement, I would say it probably depends on how you deal with the path and the millions of difficulties that arise along the way" (PS13).

Another connotation of success was revealed in the learning process, as participants viewed learning itself as a form of success (*n* = 9).

> The education system and the curriculum are not organised to give us the possibility to learn, because they don't give us the tools we need. So, I think that finishing your studies and seeing that you have learned is considered a success (PS15).

Finally, two other aspects they associated with success were getting good grades (*n* = 7) and "networking with peers" (PI16) (*n* = 7). The first aspect was particularly emphasised by Italian graduates, who stressed the importance of getting good grades as this allowed them to "show the faculty member that I have studied, that I can achieve and that I can be satisfied with my work" (PI20). The second aspect noted helped graduates to feel part of the university community.

**Figure 1**
Definition of university success




## What are the internal factors that favour university success for graduates with disabilities?

The internal factors favouring success are intrinsically linked to four key aspects (Figure 2). Self-awareness emerged as the first critical factor (*n* = 30). The findings indicate that students with disabilities who possess a positive self-perception, and a strong sense of self-awareness are better equipped to understand their

abilities and needs. None of the participants described themselves negatively; rather, they characterised themselves with adjectives such as cheerful, sociable, patient, persevering, determined and with a strong desire to learn. This positive self-perception reinforced their self-esteem, helping them to maintain motivation and confidence even in times of difficulty. One participant stated: "Having a positive self-perception and accepting your disability makes life easier, although it is true that at university you have to struggle all the time" (PS8).

Another factor highlighted was resilience, mentioned by a large majority of participants (*n* = 26), which was defined as the ability to overcome obstacles and learn from experiences. One participant described it as: "Something fundamental to achieving success at university. It's not just about overcoming obstacles but adapting and growing with each one" (PI18). Another witness commented on how disability had been what allowed her to develop greater resilience: "In all these years, I have realised that in the face of any kind of problem, after what I have been through, I will be able to solve it and keep on fighting" (PS3). Resilience had emerged as a vital mechanism to persist and overcome the difficulties encountered during university life.

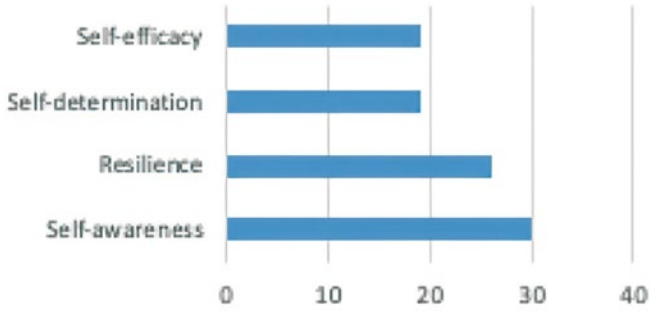
Self-determination was identified as the third key factor (*n* = 19) and was associated with graduates' ability to set clear goals, plan their academic path and be persistent in achieving their objectives. One participant underlined the importance of knowing how to plan autonomously, "I have always organised myself in my studies: I have found my method depending on the type of exam and subject" (PI25). Thanks to self-determination, other participants never thought of dropping out of university "not even in the face of difficulties because I had to achieve my goal, not only professionally but above all personally" (PI23).

Finally, self-efficacy (*n* = 19) was defined as the proactivity of graduates to ask for disability, adopt coping strategies and trust in their abilities to achieve their goals.

> The faculty member wouldn't adapt the exam for me, so I decided to talk to the vice-dean, but she didn't understand my needs either, so I went to talk to the dean. I remember it was hard because I had to face exams I couldn't take and people who didn't understand me (PS15).

However, participants not only had to find solutions to these challenges, but also had to trust in themselves and their abilities because they could not count on the support of their environment: "when I started my studies I was told that I could not do English as a hearing impaired person, but luckily I trusted in myself and, as I expected, I succeeded" (PS6).

**Figure 2**
*Internal factors influencing the university success of graduates with disabilities*




## What are the external factors that favour university success for graduates with disabilities?

Most of the graduates (*n* = 23) stressed the importance of the disability received from their classmates. Classmates shared notes, helped with revision for exams, offered moral support and assistance with travel. Graduates described them as empathetic, available, helpful, understanding and approachable.

> I was lucky that my classmates came together to help me, without them, I wouldn't have been able to finish university. They listened to me, asked me if I needed anything or just how my day had gone. Also, they were always available to help and encourage me, you could see that they empathised with me (PI18).

Without them the graduates would not have been able to consist of class activities or specific actions, "they helped me with tasks that, because of my physical disability, were more difficult for me, such as setting up a circuit, taking out the computer, picking up my backpack or changing classrooms" (PS2). Peers also provided an opportunity for inclusion in university life, as they were often invited to stay after class to socialise: "I stayed after class to share and discuss ideas about what had been discussed that day; it was a very interesting moment that allowed me to socialise and live the university experience like my classmates" (PI19).

While fellow students were key to success, many graduates (*n* = 21) also mentioned family members as a source of five types of support: academic, moral, financial, physical and mobility. Regarding the first, they described it as the help they received in transcribing class recordings, improving the writing of the final degree project, explaining content, recording themselves reading the notes or even accompanying them to the service for students with disabilities "to hand in the papers for the medical report and to inform them of my situation and know

what kind of services to apply for" (PS6). On the other hand, moral support was defined as encouraging "not to give up and not to give up in the face of all the difficult situations I have encountered" (PS2). Financial support was described as highlighting how lucky they had been to have a family willing to pay their tuition fees and other academic expenses. Some students mentioned that they could not live without their help because they needed it for basic things like getting dressed, putting on their shoes and going to university every day: "My mother would go 115km just to take me" (PI22).

Another key factor was the curricular adaptations and tools offered by the disability office (*n* = 20). In addition to mentioning specific adjustments (e.g. extra time for exams, having books in PDF, front row seat, travel within the university), graduates formed emotional bonds with the office staff or with people who worked with them, such as student supporters: "She is my friend, we spend a lot of time together and we help each other. Academically she made it very easy for me, she helped me with my studies and took my notes" (PS15). It turned out that the offices also acted as mediators between students and faculty members in that they interceded in situations where some faculty were reluctant to adapt exams or to implement measures such as requesting bright classrooms, recording lectures or handing out study material in advance. However, not all faculty members were an obstacle in the university pathway. Many of them were considered another key factor in university success (*n* = 19). Graduates fondly remembered those lecturers who took an interest in their welfare, offered constant support and provided follow-up from the beginning to the end of the course.

> The faculty member was very involved and made sure that I not only understood the subject but that I was motivated to learn more. She was always present throughout the course, asking me how I was doing and if I needed anything (PI30).

Another graduate recounted how a faculty member, aware of his visual impairment, took the time to explain the content to him before class: "He received me in his office and gave me a brief presentation, explaining what he would later teach in the classroom so that I could participate" (PI27). These faculty members shared common characteristics: they were friendly, approachable, helpful and, above all, disability aware.

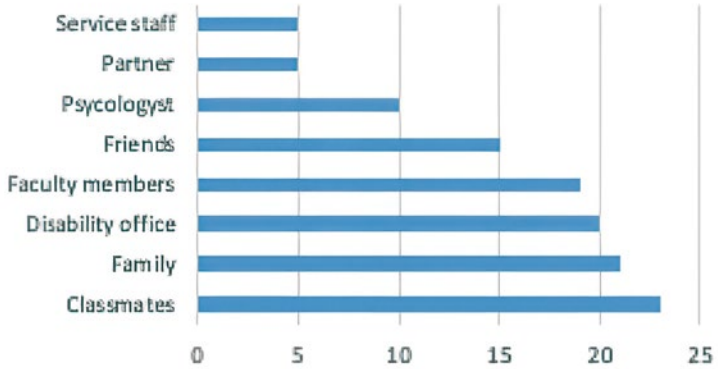
The external support the graduates received also came from their friends outside the university (*n* = 15). This was because they appreciated being able to share their uncertainties and thoughts with peers. They were a "safe place" (PS1) who "have always been there and encouraged me in the most difficult times by giving me advice" (PS4). Although some graduates preferred seeking support from friends, others opted for professional help from a psychologist (*n* = 10). The support of a professional helped them to "manage problems, to be more autonomous and to accept my disability" (PI30).

Finally, two other factors that enabled graduates to complete their degree were their partners (*n* = 5) and service staff (*n* = 5). On the one hand, especially the Italian graduates reported that their partners were supportive because they believed in their abilities, "she knew what I was worth and taught me that I should not be ashamed of my condition and that disability was not going to make me a worse engineer than my non-disabled peers" (PI27). On the other hand, the service staff were valued for facilitating access to lifts, helping to locate faculty members' offices and even putting away backpacks if they were too heavy.

Figure 3 presents a summary of the findings discussed in this section.

**Figure 3**

*External factors influencing the university success of graduates with disabilities*




## DISCUSSION AND CONCLUSIONS

This study analyses how Italian and Spanish graduates conceptualise success and the factors that determine it. It should be noted that even though this research involved two countries, no significant differences were revealed.

In the first research question, success is defined as a subjective and multifaceted concept. Russak and Hellwing (2019) consider that it should be defined in terms of what a person can achieve at a given point in time, rather than compared to pre-determined standards. This approach is in line with the findings of Bellacicco and Parisi (2021), who indicate that success is not necessarily limited to measurable outcomes such as getting good grades or obtaining a university degree. Even for some graduates in this study, the simple fact of learning or having decided to start a university degree could be seen as a success. This is why, as Fernández-Menor et al. (2024) point out, it should be a priority for educational institutions to ensure that all students have access to higher education. However, recent studies highlight the

importance of guaranteeing not only access but also retention, promoting inclusion and the development of a culture and an environment accessible to all (Guez et al., 2024). The findings of this study indicate that graduates wished to have a similar experience to their peers. However, this desire, as Santos et al. (2019) point out, was still limited by multiple barriers.

Given this scenario and the high dropout rates (ONPEGE, 2021), it would be valuable for future research to explore how dropout students with disabilities perceive success. Current scientific literature tends to focus only on those who graduate. Furthermore, it is recommended to use mixed methodological approaches to capture individual experiences and common patterns, and to adopt a polyphonic approach to investigate the perceived influence of different external agents on university success. Broadening this definition would make success a more inclusive and comprehensive concept (Russak & Hellwing, 2019).

In line with the multiple definitions of success given by graduates with disabilities, several factors leading to success were mentioned in the last two research questions. The findings of this study support the findings of research such as that of Russak and Hellwing (2019), which points to the existence of internal and external factors that favour university success. Regarding the former, the graduates' narratives mention that they serve to cope with university life and challenges (Malinovskiy et al., 2023). In addition, they promote growth that goes beyond the academic sphere, allowing for the integral formation of the individual. Fundamental life skills are developed, such as the ability to adapt, to persevere, to be independent and to know how to set goals (Russak & Hellwing, 2019).

However, this study, unlike others, shows that external support is also needed to achieve university success. Among these factors, the role of higher institutions as enablers of university success stands out. In this respect, the findings of this research provide valuable guidance for universities wishing to move towards greater inclusion (McKinney & Swarts, 2022; Nail, 2024).

An essential aspect that higher education institutions could focus on is the design of flexible and student-friendly educational policies, as this study shows that having a successful university experience depends on multiple factors. Several studies have analysed how these factors influence the academic trajectory. For example, authors such as Schreuer et al. (2024) emphasise the role of faculty members, while Römhild and Hollederer (2023) highlight the role of disability offices. The present research, like the findings of Vaccaro et al. (2015), shows that friendships also play a key role in university. In the same vein, Solis-Grant et al. (2023) conclude that peer support facilitates learning and provides an opportunity for an inclusive university experience. It should not be forgotten that attending university is not only an academic matter, but it can also be a great opportunity for participation and social inclusion (Moriña & Martins, 2024). Therefore, university institutions should

also promote actions linked to associations, sport and cultural activities, which, as has been studied, are key to feeling part of the university community (Bailey et al., 2019).

Other studies, such as McKinney and Swartz (2022), mention the importance of receiving academic, moral and financial support from the family. However, Boughton et al. (2023) suggest that parents should remain in a peripheral role, providing disability but allowing enough autonomy for students to make their own decisions. In contrast, the findings of this study revealed that graduates have played an active role in their pathway, attending the disability office and requesting academic adjustments to meet their needs. Research such as that of Goegan and Daniels (2020) confirms that these adjustments are critical to facilitating university success. Instead of focusing solely on specific measures, it would be more effective for faculty members and education policy to adopt the Universal Design for Learning (UDL) approach. This offers multiple means of expression, representation and engagement, thus benefiting all students (Fleming et al., 2017).

In addition, universities could consider consisting of more disability awareness days so that students find it a safe place worth being and staying (Römhild & Hollederer, 2023). Tinto and Pusser (2006) argue that effectively addressing the needs of these students can strengthen their self-esteem and motivate them to continue their education. This study concludes that, without support for inclusion (sensitised and trained faculty, peer support network, accessible study materials, etc.), students will continue to experience an obstacle course that discourages them from continuing their education (Schreuer et al., 2024). Moving towards true inclusion is not a simple challenge that is quickly achieved. Progress requires listening to the histories of those who have achieved university success and understanding the key factors in their experience (Moriña & Van der Mel, 2025; Pais et al., 2024).

Therefore, the testimonies presented in this research are of great value as they reflect the assessments of students with disabilities who have graduated. They can serve as a reference and inspiration for future students, motivating them to undertake university studies and demonstrating that disability is not an insurmountable obstacle in higher education. Moreover, some study participants have managed to enter the labour market and develop professionally, which shows how university studies are an opportunity for people with disabilities to get a job and improve their quality of life (Malinovskiy et al., 2023). Therefore, it can be concluded that allocating resources to higher education could be an effective strategy to respond to student diversity, ensure university success and promote the development of the whole person (Guez et al., 2024).

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# Literacy level on suicide among university students

## *Nivel de alfabetización en suicidio en estudiantes universitarios*

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## ABSTRACT

Suicide is the fourth leading cause of death worldwide among people aged 15-29 years. These data show the urgent need to address this problem, and literacy is fundamental to doing so.

The objective of this study is to determine the level of literacy about suicide and examine differences in literacy scores among students from different subject areas, as well as differences in literacy levels in the presence of psychological problems or suicidal behaviour in personal or family history in an incidental sample of students from the University of Malaga.

An incidental sample of 443 students (364 women) was obtained and completed the Literacy of Suicide Scale, short form. It was answered before attending a lecture about suicide (attendance was voluntary). The scores obtained were compared according to the field of study and the presence or absence of a history of psychological problems and suicidal behaviour, both personally and in the family. An exploratory cross-sectional and ex post facto exploratory analysis was applied using Student's test, analysis of variance, Eta squared, and Cohen's d.

Analyses performed showed that participants had a high knowledge of suicidal behaviour. By studying the dimensions that make up suicidal behaviour literacy through exploratory cross-sectional and ex post facto analysis. Differences were found in the literacy dimensions, with causes/triggers and signs being the weakest. Students with the highest literacy levels were those in the arts and humanities. Students with psychological problem histories showed higher total literacy, but no differences were found for those with or without suicidal behaviour histories.

From the results obtained, it can be concluded that more emphasis should be placed on educating students about the causes and warning signs of suicidal behavior. Likewise, university suicide prevention programs should be designed to reach out to science students in particular. Knowing who to target and what aspects to teach will help practitioners and researchers to design programs that will actually have a positive impact on suicidal behavior literacy in the university population.


**Keywords:** suicide, suicidal behaviour, literacy, prevention, university, mental health, youth


## RESUMEN

El suicidio es la cuarta causa de muerte a nivel mundial entre personas de 15 a 29 años. Este dato evidencia la necesidad urgente de abordar esta problemática y para hacerlo la alfabetización es fundamental.

El objetivo general de este estudio es analizar el nivel de alfabetización sobre suicidio y examinar las diferencias en las puntuaciones de alfabetización entre estudiantes de distintas áreas de conocimiento, así como las diferencias en los niveles de alfabetización en presencia de problemas psicológicos o conductas suicidas en la historia personal o familiar en estudiantes universitarios.

Se obtuvo una muestra incidental compuesta por 443 estudiantes (364 mujeres) de la Universidad de Málaga (España) que completaron la Escala de Alfabetización de la Conducta Suicida en su versión reducida, que se cumplimentó antes de asistir a una jornada de sensibilización en suicidio. Las puntuaciones obtenidas se analizaron de acuerdo con el área de conocimiento de los estudiantes y a la presencia o no de antecedentes de problemas psicológicos y de conducta suicida tanto personales como familiares. Se aplicó un análisis exploratorio transversal y ex post facto, utilizando el test de Student, análisis de la varianza, Eta cuadrado y d de Cohen.
Los análisis realizados mostraron que los participantes tenían un conocimiento alto sobre la conducta suicida. Al estudiar las dimensiones que componen la alfabetización de la conducta suicida se apreciaron diferencias, siendo las causas y señales de alerta o signos de la conducta suicida las más deficitarias. Los estudiantes con mejor conocimiento sobre suicidio fueron los de artes y humanidades. Los estudiantes con antecedentes de problemas psicológicos familiares o personales mostraron una mayor alfabetización, pero no se encontraron diferencias en los niveles de alfabetización entre aquellos con o sin antecedentes de conducta suicida.
A partir de los resultados obtenidos podemos concluir que hay que hacer mayor énfasis en formar al estudiantado en las causas y las señales de alerta de la conducta suicida. Así mismo, los programas de prevención del suicidio en la universidad deben diseñarse para llegar especialmente a los estudiantes de ciencias. Conocer a quién hay que dirigirse y los aspectos a enseñar ayudará a los profesionales e investigadores a diseñar programas que realmente tengan un impacto positivo sobre la alfabetización en conducta suicida de la población universitaria.

**Palabras clave:** suicidio, conducta suicida, alfabetización, prevención, universidad, salud mental, jóvenes

## INTRODUCTION

Suicidal behaviour is the fourth leading cause of death among people aged 15–29 years and also encompasses the entire spectrum, from thoughts of death to suicidal ideation, planning, and attempts. Across the globe, approximately 700,000 people die by suicide each year. However, suicide deaths are just the tip of the iceberg: it is estimated that, for every suicide, at least 20 people have had/made suicidal attempts (World Health Organization [WHO], 2019, 2021).

Similar to other issues, such as child sexual abuse, suicidal behaviour is surrounded by silence, taboos, and myths that hinder not only its detection and visibility but also its prevention (Keller et al., 2019; Mortier et al., 2018b; Rueda et al., 2021). Preventing a phenomenon requires understanding its key elements, this knowledge is called literacy. In the field of mental health, literacy refers to the knowledge about the causes/triggers, risk factors, signs, and treatment/prevention of a particular behaviour or disorder (Jorm, 2000; Jorm et al., 2003). In essence,

literacy involves understanding what suicidal behaviour is, the associated risk and protective factors, and the signs that indicate a person may be having suicidal thoughts (Carrasco et al., 2020). It has been noted that knowledge of signs, myths surrounding suicide and suicidal behaviour, steps to help at-risk individuals, and available resources are key to reducing the stigma associated with suicide, developing effective prevention programs (King et al., 2008; Schicker, 2011), and encouraging help-seeking among at-risk individuals (Jung et al., 2017). Suicide prevention should be considered a task to be undertaken not only by healthcare entities but also at the level of social, educational, and health policies (Harrod et al., 2014; Jorm, 2000; Weisz et al., 2005).

## SUICIDAL BEHAVIOUR AMONG UNIVERSITY STUDENTS AND PREVENTION PLANS

Several international studies have estimated the prevalence of suicide attempts among young people under 35 years (Castillejos et al., 2021). Carrasco et al. (2020) in his systematic review found a greater risk of suicidal ideation, attempts in subjects under 35 years of age. In Spain, suicide has been documented as the leading cause of death among young people aged 15 to 29 in 2021 (National Institute of Statistics [NIS], 2023).

A university is a gateway through which it is possible to reach a large number of young adults, not only enrolled students but also through the bridges connecting their circles of friends (Harrod et al., 2014). Among university students, the prevalence of suicidal ideation ranges from 5% to 35% (Eskin et al., 2016; Han et al., 2017; Mortier et al., 2018a; Pedrelli et al., 2015; Robins & Fiske, 2009; Wong et al., 2011). The study by Blasco et al. (2019) reported a prevalence of 9.9% of suicide ideation among Spanish university students and 0.6% of suicide attempts. In turn, a recent study carried out at the University of Malaga informed of a prevalence of up to 30.4% of suicidal behaviour among students (Ramos-Martín et al., 2023). This later study by Ramos-Martín et al. (2023) reported a slightly higher rate of suicidal ideation (13.6%), whereas the rate of suicidal attempts remained almost equal (0.5%). These figures are in line with those obtained in a 2018 meta-analysis that covered studies from 1980 to 2016 carried out in the USA, Canada, Asia, Europe, and Uganda, and reported a prevalence of suicidal ideation in university students that ranged from 22.62% considering lifetime prevalence to 10.62% referring to the last year (Mortier et al., 2018a). However, accurately estimating suicide attempts is challenging, because hospitals are likely to assist attempts that are not officially categorised as such, thus remaining outside the statistics (Miller & Glinksi, 2000; NIS, 2023). These data highlight the need to develop prevention programs focused

on early adulthood (Feliciano-López et al., 2017; Harrod et al., 2014; Mortier et al., 2018b; Pedrelli et al., 2015; Ramos-Martín et al., 2023).

It is necessary to focus on literacy not only among healthcare professionals but also among the general population and in particular among university students, to encourage the development of prevention programs, seeking help, and resources that could save lives (Auerbach et al., 2016; Eskin et al., 2016; King, 2008; Moreno-Küstner & Ramos, 2022; Mortier et al., 2018b; Pedrelli et al., 2015; Schicker, 2011). Despite efforts to prioritise suicide prevention (WHO, 2021b), a national prevention strategy in Spain is still lacking. Likewise, actually, in Spain, few universities have a suicide prevention program. For example, the Universities of Almeria (University of Almeria, 2022), Malaga (Moreno-Küstner & Ramos-Martín, 2022), Murcia (Universidad de Murcia, 2022), and Granada (Universidad de Granada, 2023) have developed or are currently working on a suicide prevention plan. All of these programs consider literacy on suicide a keystone in its prevention and have, among their strategies, conferences and/or seminars on this topic. Given the existing data on suicidal behavior within this population it is vital to understand their literacy level in order to develop and implement prevention programs.

## UNIVERSITY STUDENTS' LITERACY ON SUICIDAL BEHAVIOUR AND DIMENSIONS

Previous research has shown that the prevention of specific health and social phenomena necessarily relies on literacy in the respective matters, especially when it comes to topics marked by social stigma or silence, such as suicide (Feliciano-López et al., 2017; Rueda et al., 2021). Therefore, understanding the literacy level of university students is crucial for suicide prevention.

In line with the above, university students' literacy of suicide has been studied concerning their ideas about its causes/triggers, risk factors, treatment/prevention and signs (Calear et al., 2022; Chan et al., 2014). Several studies indicate suicide literacy levels range from moderate to intermediate in Australia (Batterham et al., 2013; Calear et al., 2022) to low in Turkey, India, and China (Arafat et al., 2022; Han et al., 2017; Öztürk & Akin, 2018). Previous studies have pointed out that although university students possess some knowledge, it can be improved, particularly in recognising its causes/triggers, risk factors and signs (Calear et al., 2022; Chan et al., 2014; Otzurk & Akin, 2018). In these studies, participants appeared to have more difficulties or lower means of recognising signs and risk factors associated with suicidal behaviour and better means in treatment/prevention dimension and cause/triggers (Calear et al., 2022; Chan et al., 2014; Ludwig et al., 2022). In line with the literature on mental health literacy, these gaps, such as poor recognition of signs and understanding of suicide risk factors, may lead to a lower likelihood of

early detection for preventing suicidal behaviour, so it is essential to act accordingly to improve this knowledge. Obtaining this background is important in order to take it into account for preventive strategies. Considering these differences in knowledge helps us guide more timely strategies that respond more directly to the knowledge needs that the population is experiencing.

## VARIABLES RELATED TO THE LITERACY LEVEL OF SUICIDAL BEHAVIOUR

Previous international scientific literature suggests that certain variables influence university students' literacy levels. Among them, the relationship between the field of study and the level of literacy on suicidal behaviour has been studied. Chan et al. (2014) conducted a study in which they compared the suicide knowledge of university students with that of medical students and postgraduate medical students. Interestingly, final-year postgraduate and undergraduate students had significantly higher levels of mental health literacy than other medical students or general university staff and students. In addition, the research by Arafat et al. (2022) also found that suicide literacy was significantly higher in students of medicine. All this shows that generally, the university population has more deficiencies in their knowledge of suicidal behaviour, a finding consistent with studies involving health science students (Chan et al., 2014; Öztürk & Akin, 2018). However, it remains to be seen whether the relationship between the area of knowledge and the level of literacy is still being examined, a point that is important to address in order to design prevention programs aimed at those who need them and where they are needed (Calear et al., 2022).

Another variable that the research has also explored is whether having a history of psychological problems or suicidal behaviour, both personal and family, influences knowledge about suicidal behaviour. The results found so far are contradictory. A recent study has shown that suicide literacy was significantly higher, having a family history of suicidal attempts and non-fatal suicide attempts (Arafat et al., 2022). Also, Batterham et al. (2013) found that people with a previous history of suicide had a higher level of literacy than those without such a background. Deane et al. (2001) also reported a positive association between previous experiences of suicidal behaviour in the family and the level of literacy, in this case, among university students. Öztürk and Akin (2018) found that students who had previously a psychiatric consultation or received a psychiatric diagnosis obtained a higher average of statistically significant literacy of suicide scores compared to students who had not received psychiatric support. This research also found that students who had had suicidal ideation or suicide attempts in the past had a higher average of statistically significant literacy of suicide scores compared to students who had not thought about or attempted suicide. However, other studies have not found this association between suicidal

behaviour and psychological problems, neither personal nor in the family, with suicide literacy, in either university students or the general population (Calear et al., 2022; Goldney et al., 2002). So, does previous experience with suicidal behaviour influence knowledge about it? What about a history of psychological problems? These are questions to which answers are still to be found. Such answers will be helpful in order to better understand how to approach suicide behaviour literacy and its role in the prevention of suicidal behaviour.

The general objective of this study is to measure suicide literacy in the context of Spanish university students. We proposed the following specific objectives:

1. To determine the level of literacy regarding suicide.
2. To determine if there are differences in knowledge across the dimensions of suicidal behaviour: signs, risk factors, causes/triggers, and treatment/prevention.
3. To explore potential differences in the level of knowledge and dimensions among different fields of study: arts and humanities, sciences, health sciences, and social sciences.
4. To explore potential differences in the knowledge level and dimensions based on a history of personal or familial psychological problems.
5. To explore potential differences in the level of knowledge and dimensions based on the presence of a history of personal or familial suicidal behaviour.

These objectives lead to the following hypotheses for this study:

1. The overall level of knowledge demonstrated by the participants will be moderate.
2. The risk factors and signs dimension will be the area with the most significant knowledge deficit.
3. Health science participants will demonstrate a more thorough knowledge than those from arts and humanities, social sciences, and sciences fields.
4. Participants with a history of personal or familial psychological problems will demonstrate better knowledge compared to those without such a history.
5. Participants with a history of personal or familial suicidal behaviour will demonstrate better knowledge compared to those without such a history.

## METHODS

### Design

The present study has a design exploratory, cross-sectional and ex post fact to assess the level of suicide literacy in an incidental sample of university students.

## Participants

The initial sample comprised 474 students of the University of Malaga (Spain). After applying the inclusion criterion of age between 18 and 30 years, the final sample resulted in 443 participants. Regarding gender, 82.2% were female. The mean age was 20.83 years (*SD* = 2.44). Table 1 provides detailed information about the participants' field of study, the current level of education, and personal and/or family history of psychological problems or history of suicidal behaviour. It should be noted that most participants were students with 19 different academic degrees.

**Table 1**
*Participants' information*

| | | **Percentage of participants (*N* = 443)** |
|---|---|---|
| Gender | Male | 17.3% |
| | Female | 82.2% |
| | Other | 0.5% |
| Field of study | Arts and humanities | 5.6% |
| | Science | 1.3% |
| | Health sciences | 66.2% |
| | Social sciences | 26.9% |
| Current level of education | Graduate | 89.1% |
| | Postgraduate | 10.9% |
| History of psychological problems | Personal | 11.1% |
| | Family | 18.7% |
| | Personal and Familiy | 29.1% |
| | None | 41.1% |
| History of suicidal behaviour | Personal | 9.1% |
| | Family | 25.7% |
| | Personal and Family | 5.4% |
| | None | 59.8% |

## Procedure

Participants were collected from students from various faculties of the University of Malaga. Each participant was informed of the purpose of the study before voluntarily attending a lecture about this topic at their faculty. They gave their

informed consent after their approval to participate in the study. The evaluation of the instruments described further down was subsequently carried out in digital format using the Google Form platform. Confidentiality and anonymity of data were ensured.

## Instruments

Firstly, we used an ad hoc questionnaire to collect the following sociodemographic information: age, gender (male, female, other), fields of study (arts and humanities, sciences, health sciences and social sciences), personal or family history of mental health problems and personal or familial history of suicidal behaviour (yes/no).

*Literacy of Suicide Scale, short form (LOSS-SF).* This scale measures literacy (knowledge) about suicidal behaviour and has been used in previous studies carried out with university students (Calear et al., 2022; Chan et al., 2014; Rivera-Segarra et al., 2018). The original 27-item English version was developed by Chan et al. (2014), the Spanish version was adapted by Rivera-Segarra et al. (2018). Subsequently Calear et al. (2022) reduced the scale to 12 items in its English short form version. This version was used for the present study by selecting the 12 corresponding items from the Spanish version translated by Rivera-Segarra et al. (2018). Finally, the Spanish version short version was tested in the Spanish adult population by Collado et al. (2023). It consists of 12 items with a true/false/do not know response format (correct answers are assigned a score of 1, and incorrect answers or lack of response receive 0 points). The total score of the questionnaire is calculated by summing the scores of the items answered correctly. The range of scores is from 0 to 12 https://orcid.org/0000-0002-3517-1307. These items are grouped into four subscales: knowledge of (1) causes/triggers (2) risk factors, (3) treatment/prevention, and (4) signs. The score for each subscale is obtained in the same way, the range of scores for the knowledge of causes/triggers of suicide dimension is 0 to 4, in the knowledge of risk factors dimension the range of scores is 0 to 3, in the knowledge of treatment/prevention the range of scores is from 0 to 2, and in Knowledge of Signs the range of scores is 0 to 3. Higher scores indicate greater literacy about suicide. The Cronbach's alpha for the scale in the present sample was 0.79, showing adequate internal consistency. The scale adapted to Spanish by Collado et al. (2023) can be found in Appendix 1.

## Statistical Analysis

The statistical analysis of the data was conducted using SPSS. Initially, the LOSS-SF scores were transformed to a range from 0 to 10, a more accessible and reader-

friendly range. This process is known as rescaling or normalisation and is common in psychometrics, education and social sciences to facilitate the interpretation of results (Cohen & Swerdlik, 2018). The procedure initially determines the minimum value (Xmin) and the maximum value (Xmax) of the original questionnaire scores, subtracts the minimum value from each score and divides it by the result of subtracting the maximum value minus the minimum value. Finally, the result is multiplied by ten to ensure that the transformed score is within the desired range. Measures of central tendency, such as mean and standard deviation, and percentages, were calculated. To compare mean scores, we used Student's *t-tests* and analysis of variance (ANOVA) or repeated measures analysis of variance (RM-ANOVA), depending on whether the comparison was made between two or more groups. Post hoc comparison analyses were used to identify significant differences between two scores. To estimate the effect sizes of the differences between scores, Eta squared ($\eta^2$) was used to measure the proportion of the total variance of the dependent variable explained by the differences between groups. The interpretation criteria for Eta squared are values close to 0.01 as small effect sizes, values around 0.06 are valued as moderate effect sizes, and values close to 0.14 are valued as large effect sizes. Similarly, to estimate effect sizes by comparing the scores between two groups, we used Cohen's d (Cohen & Swerdlik, 2018). The interpretation of Cohen's d-value results ranges from small effect sizes around scores of 0.2, moderate effect sizes at scores around 0.5, and large effect sizes for values around 0.8.

A confirmatory factor analysis was conducted to examine the factor structure of the dimensions of LOSS-SF. First, a single factor with the twelve items was assessed. The results showed a satisfactory fit of the data (X2 (54) = 56.3, p = 0.390, CFI = 0.94, TLI = 0.93, RMSEA = 0.009, and SRMR = 0.035). The factor structure of LOSS-SF indicated in the Appendix 1 corresponding to the original version (Calear et al., 2022) and the Spanish version (Collado et al., 2023) was then checked. The results showed a satisfactory fit of the data (X2 (44) = 46.9; p = 0.355, CFI = 0.93, TLI = 0.90, RMSEA = 0.011, and SRMR = 0.032). Thus, both factor structures of the LOSS-SF are adequate.

## RESULTS

In the descriptive analyses, the LOSS-SF indicated a total mean score of 7.85 (SD = 0.89), which reflects high suicide literacy among university students. Breaking it down by dimensions, the causes/triggers dimension had a mean score of 6.80 (SD = 1.81), the risk factors dimension had a mean score of 8.67 (SD = 1.71), the treatment/prevention dimension had a mean score of 6.52 (SD = 2.44), and the signs dimension had a mean score of 6.80 (SD = 1.81). Comparing these scores between dimensions, the results of mean scores by RM-ANOVA found significant differences

(F = 128.05, p < 0.001, η2 = 0.22). The causes/triggers and signs dimensions showed similar mean scores, and significant statistical differences compared to the risk factors dimension. Scores on the risk factor dimension showed significantly higher scores than the cause/trigger dimension (t = 15.40, p < 0.001, d = 0.95), higher compared with treatment/prevention scores (t = 15.76, p < 0.001, d = 1.09), and also higher scores than the sign dimension (t = 15.40, p < 0.001, d = 0.95).

In the comparative analyses of mean scores, significant differences were identified in LOSS-SF scores and dimensions based on the participant's field of study, personal or familial history of mental health problems, and history of suicide attempts. The results are presented in Table 2. First, there are not significant differences in total LOSS-SF mean scores between students from different fields of study. Second, significant differences were found in the mean scores of the causes/triggers dimension by field of study of students. Students from health science showed significant lower scores than students from social sciences (t = 4.04, p < 0.001, d = 0.46). Also, students from health science showed significant lower scores than students from arts and humanities (t = 2.80, p = 0.027, d = 0.62). Third, significant differences were found in the mean scores of the risk factors dimension. Students from health science showed significant lower scores than students from social sciences (t = 4.04, p < 0.001, d = 0.46). Fourth, not significant differences were found in the mean scores of the treatment/prevention dimension. Finally, significant differences were found in the mean scores of the signs dimension. Students from health science showed significant lower scores than students from social sciences (t = 4.04, p < 0.001, d = 0.46). Also, student from health science showed significant lower scores than students from arts and humanities (t = 2.80, p = 0.027, d = 0.62).

**Table 2**

*Comparative results on the total mean score and each dimension of the LOSS-SF* according to field of study*

| | **Field of study** | **Mean** | *SD* | *F* | *p* | $\eta^2$ |
|---|---|---|---|---|---|---|
| Total mean score on literacy | Arts and Humanities | 8.06 | 0.83 | 0.71 | 0.545 | 0.01 |
| | Sciences | 7.83 | 0.45 | | | |
| | Health Sciences | 7.79 | 0.90 | | | |
| | Social Sciences | 7.87 | 0.92 | | | |
| | Dimensions | | | | | |
| Causes/ triggers | Arts and Humanities | 7.61 | 1.80 | 7.14 | <0.001 | 0.05 |
| | Sciences | 6.50 | 1.37 | | | |
| | Health Sciences | 6.52 | 1.83 | | | |
| | Social Sciences | 7.33 | 1.54 | | | |

| | Field of study | Mean | *SD* | *F* | *p* | $\eta^2$ |
|---|---|---|---|---|---|---|
| Risks factors | Arts and Humanities | 8.93 | 1.58 | 3.76 | 0.011 | 0.03 |
| | Sciences | 7.33 | 1.49 | | | |
| | Health Sciences | 8.82 | 1.62 | | | |
| | Social Sciences | 8.28 | 1.90 | | | |
| Treatment/ Prevention | Arts and Humanities | 6.13 | 2.14 | 2.04 | 0.108 | 0.01 |
| | Sciences | 9.00 | 2.23 | | | |
| | Health Sciences | 6.51 | 2.50 | | | |
| | Social Sciences | 6.35 | 2.33 | | | |
| Signs | Arts and Humanities | 7.61 | 1.80 | 7.14 | <0.001 | 0.05 |
| | Sciences | 6.50 | 1.37 | | | |
| | Health Sciences | 6.52 | 1.83 | | | |
| | Social Sciences | 7.33 | 1.54 | | | |

*LOSS-SF: Literacy of Suicide Scale, short form

On the other hand, to explore potential differences in mean scores between participants with and without a history of personal or familial psychological problems, we conducted comparative analyses of the total mean score on literacy and means score in each dimension. The results are presented in Table 3. Significant differences were found in the total mean score literacy and in the mean scores on the risks factors dimension. The magnitude of the effect sizes between the mean score differences found were low. University students who have had some kind of psychological problem in their lives reported higher total mean score on literacy, as well as greater knowledge about suicide risks factors than their peers who have not had history of personal or familial psychological problems.

**Table 3**

*Comparative results on the total mean score and each dimension of the LOSS-SF* by participants with and without a history of personal or familial psychological problems*

| | History of personal or familial psychological problems | Mean | *SD* | *t* | *p* | *d* |
|---|---|---|---|---|---|---|
| Total mean score on literacy | No | 7.22 | 1.33 | -2.79 | 0.005 | 0.258 |
| | Yes | 7.54 | 1.14 | | | |
| Causes/triggers | No | 5.98 | 2.28 | -0.98 | 0.323 | 0.096 |
| | Yes | 6.19 | 2.06 | | | |

| | History of personal or familial psychological problems | Mean | *SD* | *t* | *p* | *d* |
|---|---|---|---|---|---|---|
| Risks factors | No<br>Yes | 8.27<br>8.64 | 2.09<br>1.81 | -1.99 | 0.047 | 0.189 |
| Treatment/ prevention | No<br>Yes | 6.12<br>6.35 | 2.56<br>2.64 | -0.91 | 0.360 | 0.088 |
| Signs | No<br>Yes | 5.98<br>6.19 | 2.28<br>2.06 | -0.98 | 0.323 | 0.096 |

*LOSS-SF: Literacy of Suicide Scale, short form

Finally, to analyse whether there were differences in total mean score on literacy and dimensions score between participants with and without a history of personal or familial suicide behaviour, we conducted comparative analyses. The results showed no significant differences in the total mean score on literacy nor in any of the dimensions. These results are presented in Table 4.

**Table 4**

*Comparative results on the total mean score and each dimension of the LOSS-SF* by participants with and without a history of personal or familial suicide attempts*

| | History of personal or familial suicide attempts | Mean | *SD* | *t* | *p* | *d* |
|---|---|---|---|---|---|---|
| Total mean score on literacy | No<br>Yes | 7.32<br>7.54 | 1.28<br>1.16 | -1.91 | 0.056 | 0.177 |
| Causes/triggers | No<br>Yes | 6.00<br>6.25 | 2.16<br>2.14 | -1.24 | 0.213 | 0.115 |
| Risks factors | No<br>Yes | 8.35<br>8.69 | 2.00<br>1.84 | -1.95 | 0.051 | 0.180 |
| Treatment/prevention | No<br>Yes | 6.30<br>6.23 | 2.67<br>2.56 | 0.29 | 0.768 | 0.027 |
| Signs | No<br>Yes | 6.00<br>6.25 | 2.16<br>2.14 | -1.24 | 0.213 | 0.115 |

*LOSS-SF: Literacy of Suicide Scale, short form

## DISCUSSION

Our study presents a descriptive and exploratory approach to suicidal literacy among students at the University of Malaga because understanding what a given population knows about a phenomenon is important for designing effective prevention programs (Jorm, 2000; Jorm et al., 2003). The current sample was 82.2% female, which is common in this study area when participation is voluntary (Dovidio et al., 2012). Regarding the field of study, 66.2% of the sample was drawn from the field of health sciences and only 1.3% to the field of science. The rest of the sample was distributed among social sciences (26.9%) and arts and humanities (5.6%). When asked about the history of psychological problems and suicidal behaviour, both personal and within the family, more than half of the participants (58.9%) acknowledged having a personal or family history of psychological problems, and 40.2% had a history of suicide. Our participants demonstrated high suicide literacy (7.85 out of 10). To be clear, these students had not received any information about suicide as part of the university's prevention program prior to administering the questionnaire. This result improves the initial prediction of the hypothesis of the present work assuming moderate levels of knowledgement, obtaining a higher mean knowledge of suicide literacy. A comparison of the present results with those obtained in previous studies on a sample of the Spanish general population (Collado et al., 2023) suggests that the literacy of university students is higher than those found in previous studies. The main difference between the samples of previous studies and the sample of the present study is the difference in the mean age. In the previous study (Collado et al., 2023) assessing suicide literacy, the mean age was 46.62 years, while the mean age of the present sample was 20.83 years. A younger population may be more knowledgeable and literacy-oriented than previous generations. It is also consistent with other previous studies that examine suicide literacy among university students, finding high scores in the young university population (Arafat et al., 2022; Chan et al., 2014; Ötzürk & Akin, 2018). In this regard, some of these researchers have previously suggested that stigma, limited knowledge and various sociocultural factors may contribute to low levels of literacy about suicide (Aldalaykeh et al., 2020; Arafat et al., 2022; Chan et al., 2014). As far as we know, Spanish society is making a reasonable effort to destigmatise suicidal behaviour and disseminate support resources, so sociocultural variables may be helping to achieve a more moderate level of literacy in suicidal behaviour in this regard. On the other hand, it is important to mention that a positive correlation has been reported between higher educational levels and better knowledge of suicidal behaviour (Batterham et al., 2013; Ludwig et al., 2022; Nakamura et al., 2023). In this sense, it can be considered that university students have a higher level of

education and this may also be as a result of their higher knowledge about suicidal behaviour.

Regarding the second hypothesis of exploring possible differences in the level of knowledge across the dimensions of suicidal behaviour—causes/triggers, risk factors, treatment/prevention, and signs—the results demonstrated that the dimensions with the lowest average literacy levels were causes/triggers and signs, followed by treatment/prevention dimension. Contrary to the hypothesis, the highest score was observed in the risk factors dimension. These findings are mostly aligned with several previous studies in which university students from Australia, China, Germany, and Turkey also showed more difficulties or lower averages in recognising the signs, risk factors, and causes/triggers of suicidal behaviour but found questions related to seeking help or treatment easier (Aldalaykeh et al., 2020; Calear et al., 2022; Chan et al., 2014; Ludwig et al., 2022; Öztürk & Akin, 2018). Similarly, Collado et al. (2023), in their study with a Spanish population, found that participants in the sample also had difficulty responding to questions about the signs and causes/triggers of suicide, as well as risk factors. However, participants provided accurate responses regarding seeking help or treatment as a preventive measure. This suggests variability in how different populations internalise aspects of suicide literacy. On reflection, since no previous initiatives had been implemented at the university before the scale was passed, the increased awareness of risk factors in this population could reflect broader societal trends, such as increased media coverage of mental health issues or growing public awareness of suicide prevention in Spain. This emphasises the need for tailored educational interventions focusing on areas of weakness, such as identifying causes/triggers and signs, while reinforcing strengths, like understanding risk factors. By addressing these gaps, we can equip individuals with the necessary knowledge for early detection and prevention, ultimately enhancing the effectiveness of suicide prevention strategies.

In summary, as Calear et al. (2022) previously emphasised and in light of the findings of this study, it is crucial to adopt an educational approach to recognising the signs, causes/triggers, and risk factors of suicide—both in oneself and in others, such as family and friends—as this could enhance the effectiveness of suicide sensitisation strategies. Addressing these gaps in literacy, such as the poor recognition of signs and limited understanding of the causes/triggers of suicidal behaviour, is essential, as they may lead to a lower likelihood of early detection and prevention of suicidal behaviour. Thus, it is vital to take steps to improve this knowledge and incorporate it into preventive strategies. Considering these differences in knowledge allows us to guide more timely and targeted strategies that address the specific knowledge needs of the population.

With regard to the third hypothesis that students from health science programs would demonstrate higher literacy compared to students in other fields, there are not significant differences in total literacy scores between students from different fields of study. Students in the arts and humanities had the highest scores, while students in the sciences and health sciences had the lowest scores, respectively. The findings showing that students from the sciences and health sciences scored lower on suicide literacy compared to those from the arts and humanities may seem counterintuitive, given the expectation that health science students would have a stronger foundation in such topics. However, this result aligns with previous research indicating that the general university population, including health science students, often has significant gaps in their knowledge of suicidal behaviour (Chan et al., 2014; Öztürk & Akin, 2018). This suggests that, despite their academic focus, students in these fields may not be adequately exposed to or educated about suicide-related topics within their curricula. It is crucial to explore further the relationship between the field of study and suicide literacy, as addressing these knowledge deficiencies is essential for developing effective prevention programs tailored to the specific needs of various student populations (Calear et al., 2022). Notably, our sample was incidental, so it is also likely that the small percentage of students who attended the lecture in the arts and humanities fields might have been highly motivated and interested in the topic, which may skew the literacy average.

Regarding the fourth hypothesis, and as was expected, university students with a history of psychological problems (both personal or familial) demonstrated higher total suicide literacy than their peers without such a history. This aligns with previous findings that students with a history of psychological problems would have better literacy (Batterham et al., 2013; Calear et al., 2024; Deane et al., 2001). It reinforces the link between mental health problems and a greater interest in knowledge of suicide, as previously documented (Calear et al., 2024; Deane et al., 2001; Žilinskas, & Lesinskienė, 2023). In other words, they suggest that personal or familial experiences with psychological issues often lead to heightened awareness and understanding of suicide-related topics.

Contrary to expectations, the fifth hypothesis did not show significant differences in total literacy scores or knowledge of signs between participants with or without a history of personal or familial suicidal behaviour. This finding aligns with studies such as Calear et al. (2022) and Goldney et al. (2002), which did not find a clear association between suicidal behavior or psychological problems (either personal or familial) and suicide literacy in university students or the general population. Therefore, this result is not contradictory to the literature but suggests that personal experiences with suicidal behaviour may not always lead to better literacy, even though such a relationship is commonly observed (Arafat et al., 2022; Batterham et al., 2013; Deane et al., 2001). Our study indicates that personal histories of suicidal

behaviour may not necessarily lead to greater suicide literacy. Further research is needed to clarify how these experiences and antecedents influence suicide literacy. This discrepancy may reflect a gap in how these experiences are internalised or processed in terms of knowledge acquisition, suggesting that having a history of suicidal behaviour does not always translate into a better understanding of the signs of suicide or a broader suicide literacy. The above highlights that there is still a pending issue in universities at a social level: raising awareness that having literacy to prevent suicide is everyone's business and that awareness must permeate the general population, whether or not they have a history of suicide, in order to be able to act from universal prevention.

The main limitation of this study relates to the sample selection procedure because our sample was incidental and our design study transversal. The participants voluntarily attended the lecture and, thus, likely were driven by motivation and interest in the topic. Furthermore, the imbalance in gender and the size of the groups by fields of study prevent comparisons from being made adequately. This is a common phenomenon in psychology studies (Dovidio et al., 2012; Ferragut et al., 2020). Despite these limitations, as far as we know this is the first study on suicide behaviour literacy conducted among the Spanish university population, the findings open the door for the design of truly effective prevention programs developed in the university setting and to be replicated while overcoming the limitations noted. Along these lines in the future, continuing to gather evidence on this matter assessing the impact of interventions and measuring the knowledge gained through them is crucial.

We encourage lecturers, as reference figures for students, to become active agents in promoting mental health and preventing problems. To achieve this, it is necessary not only to facilitate student attendance at events on the topic offered by the university but also to incentivise it. We encourage educational leaders to expand their perspectives and view university education as part of comprehensive personal development.

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## APPENDIX 1

Scale of Suicide Literacy, short form (LOSS-SF), original scale by Calear et al., (2022) and Spanish version adapted by Collado et al., (2023).

The scale presents a series of statements about suicide, and you have to answer whether each statement is true or false [La escala presenta una serie de afirmaciones sobre el suicidio, y debéis responder si cada afirmación es verdadera o falsa].

1. If assessed by a psychiatrist, everyone who suicides would be diagnosed as depressed [Si fueran valorados por un psiquiatra, todos los que se suicidan serían diagnosticados de depresión].[d]
2. Seeing a psychiatrist or psychologist can help prevent someone from suicide [Consultar a un psiquiatra o psicólogo puede ayudar a prevenir que alguien se suicide].[d]
3. Most people who suicide are psychotic [La mayoría de las personas que se suicidan son psicóticas].[d]
4. There is a strong relationship between alcoholism and suicide [Existe una fuerte relación entre el alcoholismo y el suicidio].[a]
5. People who talk about suicide rarely commit suicide [Las personas que hablan del suicidio rara vez terminan suicidándose].[a]
6. People who want to attempt suicide can change their mind quickly [Las personas que quieren intentar suicidarse pueden cambiar de opinión rápidamente].[a]
7. Talking about suicide always increases the risk of suicide [Hablar de suicidio siempre aumenta el riesgo de suicidio].[a]
8. Not all people who attempt suicide plan their attempt in advance [No todas las personas que intentan suicidarse planifican su intento con antelación].[b]
9. People who have thoughts about suicide should not tell others about it [Las personas que tienen pensamientos suicidas no deben decírselo a otros].[b]
10. Very few people have thoughts about suicide [Muy pocas personas tienen pensamientos suicidas].[b]
11. Men are more likely to suicide than women [Los hombres son más propensos a suicidarse que las mujeres].[c]
12. A suicidal person will always be suicidal and entertain thoughts of suicide [Una persona suicida siempre será un suicida y tendrá pensamientos de suicidio].[c]

([a]) Knowledge of Causes/Triggers of Suicide ([b]) Knowledge of Risk Factors, ([c]) Knowledge of Treatment/Prevention, and ([d]) Knowledge of Signs.

Calear, A. L., Batterham, P. J., Trias, A., & Christensen, H. (2022). The Literacy of Suicide Scale: Development, validation, and application. *Crisis, 43*(5), 385-390. https://doi.org/10.1027/0227-5910/a000798

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# Educational leadership for equity in rural schools: systematic literature review

## *Liderazgo educativo para la equidad en la escuela rural: revisión sistemática de la literatura*

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**ABSTRACT**

Rural schools not only play an essential role in their contexts, in which social cohesion stands out (Abascal et al., 2023; Abós et al., 2021; Leiva-Guerrero et al., 2022), but they also have a great influence on them. Educational leadership aims at educational quality (Hsieh et al., 2023), and is the second most influential factor in student learning (Leithwood et al., 2008). Educational equity is a fundamental element in the improvement of education, as educational quality cannot be understood without equity. For this reason, the aim of the present article is to analyze the international scientific production on educational leadership for equity in rural schools, based on a systematic review of the literature, taking the PRISMA

2020 standards as a reference. After applying the search equation and eligibility criteria in the Web Of Science and Scopus databases and selecting results that constituted articles between 2014 and 2023, 51 results were found. These results showed strong links between the rural school and its community, and a deep sense of identity and belonging. Similarly, all members of the educational community are fundamental and capable of promoting educational equity in their schools, highlighting a horizontal and shared educational leadership. In addition, intercultural, technological, gender and regional inequities are observed. It is possible to conclude that the researchers agree on the importance of rural schools, as they guarantee access to education in their contexts, and on the need to attain educational leadership comprised of the entire community, to achieve equity in their regions. In addition, there is a need to continue to deepen the interrelationship between these three topics, given the lack of research on them, and to develop specific equitable policies for the rural world at the international level.

**Keywords:** educational equity, rural school, leadership

## RESUMEN

Las escuelas rurales desarrollan una labor imprescindible en sus contextos, en los cuales destaca la cohesión social (Abascal et al., 2023; Abós et al., 2021; Leiva-Guerrero et al., 2022), y tienen una gran influencia en los mismos. El liderazgo educativo tiene como objetivo la calidad educativa (Hsieh et al., 2023) y supone el segundo factor más influyente en el aprendizaje del alumnado (Leithwood et al., 2008). La equidad educativa constituye un elemento fundamental en la mejora de la educación, ya que la calidad educativa no se entiende sin equidad. Por ello, el presente trabajo tiene como objetivo analizar la producción científica internacional sobre el liderazgo educativo para la equidad en la escuela rural, a partir de una revisión sistemática de la literatura, tomando como referencia los estándares de PRISMA 2020. Tras la aplicación de la ecuación de búsqueda y los criterios de elegibilidad en las bases de datos Web Of Science y Scopus, seleccionando los resultados que constituyeran artículos entre los años 2014 y 2023, se hallaron 51 resultados. Estos resultados muestran fuertes vínculos entre la escuela rural y su comunidad, y un profundo sentimiento de identidad y pertenencia. De igual modo, todos los miembros de la comunidad educativa son fundamentales y capaces de promover la equidad educativa de sus escuelas, destacando un liderazgo educativo horizontal y compartido. Además, se observan inequidades interculturales, tecnológicas, de género y territoriales. Es posible concluir que los investigadores concuerdan en la importancia de las escuelas rurales, garantizando el acceso a la educación en sus contextos, y en la necesidad de alcanzar un liderazgo educativo conformado por toda la comunidad para lograr la equidad en sus territorios. Además, se vislumbra la necesidad de continuar profundizando en la interrelación entre estas tres temáticas, dada la ausencia de investigaciones sobre ella, así como de desarrollar políticas equitativas específicas para el mundo rural a nivel internacional.

**Palabras clave:** equidad educativa, escuela rural, liderazgo

## INTRODUCTION

### Rural schools

Rural schools are based on the rural environment and culture, under a heterogeneous and unique organizational structure, configured with multidimensional didactics and pedagogy (Boix, 2004). They favor access to education in rural regions, are elements of educational development, and promote social cohesion within these contexts (Abascal et al., 2023; Abós et al., 2021; Leiva-Guerrero et al., 2022), as they promote the development of a collective identity and a sense of belonging to the community (Carrete-Marín et al., 2024). In addition, they are characterized by having multiple grades (Boix and Domingo, 2021), limited facilities, and urban-centric educational programs, at the same time that the teaching staff could feel isolated and depleted due to a lack of training to work in these contexts (Chaparro and Santos, 2018; Lupión and Gallego, 2017; San Pedro and López, 2017). In addition, they require participative and transformational leadership, open to the entire community, given the context in which they are found (Lorenzo, 2021).

### Educational leadership

The aim of educational leadership must be the improvement of educational quality (Hsieh et al., 2023). It facilitates the comprehensive development of people, and must protect and improve their context (Gento Palacios et al., 2020). Likewise, according to Meza et al. (2022), leadership directly affects the education of students, the final goal of schools, and in rural areas, it is a fundamental element in the positive relationships between schools and their contexts. Thus, teachers must incentivize the participation of the education community (Gento Palacios et al., 2020) to achieve shared leadership, which shapes successful rural education leadership for transformation (Abascal et al., 2024), which must include educational equity.

### Educational equity

Likewise, educational quality is not understood without equity (Pascual, 2006), and a high-quality education system must minimize the differences between its students, compensating for the most disadvantaged and promoting equity (Sicilia and Simancas, 2023). Therefore, the quality of an educational system is measured by its capacity to share competences, knowledge, and opportunities, and to develop abilities in the entire student body, but especially among those who are

most vulnerable, given their region, socio-economic, or ethnic situation (Martínez-Celorrio, 2019).

Analogically, Priego and Castro (2021) point out that the absence of transcendence and equity in education policies, as a result of the invisibility of rural schools, have increased inequity gaps, thereby compromising the right to education of students from these schools in their contexts. Thus, it is essential to make rural schools visible, to promote educational equity within it, a key in educational improvement, and to decrease inequities (Echevarría-Grajales, 2021). According to Morales-Romo (2023), the incorporation of minorities to schools, the increase in migration movements, geographical and gender inequalities, or the digital divide, equal opportunities among students impossible. Likewise, committing to educational equity is necessary to eradicate inequities and to prevent further harm to the most vulnerable students, considering intercultural, technological, gender, and regional equity.

a) *Intercultural equity*: In the past few years, due to the phenomenon of immigration, as a result of globalization and agricultural work, many of the students in some rural schools come from other regions or countries (Gutiérrez, 2019). These movements of people favor the settling of the population in these territories, delaying the closing schools, and therefore, the disappearance of towns. In parallel, new inequities have emerged related to the place of origin (Ancheta-Arrabal, 2019), which affect the development of life (Pérez-Escamilla et al., 2017), but the community plays an essential function as a social reference.
b) *Technological equity*: In parallel, Morales-Romo (2023) point out that on some occasions, rural schools in Spain possess installations that are more deficient than the urban ones, less cultural resources in their area, and insufficient connectivity. In turn, due to the low ratios and ease of accessing resources in the environment, they have a great education potential. In addition, there is no equity in rural schools, due to the social isolation of the students and the teachers, the scarce cultural resources, the inexistence of extra-curricular activities, and the absence, in many centers, or parents of students associations (AMPAs).
c) *Gender equity*: Education for women is an extremely important aspect in social development and a measurement of social progress internationally. The mandatory education programs, the reduction in the number of children, and the improvements in gender perspective have led to the reduction in the differences between men and women in these settings (Juan, 2018; Qi, 2015). In some cases, in countries such as China, education is deficient, and the provision or priority of some families for the education of their male children, makes the access to education of their female children more difficult (Danke and Mun, 2012; Xuemin and Zhenhua, 2019).

d) *Regional equity*: Likewise, the regional equity of students in rural education centers is harmed by the travel distance and the time needed. To deal with this inequity, it is essential to promote the improvement of communication, adapt the school day to the travel time, and perform an economic investment for transport (Montes et al., 2020). Likewise, the region plays a vital role in educational equity, as it determines feasible education opportunities and their circumstances. It has a considerable impact on all the students who are found in unfavorable situations and are more vulnerable to school failure, and it influences students differently according to their profile. Their context undermines them individually, and systematic differences are reflected in their education results, which condition their life paths (Martínez, 2021).

## METHOD

The aim of the present study is to analyze the international scientific production on educational leadership for equity in rural schools, starting with a systematic review of the literature, considering the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). It will be conducted with respect to three areas:

- Research area 1. Identification of studies that address educational leadership for equity in rural schools.
- Research area 2. Description of methods utilized to investigate educational leadership for equity in rural schools.
- Research areas 3. Analysis of the results on educational leadership for equity in rural schools.

### Phase 1: Research questions

Table 1 shows the research questions on the three areas presented.

**Table 1**
*Research questions associated to the areas posed*

| Research areas | Research questions |
|---|---|
| Research area 1 | Q1. What is the distribution of studies in the WOS and SCOPUS databases between 2014 and 2023?<br>Q2. What is the temporal and geographic distribution of the studies? |

| | |
|---|---|
| Research area 2 | Q3. What types of research designs were used in the studies?<br>Q4. What instruments and techniques were used in the studies?<br>Q5. What were the characteristics of the study samples? |
| Research area 3 | Q6. At what educational level(s) are the studies conducted?<br>Q7. With what scientific discipline are the studies associated?<br>Q8. What are the main aspects addressed regarding rural schools?<br>Q9. What are the main aspects addressed regarding educational leadership?<br>Q10. What are the main aspects addressed regarding educational equity? |

*Source:* Author created.

### Phase 2: Sources of information and eligibility criteria

To search for the studies, the most important international databases were consulted: Web of Science (WOS) and Scopus. In WOS, the search was refined to studies that contained descriptors in the title, abstract, or keywords, and in Scopus, in the topic. Likewise, it was limited to those that were published as an article, and between 2014 and 2023.

### Phase 3: Search strategy

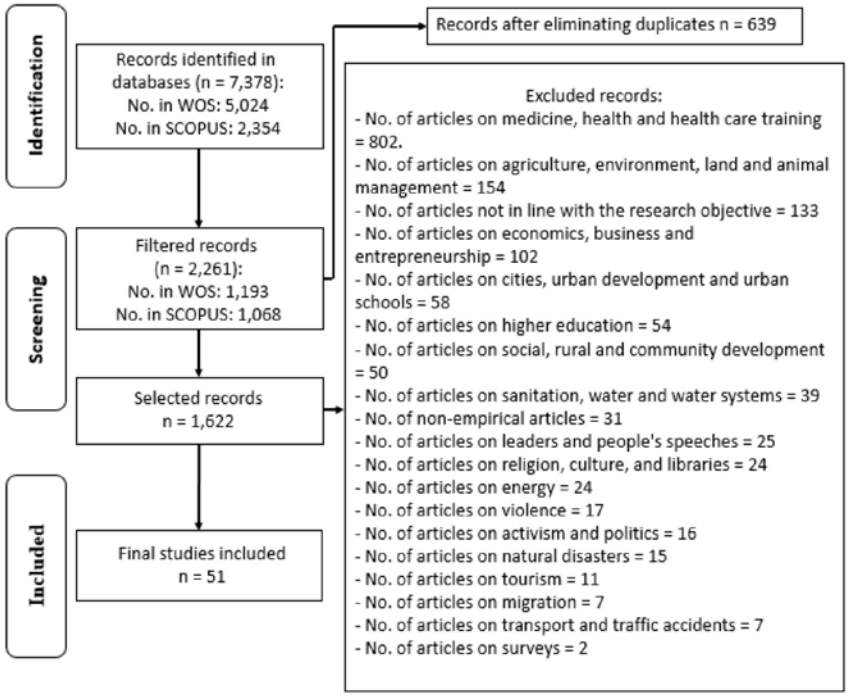
To search for the studies, the following search equation was used in both databases: (rural OR town OR countryside OR countrified) AND (headteach* OR manage* OR principal OR director OR lead* OR headmaster OR headmistress") AND (equit* OR fair* OR equal* OR equab* OR justness OR justice OR evenhanded* OR "level playing field") AND (school OR college OR educat* OR "centre of learning" OR "academic centre").

### Phase 4: Selection process

The use of the search equation in WOS and Scopus resulted in a total of 5,021 results in the WOS and 2,354 in Scopus, for a total of 7,375 results. After the implementation of eligibility criteria in both databases, a total of 1,193 results were found in the WOS, and 1,068 in Scopus, for a total of 2,261 results. Of these, 639 were duplicates, as they were found in both databases. This reduced the number of articles to 1,622. Next, the articles that were not relevant to the research, through the reading of the title and the abstract, and on many occasions, the full article, were discarded. The following were excluded: articles that dealt with medicine,

health, and the training of health care professionals; agriculture, environment, management of land and animals, economics, businesses, and entrepreneurship; cities, urban development, and urban schools; higher education; social, rural, and community development; sanitation, water, and water systems; energy; violence; activism and politics; natural disasters; tourism; migration; transport and traffic accidents; polls; and those that were not empirical or that did not meet the research aim. This analysis resulted in a final 51 articles (Figure 1).

**Figure 1**
*Flow diagram*




*Source:* Author created.

## RESULTS

The results from the analysis of the 51 articles (identified in the bibliographical references section) are grouped into the three areas of research.

## Research area 1. The identification of studies that address educational leadership for equity in rural schools

In research area 1, related to the identification of research studies, the answers to research questions Q1 and Q2 are presented.

To answer Q1, most of the articles were found distributed in both databases, Web of Science and Scopus (n=29), followed by those that were only found in Scopus (n=154), and those that were only found in the Web of Science (n=8) (Table 2).

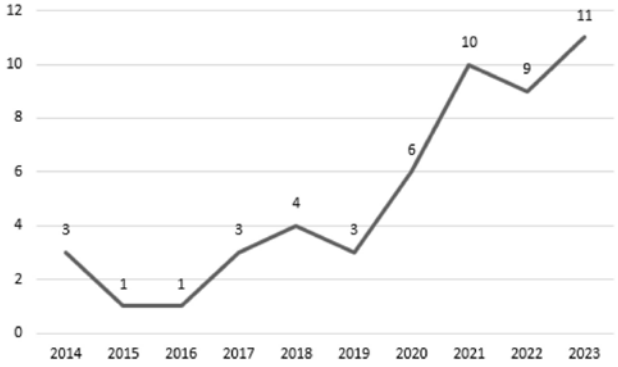
**Table 2**
*Distribution in the databases*

| | |
|---|---|
| **Both databases (29)** | Aylward et al., 2021; DeMatthews et al., 2023; Donkoh et al., 2023; Edwards and Peruma, 2017; English et al., 2022; Fikuree et al., 2021; Gajardo-Espinoza and Torrego-Egido, 2023; González-Alvarado et al., 2020; Hallinger and Liu, 2016; Hao et al., 2021; Heinrich et al., 2020; Image, 2023; Langer et al., 2019; Luo et al., 2022; Mestry and Ndhlovu, 2014; Miranda-Calderón and Rosabal-Vitoria, 2018; Nguyen and Ha, 2021; Peng et al., 2014; Peterson et al., 2020; Ramirez et al., 2023; Rangarajan et al., 2023; Sehlako, 2023; Shi et al., 2021; Slaughter et al., 2019; Story et al., 2023; Wang et al., 2021; Wargo et al., 2021; Yu et al., 2023; Zheng, 2020. |
| **Scopus (14)** | Bolaji et al., 2019; De Klerk and Palmer, 2021; Hu et al., 2022; Joyce, 2014; Knutas, 2017; Li and Qiu, 2018; Nkwiga and Brock-Utne, 2022; Oldham et al., 2020; Plein, 2022; Sutherland et al., 2022; Vuzo, 2018; Yuxiao and Chao, 2022. |
| **WOS (8)** | Ayscue and Uzzell, 2022; Cerdá, 2017; Chitpin and Karoui, 2021; Jabbarian et al., 2022; Merchant et al., 2020; MnCube et al., 2023; Tuters, 2015; Washington, 2021. |

*Source:* Author created.

With respect to Q2, as shown in Figure 2, an exponential growth was observed throughout the decade analyzed, from 2014 (n=3) to 2023 (n=11). This increase in scientific production rose after the year 2020 (n=6), and continued in the following years, 2021 (n=10), and 2022 (n=9). Likewise, in the years 2015 and 2016, one article was published every year. In 2017 and 2019, three articles were published per year. In addition, four articles were published in 2018.

**Figure 2**
*Temporal distribution*




*Source:* Author created.

As for the geographical distribution of the studies addressed, as shown in Figure 3 (Table 3), the same number of studies were conducted in both the United States and China (n=12), with both countries being the most prominent. In South Africa, six studies were conducted, while two studies were conducted in Canada, Costa Rica, and Tanzania. Likewise, research was performed in Argentina, Nigeria, Norway, Spain, Portugal, Ghana, Finland, Maldives, Burkina Faso, Kenya, Ecuador, Nepal, Sweden, Vietnam, Australia, and India. It must be noted that the study conducted by Merchant et al. (2020), as shown, was performed in two countries, the United States, and Sweden.

**Figure 3**
*Geographical distribution*


Fuente: Author created.

**Table 3**
*Geographical distribution*

| | |
|---|---|
| **United States** | Aylward et al., 2021; Ayscue and Uzzell, 2022; DeMatthews et al., 2023; Merchant et al., 2020; Oldham et al., 2020; Peterson et al., 2020; Plein, 2022; Ramirez et al., 2023; Story et al., 2023; Sutherland et al., 2022; Wargo et al., 2021; Washington, 2021 |
| **China** | Hallinger and Liu, 2016; Hao et al., 2021; Hu et al., 2022; Li and Qiu, 2018; Luo et al., 2022; Peng et al., 2014; Shi et al., 2021; Wang et al., 2021; Yang et al., 2018; Yu et al., 2023; Yuxiao and Chao, 2022; Zheng, 2020 |
| **South Africa** | De Klerk and Palmer, 2021; Edwards and Peruma, 2017; Joyce, 2014; Mestry and Ndhlovu, 2014; MnCube et al., 2023; Sehlako, 2023 |
| **Canada** | Chitpin and Karoui, 2021; Tuters, 2015 |
| **Costa Rica** | González-Alvarado et al., 2020; Miranda-Calderón and Rosabal-Vitoria, 2018 |
| **Tanzania** | Nkwiga and Brock-Utne, 2022; Vuzo, 2018 |
| **Argentina** | Cerdá, 2017 |
| **Nigeria** | Bolaji et al., 2019 |
| **Norway** | Knutas, 2017 |
| **Spain** | Gajardo-Espinoza and Torrego-Egido, 2023 |
| **Portugal** | Silva, 2023 |
| **Ghana** | Donkoh et al., 2023 |
| **Finland** | English et al., 2022 |
| **Maldives** | Fikuree et al., 2021 |
| **Burkina Faso** | Jabbarian et al., 2022 |
| **Kenya** | Heinrich et al., 2020 |
| **Ecuador** | Image, 2023 |
| **Nepal** | Langer et al., 2019 |
| **Sweden** | Merchant et al., 2020 |
| **Vietnam** | Nguyen and Ha, 2021 |
| **Australia** | Slaughter et al., 2019 |
| **India** | Rangarajan et al., 2023 |

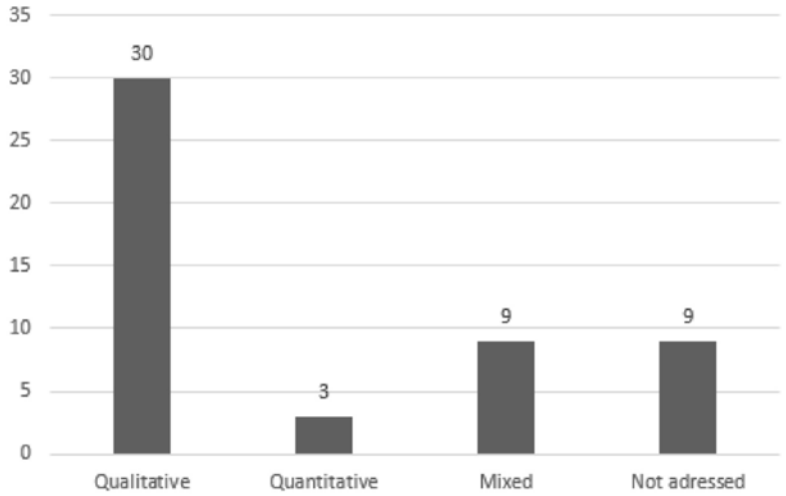
*Source:* Author created.

## Research area 2. Description of methods utilized to investigate educational leadership for equity in rural schools

In research area 2, corresponding to the methods used in the studies, questions Q3, Q4, and Q5 are addressed.

With respect to the design of the research methods in the studies reviewed (Q3) (Figure 4) (Table 4), most were qualitative (n = 30), followed by those that combined the implementation of quantitative and qualitative methodologies, mixed (n = 9), and those that developed a quantitative methodology (n = 3). Likewise, in 9 of them, the method developed is not provided.

**Figure 4**
*Research method*




*Source*: Author created.

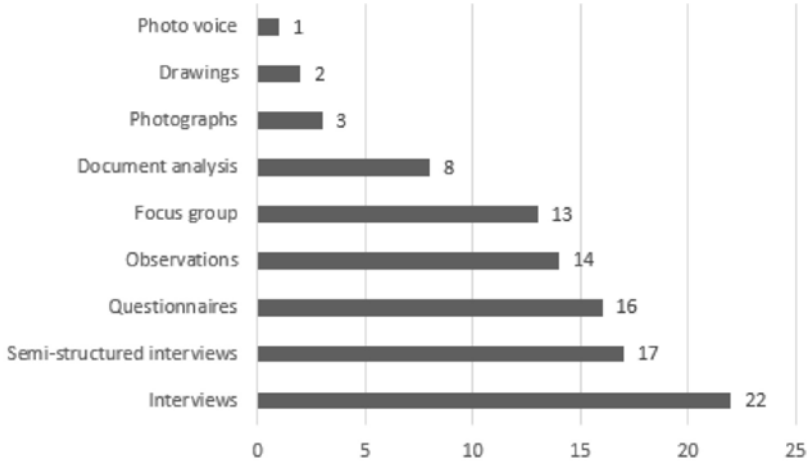
**Table 4**
*Research method*

| | |
|---|---|
| **Qualitative** | Ayscue and Uzzell, 2022; Bolaji et al., 2019; Chitpin and Karoui, 2021; De Klerk and Palmer, 2021; Edwards and Peruma, 2017; English et al., 2022; Gajardo-Espinoza and Torrego-Egido, 2023; Jabbarian et al., 2022; Joyce, 2014; Knutas, 2017; Langer et al., 2019; Luo et al., 2022; Merchant et al., 2020; Miranda-Calderón and Rosabal-Vitoria, 2018; MnCube et al., 2023; Nguyen and Ha, 2021; Nkwiga and Brock-Utne, 2022; Oldham et al., 2020; Peng et al., 2014; Plein, 2022; Ramirez et al., 2023; Rangarajan et al., 2023; Sehlako, 2023; Story et al., 2023; Sutherland et al., 2022; Tuters, 2015; Vuzo, 2018; Wargo et al., 2021; Washington, 2021; Yu et al., 2023. |
| **Quantitative** | Donkoh et al., 2023; Mestry and Ndhlovu, 2014; Yuxiao and Chao, 2022. |
| **Mixed** | Cerdá, 2017; Fikuree et al., 2021; González-Alvarado et al., 2020; Heinrich et al., 2020; Hu et al., 2022; Silva, 2023; Wang et al., 2021; Yang et al., 2018; Zheng, 2020. |

*Source:* Author created.

As for the results concerning the instruments and techniques used in the research analyzed (Q4) Figure 5) (Table 5), a great variety of means was observed. Likewise, Figure 5 shows the main instruments and techniques used, in a general manner. Among them, the most commonly used were questionnaires (n = 16), semi-structured interviews (n = 17), and interviews (n = 22), which did not specify if these were structured, semi-structured, or non-structured. Likewise, many studies used observations (n = 14), focus groups (n = 13), and document analysis (n = 8). Additionally, some studies also used photographs (n = 3), drawings (n = 2), and photovoice (n = 1).

**Figure 5**
*Instruments and techniques*




*Source:* Author created.

**Table 5**
*Research instruments and techniques*

| | |
|---|---|
| **Questionnaire** | DeMatthews et al., 2023; Donkoh et al., 2023; Fikuree et al., 2021; Hallinger and Liu, 2016; Hao et al., 2021; Heinrich et al., 2020; Hu et al., 2022; Image, 2023; Li and Qiu, 2018; Mestry and Ndhlovu, 2014; Miranda-Calderón and Rosabal-Vitoria, 2018; Shi et al., 2021; Silva, 2023; Wang et al., 2021; Yang et al., 2018; Zheng, 2020. |
| **Semi-structured Interviews** | Ayscue and Uzzell, 2022; Bolaji et al., 2019; De Klerk and Palmer, 2021; González-Alvarado et al., 2020; Jabbarian et al., 2022; Joyce, 2014; Langer et al., 2019; Miranda-Calderón and Rosabal-Vitoria, 2018; MnCube et al., 2023; Nguyen and Ha, 2021; Nkwiga and Brock-Utne, 2022; Sehlako, 2023; Story et al., 2023; Sutherland et al., 2022; Wang et al., 2021; Washington, 2021; Zheng, 2020. |

| | |
|---|---|
| **Interviews** | Chitpin and Karoui, 2021; Edwards and Peruma, 2017; English et al., 2022; Fikuree et al., 2021; Gajardo-Espinoza and Torrego-Egido, 2023; Heinrich et al., 2020; Hu et al., 2022; Image, 2023; Luo et al., 2022; Merchant et al., 2020; Oldham et al., 2020; Peng et al., 2014; Ramirez et al., 2023; Rangarajan et al., 2023; Silva, 2023; Slaughter et al., 2019; Tuters, 2015; Vuzo, 2018; Wargo et al., 2021; Yang et al., 2018; Yu et al., 2023; Yuxiao and Chao, 2022. |
| **Observations** | Aylward et al., 2021; Ayscue and Uzzell, 2022; Edwards and Peruma, 2017; English et al., 2022; Gajardo-Espinoza and Torrego-Egido, 2023 Heinrich et al., 2020; Image, 2023; Joyce, 2014; Luo et al., 2022; Merchant et al., 2020; Nkwiga and Brock-Utne, 2022; Sutherland et al., 2022; Washington, 2021; Yang et al., 2018. |
| **Focus group** | Edwards and Peruma, 2017; Heinrich et al., 2020; Image, 2023; Knutas, 2017; Langer et al., 2019; MnCube et al., 2023; Nguyen and Ha, 2021; Peng et al., 2014; Rangarajan et al., 2023; Silva, 2023; Sutherland et al., 2022; Wang et al., 2021; Wargo et al., 2021; Yang et al., 2018. |
| **Document analysis** | Aylward et al., 2021; Ayscue and Uzzell, 2022; Bolaji et al., 2019; Cerdá, 2017; Edwards and Peruma, 2017; Gajardo-Espinoza and Torrego-Egido, 2023; Merchant et al., 2020; Slaughter et al., 2019. |
| **Photographs** | Image, 2023; Luo et al., 2022; Rangarajan et al., 2023. |
| **Drawings** | Image, 2023; Rangarajan et al., 2023. |
| **Photovoice** | Rangarajan et al., 2023. |

*Source:* Author created.

With respect to the studies addressed (Q5) (Table 6), most of them obtained diverse members of the education community as the sample (n = 29). Likewise, others only counted with principals or education leaders (n = 9), teachers (n = 6), or students (n = 5). It must underlined that in two of them, the sample used was not provided.

**Table 6**
*Sample*

| | |
|---|---|
| **Diverse members of the education community** | Ayscue and Uzzell, 2022; Cerdá, 2017; Donkoh et al., 2023; Fikuree et al., 2021; González-Alvarado et al., 2020; Hao et al., 2021; Heinrich et al., 2020; Jabbarian et al., 2022; Langer et al., 2019; Li and Qiu, 2018; Luo et al., 2022; Merchant et al., 2020; Mestry and Ndhlovu, 2014; Nguyen and Ha, 2021; Nkwiga and Brock-Utne, 2022; Peng et al., 2014; Plein, 2022; Rangarajan et al., 2023; Sehlako, 2023; Silva, 2023; Slaughter et al., 2019; Story et al., 2023; Sutherland et al., 2022; Vuzo, 2018; Wang et al., 2021; Wargo et al., 2021; Washington, 2021; Yang et al., 2018; Yu et al., 2023. |
| **Principals or education leaders** | Bolaji et al., 2019; Chitpin and Karoui, 2021; De Klerk and Palmer, 2021; DeMatthews et al., 2023; Edwards and Peruma, 2017; Gajardo-Espinoza and Torrego-Egido, 2023; Miranda-Calderón and Rosabal-Vitoria, 2018; MnCube et al., 2023; Oldham et al., 2020. |

| | |
|---|---|
| **Teachers** | English et al., 2022; Hallinger and Liu, 2016; Joyce, 2014; Knutas, 2017; Ramirez et al., 2023; Tuters, 2015. |
| **Students** | Hu et al., 2022; Image, 2023; Shi et al., 2021; Yuxiao and Chao, 2022; Zheng, 2020. |

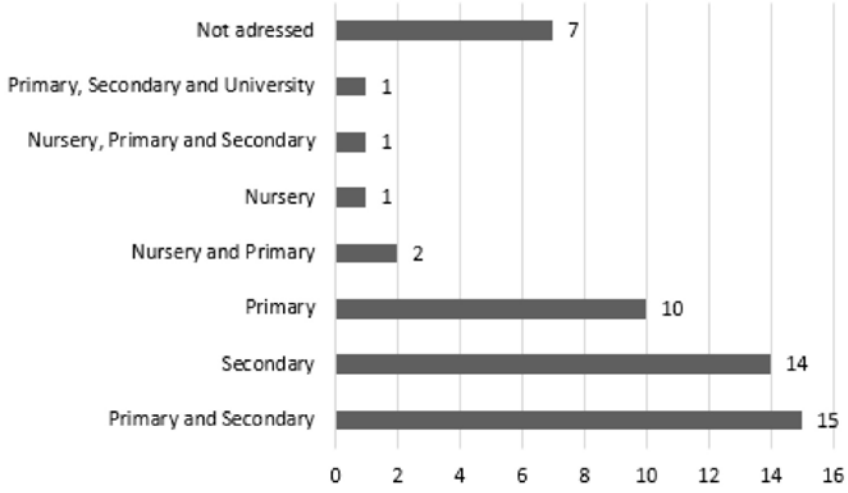
*Source:* Author created.

## Research areas 3. Analysis of the results on educational leadership for equity in rural schools

Questions Q6, Q7, Q8, Q9, and Q10 are dealt with in research area 3, in which the results of the research are analyzed.

With respect to the level of education in which the studies reviewed were centered (Q6), as Figure 6 (Table 7) shows, a large number of them (n =15) were conducted in both Primary and Secondary Education stages. In addition, many of them were centered exclusively on Secondary Education (n = 14), or Primary Education (n = 10). Likewise, other studies were conducted in the Early Education and Primary Education stages (n = 2), Early Education (n = 1), Early Education, Primary and Secondary Education (n = 1), and Primary and Secondary Education, and University (n = 1). Likewise, it is important to note that seven of the articles did not allude to the level of education in which the study was conducted.

**Figure 6**
*Level of education*




*Source:* Author created.

**Table 7**
*Level of education*

| | |
|---|---|
| **Primary and Secondary** | Cerdá, 2017; Chitpin and Karoui, 2021; DeMatthews et al., 2023; Fikuree et al., 2021; Hao et al., 2021; Hu et al., 2022; Image, 2023; Langer et al., 2019; Li and Qiu, 2018; Mestry and Ndhlovu, 2014; Peterson et al., 2020; Story et al., 2023; Wang et al., 2021; Wargo et al., 2021; Washington, 2021. |
| **Secondary** | González-Alvarado et al., 2020; Jabbarian et al., 2022; MnCube et al., 2023; Nguyen and Ha, 2021; Oldham et al., 2020; Peng et al., 2014; Plein, 2022; Ramirez et al., 2023; Shi et al., 2021; Silva, 2023; Vuzo, 2018; Yu et al., 2023; Yuxiao and Chao, 2022; Zheng, 2020. |
| **Primary** | Donkoh et al., 2023; Heinrich et al., 2020; Knutas, 2017; Luo et al., 2022; Miranda-Calderón and Rosabal-Vitoria, 2018; Nkwiga and Brock-Utne, 2022; Rangarajan et al., 2023; Sehlako, 2023; Slaughter et al., 2019; Tuters, 2015. |
| **Early Education and Primary** | Ayscue and Uzzell, 2022; Gajardo-Espinoza and Torrego-Egido, 2023. |
| **Early Childhood** | Yang et al., 2018 |
| **Early Childhood, Primary, and Secondary** | Sutherland et al., 2022 |
| **Primary, Secondary, and University** | English et al., 2022 |

*Source:* Author created.

With respect to the scientific discipline that corresponds to the studies analyzed (Q7) (Table 8), most of them addressed education (n = 38), followed by those that were centered on sociology (n = 6), psychology (n = 2), and theology (n = 2). Likewise, a scarcity was observed of those that were oriented towards linguistics (n = 1), history (n = 1), and science and technology (n = 1).

***Table 8***
*Scientific discipline*

| | |
|---|---|
| **Education** | Ayscue and Uzzell, 2022; Bolaji et al., 2019; Chitpin and Karoui, 2021; De Klerk and Palmer, 2021; DeMatthews et al., 2023; English et al., 2022; Fikuree et al., 2021; Gajardo-Espinoza and Torrego-Egido, 2023; González-Alvarado et al., 2020; Hallinger and Liu, 2016; Heinrich et al., 2020; Hu et al., 2022; Jabbarian et al., 2022; Joyce, 2014; Knutas, 2017; Li and Qiu, 2018; Luo et al., 2022; Merchant et al., 2020; Mestry and Ndhlovu, 2014; Miranda-Calderón and Rosabal-Vitoria, 2018; MnCube et al., 2023; Nguyen and Ha, 2021; Nkwiga and Brock-Utne, 2022; Peng et al., 2014; Peterson et al., 2020; Rangarajan et al., 2023; Sehlako, 2023; Silva, 2023; Story et al., 2023; Tuters, 2015; Vuzo, 2018; Wang et al., 2021; Wargo et al., 2021; Washington, 2021; Yang et al., 2018; Yu et al., 2023; Yuxiao and Chao, 2022; Zheng, 2020. |
| **Sociology** | Aylward et al., 2021; Hao et al., 2021; Oldham et al., 2020; Plein, 2022; Shi et al., 2021; Sutherland et al., 2022. |
| **Psychology** | Langer et al., 2019; Ramirez et al., 2023. |
| **Theology** | Edwards and Peruma, 2017; Image, 2023. |
| **Linguistics** | Slaughter et al., 2019 |
| **History** | Cerdá, 2017 |
| **Science and technology** | Donkoh et al., 2023 |

*Source:* Author created.

With respect to rural schools (Q8), Bolaji et al. (2019) described a low level of education in the rural Nigerian schools, and MnCube et al. (2023) manifested that the provision of resources in these South African centers was inadequate. Likewise, it is observed that some American rural schools could not participate in certain activities, as a minimum number of students was required, and these did not reach it (Story et al., 2023).

As for the community in a rural school, in the United States, South Africa, Spain, India, and Portugal, strong links between the community and the rural school were observed, as well as the development of a sense of identity and belonging to them (Aylward et al., 2021; Edwards and Peruma, 2017; Gajardo-Espinoza and Torrego-Egido, 2023; Plein, 2022; Rangarajan et al., 2023; Silva, 2023; Sutherland et al., 2022).

On the other hand, some teachers pointed out that the rural Canadian students were somewhat more naive than those from urban environments, as they lacked access to cosmopolitan experiences. Some viewed them as positive, while others did not, as they lacked of knowledge or life experience that limited their educational and employment aspirations (Tuters, 2015).

With respect to the multiple grades taught at the rural school Joyce (2014) recognized this school organization as a viable alternative due to the access to basic

education of disadvantaged South African children, particularly those who live in rural contexts. In addition, the promotion of inter-generational cooperation in Spanish and Norwegian schools was pointed out (Gajardo-Espinoza and Torrego-Egido, 2023; Knutas, 2017), as well as the development of understanding and tolerance in the United States (Ayscue and Uzzell, 2022). In addition, the excessive rotation of teachers was underlined, as well as the scarcity of teachers and their lack of skills and knowledge to work in these contexts (Aylward et al., 2021; Joyce, 2014; Wargo et al., 2021).

As for educational leadership (Q9), a lack of control and monitoring was observed, as well as inadequate supervision and unequal access to education (Bolaji et al., 2019), along with a lack of planning, preparation, and resources to address certain crises (DeMatthews et al., 2023), as found in Nigeria and the United States, respectively. In addition, as Edwards and Peruma (2017), Ramirez et al. (2023), Sutherland et al. (2019) and Yang et al. (2018) expressed, in South Africa, the United States, and China, all the members of the education community are essential, and can promote educational equity in their schools. To promote this equity, some American schools appeal to the hiring of specialists in these matters to develop them at their centers, as well as the participation of consultants for the staff and to exert as school leaders to promote equitable practices and policies (Ramirez et al., 2023). Similarly, Chitpin and Karoui (2021) highlighted the use of individual differentiation strategies to promote equity within schools, to tackle, in first place, the specific needs of the students. These range from basic needs, to interventions destined to guarantee the sense of belonging of the immigrant students.

Likewise, in their study conducted in Spain, Gajardo-Espinoza and Torrego-Egido (2023) underlined the existence of horizontal and shared leadership, in which the school operates as a community. Within it, each member is relevant and has an influence in the making of decisions, and students and their families can intervene and make proposals. Likewise, Oldham et al. (2020) argued that leadership based on empathy, care, and understanding, by the principal, promotes trust with the education community of the school.

With respect to educational equity (Q10), racial discrimination was observed in the United States, as well as the exclusion to equal education opportunities for children who are native or of color (Aylward et al., 2021; Washington, 2021). In turn, Sutherland et al. (2022) described that African American children who belonged to the community were treated as the rest, which was not observed in those who had just arrived, and must overcome many obstacles to become integrated.

On the other hand, language was considered to be one of the great barriers for ethnic minority children to access basic education in Vietnam, (Nguyen and Ha, 2021) and to participate in activities outside of the center, such as field trips for environmental education, in the United States (Story et al., 2023). Additionally,

Ayscue and Uzzell (2022) pointed out that in the United States, close relationships improved respect, understanding, and empathy among students, including those with different racial or linguistic origins.

As for the findings related to equal technological equity, great difficulties were observed for accessing devices and the Internet in the United States, the Maldives, and Costa Rica (DeMatthews et al., 2023; Fikuree et al., 2021; Miranda-Calderón and Rosabal-Vitoria, 2018). DeMatthews et al. (2023) points out that in the Unites States, aside from the lack internet access and devices, there was a lack of support by families to their children. In addition, many teachers and principals from rural Costa Rican schools did not possess notions about the use of technological devices, or they were very deficient, and also had a lack of technological resources (Miranda-Calderón and Rosabal-Vitoria, 2018). According to Donkoh et al. (2023), in Ghana, Internet services did not significantly affect the quality of education in rural environments, and the Internet installations did not have a statistically significant effect on rural schools, given that there was a weak incursion of the internet in these education centers.

As for the technological and digital divide of students in rural and urban schools in China, this was mainly observed in terms of basic hardware (Hu et al., 2022). Thus, differences were observed in the distribution of resources in the different studies analyzed. Peterson et al. (2020) pointed out that in the United States, education technology advisors worked diligently to incorporate the families that had not connected digitally to applications and communications, and distributed tablets and portable computers to families who did not have them. Along the same line, Wang et al. (2021) indicated that the Chinese schools studied provided computers to the families who needed them, and invited diverse companies to donate phones, but in spite of this, it was impossible to guarantee access to online education to all students. For this, a suggestion was made for television programs to give classes to students through this device, although many of them did not participate, as they lacked interactivity and did not consider the different levels of skills of the students. In turn Sehlako (2023) stated that in the three South African schools in their study, the resources were no distributed equally.

At the same time, unstable financing was perceived for the acquisition and use of technology, as well delayed maintenance and limited support, a reflection of the vulnerable position and the lack of resources in rural areas in the United States (Wargo et al., 2021). In addition, the limited realities with respect to the use of technologies were not taken into account in these contexts when considering technological solutions for greater access and better quality of education.

With respect to education equity based on gender, in South Africa, China, Burkina Faso, Nepal, and Tanzania, great differences were observed in the access and continuation of education between men and women (De Klerk and Palmer,

2021; Hao et al., 2021; Jabbarian et al., 2022; Langer et al., 2019; Vuzo, 2018). In some places such as China, women have been deprived of education, as they came from low-income families, and these believed that the education of their male children was essential (Hao et al., 2021). In addition, many Chinese, Burkinabe, and Nepalese families refused to continue paying for the education costs of their female offspring, as they oriented their future to domestic tasks, leading to early abandonment of education (Hao et al., 2021; Jabbarian et al., 2022; Langer et al., 2019), which on many occasions in Tanzania, was also due to early marriage and pregnancies (Vuzo, 2018). On the contrary, more educational and employment opportunities were given to Burkinabe and Nepalese men (Jabbarian et al., 2022; Langer et al., 2019).

Likewise, it was pointed out that in China, gender was a negative predictor of academic performance of children, which means that girls tended to obtain lower scores. This may be due to the fact that they were perceived as being weak in mathematics due to gender stereotypes and the self-perception of the girls about their value, performance, and ability in certain disciplines such as STEM (Shi et al., 2021).

As for regional education equity, Story et al. (2023) described that some students from rural schools in the United States faced territorial barriers that impeded them from being able to participate in activities performed outside of their area. In some cases, to be able to participate in school field trips, they had to travel, and did not have the necessary funds to pay for the costs of travel. Likewise, Tuters (2015) pointed out that Canadian students lacked access to cosmopolitan experiences, such as visiting museums or art galleries. This leads to rural students being more naive than the urban ones.

## DISCUSSION AND CONCLUSIONS

The present systematic review of the literature analyzed 51 international articles in high-impact journals found in the WOS and Scopus databases in the last decade, between 2014 and 2023, which addressed rural schools, equity, and educational leadership variables, three extremely diverse and fundamental aspects for rural students.

With respect to the first area of research, most of the studies were indexed in both databases (WOS and Scopus) (Aylward et al., 2021; Luo et al., 2022; Sehlako, 2023; Slaughter et al., 2019), which shows their great relevance and impact. Likewise, an exponential growth of publications on educational leadership for equity in rural schools was observed starting in 2020 (González-Alvarado et al., 2020; Zheng, 2020) and 2021 (Aylward et al., 2021; Washington, 2021). This is due to the COVID-19 pandemic and the need to study its consequences on education, emphasizing the

existing digital divide in rural schools, as compared to the urban ones. In addition, a predominance of studies conducted in the United States (Plein, 2022; Story et al., 2023) and China (Hu et al., 2022; Yu et al., 2023) was observed, with the continents of both countries, America and Asia, hosting the highest number of studies. This evokes the need to provide a greater scientific and educational importance, as well as political, essential for the development of the first two, to rural schools.

With respect to the research method, most used a qualitative method (Sehlako, 2023; Yu et al., 2023), and interviews were the main instrument used for data collection (Image, 2023; Silva, 2023), which shows the need to delve into each context, instead of generalizing. However, it is notable that nine studies did not explicitly state the methodology utilized. In addition, a predominance of diverse members of the education community was observed as the sample used in the studies (Silva, 2023; Washington, 2021).

As for the level of education, the stages in which most of the studies were conducted were Primary and Secondary education (Cerdá, 2017; Image, 2023), given that they are the main levels of education found in rural contexts. At the same time, education was the scientific discipline that was most associated with the research articles studied (Bolaji et al., 2019; MnCube et al., 2023).

Likewise, with respect to rural schools, the strong links between the schools and the community were notable (Plein, 2022; Rangarajan et al., 2023; Silva, 2023; Sutherland et al., 2022), which was also observed in the previous studies presented (Abascal et al., 2023; Abós et al., 2021). In addition, in the studies analyzed in the systematic review, an excessive rotation of teachers and lack of teacher training to work in rural contexts were observed (Aylward et al., 2021; Wargo et al., 2021), which was also observed in the studies by Chaparra and Santos (2018) and Lupión and Gallego (2017). Also, in the study by Joyce et al. (2014) it was recognized that the multiple grade education implied a possibility of accessing basic education for many boys and girls, as previously pointed out (Abós et al., 2021), as rural schools welcome all the diversity of the territory.

Likewise, in the studies analyzed, Gajardo-Espinoza and Torrego-Egido (2023), Oldham et al. (2020), and Yang et al. (2018) argue for the need for shared and horizontal leadership, in which all the members of the community are indispensable for promoting equity. This is also in agreement with what Abascal et al. (2024) and Hsieh et al. (2023) sustain, who argued for the need for shared and transformational leadership, with the aim of improving educational quality, to attain successful educational leadership.

With respect to equity, in the research studied, intercultural, technological, gender, and regional inequities were observed. At the intercultural level, discrepancies were observed as Aylward et al. (2021) and Washington (2021) pointed to racial discrimination and exclusion from opportunities of students who

were indigenous or of color. This was previously observed in the studies by Morales-Romo (2023), who pointed out that the increase in migratory movements made equality of opportunities among the students impossible, and Ancheta-Arrabal (2019), who pointed out to the resurgence of new inequities relative to the place of origin. On the contrary, it was observed that in some places, the immigrant students from that place were treated as part of the community, while the newcomers were not (Sutherland et al., 2022).

With respect to technology, some difficulties in accessing devices and the Internet were observed in some countries, which is comparable to what was pointed out by Morales-Romo (2023), although this author indicated that although rural schools have more deficient equipment, they have better competences and a high potential due to the low ratios. As for genders, in both the studies analyzed (Hao et al., 2021; Vuzo, 2018) as well as those addressed previously (Danke and Mun, 2012; Xuemin and Zhenhua, 2019), inequities were remarked on the access to education between men and women in some under-developed countries, in which the families lacked economic resources. Likewise, the regional inequality of the students was underlined with respect to their urban peers, in the publications reviewed (Tuters, 2015), and those previously addressed (Martínez, 2021).

The limitations of the present study are based on the research being performed in two international databases, and only addressing intercultural, technological, gender, and regional equity. In addition, the articles reviewed were written in English or Spanish, so that there was no linguistic or geographical diversity, as most of the studies were conducted in the United States and China. In parallel, this study addressed the interrelationship between three broad topics that are well-researched separately, although their interconnections between them, as the present study intended, has not been well studied. Thus, the many studies found did not allow for the comparison of the results found.

In future lines of research, it would be useful to use more databases and analyze other inequities or address the ones analyzed in the present study to compare them between countries or regions within the same country. Also, it would be useful to compare this study with previous and posterior ones, to elucidate if an evolution or devolution has occurred with respect to equity in these contexts, or to perform a detailed bibliometric analysis. Likewise, it would be desirable to conduct a deeper analysis in future studies of the geographical-prevalent tensions in the studies, the methods, and research techniques. In addition, it would be significant to be able to perform deeper case studies to be able to specifically analyze successful rural educational leadership to attain educational equity in various countries, both developed and under-developed. The present study highlights the educational inequities that exist in rural contexts worldwide, so that it would be desirable for governments to emphasize the needs that are found in these contexts, as a large

part of these inequality of opportunities also affect other areas of life. For this, specific rural education policies are needed to help address these disparities.

An exhaustive international review was conducted in the present study on educational leadership for equity in rural schools, providing a global perspective. In also highlights rural schools, a type of educational organization that is deeply rooted in the region, and which facilitates education in isolated settings. In parallel, educational leadership was praised, as it is key in school organization and the present and future development of students, and its goal is educational quality. Likewise, educational equity was underlined, as being fundamental in the improvement of education to stop neoliberal policies and promote social justice. For this, the present study not only delved into three key elements for the education of rural students, but they have been emphasized and analyzed to achieve a more equitable and fair education and society, in which the whole of society, as members of the educational community, leads educational improvement to achieve quality and equity.

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# Are executive functions and academic performance in Primary Education related? Evaluation of the Rubik educational model

## *¿Están relacionadas las funciones ejecutivas y el rendimiento académico en Educación Primaria? Evaluación del modelo educativo Rubik*

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## ABSTRACT

The literature makes us aware of a relationship between executive functions and academic performance. This study evaluates the impact of the Rubik educational model, focused on the teaching and development of executive functions, on academic performance in Primary Education. A sample of 232 students in 2nd, 4th, 5th and 6th grades of Primary Education from three subsidized schools of the Trilema network was used. A pretest-post test design was used to measure executive functions using the BRIEF-2 instrument and academic performance using school grades in mathematics, science, and language. This work has a triple objective. The study of the change in executive functions after school intervention and the study of this evolution by performance levels is conducted using non-parametric analyses of mean differences. The analysis of the causal relationship between executive functions and academic performance is carried out using structural equation modelling. The results show that there is a significant improvement in executive functions after the intervention in the upper levels of primary school, being especially important in initiative, working memory and planning, although effect sizes are small. It is also observed that students with lower initial performance were the most benefited by the intervention, showing significant changes in executive functions especially in the 4th, 5th and 6th grades of primary school. The most conclusive result points to the strong and significant causal relationship between executive functions and school performance, explaining 35% of the variance in the results. Executive functions are crucial for learning, as shown by the results of this work, and educational programs such as Rubik are effective because they combine the teaching of these functions with the development of school learning.


**Keywords:** executive function, learning processes, academic achievement, elementary education, program evaluation


## RESUMEN

La literatura advierte de una relación entre las funciones ejecutivas y el rendimiento académico. En este estudio se evalúa el impacto del modelo educativo Rubik, centrado en la enseñanza y el desarrollo de las funciones ejecutivas, sobre el rendimiento académico en Educación Primaria. Se utiliza una muestra de 232 alumnos de 2º, 4º, 5º y 6º de Educación Primaria de tres centros educativos concertados de la red Trilema. Se empleó un diseño con medidas de pretest-postest para la medida de las funciones ejecutivas usando el instrumento BRIEF-2 y el rendimiento académico usando las calificaciones escolares en matemáticas, ciencias y lengua. Este trabajo tiene un triple objetivo. El estudio del cambio en las funciones ejecutivas tras la intervención escolar y el estudio de esta evolución por niveles de rendimiento se realiza utilizando análisis no paramétricos de diferencias de medias. El análisis de la relación causal de las funciones ejecutivas con el rendimiento académico se desarrolla a través de un modelo de ecuaciones estructurales. Los resultados muestran que se observa una mejora significativa de las funciones ejecutivas tras la intervención en los niveles superiores de la Primaria, siendo especialmente importante en iniciativa, memoria de

trabajo y planificación, si bien las magnitudes del efecto son pequeñas. Se observa además que los estudiantes con un rendimiento inicial más bajo fueron los más beneficiados por la intervención, mostrando cambios significativos en las funciones ejecutivas sobre todo en 4º, 5º y 6º de Primaria. El resultado más concluyente señala la fuerte y significativa relación causal entre las funciones ejecutivas y el rendimiento escolar, llegando a explicar el 35% de la varianza de los resultados. Las funciones ejecutivas son cruciales para el aprendizaje, como demuestran los resultados de este trabajo, y programas educativos como el Rubik son efectivos ya que conjugan la enseñanza de estas funciones junto con el desarrollo de los aprendizajes escolares.

**Palabras clave:** funciones ejecutivas, procesos de aprendizaje, rendimiento académico, educación primaria, evaluación de programas

## INTRODUCTION

Interventions within educational contexts require an accumulation of diverse evidence to inform the educational community comprehensively about their impact on various educational outcomes. This paper evaluates an educational intervention model, the Rubik model (Fundación Trilema, 2025, in press). From its conception, primary education students' academic learning is supported by the development of cognitive self-regulation tools and their positive impact on academic performance. It is important to highlight that the Rubik model is based on the premise that cognitive self-regulation not only improves academic performance but also fosters socio-emotional skills essential for students' overall development. This research focuses on establishing the relationship between the actual classroom implementation of executive functions through an original educational model and its impact on academic performance across different academic performance levels.

### Executive Functions and Academic Performance in Primary Education

Research on the relationship between executive functions (EF hereafter) and academic performance has significantly expanded in recent decades, establishing itself as a critical field of study in neuroscience and education. Executive functions are defined as a set of high-level cognitive processes essential for planning, self-regulation, and problem-solving, directly influencing students' ability to organize behaviour, manage emotions, and effectively monitor their thoughts (Flavell & Wellman, 1977). The relevance of EF lies in their ability to integrate multiple cognitive processes, enabling students to adapt effectively to academic and social demands. These skills are crucial not only for academic learning but also for social and emotional development (Zelazo & Carlson, 2020; Martín-Requejo et al., 2023;

Shaul & Schwartz, 2022), essential for successful adaptation within educational contexts.

EF encompasses various interrelated skills. Dawson and Guare (2010), from a neuropsychological education-oriented perspective, consider executive functioning as the high-level cognitive processes necessary to plan and direct activities. Key components include inhibition, the capacity to suppress impulsive or automatic responses, working memory, and the ability to maintain and manipulate short-term information (Baddeley, 2000). Cognitive flexibility, planning and organization, sustained attention, metacognition, emotional control, task initiation, and goal-directed persistence are also key aspects linking EF with academic performance (Best, Miller & Naglieri, 2011; Bryce, Whitebread & Szucs, 2015).

The development of EF is a continuous process extending throughout life; this study specifically focuses on primary school-aged children. This development is influenced both by biological maturation of brain structures and environmental experiences. Korzeniowski (2011) notes that adapting to the school environment requires children to resolve conflicts and organize behaviour around objectives and work norms, thus exhibiting adaptive behaviours beneficial to academic performance.

## Executive Functions as Predictors of Academic Performance

EF are essential for academic success, facilitating task organization, impulse control, and adaptation to school demands. Blair and Raver (2015) and Jacob and Parkinson (2015) demonstrated that EF are better predictors of academic success than IQ, due to their influence on self-regulation, planning, and problem-solving skills. This suggests educational interventions that strengthen EF could effectively enhance academic performance. Cortés Pascual et al. (2019) meta-analysis shows working memory as a key predictor of academic performance in primary education. Students with strong executive functioning better manage their time, prioritize information, review work, and make effective decisions, resulting in improved academic performance. Conversely, inadequate development of EF may lead to difficulties in organization, attention, and problem-solving, negatively impacting school performance. García and Muñoz (2000) highlighted the relationship between executive dysfunction and academic difficulties.

The educational context plays a critical role in developing EF. Classrooms can significantly enhance these functions, with pedagogical practices fostering EF and improving learning processes (Canosa et al., 2021; Moriguchi, 2022). Pedagogical strategies promoting self-regulation and self-control are particularly effective in developing EF, as they enable students to actively engage in their learning. Specifically, studies utilizing metacognitive strategies to promote self-regulation and self-control have demonstrated high efficacy and significant correlation with

performance (Lajoie et al., 2022; Rigo de la Barrera & Travaglia, 2019; Romero-Lopez et al., 2021).

Furthermore, educational interventions strengthening EF can mitigate academic performance gaps, especially among students from vulnerable socioeconomic backgrounds. Lipina (2016) investigated the importance of adapting assessment tools to low-resource contexts through educational programs that balance EF with academic development by enhancing cognitive capacities, promoting inclusive, autonomous, and sustainable learning. It is crucial to acknowledge that the relationship between EF and academic performance is not linear and has a multicausal nature, involving other factors like motivation, family environment, and teaching strategies.

## RUBIK: AN EDUCATIONAL MODEL BASED ON EF

The Rubik model systemically organizes educational centres, combining six key elements: curriculum, methodology, evaluation, organization, personalization, and leadership.

In this model, executive functions are central to curriculum articulation, as they underpin curricular goals and teaching and learning procedures (Pellicer & Marina, 2015). Teaching and learning processes are based on projects, problems, challenges, cooperative teams, and graphic resources that activate and make visible critical and creative thinking and mobilize memory. This is where EF instruction is articulated within the school context, marking the distinctive feature of this educational model.

The current study evaluates the effects of the Rubik educational model, implemented in the Trilema school network. This educational model positions EF as the core of the school curriculum, emphasizing metacognition development. The model aims to improve specific cognitive skills such as planning and working memory and foster students' ability to reflect on their learning, identify errors, and autonomously correct them (Lajoie et al., 2022).

To analyse the impact of the Rubik model, this study focuses on evaluating the effectiveness of the model in developing executive functions and academic performance through a pre-experimental design with pretest-post-test measures.

Thus, this study aims to analyse how the Rubik model contributes simultaneously to the development of FF. EE. and academic performance in school contexts characterized by socioeconomic vulnerability. This approach seeks to provide empirical evidence regarding the model's effectiveness and to lay the groundwork for designing more inclusive and effective educational programs, capable of addressing cognitive needs within students' contextual realities. Consequently, the general objective focuses on evaluating the outcomes of the Rubik model for Primary Education students, specifically in the development of executive functions and academic performance. To achieve this, three specific objectives were formulated:

1. To evaluate the effects of the Rubik model on students' executive functions throughout the academic year.
2. To compare the differences in the impact of the Rubik model on various student performance profiles within Trilema schools.
3. To analyse the influence of the developed executive functions on students' academic performance.

## METHOD

The design of this study falls within the framework of educational program evaluation, focusing on the quantitative analysis of its impact on FF. EE. and academic performance (Bernal-Ruiz & Cerda, 2024; Campeño-Martínez et al., 2017).

For the first objective, a pre-experimental design with a pretest/post-test approach was used. The executive functions of Primary Education students were assessed before and after the implementation of the Rubik model.

For the second objective, an analysis was conducted on the gain in executive functions among students with different academic performance profiles. Students were categorized based on tertiles of their average scores in mathematics, language, and science at the beginning of the academic year. Differences in the impact of the Rubik model on executive functions were compared across high, medium, and low performance levels. This analysis allowed for the identification of how the model affects students with varying initial performance levels.

Finally, for the third objective, an explanatory model of the impact of FF. EE. on academic performance was tested using structural equation modelling. Three measurement models were constructed to obtain overall scores for FF. EE., both in the pretest and post-test, along with an additional model for academic performance at the end of the intervention. Furthermore, a structural model was developed to examine the effect of FF. EE. on academic performance while controlling for pretest effects. This approach enables a more detailed analysis of how improvements in executive functions influence students' academic performance, providing a deeper understanding of the causal relationships between these variables.

### Sample

For the evaluation of outcome factors (executive functions and academic performance), the sample consisted of students from four grade levels in Primary Education (2nd, 4th, 5th, and 6th) from Trilema schools. These experimental schools were strategically selected due to their implementation of the Rubik Model and

their geographical distribution. Data was collected from two main sources: teachers and students' families, as shown in Table 1.

The values represent the number of students evaluated by both sources in the pretest and post-test across the four Primary Education (PE) grade levels, as well as the corresponding percentages.

**Table 1**

*Distribution of students by academic grade assessed by teachers and families in the pretest and post-test*

| Grade | Source: Teachers | | | | Source: Family | | | |
|---|---|---|---|---|---|---|---|---|
| | Pretest | | Postest | | Pretest | | Postest | |
| | N | % | N | % | N | % | N | % |
| 2º PE | 63 | 22.58% | 61 | 26.29% | 46 | 18.85% | 35 | 20.59% |
| 4º PE | 70 | 25.09% | 69 | 29.74% | 63 | 25.82% | 51 | 30.00% |
| 5º PE | 65 | 23.30% | 44 | 18.97% | 61 | 25.00% | 43 | 25.29% |
| 6º PE | 81 | 29.03% | 58 | 25.00% | 74 | 30.33% | 41 | 24.12% |
| Total | **279** | **100%** | **232** | **100%** | **244** | **100%** | **170** | **100%** |

PE=Primary Education

A higher response rate was observed among teachers, who assessed a total of 279 students in the pretest and 232 in the post-test. Families assessed 25 fewer students in the pretest and 62 fewer in the post-test. On the one hand, in the teacher assessments, 47 students were lost between the pretest and post-test, representing 16.85% of the cases. On the other hand, the family assessments saw a loss of 74 students, equivalent to 30.33%.

The data loss was mainly due to contextual factors, such as participants' availability during the post-test data collection. The greatest loss occurred in 5th and 6th grade levels, where an entire group did not participate in the final assessment.

Of the total number of students, 44.8% were girls. For the evaluation, a total of 12 teachers from three Trilema schools participated. On a scale from 0 to 10, they reported an average familiarity with each student of 7.2 points. Additionally, 244 families participated, with the evaluation instruments mostly completed by mothers (78.8%).

## Instruments

To assess executive functions, the Spanish version of the BRIEF-2 instrument (Behaviour Rating Inventory of Executive Function; Gioia et al., 2015) was used. This

is a validated and widely employed tool in both educational and clinical contexts to measure different dimensions of FF. EE., such as inhibition, working memory, and planning. The instrument includes 63 items grouped into nine dimensions: inhibition, self-monitoring, flexibility, emotional control, initiative, working memory, planning and organization, task monitoring, and organization of materials. Items are rated on a 3-point Likert scale (1 = Never, 2 = Sometimes, 3 = Often). Higher scores initially indicate lower levels of performance in the assessed executive functions. However, to facilitate interpretation of the results in this study, scores were recoded so that higher values represent better performance in each dimension of executive functioning.

The BRIEF-2 was completed by two sources of information: teachers and families. Each teacher provided data for each student in their group, while one family member per student completed the same instrument. This dual-source approach allowed the collection of data on executive functions from two complementary perspectives: the school and the home environment. The use of multiple informants aligns with best practices in executive function assessment, as these skills can manifest differently across contexts (Diamond & Ling, 2020). All ratings were collected using paper-and-pencil format to prevent data loss from families.

Measurements were conducted before and after the implementation of the educational program, with a five-month interval during the 2022–2023 academic year. This period is considered appropriate for detecting significant changes in executive functions and academic performance, as suggested by previous studies in similar interventions (Diamond & Ling, 2020). While these are not direct measurements of students, they are contextual, comparative, and consistent measures across 2nd, 4th, 5th, and 6th grades of Primary Education.

Regarding academic performance, first-term grades in Science, Language, and Mathematics were used as the initial measure of achievement. These grades served as the baseline for academic performance to establish performance profiles. Final grades in the same subjects at the end of the school year were used as the measure of final academic performance.

## Data Analysis

In line with the objectives for evaluating the outcomes of the Rubik program, the first objective involved comparing executive function scores before and after the program's implementation using the Wilcoxon signed-rank test. This non-parametric test is suitable for paired data and does not require the assumption of normality. The choice of non-parametric statistics was justified by the non-normal distribution of executive function scores in both the pretest and post-test, as well as in the assessments from both teachers and families across all grade levels.

For the second objective, which analysed the differences in the impact of the Rubik program on students with different initial performance profiles, non-parametric statistics were also used—specifically, the Kruskal-Wallis H test. The gain in FF. EE. was compared across three performance groups (high, medium, low), which were established based on average grades in mathematics, language, and science, using tertiles as cutoff points. Thus, each group represented approximately 33% of the student sample. The dependent variable was the change in executive function scores (post-test minus pretest), with positive values indicating improvement. In dimensions showing significant differences, pairwise comparisons were conducted using the Dwass-Steel-Critchlow-Fligner test (Hollander et al., 2015) to identify which groups exhibited the largest discrepancies.

In addition, effect sizes were estimated to assess the magnitude of observed differences. For the Wilcoxon test, the rank-biserial correlation (rbrank) was used, and for the Kruskal-Wallis test, the epsilon-squared ($\varepsilon^2$) statistic. Different interpretation scales were applied following Cohen's guidelines (López-Martín & Ardura-Martínez, 2023). For rbrank, values of .3 or higher are considered moderate, and .5 or higher are considered large. For $\varepsilon^2$, values of .06 or more are considered moderate, and .14 or more are considered large. However, Hattie (2009) reinterprets these thresholds in the educational context, suggesting that the average educational intervention has an effect size of .4 in Cohen's d, which corresponds approximately to .2 in rbrank and .04 in $\varepsilon^2$. Therefore, effect sizes above these thresholds are desirable in educational research. Hattie also considers rbrank values between .1 and .2, and $\varepsilon^2$ values between .01 and .04, to be small effects. Consequently, this study adopted those references to interpret the practical significance of the Rubik model's impact.

Finally, for the third objective—analysing the influence of developed FF. EE. on academic performance—a structural equation modelling (SEM) analysis was conducted. An explanatory model was proposed linking FF. EE. and academic performance. This model included a measurement model that calculated a global executive function score based on the nine BRIEF-2 dimensions (pretest and post-test), and a structural model that evaluated the effect of final FF. EE. scores on academic achievement. Model fit was assessed using standard indices such as the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA), following Kline's (2016) criteria: CFI values above .95 and RMSEA values below .06 indicate good model fit. The model was estimated using the diagonally weighted least squares (DWLS) method, which is robust to violations of normality and provides accurate parameter estimates (Li, 2016). Additionally, reliability and convergent validity of the latent factors were evaluated using the omega coefficient and the Average Variance Extracted (AVE), respectively.

## RESULTS

First, the effects of the Rubik model on students' executive functions were evaluated by comparing the results before and after the educational intervention (Objective 1). Table 2 presents the means and standard deviations of the scores in the different dimensions of executive functions before and after the intervention, broken down by grade level.

**Table 2**

*Descriptive Statistics of FF. EE. in the Pretest and Post-test by Grade Level*

| | | PRETEST | | | | POSTEST | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2º EP | 4º EP | 5º EP | 6º EP | 2º EP | 4º EP | 5º EP | 6º EP |
| **INHIBITION** | Mean | 2.56 | 2.49 | 2.56 | 2.65 | 2.51 | 2.60 | 2.58 | 2.79 |
| | S.D. | 0.40 | 0.40 | 0.42 | 0.40 | 0.48 | 0.42 | 0.37 | 0.30 |
| **SELF-MONITORING** | Mean | 2.61 | 2.44 | 2.51 | 2.60 | 2.51 | 2.50 | 2.53 | 2.73 |
| | S.D. | 0.45 | 0.56 | 0.51 | 0.51 | 0.54 | 0.52 | 0.44 | 0.40 |
| **FLEXIBILITY** | Mean | 2.64 | 2.49 | 2.53 | 2.64 | 2.61 | 2.53 | 2.61 | 2.73 |
| | S.D. | 0.37 | 0.46 | 0.43 | 0.38 | 0.43 | 0.50 | 0.32 | 0.31 |
| **EMOTIONAL CONTROL** | Mean | 2.65 | 2.58 | 2.63 | 2.65 | 2.61 | 2.63 | 2.61 | 2.78 |
| | S.D. | 0.45 | 0.45 | 0.41 | 0.43 | 0.46 | 0.45 | 0.41 | 0.38 |
| **INITIATIVE** | Mean | 2.63 | 2.39 | 2.42 | 2.56 | 2.59 | 2.49 | 2.56 | 2.71 |
| | S.D. | 0.42 | 0.54 | 0.48 | 0.44 | 0.53 | 0.55 | 0.41 | 0.37 |
| **WORKING MEMORY** | Mean | 2.60 | 2.42 | 2.46 | 2.56 | 2.59 | 2.53 | 2.60 | 2.76 |
| | S.D. | 0.46 | 0.57 | 0.50 | 0.49 | 0.52 | 0.57 | 0.36 | 0.34 |
| **TASK MONITORING** | Mean | 2.38 | 2.21 | 2.26 | 2.38 | 2.35 | 2.32 | 2.34 | 2.56 |
| | S.D. | 0.52 | 0.53 | 0.54 | 0.53 | 0.61 | 0.59 | 0.49 | 0.40 |
| **PLANNING & ORGANIZATION** | Mean | 2.56 | 2.34 | 2.35 | 2.46 | 2.48 | 2.42 | 2.47 | 2.67 |
| | S.D. | 0.41 | 0.51 | 0.47 | 0.47 | 0.47 | 0.56 | 0.40 | 0.35 |
| **ORGANIZATION OF MATERIALS** | Mean | 2.59 | 2.47 | 2.57 | 2.59 | 2.48 | 2.42 | 2.47 | 2.67 |
| | S.D. | 0.43 | 0.50 | 0.37 | 0.46 | 0.47 | 0.56 | 0.40 | 0.35 |
| **Total BRIEF** | Mean | 2.60 | 2.46 | 2.51 | 2.59 | 2.56 | 2.54 | 2.57 | 2.74 |
| | S.D. | 0.33 | 0.38 | 0.33 | 0.36 | 0.40 | 0.40 | 0.28 | 0.27 |

*Note*. PE = Primary Education, SD = Standard Deviation.

Overall, a slight improvement in some dimensions of FF. EE. can be observed in 4th, 5th, and 6th grade levels. In contrast, in the first grade level assessed (2nd PE), scores remain stable or show a slight decline.

In 2nd PE, there is a decrease in the dimensions of inhibition (from 2.56 to 2.51) and self-monitoring (from 2.61 to 2.51), as well as in flexibility (from 2.64 to 2.61) and emotional control (from 2.65 to 2.61), although the latter are less pronounced. In the remaining grade levels, a general increase in executive functions is observed. The only exceptions are slight decreases in the organization of materials in 4th and 5th grades.

Table 3 presents the results of the Wilcoxon signed-rank test (W) used to compare pretest and post-test scores across the different FF. EE. dimensions in each grade level. The table includes the W statistic, its transformation to Z, the p-value, and the effect size (rank-biserial correlation, rbrank).

**Table 3**

*Pretest-Posttest Comparisons in FF. EE. with the Wilcoxon W test and effect sizes*

| Grade | | Inhibition | Self-Monitoring | Flexibility | Emotional Control | Initiative | Working Memory | Task Monitoring | Planning & Organization | Organization of Materials | Total BRIEF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2º PE** | *Z* | -2.34 | -2.644 | -1.473 | -1.227 | -0.974 | -1.218 | -1.171 | -2.8 | -1.262 | -1.811 |
| | *W* | 1553 | 909 | 1114 | 1047 | 902 | 1184 | 1206 | 1857 | 1111 | 2401 |
| | *p* | .019* | .008* | .141 | .220 | .330 | .223 | .241 | .005* | .207 | .070 |
| | rbrank | **.324** | **.425** | **.217** | .182 | .171 | .175 | .160 | **.375** | .175 | **.226** |
| **4º PE** | *Z* | -3.329 | -1.483 | -1.281 | -0.988 | -1.765 | -2.404 | -2.043 | -1.557 | -1.334 | -2.879 |
| | *W* | 1356 | 1213 | 1937 | 1565 | 1334 | 1636 | 1863 | 2031 | 1735 | 2308 |
| | *p* | .001* | .138 | .200 | .323 | .078 | .016* | .041* | .119 | .182 | .004* |
| | *rbrank* | **-.393** | -.192 | -.151 | -.124 | **-.216** | **-.283** | **-.232** | -.180 | -.134 | **-.308** |
| **5º PE** | *Z* | -0.683 | -0.506 | -1.176 | 0.000 | -1.792 | -2.087 | -0.345 | -1.586 | -1.162 | -1.179 |
| | *W* | 1227 | 1015 | 1106 | 1173 | 944 | 834 | 1280 | 1158 | 919 | 1554 |
| | p | .494 | .613 | .239 | 1.000 | .073 | .037* | .730 | .113 | .245 | .238 |
| | rbrank | -.091 | .074 | -.159 | .000 | **-.261** | **-.289** | -.026 | **-.209** | -.144 | -.150 |
| **6º PE** | *Z* | -1.717 | -0.198 | -0.374 | -1.028 | -1.516 | -2.206 | -0.561 | -1.722 | -0.246 | -1.409 |
| | *W* | 761 | 583 | 1180 | 776 | 953 | 1133 | 1346 | 1132 | 921 | 1698 |
| | *p* | .086 | .843 | .708 | .304 | .129 | .027* | .575 | .085 | .806 | .159 |
| | rbrank | **-.246** | .033 | -.051 | -.152 | **-.211** | **-.283** | -.080 | **-.226** | -.057 | -.171 |

(*) Significant at p ≤ .05

*Note*. rbrank values in bold indicate noteworthy effects based on the defined criteria.

In 2nd grade of Primary Education (2nd PE), a significant decrease was observed in the dimensions of inhibition (rbrank = .324, p = .019), self-monitoring (rbrank = .425, p = .008), and planning and organization (rbrank = .375, p = .005). Additionally,

effect sizes above .2 were found in the dimensions of flexibility (rbrank = .217) and in the total BRIEF score (rbrank = .226).

In 4th PE, significant improvements were found in the dimensions of inhibition (rbrank = –.393, p = .001), working memory (rbrank = –.283, p = .016), task monitoring (rbrank = –.232, p = .041), and in the total BRIEF score (rbrank = –.308, p = .004). In addition, effect sizes above .2 were observed in the initiative dimension (rbrank = –.216).

In 5th PE, a significant improvement was observed in the working memory dimension (rbrank = –.289, p = .037). Effect sizes greater than .2 were also found in initiative (rbrank = –.261) and planning and organization (rbrank = –.209).

In 6th PE, a significant improvement was found in the working memory dimension (rbrank = –.283, p = .027). Effect sizes greater than .2 were also observed in inhibition (rbrank = –.246), emotional control (rbrank = –.152), initiative (rbrank = –.211), planning and organization (rbrank = –.226), and in the total BRIEF score (rbrank = –.171).

These results suggest meaningful improvements in these dimensions of executive functions following the intervention. Specifically, initiative and working memory improved in 4th, 5th, and 6th grades, while planning improved in 5th and 6th. In many cases, the effect sizes fall within the correlation range of 0.1 to 0.2, which can be considered small effects.

The analysis for the second objective consisted of comparing the changes that occurred in the dimensions of executive functions during the educational intervention among students with different levels of academic performance. As previously noted, the three performance groups were created using tertiles as cut-off points. The dependent variable represents the change in executive function scores, calculated as the difference between the post-test and pretest scores in each of the BRIEF-2 dimensions within each of the three academic performance groups.

Table 4 shows the average differences in each of the three performance levels. The difference is calculated as post-test minus pretest, so positive values indicate better FF. EE. scores at the end of the intervention.

**Table 4**

*Descriptive Statistics of Differences in FF. EE. (Post-test – Pretest) by Performance Level (Tertiles) and Grade Level*

| | | 2º PE | | 4º PE | | 5º PE | | 6º PE | |
|---|---|---|---|---|---|---|---|---|---|
| **FF. EE** | **Performance** | **Mean** | **S.D.** | **Mean** | **S.D.** | **Mean** | **S.D.** | **Mean** | **S.D.** |
| Dif_Inhibition | Low | -0.211 | 0.291 | 0.087 | 0.752 | 0.260 | 0.722 | 0.050 | 0.418 |
| | Medium | -0.016 | 0.136 | 0.168 | 0.246 | 0.106 | 0.590 | 0.048 | 0.081 |
| | High | -0.032 | 0.192 | 0.046 | 0.247 | -0.052 | 0.433 | -0.114 | 0.301 |

| | | 2º PE | | 4º PE | | 5º PE | | 6º PE | |
|---|---|---|---|---|---|---|---|---|---|
| **FF. EE** | **Performance** | **Mean** | **S.D.** | **Mean** | **S.D.** | **Mean** | **S.D.** | **Mean** | **S.D.** |
| Dif_Self-Monitoring | Low | -0.644 | 0.659 | 0.142 | 0.881 | 0.188 | 1.133 | -0.188 | 0.590 |
| | Medium | -0.178 | 0.418 | -0.017 | 0.452 | 0.050 | 0.459 | -0.177 | 0.252 |
| | High | -0.115 | 0.412 | -0.053 | 0.737 | -0.600 | 0.702 | -0.267 | 0.422 |
| Dif_Flexibility | Low | -0.156 | 0.248 | 0.317 | 0.622 | 0.563 | 0.755 | 0.081 | 0.290 |
| | Medium | -0.008 | 0.185 | 0.016 | 0.405 | 0.423 | 0.537 | 0.039 | 0.247 |
| | High | -0.074 | 0.251 | 0.004 | 0.278 | -0.125 | 0.331 | -0.038 | 0.170 |
| Dif_ Emotional Control | Low | -0.330 | 0.414 | -0.019 | 0.867 | 0.063 | 0.654 | 0.038 | 0.340 |
| | Medium | -0.047 | 0.277 | 0.060 | 0.287 | 0.173 | 0.651 | 0.106 | 0.183 |
| | High | -0.079 | 0.331 | 0.021 | 0.344 | 0.029 | 0.329 | -0.092 | 0.320 |
| Dif_Initiative | Low | -0.188 | 0.369 | 0.677 | 0.839 | 0.750 | 0.622 | 0.090 | 0.492 |
| | Medium | -0.013 | 0.200 | 0.130 | 0.407 | 0.354 | 0.669 | 0.077 | 0.311 |
| | High | 0.052 | 0.181 | -0.013 | 0.517 | -0.200 | 0.570 | -0.139 | 0.384 |
| Dif_Working Memory | Low | -0.172 | 0.281 | 0.625 | 0.917 | 0.624 | 0.699 | 0.244 | 0.441 |
| | Medium | -0.023 | 0.184 | 0.141 | 0.503 | 0.337 | 0.504 | 0.000 | 0.357 |
| | High | 0.028 | 0.171 | -0.054 | 0.492 | -0.199 | 0.390 | -0.109 | 0.273 |
| Dif_Task Monitoring | Low | 0.055 | 0.381 | 0.587 | 0.767 | 0.715 | 0.775 | 0.483 | 0.668 |
| | Medium | 0.039 | 0.287 | 0.160 | 0.577 | 0.296 | 0.604 | 0.273 | 0.416 |
| | High | 0.056 | 0.225 | 0.244 | 0.632 | -0.096 | 0.547 | -0.183 | 0.376 |
| Dif_ Planning & Organization | Low | -0.273 | 0.251 | 0.468 | 0.845 | 0.615 | 0.712 | 0.194 | 0.522 |
| | Medium | -0.078 | 0.232 | 0.125 | 0.423 | 0.240 | 0.634 | 0.125 | 0.298 |
| | High | -0.051 | 0.236 | -0.012 | 0.515 | -0.316 | 0.472 | -0.212 | 0.348 |
| Dif_ Organization of materials | Low | -0.135 | 0.293 | 0.269 | 0.821 | 0.306 | 0.550 | 0.083 | 0.318 |
| | Medium | 0.021 | 0.365 | 0.151 | 0.445 | 0.205 | 0.320 | -0.026 | 0.191 |
| | High | 0.037 | 0.214 | -0.050 | 0.301 | -0.216 | 0.390 | -0.058 | 0.205 |
| Dif_Total BRIEF | Low | -0.211 | 0.229 | 0.315 | 0.623 | 0.437 | 0.558 | 0.124 | 0.342 |
| | Medium | -0.031 | 0.112 | 0.118 | 0.285 | 0.253 | 0.379 | 0.056 | 0.162 |
| | High | -0.022 | 0.145 | 0.004 | 0.295 | -0.153 | 0.316 | -0.111 | 0.232 |

In 2nd grade of Primary Education (2nd PE), there is a general trend of decline in FF. EE. among students in the low-performance group, with the most notable decreases observed in self-monitoring (M = –0.644, SD = 0.659) and emotional control (M = –0.330, SD = 0.414). In contrast, the medium- and high-performance groups show relatively stable scores between the pretest and post-test.

In 4th, 5th, and 6th PE, the overall trend is that students in the low-performance group show the greatest gains in executive functions, followed by the medium group, with the high-performance group showing the smallest gains or even declines. For instance, in 4th PE, the low-performance group demonstrates improvements greater than half a point in initiative (M = 0.677, SD = 0.839) and working memory (M = 0.625, SD = 0.917). The medium group shows smaller improvements in the same dimensions (M = 0.130, SD = 0.407 and M = 0.141, SD = 0.503, respectively), while the high-performance group exhibits virtually no change.

The following Table 5 presents the results of the between-group differences test (Kruskal-Wallis H), including the associated p-values and effect sizes ($\varepsilon^2$). The results show that the changes in executive functions during the educational intervention differ significantly among the performance groups ($p \leq .05$).

**Table 5**

*Comparisons of Changes in FF. EE. Between Performance Groups Using Kruskal-Wallis H Test and Effect Sizes*

| Grade | | Inhibition | Self-Monitoring | Flexibility | Emotional Control | Initiative | Working Memory | Task Monitoring | Planning & Organization | Organization of Materials | Total BRIEF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2º PE | *H* | 5.367 | 7.361 | 2.109 | 7.320 | 11.644 | 6.388 | .147 | 7.510 | 4.544 | 9.267 |
| | *Df* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | *P* | .068 | .025* | .348 | .026* | .003* | .041* | .929 | .023* | .103 | .010* |
| | $e^2$ | .093 | **.127** | .036 | **.126** | **.197** | **.110** | .003 | **.129** | .082 | **.161** |
| 4º PE | *H* | 2.426 | .491 | 6.680 | .691 | 11.456 | 13.444 | 3.499 | 5.672 | 9.692 | 9.746 |
| | *Df* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | *P* | .297 | .782 | .035* | .708 | .003* | .001* | .174 | .059 | .008* | .008* |
| | $e^2$ | .037 | .007 | **.103** | .011 | **.174** | **.207** | .054 | .087 | **.150** | **.149** |
| 5º PE | *H* | 1.658 | 7.680 | 11.187 | .971 | 12.414 | 13.673 | 7.790 | 12.817 | 1.274 | 11.651 |
| | *df* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | *P* | .436 | .021* | .004* | .615 | .002* | .001* | .020* | .002* | .006* | .003* |
| | $e^2$ | .040 | **.188** | **.273** | .024 | **.320** | **.334** | **.191** | **.313** | **.247** | **.284** |
| 6º PE | *H* | 8.124 | .093 | 3.751 | 6.153 | 4.158 | 6.556 | 13.960 | 1.119 | 3.690 | 7.898 |
| | *df* | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | *P* | .017* | .954 | .153 | .046* | .125 | .038* | .001* | .006* | .158 | .019* |
| | $e^2$ | **.148** | .002 | .068 | **.112** | .076 | **.119** | **.254** | **.184** | .068 | **.144** |

(*) Significant at $p \leq .05$

*Note*. Values of $\varepsilon^2$ in bold indicate notable effects according to the established criteria.

In 2nd PE, significant differences were observed in the dimensions of self-monitoring ($p = .025$, $\varepsilon^2 = .127$), emotional control ($p = .026$, $\varepsilon^2 = .126$), initiative ($p = .003$, $\varepsilon^2 = .197$), working memory ($p = .041$, $\varepsilon^2 = .110$), planning and organization ($p = .023$, $\varepsilon^2 = .129$), and in the total BRIEF score ($p = .010$, $\varepsilon^2 = .161$). Remember that in this grade, the differences are negative, meaning a lower level in the posttest.

In 4th PE, significant differences were found in the dimensions of flexibility ($p = .035$, $\varepsilon^2 = .103$), initiative ($p = .003$, $\varepsilon^2 = .174$), working memory ($p = .001$, $\varepsilon^2 = .207$), organization of materials ($p = .008$, $\varepsilon^2 = .150$), and in the total BRIEF score ($p = .008$, $\varepsilon^2 = .149$). In 5th PE, significant differences were observed in the dimensions of self-monitoring ($p = .021$, $\varepsilon^2 = .188$), flexibility ($p = .004$, $\varepsilon^2 = .273$), initiative ($p = .002$, $\varepsilon^2 = .320$), working memory ($p = .001$, $\varepsilon^2 = .334$), task monitoring ($p = .020$, $\varepsilon^2 = .191$), planning and organization ($p = .002$, $\varepsilon^2 = .313$), organization of materials ($p = .006$, $\varepsilon^2 = .247$), and in the total BRIEF score ($p = .003$, $\varepsilon^2 = .284$). Finally, in 6th PE, significant differences were found in the dimensions of inhibition ($p = .017$, $\varepsilon^2 = .148$), emotional control ($p = .046$, $\varepsilon^2 = .112$), working memory ($p = .038$, $\varepsilon^2 = .119$), task monitoring ($p = .001$, $\varepsilon^2 = .254$), planning and organization ($p = .006$, $\varepsilon^2 = .184$), and in the total BRIEF score ($p = .019$, $\varepsilon^2 = .144$). In these cases, the effect sizes ($\varepsilon^2$) indicate considerable differences, with values above .1 in all mentioned dimensions, and even higher in 5th PE, with values exceeding .2 and .3.

The post hoc comparisons between each pair of performance groups show that, in 4th PE, in flexibility, there are differences between the low and high groups ($W = –3.500$, $p = .036$), as well as in working memory ($W = –4.710$, $p = .002$), in organization of materials ($W = –3.370$, $p = .045$), and in the total BRIEF score ($W = –3.980$, $p = .013$). Finally, in initiative, significant differences were observed between the low and medium groups ($W = –3.510$, $p = .035$), between the low and high groups ($W = –4.160$, $p = .009$), and between the medium and high groups ($W = –3.820$, $p = .019$).

In 5th PE, differences were observed in self-monitoring between the medium and high groups ($W = –3.529$, $p = .034$). In contrast, for initiative, significant differences were found between the low and high groups ($W = –4.810$, $p = .002$), as well as in task monitoring ($W = –3.510$, $p = .035$) and planning ($W = –4.680$, $p = .003$).

In flexibility, significant differences were observed between the low and high groups ($W = –3.880$, $p = .017$) and between the medium and high groups ($W = –4.030$, $p = .012$), as well as in working memory ($W = –4.650$, $p = .003$ and $W = –3.870$, $p = .017$), in organization of materials ($W = –3.531$, $p = .034$ and $W = –4.011$, $p = .013$), and in the total BRIEF score ($W = –4.070$, $p = .011$ and $W = –3.880$, $p = .017$).

Finally, in 6th PE, significant differences were found in inhibition between the low and high groups ($W = –3.470$, $p = .038$), as well as in working memory ($W = –3.520$, $p = .034$) and in the total BRIEF score ($W = –3.850$, $p = .018$). In contrast, in emotional control, significant differences were observed between the medium and high groups ($W = –3.582$, $p = .030$).

In task monitoring, both the low vs high (W = –4.580, p = .003) and the medium vs high (W = –4.190, p = .009) groups showed significant differences. The same applies to planning and organization (W = –3.991, p = .013 and W = –3.533, p = .033).

In 4th, 5th, and 6th PE, consistent differences were found in the dimensions of working memory and task monitoring between low and high-performance groups. Additionally, in 4th and 5th PE, significant differences in the initiative dimension were observed between low and high groups. Regarding performance groups, it is noted that the low-performance group shows the greatest gains in FF. EE. compared to the medium and high groups.

Finally, to address the third objective, a structural equation model was estimated to examine the effects of FF. EE. on academic performance in the context of the Rubik model. This included three measurement models and one structural model. Two measurement models were used to define the pretest and post-test FF. EE. factors based on the nine dimensions (inhibition, self-monitoring, flexibility, emotional control, initiative, working memory, task monitoring, planning and organization, and organization of materials). The third measurement model includes grades in Science, Language, and Mathematics to build the academic performance factor.

The structural model evaluates the effect of FF. EE. on academic performance, controlling for pretest effects—specifically, the effect of pretest FF. EE. on post-test FF. EE. as a covariate, and the effect of post-test FF. EE. on academic performance. Figure 1 shows the structure of the structural equation model and the estimated factor loadings.

En la Tabla 6 se incluyen los índices de ajuste de la estimación DWLS.

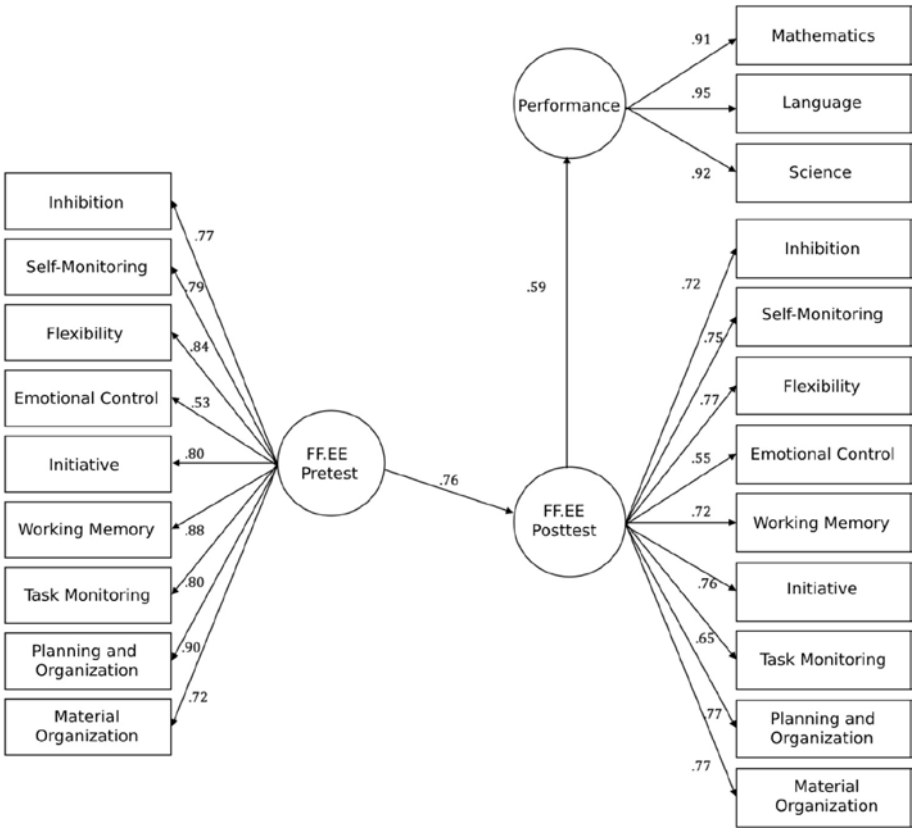
**Table 6**

*Fit Indices of the Structural Equation Model Relating Academic Performance and Executive Functions in Primary Education*

| | |
|---|---|
| ($X^2$) | 535 |
| gl | 187 |
| p-valor | <.001 |
| RMSEA | .082 |
| I.C. RMSEA | .074-.090 |
| p-valor RMSEA | <.001 |
| CFI | .977 |
| TLI | .974 |
| GFI | .993 |

**Figure 1**

*Path Diagram of the Structural Equation Model with Factor Loadings*




It can be observed that, although the chi-square statistic is significant, its normalized value ($X^2/df$) is below 3 ($X^2/df = 2.86$), indicating a good fit. The RMSEA was .082 with a 95% confidence interval between .074 and .090, and an associated p-value below .001, suggesting an acceptable model fit, although ideally a value below .06 would be expected for a good fit. The CFI and TLI indices were .977 and .974, respectively—both above .95, indicating good model fit. Finally, the GFI was .993, very close to 1, which also suggests a good fit. Therefore, the model shows an acceptable fit to the data (Kline, 2016).

The structural model shows that, once initial executive function levels are controlled for ($\beta = .760$, $p < .001$), the final executive function outcomes have a significant effect on academic performance outcomes ($\beta = .59$, $p < .001$)—that is, they contribute to explaining performance scores. An effect size of .59 corresponds to approximately 35% of the explained variance in academic performance. This is

a considerable effect size and suggests that improvements in executive functions after the intervention are associated with better academic achievement.

This finding supports previous research identifying executive functions as a key predictor of academic success (Blair & Raver, 2015; Jacob & Parkinson, 2015). The dimensions of working memory, planning, and monitoring (both self and task) emerged as the most influential on final grades.

Regarding reliability and convergent validity analyses, the Omega indices were above .9, confirming the high reliability of the measures, and the Average Variance Extracted (AVE) for each factor was greater than .5, indicating good convergent validity. Specifically, the measurement model explains 67.3% of the variance in pretest executive functions, 52.2% in post-test executive functions, and 86.1% in the academic performance factor.

Therefore, the results of the measurement model show that the selected dimensions are good indicators of the corresponding latent factors, and the structural model suggests that executive functions have a significant impact on academic performance. The high reliability and strong convergent validity of the factors reinforce the robustness of the model.

## DISCUSSION AND CONCLUSIONS

The results of the study show that the Rubik model is effective in improving certain aspects of executive functions (FF. EE.) in Primary Education students. The measurement of change in executive functions after the educational intervention reveals positive and significant improvements, especially in the upper primary grades (4th, 5th, and 6th). The functions of initiative and working memory improved in 4th, 5th, and 6th grades, and planning and organization improved in 5th and 6th grades. These results suggest that the pedagogical approach used in the classroom positively influences the development of these skills.

Similarly, in 2nd PE, no positive changes in executive functions were observed, indicating the need for further research on this point, as the impact in the earlier grades cannot be ruled out and may become evident from 4th grade onwards. The strengthening of executive functions—particularly initiative, planning, and working memory—supports the consolidation of learning that will serve throughout students' development, promoting autonomy and self-regulation processes that are valuable not only in the school context but across all areas of life.

The changes in executive functions among students with different performance levels were more positively pronounced in students in the lowest performance tertile compared to those in the other two groups. In other words, a significant improvement in FF. EE. was observed in the group of students with the lowest academic achievement. In 4th, 5th, and 6th grades of Primary Education, similarities

were identified in the dimensions of working memory and task monitoring, with significant differences between the high- and low-performance student groups. Additionally, in 4th and 5th grades, significant differences were observed in the initiative dimension between these groups.

Moreover, when analysing performance, students with low academic achievement showed the greatest improvements in executive functions compared to those with medium and high achievement. These results suggest that the Rubik model could be particularly beneficial for students with lower academic performance. Students facing academic challenges may benefit more from improvements in FF. EE., which in turn could enhance their long-term academic skills and highlight the potential of the Rubik model as a strategy for diversity and inclusion.

These findings are consistent with existing literature, which emphasizes the importance of executive functions in the school context—not only for cognitive self-regulation, but also as predictors of academic achievement (Diamond, 2013; Zelazo et al., 2016).

One of the most relevant findings is that, once initial levels of executive functions are controlled for, there is a significant relationship with academic performance, with a standardized regression coefficient of .59. This figure suggests that executive functions play an important role in determining school performance, explaining approximately 35% of the variance in academic outcomes.

This connection highlights the importance of executive functions as a key predictor of academic success. The magnitude of this relationship is not only statistically significant, but also educationally meaningful, as it indicates that the development of executive functions is associated with improved academic performance. These results are consistent with those reported by Blair & Raver (2015) and Jacob & Parkinson (2015).

It is important to note that this study did not include a comparison group, which is undoubtedly the main limitation of this work. Although the observed changes in executive functions are positive across four Primary Education grade levels and a large sample of students from various schools, all these schools belong to the Trilema network, which clearly limits the generalizability of the results to other educational contexts. Future studies would benefit from including a broader and more diverse sample of schools to validate the findings in different educational settings.

In summary, this study provides evidence of the effectiveness of the Rubik model of educational intervention focused on the development of executive functions. More specifically, it offers robust evidence supporting the efficacy of educational interventions focused on executive functions to enhance learning and reduce achievement gaps in real-world contexts. The results underscore the importance of implementing programs like this to promote students' holistic development in diverse and particularly complex educational environments (Vigo Aranzola, 2024).

Executive functions are an essential component of learning and academic performance in primary education and represent only one dimension of the Rubik model. Scientific evidence emphasizes the need to integrate the development of these skills into the school curriculum through innovative educational approaches that are tailored to the individual and contextual needs of students. In this sense, the Rubik model represents a strong alternative for achieving this goal and, from a didactic perspective, offers a meaningful opportunity to transform everyday pedagogical practices through a fair and equitable approach.

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# Sensitivity to the (educational) environment: self-management of high demand in university students and professionals

## *Sensibilidad al ambiente (educativo): autogestión de la alta demanda en estudiantes y profesionales universitarios*

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## ABSTRACT

Currently, the educational sector echoes the knowledge contributed by Psychology, understanding within the context of its social responsibility that it must facilitate the integral development of individuals by enhancing the acquisition of competencies in an environment that promotes physical, mental, and emotional well-being. It is well known that personality traits influence this well-being and the expression of individual potential. Scientific literature has evidenced that the personality trait characterized by high Sensory Processing Sensitivity (SPS), present in approximately 30% of the population, makes the so-called highly sensitive person much more sensitive to environmental influences. Thus, high SPS can lead to greater benefits from positive environments but also pose a risk for developing physical and mental health problems in unfavorable environments. Despite its social impact, few studies have been conducted on these individuals in the university context, especially among professionals. In response to this need, this study aims to: 1) analyze, based on the perceptions of university students and professionals, with and without the high SPS trait, the difficulties and strengths present in daily management when facing highly demanding situations, and 2) comparatively analyze the differential aspects exhibited by highly sensitive individuals. A qualitative methodology was followed, using focus groups as the source of information, in which 10 students and 17 professionals participated. Content analysis reveals five common themes (trait visibility, health, personality, strategies, and difficulties). All groups display strengths but also difficulties in daily coping, with particularities among the highly sensitive group. The results are discussed, including a training proposal focused on SPS, but applicable and beneficial for the entire university community..


**Keywords:** sensory processing sensitivity, university students and professionals, daily coping, well-being, university training program, higher education


## RESUMEN

Actualmente el sector educativo se hace eco del conocimiento aportado por la Psicología, pues comprende en el contexto de su responsabilidad social, que debe facilitar el desarrollo integral de las personas, potenciando la adquisición de competencias en un ambiente que promueva el bienestar físico, mental y emocional. Es bien sabido que características de personalidad influyen en dicho bienestar y en la expresión de la máxima potencialidad individual. La literatura científica ha evidenciado que el rasgo de personalidad caracterizado por una alta Sensibilidad del Procesamiento Sensorial (SPS), presente en aproximadamente el 30% de la población, hace a la denominada persona altamente sensible, mucho más sensible a las influencias del ambiente. De este modo, una alta SPS puede conducir a un mayor beneficio de ambientes positivos, pero ser también factor de riesgo para desarrollar problemas de salud física y mental en ambientes desfavorables. Pese a su impacto social, escasos estudios se han llevado a cabo sobre estas personas en el contexto universitario, y en especial, sobre profesionales. En respuesta a esta necesidad, este estudio pretende: 1) a partir de las percepciones de estudiantes y profesionales universitarios, con y

sin rasgo de alta SPS, analizar las dificultades y fortalezas presentes en la gestión diaria al enfrentarse a situaciones altamente demandantes y, 2) analizar comparativamente los aspectos diferenciales que muestran las personas altamente sensibles. Se siguió una metodología cualitativa con focus groups como fuente de información, en los que participaron 10 estudiantes y 17 profesionales. El análisis de contenido evidencia cinco temas comunes (visibilidad del rasgo, salud, personalidad, estrategias y dificultades). Todos los grupos muestran fortalezas, pero también dificultades en el afrontamiento diario, con particularidades en el colectivo altamente sensible. Se discuten los resultados incluyendo una propuesta formativa con foco en la SPS, pero de aplicación y beneficio para toda la comunidad universitaria.

**Palabras clave:** sensibilidad del procesamiento sensorial, estudiantes y profesores universitarios, afrontamiento diario, bienestar, programa formativo universitario, educación superior

## INTRODUCTION

Environmental sensitivity is a skill found in most organisms to record, process, and respond to external factors (Pluess & Boniwell, 2015). Individuals differ in this sensitivity, with some being much more sensitive to environmental influences than others (Lionetti et al., 2018). The term 'environment' should be understood in a broad sense:

> Any salient conditioned or unconditioned internal or external stimuli, including physical environments (e.g. food, caffeine intake), social environments (e.g. childhood experiences, other people's moods, crowds), sensory environments (e.g. auditory, visual, tactile, olfactory), and internal events (e.g. thoughts, feelings, bodily sensations such as hunger, pain) (Greven et al., 2019, p. 289).

It has been found that approximately 20-35% of the population possesses increased environmental sensitivity (Aron & Aron, 1997; Lionetti et al., 2018) termed High Sensitivity or Sensory Processing Sensitivity (SPS), which is described as a personality trait with a genetic basis and environmental modulation (Greven et al., 2019). SPS, Differential Susceptibility, and Biological Sensitivity to Context constitute the three theories under the framework of Environmental Sensitivity. All of them describe individual differences in sensitivity to positive and negative environments (Greven et al., 2019). In particular, SPS encompasses a phenotypic trait characterised by deeper information processing, greater emotional reactivity and empathy, greater awareness of environmental subtleties and a greater facility for overstimulation (Aron et al., 2012).

Studies in adults and children link high SPS with clinical aspects such as anxiety, depression, stress, and physical symptoms (Bakker & Moulding, 2012). Conversely,

highly sensitive persons (HSPs) are also more sensitive (even advantageously) to positive environmental experiences. Pluess y Boniwell (2015) explored this 'vantage sensitivity' in response to a school-based depression prevention intervention. Only those who scored high in SPS saw a reduction. Kibe et al. (2020), in a resilience education programme for secondary school students, showed that highly sensitive students had lower well-being but responded better to the intervention, with greater reductions in depression and improvements in self-esteem.

Numerous studies reveal that the family environment, early experiences, or the social and educational environment are key to how highly sensitive individuals can develop, as well as their health and social competencies in adulthood (Greven et al., 2019). Nevertheless, many people become aware of their trait after years of academic and relational difficulties or health problems. In the context of education, studies such as Pluess y Boniwell (2015) o Kibe et al. (2020) show how highly sensitive individuals can benefit from appropriate educational environments, where the atmosphere is emotionally positive and the incorporation of diversity is effective and suited to their needs.

## Highly sensitive people in university environments

The university environment can be highly demanding for students on cognitive, emotional, and social levels, often leading to elevated stress and anxiety levels (Amanvermez et al., 2023). Young adults entering university deal not only with the developmental changes typical of their age but also with stressors such as moving to a new city, changing peer groups, and/or academic pressures (Dyson & Renk, 2006). Although these factors could have a greater impact on highly sensitive students, few studies have investigated this. In a recent work, Mac et al. (2024) reviewed the impact of SPS on mental health in university students, showing that higher SPS levels were associated with greater communication apprehension and perceived university stress (most notably academic stress) (Gearhart & Bodie, 2012) and lower attention control and higher negative mood states (Amemiya et al., 2020). May y Pitman (2023) examined differences in university adaptation between students with high and low SPS. Highly sensitive students showed poorer adaptation, possibly due to a propensity towards negative affectivity. However, "the ability of high SPS individuals to carefully and deeply process stimulation served to partially offset adjustment difficulties" (May & Pitman, 2023, p. 7938). Interestingly, effective coping strategies employed by university students seem to depend on the level of SPS (Yano, Endo, et al., 2021). Thus, highly sensitive students with better mental health tend to use strategies such as positive thinking, emotional expression and regulation, and seeking emotional support from others. Conversely, highly sensitive students with poorer mental

health tend to use coping strategies such as temporary avoidance, resistance, cause analysis, and information gathering. Life skills, such as emotional coping, negatively correlate with depressive tendencies in highly sensitive students (Yano, Kase, et al., 2021). Cater (2017) , in a mixed-methods study, examined the self-awareness and knowledge of the SPS trait among highly sensitive students, who perceived it as useful for managing their lives and studies. Saglietti et al. (2024) qualitatively explored academic socialisation in highly sensitive university students. While most were satisfied with their academic achievements and rated their relationships with peers and professors positively, they also reported difficulties in relationships and anxious behaviours in various socio-academic and technological aspects.

Thus, some authors highlight the importance of developing support methods for highly sensitive students and the need for studies exploring SPS in university students (Mac et al., 2024).

Another fundamental part of the university community is the professionals. Although the roles of academic and non-academic professionals are different (typically teaching/management/research and administration/services, respectively), for both groups the university environment can entail considerable demands on cognitive resources, emotional regulation and stress management, as well as interpersonal relationships, among others. Additionally, during the COVID-19 pandemic, the prevalence of anxiety, depression, and stress among academic professionals increased (Silva et al., 2021) as they had to adapt quickly and flexibly to the needs of different teaching methods without sufficient support and emotional backing. Even after returning to pre-pandemic conditions, the impact on mental health persists, establishing a multifactorial origin in the prevalence of burnout among university faculty (Cao et al., 2024). These findings have driven the use of resources such as 'mindfulness' to reduce anxiety and stress levels among university professionals (Gherardi-Donato et al., 2023). Among the stressors, work-life conflicts are also prominent, being higher among academic professionals compared to non-academic professionals, especially post-pandemic (Garraio et al., 2022).

On the other hand, a recent review (Harrold et al., 2024) evidenced that all jobs in the education sector related SPS to higher stress levels. Additionally, it has been associated with poorer professional quality of life, especially burnout and compassion fatigue, in work environments such as education and administration/management (Chacón et al., 2023; Pérez-Chacón et al., 2021). However, as far as we know, there is no additional research that delves into the aspects of SPS in the university professional context.

Thus, based on the outlined framework, and with the aim of providing a clearer direction for our research, we propose the following hypotheses:

1. Given that university students and professionals are commonly at different stages of development and are subjected to different levels and types of life responsibilities, we hypothesise that these groups will exhibit different aspects in the self-management of high demands, possibly with more pronounced differences among highly sensitive groups.
2. Given the high demands of the university environment and framed within the Environmental Sensitivity Theory, we hypothesise that the university context will manifest as an unfavourable or risky environment for the mental health of its members, with a greater impact on the highly sensitive group..

This study is part of a broader research project, which included nearly 10,000 participants, on the trait of high sensitivity and its relationship with psychological and contextual variables in the Spanish population[1]. However, the present work follows a qualitative approach focused on the university community with the following *objectives*:

1. To analyse, through an integrative analytical approach that includes students and professionals, with and without the trait of high sensitivity, the difficulties and strengths present in day-to-day management when facing highly demanding situations.
2. To investigate in depth the differential aspects exhibited by highly sensitive individuals.

## METHOD

### Design

The research follows the methodological paradigm of a comprehensive descriptive qualitative study. Focus group interviews were used as the source of information collection, according to the methodology described by Krueger et al. (2001) y Patton y Cochran (2002). This methodology was the most suitable for addressing our objectives, as few studies have provided knowledge about SPS from a qualitative perspective, and specifically, *focus groups* allow us to delve deeper into how people think, feel, or behave in the university context through open but focused topics.

*Focus groups* were conducted separately with: i) students with the trait of high sensitivity (S-HSP); ii) students without the trait of high sensitivity (S-Non-HSP); iii) professionals with the trait of high sensitivity (PR-HSP); and iv) professionals without

1 "Study of the Trait of High Sensitivity and its Relationship with Psychological and Contextual Variables in Adults and Young Adults in Spain" (CIPI21300645, PI: María de la Luz Morales Botello). This project involved 9447 participants residing in Spain.

the trait of high sensitivity (PR-Non-HSP). Numerical parity was sought between participants with and without high sensitivity trait across both groups (students and professionals). The latter group comprised both academic professionals (AP) and non-academic professionals (non-AP). Due to unequal representation across these groups, all professional participants were analysed together under the 'professionals' category (PR).

## Participants

Participants included students from various university degrees, and academic and non-academic professionals from a Spanish university. Selection was carried out through non-probabilistic convenience sampling. A total of 27 participants were recruited: 10 students aged between 18 and 29 years (HSP: 2 men and 3 women; Non-HSP: 4 men and 1 woman) and 17 professionals aged between 36 and 53 years (HSP: 3 men and 6 women; Non-HSP: 4 men and 4 women). Among the HSP professionals, 7 were academic professionals (2 men and 5 women) and 2 were non-academic professionals (1 man and 1 woman), and among the Non-HSP professionals, 7 were academic professionals (4 men and 3 women) and 1 was non-academic professional (woman).

## Procedure

Participant recruitment was initially conducted by contacting all students and professionals at the study university who had previously completed questionnaires for the broader research project and had expressed interest in focus group participation. To enhance recruitment, direct invitations were subsequently issued to workers and students through multiple channels (emails and in-person encounters). Following confirmation of participation, individuals completed the HSPS-S questionnaire to determine appropriate focus group allocation.

Prior to each focus group, participants were provided with an information sheet and required to sign an informed consent form. The focus groups had one or two moderators, were audio-recorded, lasted approximately 60 minutes, and were conducted in classrooms with environmental conditions that ensured the comfort of all participants. To preserve anonymity, each participant was assigned a numerical identifier for use before each intervention. The dates of the focus groups were scheduled according to the availability of participants and moderators. After each focus group, participants were given gifts in gratitude for their involvement in the research.

This study received ethical approval from the Ethics Committee of the institution where it was conducted.

## Instruments

- *Sensory Processing Sensitivity:* it was assessed using the HSPS-S (Chacón et al., 2021), a Spanish adaptation and validation of the original "Highly Sensitive Person Scale" (Aron & Aron, 1997), which showed good internal consistency (α de Cronbach = 0.92). It is a 27-item instrument, each measured on a Likert scale with 1 = strongly disagree and 7 = strongly agree. Participants with an HSPS-S score at the percentile P ≥ 67 were considered HSP (Chacón et al., 2021, p. 1046).
- *Topic guide for focus group:* it was developed ad hoc by the research team and structured around three themes (regulation of response to stimuli, coping with high-demand situations, and strategies used to improve academic/work performance). The discussions began by addressing the participants' level of knowledge about the trait and its implications for daily functioning. They were given the freedom to express themselves, and if any participant had not contributed to a topic, they were carefully and explicitly asked.

## Data analysis

A literal transcription of the recordings from the five *focus groups* was carried out, from which a content analysis was performed using Nvivo 12 software (QSR International Pty Ltd., 2018). A classic deductive procedure was followed using triangulation with three researchers. After several successive readings of the transcribed material, the researchers independently coded units of meaning, extracted categories, and subsequently grouped them into themes until content saturation was reached. Four meetings were held where information was shared, and initial discrepancies in the naming of final categories and dimensions were discussed until consensus was reached. Table 1A (Annex) shows examples of the coding of evidence into categories based on the analysis of units of meaning.

The content analysis enabled the extraction of frequencies for each dimension and category, both overall and stratified by group (S-HSP, PR-HSP, S-Non-HSP, PR-Non-HSP), as well as textual passages that exemplified each thematic category.

## RESULTS

### Perception of students and professionals with and without the High Sensitivity trait

The qualitative analysis yielded 11 categories of information, which were grouped into five dimensions: visibility, personality/self-concept, health, difficulties, and strategies (Table 1).

**Table 1**
*Dimensions, definitions and categories resulting from the focus groups*

| Dimension | Definition | Categories |
|---|---|---|
| Visibility | The extent to which the trait can be seen and recognized. This dimension includes appreciation for creating spaces to raise awareness and conduct research on the trait. | |
| Personality/Self-concept | A relatively stable organization of structural and functional characteristics that make up personality. | Behaviours<br>Thoughts<br>Emotions and Feelings<br>HSP Trait |
| Health | A complete state of physical, mental, and social well-being, not merely the absence of disease or infirmity (WHO). Manifested through symptoms such as sleep disturbances, headaches, etc. | Diagnoses<br>Symptoms |
| Strategies | Ways of reacting or behaving in difficult, stressful or painful situations. In this context, when faced with very demanding situations that generate stress or in order to be more effective at work or at school. | Coping<br>Avoidance and Escape |
| Difficulties | Situations, circumstances, or obstacles that are difficult to overcome. In this case, due to the presence of stressors (external or internal), labels/diagnoses (accurate or not), and lack of support (including familial, professional, informational, and personal resources). | Stressors<br>Lack of support<br>Labels |

The categories within each dimension are described below, with supporting evidence provided by participants. These are coded as follows: i) students with the trait of high sensitivity (S-HSP); ii) students without the trait of high sensitivity (S-Non-HSP); iii) professionals with the trait of high sensitivity (PR-HSP); and iv) professionals without the trait of high sensitivity (PR-Non-HSP). After the previous codes an identification number is added.

**Figure 1**
*Coded evidences by category for student groups*

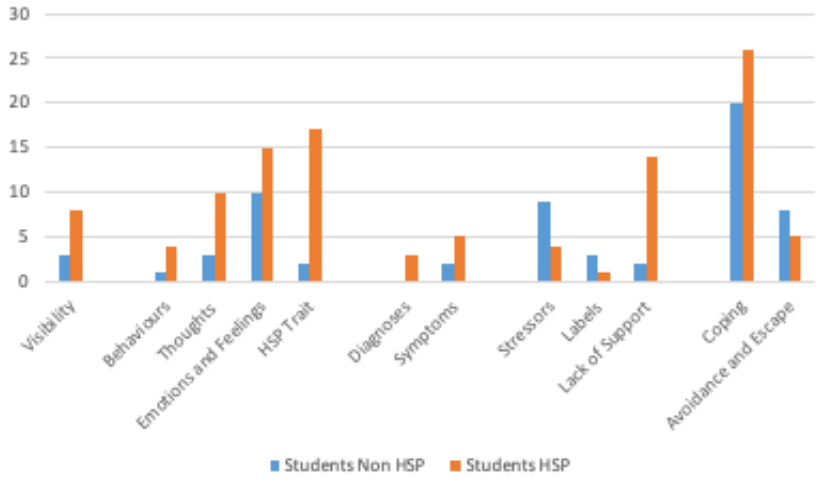
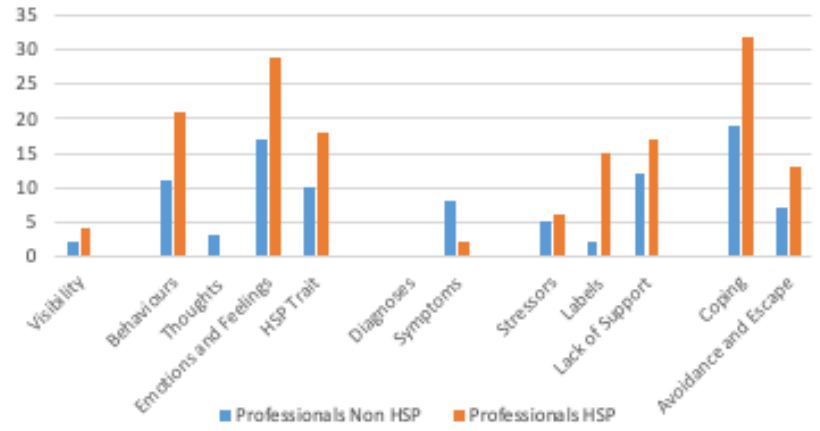



**Figure 2**
*Coded evidences by category for professional groups*




### *Visibility of high sensitivity trait*

This dimension includes evidence highlighting the need to raise awareness of this trait in society to promote the acceptance of diversity: “I wanted to help

people discover it earlier, before they reached my age" [S-HSP-4]. According to participants, the trait holds potential when it is understood. In response to whether they experience it as something positive or negative, one participant shared: "I think if I weighed it on a scale, and if I had had better tools earlier on, it would have been quite positive" [S-HSP-6]. Knowledge of the trait appears to facilitate greater self-acceptance and reduce discomfort or difficulties associated with it. One participant emphasized the importance of discussing the trait with their children, noting that understanding that others may feel the same way can be helpful: "It calms them down, and little by little they begin to find tools and accept it" [PR-HSP-8]. Participants also expressed appreciation for the creation of spaces where they can speak openly about the trait and connect with others who share similar challenges and strengths:

> Just as learning about it helped me to accept and work through many things, it might help others too. I find it remarkable—it's surprising to have been here for 15 years and that this hasn't been discussed until now. I think it's great" [PR-HSP-5].

### *Personality/Self-concept*

This dimension includes evidence related to the participant's personality. There are four categories of behaviors, thoughts, emotions and feelings, and trait of High Sensibility.

*Behaviors*. Participants refer to behaviors they perform when they are under too much stress or too many stimuli: "I'm protesting all day long" [PR-Non-HSP-4], or "I tried to enter the teachers' room, there was noise, a student coming out, another person talking, another one telling a joke... and there was a moment when I said to myself - get out of here" [PR-Non-HSP-5]. They also mention actions in relation to their children: a participant talking about his way of managing the trait in his son said "at first you try to make him the typical tough guy, that he is not a softie. And all you do is put him in front of something that he is not... teaching your children (how to manage the trait) is very complicated" [PR-PAS-8]. Students with the trait name coping behaviors: "I study here at the university, alone, being in an environment where I see other people studying motivates me to study" [S-HSP-3].

*Thoughts*. This category includes the ideas people have about themselves and others. Most of the evidence includes self-labels or value judgements about one's own personality, regardless of whether one has the trait: "I have a very creative mind. Too creative. I would spend hours and hours looking at the same spot without doing anything, imagining anything" [S-Non-HSP-3] or "I think I'm the weird one" [S-Non-HSP-3] or "I become dependent, and I need someone to sit with me (talking about getting down to study)" [E-HSP-4]. Psychological diagnostic terms are used

as a label: "Because of my anxiety, I am sad-anxious... very explosive" [S-HSP-3]. Judgement also appears: "At my age I'm a bit old for bullshit. No disrespect to anyone, but just enough nonsense" [PR-Non-HSP-4].

*Emotions and feelings*. This is one of the most numerous categories. All the groups mention difficulties in emotional regulation: "I feel unhappy, there are many things to manage, and it is a feeling that I don't like, I feel stressed, anxious and I don't rest. It is a bit unpleasant" [S-HSP-1]. Also, the importance of the context and the family environment in the management of emotions: "Since I was a child, I have been very emotional, I think it is due to the environment in which you grow up. My mother always expressed her emotions a lot. My father, well, from time to time he would explode with joy or sadness" [S-Non-HSP-2].

*High Sensitivity trait*. The evidence shows the different aspects that define the trait of high sensitivity. Some students had difficulty maintaining eye contact during the focus group. Depth of thought is evidenced at different times: "The truth is that things affect me more because I think about them a lot" [PR-HSP-9] or "I manage to have a very cool mind, when people get stuck and don't know what to do, I work faster, I analyze the situation very well and solve problems very calmly" [S-HSP-4]. Emotional breadth and intensity are illustrated by all participants with high sensitivity:

> My personal relationships have been complicated because of the number of feelings, because you feel so high and so low that it is difficult for the other person to be with someone who is from here to here (making an up-down gesture) [S-HSP-4].
> I feel everything intensively, when I have certain reactions people around me don't understand why I feel that way and they make me feel that I exaggerate [S-HSP-3].

The perception of the fine details of the environment: "I notice quite small things that for people go unnoticed" [S-HSP-1] or talking about a child with the trait: "He smells what nobody else smells and vomits because he can't stand it" [PR-Non-HSP-2]. Taste for aesthetics and creativity: "I play the piano, the cello, I like theatre, cinema" [PR-HSP-3]. Overstimulation and overload:

> I live quite overwhelmed, and I need to go for a walk on solitude and connect with nature. It's the way I feel better again, but if I have the same level of life as my peers, I feel that I become bitter, that I can't cope with everything [S-HSP-1].

## Health

This dimension comprises two categories: symptoms and diagnoses.

*Symptoms*. This category includes evidence of alterations in the organism that generate discomfort or discomfort: "I have not been able to meditate as much as I would like to and manage all the stress that is generated throughout the day, I have

somatised it into headaches" [S-HSP-6] or "I always have headaches. It causes me anxiety, shortness of breath, discomfort" [PR-Non-HSP-6].

*Diagnoses*. This includes evidence where the person reports having been diagnosed by a professional, e.g. "I am diagnosed with anxiety" [S-HSP-3].

### *Strategies*

This dimension, together with personality/self-concept, is the one that gathers the most evidence. It includes two categories: coping and avoidance.

*Coping*. We consider a coping strategy when the person has a regular and sustained pattern of behaviour that allows responding to difficult, stressful and painful situations. The HSP groups provide more evidence under this category (Figures 1 and 2). Participants use resources such as prioritising tasks, writing, meditation, physical exercise, nature or finding spaces of intimacy and solitude: "I have a writing technique, I have learned to carry something to write down... and unload my head a little" [S-HSP-6], or "I need to walk in solitude and connect with nature" [S-HSP-1].

*Avoidance*. On other occasions, the person uses an escape behaviour to avoid the situation that generates discomfort, in some cases, resorting to food, "I eat a lot when I am stressed" [S-HSP-5] or keeping silent, "I prefer to swallow it... and the moment will pass" [S-Non-HSP-2].

### *Difficulties*

This dimension includes three categories related to circumstances or situations that are difficult to overcome: stressors, lack of support and labels.

*Stressors*. Sometimes, difficulties arise from stressors mainly related to studies (students) or to work and family situation (professionals): "All the children sick, communions, parties, work... so many things pile up on me" [PR-Non-HSP-2] or "The simple fact of getting up on the stage (referring to a classroom presentation)" [S-Non-HSP-4].

*Lack of support*. This category refers to the lack of support from family and professionals, lack of adequate and accurate information, and lack of internal resources to cope with difficult situations. Professionals who have children with the trait mention the difficulty in finding quality information and specialised professionals: "I have visited so many psychologists with my children" [PR-Non-HSP-2]. It is noteworthy in this case that people with the trait of high sensitivity show learning in their search for external resources as well as in their own:

> Over time you get older, you mature, and you learn to manage yourself a bit better... Then also, knowing that I have the HSP trait, I have already managed to say –okay, this is something of mine–, try to put it aside and move on. I've learnt to manage it, but it's true that I still find a lot of things difficult [S-HSP-4].

*Label*. This category includes those self-diagnoses without a professional assessment or those definitions that the person gives him/herself and that condition his/her behaviour: "I have had episodes of depression because bad things affect you more" [S-HSP-6] or "I don't know how to distinguish between the thousand things I have, I don't know which one is this one, I think I am strange in many aspects and this is one of them" [PR-HSP-3].

### Comparative HSP - Non HSP

The number of overall evidence coded was higher for HSP participants (269) compared to Non-HSP participants (159). This was true for both students (112 vs. 63) and professionals (157 vs. 96). In particular, the HSP groups provided more evidence for all categories except for stressors, labels and diagnoses, avoidance and escape in the case of students, and symptoms and thoughts in the case of professionals.

HSP students provided more evidence in the categories of traits, lack of support, thoughts, coping, emotions and feelings (Figure 1) and HSP professionals in labels, coping, emotions and feelings and behaviours (Figure 2).

## DISCUSSION AND CONCLUSIONS

Although more than 600 studies on Sensory Processing Sensitivity have been published since its conceptualization (Aron & Aron, 1997), research in the university context remains limited and has predominantly focused on students (Cater, 2017; Gearhart & Bodie, 2012; May & Pitman, 2023; Saglietti et al., 2024; Yano, Kase, et al., 2021), with scarce attention given to academic and non-academic professionals. The present study aims to address this gap in the university scientific corpus through a qualitative investigation exploring the trait of high sensitivity in university groups (students and professionals), both with and without the trait.

Five common themes emerged from the focus group analysis: visibility of high sensitivity, health, personality/self-concept, strategies, and difficulties. Among these, *coping strategies* was the category that gathered the most evidence across all groups, followed by *emotions and feelings*. This could be explained by the thematic focus of the groups and the relationship between coping strategies and emotions (Valdivieso-León et al., 2020). While this study focuses on students, this result was

evidenced for our study across all groups (university students and professionals, HSP and Non-HSP). Additionally, all groups mentioned stress, regardless of its origin, and employed coping strategies. On the other hand, the use of "labels" was particularly prominent in the group of highly sensitive professionals (PR-HSP), with notable differences compared to other groups. Meanwhile, lack of support was frequently referenced by both highly sensitive and non-highly sensitive professionals, as well as by highly sensitive students.

One of the more points out themes was the visibility of the SPS trait. Evidence from HSP participants suggests that awareness of the trait appears to mediate greater acceptance of it and a decrease in the discomfort or difficulties it may entail. Evidence from HSP participants suggests that awareness of the trait appears to mediate greater acceptance of it and a decrease in the discomfort or difficulties it may entail. Students emphasized helping others to also know about the trait and research it, framing their interventions with a positive perspective of personal growth and contribution to society. Professionals emphasized self-management and acceptance of their characteristics for greater well-being. Overall, both groups pointed to the importance of the visibility of the trait. This is consistent with previous research such as that by Bas et al. (2021), who, through qualitative research with adults, showed that 50% of participants reported an improvement in their well-being after learning they were highly sensitive. Similarly, Cater (2017) demonstrated how students (aged 18 to 53) valued the knowledge of the SPS trait as an empowering element in managing their lives and studies. A different perspective is offered by Saglietti et al. (2024), in their qualitative study with university students, who describe and suggest that teachers should be more aware of SPS as a favorable condition. Our students did not specifically mention the visibility of SPS among teachers, but rather in general, perhaps because they were implicitly referring to this issue or due to different approaches between the two studies. Lindsay (2017) ), in a qualitative study with highly sensitive teachers, found that participation in interviews and workshops on SPS contributed to an immediate and heightened self-awareness, which provided greater clarity regarding their classroom experiences, accompanied by a shift in cognitive appraisal. In comparison, our academic participants focused more on the importance of the visibility of high sensitivity towards its impact on their well-being, perhaps due to increased work pressures and work-life balance challenges faced by university faculty. Thus, our study provides a comprehensive view of two groups (students and professionals) with and without high sensitivity in the university context.

## Differential Aspects in Highly Sensitive University Students and Professionals

Highly sensitive university students and professionals contributed more evidence than their counterparts without high SPS. This result is consistent with the

characteristics of high sensitivity, such as deeper processing of stimuli, including greater reflection on lived experiences (Aron et al., 2012). Thus, compared to the Non-HSP groups, highly sensitive university students stood out with a greater amount of evidence in the categories *Traits*, *Lack of Support*, *Thoughts*, *Coping*, and *Emotions and Feelings*; the latter two categories, along with *Labels* and *Behaviors*, were the most prominent among highly sensitive professionals. This suggests that lack of self-awareness and support, as well as excessive thoughts, could contribute to the establishment of negative labels and behaviors in adulthood, although this should be interpreted with caution given our experimental conditions. Although, numerous studies such as that by Karaca Dinç et al. (2021) have evidenced the impact of early experiences on physical/mental health in adulthood.

In the aforementioned categories, the analyses also revealed interesting differences between HSP students and professionals. These professionals differed from Non-HSP professionals similarly across all categories, whereas students differed more in *Trait* and *Lack of Support*. This difference could be explained by age differences themselves or by the different impact of SPS with age (Licht et al., 2020). Nevertheless, it is an important result in the university context, as it reflects a clear need among highly sensitive students. On the other hand, both students and professionals provided more evidence in *Coping Strategies*, but also in *Difficulties*. This result is consistent with the quantitative study by May y Pitman (2023), which indicated that the characteristics of HSP students allowed them to partially compensate for difficulties in university adaptation. Additionally, preliminary quantitative results from ongoing research lend robustness to our qualitative findings. Specifically, higher SPS levels are associated with greater coping strategies but also with poorer overall health.

Among the aspects that most differentiate highly sensitive students from non-highly sensitive students are the barriers they encounter before undertaking tasks such as studying, sometimes feeling dependent on others to overcome them, and rumination on various issues, which leads to greater mental and emotional burden. These aspects could be indicators of poor mental health, as described by Yano, Endo, et al. (2021) in their study on effective coping strategies employed by students with different levels of SPS (low, medium, and high). This highlights the importance of providing support to students to improve their coping strategies. From a positive perspective, they exhibit greater self-awareness and reflection on themselves, although they do not always find resources for positive self-management. They express a wide variety of coping strategies, including rationalization of experiences, writing, anticipation, physical exercise, learning and acceptance, planning, and order. They also refer to aesthetics as a source of calm and well-being.

Finally, a commonly employed resource is the avoidance of stimuli or isolation as a way out of overload. This may be considered an inappropriate strategy for the

general population, but for highly sensitive individuals, it can sometimes be a useful resource to reduce the overstimulation that the environment can lead to. Regarding their emotions and feelings, they often feel different from others, experience emotional contrasts, intense feelings, moments of clarity, and intense appreciation and enjoyment of subtleties in their environment (such as perceiving small positive changes in others' behaviors). They also struggle to manage their emotions. Empathy, which is seen positively as facilitating interpersonal relationships, but also negatively, because they are frequently demanded and consequently, becoming drain for others' emotions. Some of these findings are similar to qualitative studies in the general adult population (Bas et al., 2021) and in university students (Saglietti et al., 2024). Fundamentally, those related to aspects typically attributed to high sensitivity. However, there are specific aspects such as anxiety due to technological reasons highlighted in the latter study, which was not mentioned per se by our students, possibly because Saglietti et al. (2024) focused more on this aspect, or due to the different profiles of students and their technological experiences in the academic context. In parallel, the aspects that most differentiate highly sensitive professionals are the greater presence of self-imposed labels, which condition their behavior and personal growth. They also stand out for the variety of coping strategies they use, like those employed by students, although with a greater emphasis on seeking knowledge and personal development, as well as using therapies to facilitate this. In this regard, Bas et al. (2021) showed that HSPs (aged 18 to 50) used strategies to improve their well-being such as reducing sensory stimulation, sharing experiences with others, or modulating their mental state to promote positive thoughts and reduce negative ones. In comparison to this study, our research provides a more in-depth analysis of the strategies employed, while specifically contextualizing them within the university context and differentiating between distinct participant groups. In terms of emotions and feelings in HSP professionals versus non-HSP, the formers highlight emotional saturation and overload, difficulty in social relationships (romantic or friendships), empathy with its positive and negative implications, and difficulty in team management, despite having the skill for it, due to a mix of sensations and feelings. Conversely, they also show greater appreciation and enjoyment of subtleties in the environment such as art, nature, or people, as well as a desire to learn more about SPS. While they describe general aspects of high sensitivity, others such as the difficulty in managing teams emerge from the university professional context.

Thus, our findings show that the highly sensitive university community, in addition to exhibiting characteristics typical of high sensitivity (Aron et al., 2012), also manifest negative outcomes commonly associated with the trait in unfavorable environments (Greven et al., 2019). This highlights the need for institutional actions that impact the well-being of these individuals, and in line with what Gil-Galván

et al. (2021) suggested in the context of university students, an enhancement of educational models focused on intellectual, personal, and emotional development.

## Theoretical and practical implications

From a theoretical perspective, this article contributes to enhancing the knowledge of the theoretical framework of Environmental Sensitivity in the university context, as few studies have explored SPS in this setting (Bas et al., 2021; Saglietti et al., 2024). Moreover, this study is the first to incorporate a qualitative methodological approach that includes an analysis of the perceptions of both students and professionals. Our results suggest that the university context may be a risk factor, especially for highly sensitive individuals, thus highlighting the need for further research in this field. The coherence between our qualitative and quantitative results strengthens the scientific and practical value of employing qualitative studies to explore specific aspects of high sensitivity in greater depth.

Another theoretical implication of our results, supported by quantitative findings, is that under the paradigm of high-demand self-management analysis, high sensitive individuals exhibit behaviours consistent with the theoretical model of differential susceptibility (Greven et al., 2019), with a greater positive response (coping) as well as a negative one (health impact).

This work also entails numerous practical implications. First, based on our findings and previous literature, we propose a training program aimed at the entire university community, which includes: i) Scientific information about the trait, its impact on health, and self-identification of the HSP group; ii) Awareness of individual differences and affective and inclusive environments; iii) Enhancement of life skills within the framework of the World Health Organization's proposal (emotional, social, and cognitive skills), tailored to the needs identified in each group.

Institutional actions in this direction also align with relevant areas in higher education, such as sensitive pedagogy, inclusive education and affective classroom, emotional intelligence, or the impact of personality in the educational context (Santos Álvarez & Garrido Samaniego, 2015). Furthermore, universities should facilitate improvements in the university environment in a broad sense, enabling the full development of all individuals, within their social university responsibility (Ali et al., 2021).

In line with the practical implications of our study, it is worth mentioning that there are strategies and interventions that have proven effective in other contexts and could be adapted to the university environment. In this regard, some reference studies demonstrate the suitability of incorporating specific programs into the educational setting to increase self-awareness, regulate stress and anxiety, and provide resources for adequate emotional management. Proposals such as mindfulness (González-

Martín et al., 2023) or yoga (Yumei et al., 2023), which have proven effective in reducing stress and improving the mental health of student, are easily applicable to highly sensitive individuals.

Additionally, the enhanced perceptual sensitivity and emotional receptivity of HSP make them ideal candidates for multimodal artistic interventions (Arriaga et al., 2024). Accordingly, programs incorporating embodied cognition through creative movement and dance (Rodríguez-Jiménez et al., 2022) have shown significant improvements in the mental health of university students and faculty. These benefits include enhanced self-awareness, stress reduction, and the acquisition of self-care strategies and interpersonal skills. Such interventions would be particularly suitable for highly sensitive individuals, given their inherent characteristics, and could be readily adapted for this population.

## Limitations and future research

This study presents some limitations that we describe below, along with the research areas that require more attention and possible methodological approaches to address the limitations of our findings: (i) Sample size: although 27 participants constitute a significant sample in qualitative studies, this may limit the generalizability of findings to the broader target population; (ii) Sampling procedure: the use of convenience probability sampling may introduce significant biases such as self-selection. Individuals with greater interest in or personal connection to the study topic may have been more inclined to participate, potentially introducing selection bias and compromising external validity. Furthermore, the use of self-administered questionnaires risks social desirability bias and participant misinterpretation. However, the consistency between our findings and existing quantitative data suggests these limitations may have limited impact; (iii) Low representation of the non-teaching professional group, making it impossible to investigate possible specific aspects of this group. We suggest that future studies investigate this group in greater depth, given its scarce representation in the higher education literature.

To enhance the generalizability of findings, future studies should employ random sampling techniques or more systematic recruitment strategies to ensure greater sample heterogeneity and size, as well as replicate the study in different sociocultural contexts or geographical regions. Additionally, since cross-sectional studies do not allow for the establishment of causal relationships between the evaluated variables, only observing associations, the authors recommend conducting longitudinal studies to assess the evolution of the observed effects and establish causal relationships. Such studies might investigate potential moderating or mediating variables through more sophisticated analyses to elucidate the mechanisms underlying our observations. This would advance understanding

of environmental impacts and inform effective interventions for highly sensitive persons (HSPs) across clinical psychology, mental health, and higher education settings.

In conclusion, this investigation constitutes a descriptive study examining university students' and professionals' perceptions regarding self-management of high demands, incorporating environmental sensitivity perspectives. Our findings provide theoretically relevant insights, evidencing through qualitative analysis supported by robust quantitative results that highly sensitive individuals exhibit behaviors aligned with negative environment responses. This highlights the university context as a potential risk factor for the physical, mental, and emotional wellbeing of the highly sensitive academic community. Our results can drive educational policies that promote the integral well-being of individuals through specific training actions to increase knowledge of SPS, self-awareness, regulate stress and anxiety, and provide resources for adequate emotional management. Similarly, structural or educational management changes that lead to strategies or learning or working environments that avoid sensory and emotional overload could benefit the entire university community, but especially highly sensitive individuals, ultimately building a more inclusive university.

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## APPENDIX

**Table 1A**

*Examples of participant quotes and their corresponding coding categories*

| Quote | Category |
|---|---|
| "I would like to share something I experience and have never had the chance to express." [S-HSP] | Visibility |
| "But of course, managing it is not easy, and for someone who's not HSP, it's really hard to understand you and why you suddenly do certain things. Now, you have to be, you know, in this way, and with kids it's really complex. And also, when they see that you're going through it because you've experienced it, because I share a lot with them, and you tell them, well, this and that happened to me too, and they say 'It happened to you too? Oh my God.' Then they feel more at ease, you know, and little by little they start finding tools and accept it, and they say, 'Dad, I'm grown now, I'm 17 and I know it seems weird, but I love it and I even say it myself — I'm weird, do you like it? If not, that's your problem.' So it's great. That change also makes you see that all the work is worth it." [PR-HSP] | |
| "I go from zero to a hundred really quickly." [PR-Non-HSP] | Behaviours |
| "Like, even eating sometimes, if someone next to me is making noise, it's hard, I just get up and leave." [PR-HSP] | |
| "It's an apparently neutral trait, but depending on the tools you're given, it can go toward the negative or the positive. In my case, as you grow up, you develop certain defences. For me, for example, having high reactivity, sensitivity, depth in things and everything that comes with it led to emotional isolation — not wanting to experience what was really going on in my body. So, learning that an emotion has to be felt and that afterward you go through your process of rationalizing it, understanding that and learning that, helped me to live everything much better." [S-HSP] | Thoughts |
| "The problem is that I don't have a problem." [PR-Non-HSP] | |
| "It depends on my mood. I'm… If I'm in better mood, more active and all that, I can produce more than on days when I'm more depressed. Because on those days, even if I try to study for just two hours, it's not productive. So, on those days, I just watch videos or do other things. And when my mood improves, that's when I start to get more done." [S-Non-HSP] | Emotions and Feelings |
| "The social demand, in my case, is quite high, I notice it quite a lot.... because people demand you, above all because they also see you as the figure, in my case of course, as the one who listens, as the zen person they can turn to and of course, above all in demanding times, in times of academic demand, that in the end also generates a kind of feeling of guilt, because you try to give yourself to your friends but you can't and you have to accept that in order to help others. You also have to recharge yourself and you have to be well, otherwise you won't be able to listen to them to the full" [S-HSP]. | |

| Cita | Categorías |
|---|---|
| "I can read people very quickly. I can sense how I can relate to each person because I can identify what each one needs. Even when I meet someone new, I can tell if something's off without really knowing them. So, I figured it must be something strange or really personal (laughs), because I'd say to someone 'Hey, don't you think something's wrong with so-and-so?' and they'd say 'No, I don't see anything.' And it was super obvious (laughs). What I saw, hardly anyone else saw, and I'd be like, 'But it's so obvious, this or that.' I could even tell when people were becoming a couple way before anyone else. I don't know… I perceive people really well." [S-HSP] | HSP trait |
| "It brings out your own creativity." [PR-HSP] | |
| "Well, a bit of my story… I had heard about the trait… I was diagnosed as gifted and was told that high sensitivity is one of its features… so I was encouraged to learn more about it." [S-HSP] | Diagnoses |
| "Yes, I had heard of the trait, and since I've also been diagnosed with anxiety, I wanted to see if there's a connection between the two, if they." [S-HSP] | |
| "Last week there was a lot of stress around me at home, and I felt some anxiety — chest pain, shortness of breath… It really blocks me when there's a lot of visible stress around. "[S-HSP] | Symptoms |
| "Even if I'm not aware of being super stressed, my body gives me signals. My body is telling me to take better care of myself." [PR-Non-HSP] | |
| "I can spend all day staring at the to-do list waiting for it to do itself, I don't know (laughs), because I feel so overwhelmed. Even if I see the order, I don't know where to start because I want to do everything at once, and getting out of that… it's like I trap myself in my own head. So yeah, stress tends to really block me." [S-HPS] | Stressors |
| "I know there are things in my head that aren't letting me rest." [PR-Non-HSP] | |
| "Over the years I'd heard about it on social media, online… I even took the test once, but I wasn't convinced that I belonged to any particular category." [PR-HSP] | Labels |
| "But it's not normal to feel this uncomfortable all the time." [PR-Non-HSP] | |
| "When I found out what it was, I said, now a lot of things make sense — I could have avoided a lot of suffering." [PR-HSP] | Lack of support |
| "My social life becomes overwhelming when I have a lot of tasks. Social life stops existing for me and I just focus on what I have to do. But when I have a lot of tasks, I struggle to get started. There's so much mental noise that I can spend two hours just trying to sit down. It's like I want to do everything at once, but I can't, so I freeze. Then once I manage to sit down, I start to get things done." [S-HSP] | |

| Cita | Categorías |
|---|---|
| "Over time, I've learned that the only way to solve problems is by accepting them and doing my best to move forward. At first, I used to get more frustrated because I didn't know how to handle situations, but dealing with them has taught me how I need to behave in order to overcome them." [S-HSP] | Coping |
| "Well, you just go through it however you have to. And that's it. But I don't fall into a hole or anything like that." [PR-Non-HSP] | |
| "The moment I have to start studying overwhelms me so much that I find excuses to clean the kitchen or tidy up the room." [S-HSP]" | Avoidance and escape |
| "And there was a moment when I just said, 'I'm out of here.'" [PR-HSP] | |

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# Students' negative perceptions of the use of artificial intelligence in academic writing: didactic implications for Higher Education

## *Percepciones negativas del alumnado sobre el uso de la IA en la escritura académica: implicaciones didácticas para la educación superior*

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## ABSTRACT

Artificial intelligence (AI) is gaining ground in higher education writing. Its use fosters a global and pluricultural vision in teaching, as well as enhancing scholarly communication and research dissemination. However, these benefits cannot be evaluated without considering students' perspectives. This study analyzes the negative aspects students identify when using AI in their university work. A total of 314 undergraduate and graduate students in the field of education were surveyed. The data collection instrument was an online self-administered questionnaire composed of two parts: a sociodemographic section and a free association exercise, which explored students' spontaneous representations regarding the effects of AI use in academic writing. The results were examined using the Reinert method of descending hierarchical classification. The analysis, carried out through the IRaMuTeQ software, identified six lexical classes that were subsequently grouped into three overarching thematic categories. The first category relates to academic ethics, including students' perceptions that AI is not a reliable source of information and that its use may negatively affect academic grading. The second category refers to the development of transversal skills, particularly the loss of creativity, personal ideas, and reflective thinking, as well as the promotion of passivity and disengagement. The third and final category concerns the lack of development of academic writing competence, highlighting how AI use may hinder students' abilities in argumentation, coherence, and authorship. Based on these results, the study reflects on the didactic implications and the measures that higher education institutions could adopt to promote a responsible and profitable use of AI in educational contexts.


**Keywords:** student attitudes, writing competence, perceived drawbacks, higher education, artificial


## RESUMEN

La inteligencia artificial (IA) está ganando terreno en la redacción en la educación superior. Su uso fomenta una visión global y pluricultural en la enseñanza, además de impulsar la comunicación académica y la difusión de investigaciones. Sin embargo, no pueden evaluarse estos beneficios sin tener en cuenta la opinión de los estudiantes. Este estudio analiza los aspectos negativos que el alumnado identifica al utilizar la IA en sus trabajos universitarios. Se encuestó a 314 estudiantes de grado y posgrado en el ámbito de Educación de una universidad pública. La recolección de datos se realizó mediante un cuestionario online autoadministrado, que incluía una sección sociodemográfica y un ejercicio de asociación libre. Las respuestas fueron analizadas a través del método Reinert, utilizando el software IRaMuTeQ, y complementadas con un análisis de similitud léxica para explorar la organización de las representaciones estudiantiles. Los hallazgos revelan que los aspectos negativos señalados por el estudiantado se agrupan en tres grandes subgrupos: el primero está relacionado con la ética académica, e incluye percepciones sobre la falta de fiabilidad de la información generada por IA y su posible repercusión negativa en las calificaciones; el segundo se vincula al desarrollo de competencias transversales, en concreto la pérdida de

creatividad, ideas propias, capacidad de reflexión y el fomento de la dejadez y la pasividad; el tercero hace referencia al no desarrollo de la competencia escritora académica. Fruto de estos resultados, se reflexiona acerca de las implicaciones didácticas del estudio y de las medidas que podrían adoptarse desde las instituciones de educación superior para promover un uso responsable y provechoso de la IA en el ámbito educativo.

**Palabras clave:** actitudes del alumnado, competencia escritora, desventajas percibidas, educación superior, inteligencia artificial

## INTRODUCTION

Artificial intelligence (hereafter, AI) is rapidly transforming the landscape of higher education, especially in the field of academic writing. Recent years have witnessed a significant increase in the adoption of AI-based tools for text creation and editing in university settings (Alharbi, 2023; Fryer et al., 2019). This phenomenon has sparked intense debate in the academic community about its implications for teaching, learning, and academic integrity (Bearman et al., 2022).

Integrating AI in academic writing promises numerous benefits. There seems to be agreement that it brings a more global and multicultural perspective to education as it allows students to access a broad spectrum of knowledge and writing styles (Malik et al., 2023). In addition, it has the potential to enhance scholarly communication and research dissemination through tools that can help them express their ideas more clearly and effectively (Friederich & Symons, 2023). However, as these technologies become more prevalent, there is a critical need to examine their impact from the perspective of the primary users: students (Ou et al., 2024).

In this context, the present study focuses on the negative aspects that students identify when using AI in their university work. This perspective is necessary to develop a balanced and ethical approach to integrating AI into higher education. By understanding the concerns and challenges faced by the student body, it will be possible to work toward solutions that maximize the benefits of AI while mitigating its potential disadvantages. To address this question, the opinions of 314 undergraduate and graduate students in the field of education were analyzed. Employing the Reinert method, a lexical analysis of the results was carried out, and, subsequently, we have reflected on the didactic implications of these results.

With this objective in mind, this paper presents a review of the negative aspects associated with artificial intelligence in the field of writing and, specifically, in writing in higher education. Subsequently, the methodological framework is presented, which sheds light on the profile of the participants, as well as the procedure for data collection and analysis. Finally, the results are presented, discussed with those obtained in previous studies, and their implications are explored.

## THEORETICAL FRAMEWORK

AI tools have brought about a teaching revolution in higher education (Rodriguez et al., 2023). Among its benefits is, for example, the personalization of learning, which has led to greater efficiency in teaching processes. Through AI systems, it is possible to adapt both educational materials and methods to the specific needs of each student and thus optimize their academic performance (Chicaiza et al., 2024). Likewise, implementing these technologies has increased teaching efficiency by automating routine tasks and favoring a more individualized approach to student attention (Garcés et al., 2024).

These benefits have also been identified in academic writing. However, their regular use for university-level writing presents several challenges (Malik et al., 2023). One of the first contentious issues concerns ethical and academic integrity considerations (Kasneci et al., 2023; Lund & Wang, 2023; Ray, 2023). In academia, originality and authorship are essential. If a paper is AI-assisted, the question arises to what extent the author is responsible for its content. AI cannot author papers because it cannot take responsibility for the claims it yields (Dergaa et al., 2023; Thorp, 2023). AI generates texts from statistical word predictions without applying any rhetorical intelligence. Therefore, it does not know what it is writing and what it means (Bedington et al., 2024).

Similarly, individuals should not take credit for what they have generated with the help of AI (Friederich & Symons, 2023), because it is not their intellectual product. In this sense, institutions should establish some guidelines; otherwise, the student body will continue to develop divergent and eclectic views on decisions that pertain to this dimension and norms about academic collaboration (Ou et al., 2024).

Linked to this are problems with originality and authenticity (Nguyen et al., 2024). Despite the transformative potential of AI for education, there are criticisms regarding the excess of optimism and conceptual ambiguity in the texts generated by these tools, especially regarding the weak connections with theoretical perspectives (Humble & Mozelius, 2022). In fact, in academia, there is already research that has corroborated the existence of fake abstracts (Dergaa et al., 2023), which only highlights the problems with authenticity and credibility.

Although AI can easily generate texts, analyze data, and review studies, it can also generate errors. According to the study by Van Dis et al. (2023), analysis of responses generated by language models such as ChatGPT has revealed the presence of inaccuracies and misrepresentations of information. Current AI tools tend to generate responses based on previous patterns, which can lead to superficial analysis or overgeneralizations. AI-generated texts may lack critical depth, reflection, or original interpretation, essential elements in academia. These shortcomings can

be attributed to a variety of causes, including the absence of relevant literature in the model's training corpus and/or an inherent inability to discern between high and low credibility sources of information.

In addition, there is a clear need to develop effective strategies to counteract the proliferation of what might be termed digital pseudoscience or fake science. This phenomenon, enhanced by the ability of language models to generate seemingly plausible but factually incorrect content, represents a significant challenge to the integrity of science communication in the digital age (Ansar & Goswami, 2021). Users may rely too heavily on the results, which could affect the quality and accuracy of their scholarly work. To mitigate these issues, the scientific community must maintain a posture of epistemological and methodological vigilance. This implies the implementation of rigorous data verification and validation protocols, which should be carried out by specialists in the corresponding fields.

This integrity also means considering that AI feeds on ideas automatically reproduced, including biases such as racism or other discriminatory behaviors. AI tools train on large volumes of data that may contain cultural, political, racial, or gender biases. This can lead to AI-produced texts reflecting such biases, which could compromise the fairness and validity of academic papers. Moreover, not all voices are equally represented in these training data (Bedington et al., 2024). In this regard, Friederich and Symons (2023) raise the question of who should take responsibility in this context

It is also necessary to focus on the development of the skills of AI learners-users. Thanks to digital technologies, thinking itself has become technologized and is in the process of becoming industrialized. A multitude of tools are now available to support, augment, extend, or even replace human thinking. The proportion of automatically processed writing subtasks is increasing, transforming writers into tool users who know which button to press to carry out a complex thinking activity (Kruse & Anson, 2023).

Consequently, it is considered that the advent of these tools has contributed to the abandonment of tasks that require intellectual effort - be it research or structuring arguments, among others - which can lead to a loss of fundamental critical and analytical writing skills. The same is true for critical thinking. Students need to be able to evaluate the quality and reliability of content generated through AI. This will also be linked to over-reliance on such automated tools (Tlili et al., 2023) and analytical skills (Nguyen et al., 2024).

Similarly, overuse of AI may inhibit personal creativity, as users may opt for automatically generated solutions rather than developing their own ideas. Thus, there is a risk that academic papers will become dehumanized, as machine-generated texts lack the experience, emotions, and context that enrich the work of humans.

Another transversal competency in the academic field at risk is the communication of knowledge. Knowing how to communicate is not a functional skill, but a required competence in all disciplines (Nguyen et al., 2024). The use and overuse of these tools can lead to the loss of communication skills. Digital technology not only modifies basic linguistic and formatting skills, such as hyphenation, spelling, grammar, and typesetting, but also higher-order processes, such as translation, argumentation, and summarization (Kruse & Anson, 2023).

Digital writing technology may have detrimental effects on the development of certain thinking skills, because automatic computer support, such as spelling, grammar, hyphenation, collocation, style or register choices, etc., may lead to a loss of the respective linguistic and cognitive skills that are no longer needed when the machine takes over. In this regard, Kruse and Anson (2023) point out that it is not yet clear how to respond to these losses and whether they can and should be replaced by new technological skills.

Another challenge brought about by using AI for writing is the digital divide between users in different countries. This highlights the need for equitable distribution of technology and training opportunities and access to resources (Malik et al., 2023). In high-income countries and privileged backgrounds -especially in the West - they have more opportunities to exploit these resources in ways that accelerate their research and further widen inequalities. In this regard, users' mother tongue can also be a determining factor. Territories with minority languages do not have access to the same tools and services as those with majority languages, especially English (Dergaa et al., 2023).

Likewise, it cannot be ignored that the future of AI systems is unknown in the short term. There are no studies available to measure the long-term impact of these tools, which are in continuous development. Floridi (2019) suggests that, in the future, AI may even surpass human capabilities in more key aspects of analytical reasoning.

Ultimately, AI tools offer promising possibilities for optimizing the transmission of knowledge in academia and broadening the scope of scientific studies. These technologies could assist those in academia in more accurately and effectively articulating their concepts (Friederich & Symons, 2023). However, as these systems gain ground, it becomes imperative to analyze their effects from the point of view of those who will use them most: the student body (Ou et al., 2024). The students' perspective will also serve to reflect on how to achieve adequate training and education on the effective and responsible use of AI in writing (Chan, 2023; Tlili et al., 2023). This is precisely the focus of this study, which is part of a broader investigation that seeks to understand the perceptions of both students and teachers and thus obtain a complete perspective of the educational ecosystem.

## METHOD

This article is part of a larger study on the uses, perceptions, and relationships between academic writing and AI. To achieve the objectives outlined for this project, both qualitative and quantitative data have been systematically collected through online questionnaires designed for this specific purpose. These surveys incorporate open-ended and closed-ended questions to ensure comprehensive and detailed responses from participants.

The general objective of this study is to explore the university students' perceptions about the possible negative effects of using AI tools in academic writing, at a time of increasing integration of these technologies in educational environments. Specifically, we seek to describe how students conceptualize these effects, examine whether there are differences according to gender, degree, or academic year, identify ethical, cognitive, and pedagogical concerns, and analyze the degree of awareness of possible technological dependence.

Based on these objectives, the following research questions were formulated:

1. How do college students perceive the negative effects of AI use on academic writing?
2. Are there different perceptions according to gender, degree, or course?
3. What ethical or educational concerns does the use of AI raise from the perspective of the learner?
4. Does the student body identify any risk of AI dependency and its impact on learning?

Given the exploratory nature of this study, no specific hypothesis is proposed, in line with the methodological principles that indicate that, in the initial phases of research on emerging phenomena, it is more appropriate to investigate without prior theoretical conditioning. As Agee (2009) points out, in qualitative or exploratory studies, open-ended questions allow access to meanings and social representations not yet defined in the literature and facilitate an inductive understanding of the study phenomenon.

### Sample

The sample consisted of 314 students in Education at a public university in Spain. Considering that the approximate total population amounts to 1700 students, the sample size reaches a margin of error of ±5.00% with a confidence level of 95%, which is considered adequate for an exploratory study. The mean age of the participants was 20.47 years (sd=3.80). As for gender distribution, most of the sample identified themselves as women, 74.07%, while 21.30% identified themselves as men and

1.54% as non-binary, proportions that largely reflect the characteristic feminization of the degrees analyzed.

In terms of degrees, the largest proportion of students were enrolled in Early Childhood Education (43.95%), followed by Primary Education (36.94%), Social Education (16.56%) and the master's degree in Teacher Training for Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching (2.55%). Concerning the academic year, the distribution was as follows: 43.63% were first-year students, 26.43% were second-year students, 22.61% were third-year students, 4.78% were fourth-year students, and 2.55% were master's degree students.

## Procedure and instrument

Before data collection, approval was obtained from the university ethics committee (approval M10_2023_166). All participants volunteered in the study and received comprehensive information about the research procedures. Informed consent was obtained from each informant before participation. The questionnaire was completely anonymous: no identifiable personal data were collected, and no information was requested that would allow the responses to be linked to the identity of the students. The study was assessed as minimal risk by the ethics committee, and all the ethical and legal guarantees in force were complied with. Recruitment was carried out using a non-probabilistic snowball sampling method. Data were gathered between March 18, 2024, and June 8, 2024, using a self-administered online questionnaire. This was disseminated through different digital channels, such as institutional virtual platforms, social networks, and emails from university accounts by the research team. This strategy allowed broad and flexible access to the questionnaire, guaranteeing voluntariness, anonymity, and the non-intrusive nature of participation.

The online questionnaire consisted of two distinct sections. The first section included four closed-ended questions for the collection of sociodemographic data: age (open-ended numerical response), gender (female, male, non-binary person), degree, and current academic year. The second section consisted of a structured free association exercise following the Grid Elaboration Method (Joffe & Elsey, 2014) to examine participants' perceptions regarding the use of AI in academic text composition. This methodology, previously applied in studies investigating the collective representations of young people on various topics (Idoiaga-Mondragon, 2021; Idoiaga-Mondragon et al., 2024), was selected for its effectiveness in eliciting spontaneous responses. Specifically, participants were asked to list the first three negative aspects that came to mind regarding the use of AI for writing academic texts (papers, presentations, etc.) in a university context. They were then asked to

explain the words or ideas chosen, to elaborate extensively on their meaning. These explanations served as the basis for the subsequent analysis.

## Data analysis method

The present study used the Iramuteq software, developed by Ratinaud (2009) and refined by Ratinaud and Marchand (2012), to carry out a comprehensive lexical analysis of the corpus of collected responses. It comprised two different methodologies: the Reinert method and the lexical similarity analysis.

The Reinert method (Reinert, 1983, 1990) was implemented using Iramuteq software to scrutinize the reasoning behind the positive or negative aspects associated with using AI in academic writing, as articulated by university students. This method, known for its application in open-ended question analysis (Legorburu et al., 2022; Boillos et al., 2024), ensures the reliability and validity of textual analysis (Klein & Licata, 2003). From a top-down hierarchical cluster analysis format, the Reinert method facilitated the identification of classes and statistical indicators, such as typical words and text segments (Idoiaga & Belasko, 2019), with high chi-square values signifying significant repetition among participants' responses.

Consistent with precedent methodologies (Camargo & Bousfield, 2009), raw data were entered into Iramuteq software, and key vocabulary items within each class were selected based on specific criteria. These included an expected word frequency greater than 3, evidence of significant association according to the chi-square statistic ($\chi^2 \geq 3.89$, $p = .05$, $df = 1$), and predominant occurrence within class (≥50%). Subsequently, text segments associated with each class were identified and ranked according to their respective chi-square values.

These lexical universes were then linked to passive variables (independent variables), resulting in a comprehensive description of the lexical worlds. In this case, the passive variables were gender, degree, and current academic year. In addition, a systematic process was adopted to label each class, in which two researchers independently proposed labels based on words and associated quotations, followed by consensus approval by both researchers.

During the analysis, the corpus was segmented into 537 context units (CTUs), of which 81.32% were successfully classified by the algorithm, indicating a high stability and robustness of the classification model. It should be noted that the calculation of chi-square ($\chi^2$) values and the assignment of typical words to each class were performed automatically by the software, which significantly reduces the risk of interpretive bias or external interference during data segmentation and clustering. The interpretation of the resulting classes was subsequent, based on semantic criteria and the analysis of the most representative words of each lexical universe.

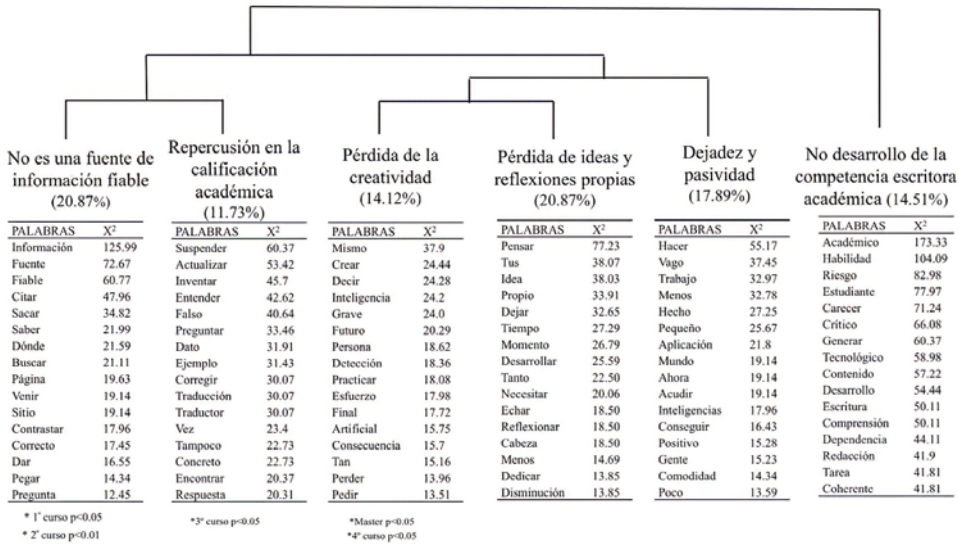
Subsequently, a lexical similarity analysis was performed with the Iramuteq tool. For this purpose, the corpus was considered a unified entity, independently of the participants' responses. This analysis elucidated the structural organization of the textual content through the identification of word co-occurrences, and visual representations of the social representation under scrutiny were generated (Marchand & Ratinaud, 2012).

## RESULTS

The Reinert method, using a top-down hierarchical analysis, was used to identify participants' main negative ideas about using AI for writing academic texts. Each theme or concept is encapsulated by a collection of characteristic words and text segments referred to as a class. The analysis segmented the corpus into 537 sections, resulting in six distinct classes, as illustrated in Figure 1.

**Figure 1**

*Top-down hierarchical dendrogram showing the most frequent words and those with the highest association χ2 (1), p < .001 extracted by the Reinert method*




The results are grouped into three subgroups: the first is related to academic ethics, where it is mentioned that AI is not a reliable source of information and the impact that its use can have on the academic grade; the second is related to the development of transversal competencies, specifically the loss of creativity, own

ideas and reflective capacity and the promotion of laziness and passivity; finally, the third is linked to the non-development of academic writing competence.

The first idea extracted from the hierarchical grouping dendrogram, weighting 20.87%, is that AI "is not a reliable source of information". The student body remarked that the information sought through AI should be contrasted, since many times it is not correct, and it is not known from which sources it comes. This idea was mostly mentioned by first ($p< .05$) and second-year students ($p< .01$). The most significant sentences linked to this idea, i.e., those with the highest chi-square sum for this class, are presented below:

1. You have to know how to formulate the question, you have to check if the information is reliable. Articles and quotes do not usually come out because depending on how you formulate the question, you will get one information or another or the information will be sorted. There are no sources or where the information was taken from ($\chi2 = 359.82$; female, second year of primary education).
2. You often don't know if the information is reliable because you don't get it from reliable sources ($\chi2 = 343$; female, first grade of Primary Education).
3. These are not texts you have done and are not reliable sources ($\chi2 = 339.56$; Male, first grade of Primary Education).

The second negative aspect of using AI for writing academic texts, mentioned by the students, with a weight of 11.73%, refers to the "Impact on the academic grade". Students know that using these resources for their work can be a reason for failing, both because the teachers may notice it and because the information presented in the academic work is not correct. Third-year students mentioned this idea more ($p<0.05$). The most significant sentences used by the participants to explain this idea were:

4. Plagiarism can lead to failure. Sometimes too much information leads to not solving the paper completely or not finding a good answer. Sometimes they make references to bibliographic references that do not exist or that are hard to find ($\chi2 = 182.96$; female, first year of early childhood education).
5. Teachers can catch you out. Sometimes they don't write in the best way, two different pages can give you different things. Sometimes many people copy the texts provided by these tools and without knowing it, teachers can catch you for plagiarism and you can be suspended ($\chi2 = 161.90$; female, third year of early childhood education).
6. The translator may be fine for translating a few things, but if you want to translate a complete text it is better not to rely on its help as its translations may be wrong. If artificial intelligence is used repeatedly in university papers you will be failed ($\chi2 = 321.56$; male, first year of primary education).

The third negative aspect of using AI for writing academic texts, which accounts for 14.12% of the weight, exposes the students' concern linked to the "Loss of creativity". Specifically, the student body believes that the fact that there are numerous facilities for using AI means that there are fewer and fewer productions of their own. This could have consequences for future generations, as they will have fewer professional skills to solve difficulties. This idea was mostly mentioned by master's ($p<.05$) and fourth year ($p<.05$) students. The most significant sentences used by the participants to explain this idea were:

7. Since it is so easy, it is very possible to fall into laziness to create the content ourselves, since this creates it for us without any effort. By not creating the texts ourselves, we do not learn in the right way, since a good use brings things, but a bad one will only stop us from learning ($\chi2 = 117.18$; female, master).
8. It is not something created by yourself so that identity is somehow lost, everything that we are told in it we believe without doubting anything, it seems to me that we are too hasty, losing our reasoning ($\chi2 = 112.17$; female, fourth year of infant education).
9. Lack of habit, lack of originality, little self-demand. I believe that artificial intelligence is a useful tool to help us in some areas, but if we use it constantly, we will lose the habit of doing things by our own hands ($\chi2 = 92.78$; male, first year of primary education).

The expressed fourth negative aspect of the use of AI for writing academic texts is its link with the "Loss of ideas and own reflections". This idea was one of the most mentioned, with 20.87% of the total weight, and referred to equally by the students of all courses. The most significant sentences used by the participants to explain this idea were:

10. You don't have the opportunity to develop your own skills. You don't learn, we don't spend time thinking about our ideas ($\chi2 = 257.08$; female, second year of Social Education).
11. You are not using your own ideas when making a reflection, so it is not quite reflection, you are not thinking for yourself ($\chi2 = 233.02$; female, first year of Early Childhood Education).
12. When you get used to using Artificial Intelligence, if at some point you do not have access to a certain source of information, it will be very likely that your inability to reflect, argue or develop your discourse ideas will be banal and scarce ($\chi2 = 182.30$; female, fourth year of Social Education).

The fifth negative aspect of using AI for writing academic texts, which accounts for 17.89% of the total weight, is associated with the students' belief that it encourages "Laziness and passivity". The participants express that the repeated use of AI makes them feel increasingly lazy when thinking or writing by themselves. This

idea was mentioned by students in all courses. The most significant sentences used by the participants to explain this idea were:

13. Since there are now all kinds of artificial intelligences, you don't have to put yourself and spend a lot of time on the work. So, you become lazier when it comes to doing a job, you put less effort into the work, since you get everything done ($\chi 2 = 252.28$; female, first year of primary education).
14. You don't learn much, you become lazier when it comes to doing work and you put less effort into doing it. As you use the applications, you are not doing or using your positive points to generate the work, so you do not learn anything since you get everything done ($\chi 2 = 163.02$; female, first year of primary education).
15. It makes you think and work less, so you become lazier. With artificial intelligence you lose originality, since you are copying something that a machine has created and not you yourself ($\chi 2 = 158.43$; female, first year of primary education).

Finally, the last negative aspect of using AI for writing academic texts, with 14.51% of the total weight, is that using them affects the "Non-development of academic writing competence". The students focus on the loss of academic writing ability or competence with all that this implies: search for sources, synthesis of information, critical analysis, etc. They also reflect on the capacity for critical thinking or analysis, which, according to them, decreases with these tools. The most significant phrases used by the participants to explain this idea were:

16. Over-reliance on artificial intelligence for text writing may result in the loss of writing and critical thinking skills among students and teachers if technology is relied upon to automatically generate academic content ($\chi 2 = 842.57$; female, first grade Early Childhood Education).
17. Limitations in contextual understanding. Despite its ability to produce coherent text, artificial intelligence may not fully understand the context of a topic or lack the ability to perform deep critical analysis, which may affect the quality and depth of the academic content generated ($\chi 2 = 782.40$; female, third grade of primary education).
18. Technological dependence and possible loss of writing skills among students and professionals who use artificial intelligence to write academic texts. This implies that lack of practice in manual writing may limit their ability to communicate effectively and develop independent arguments ($\chi 2 = 705.69$; female, third year of elementary education).

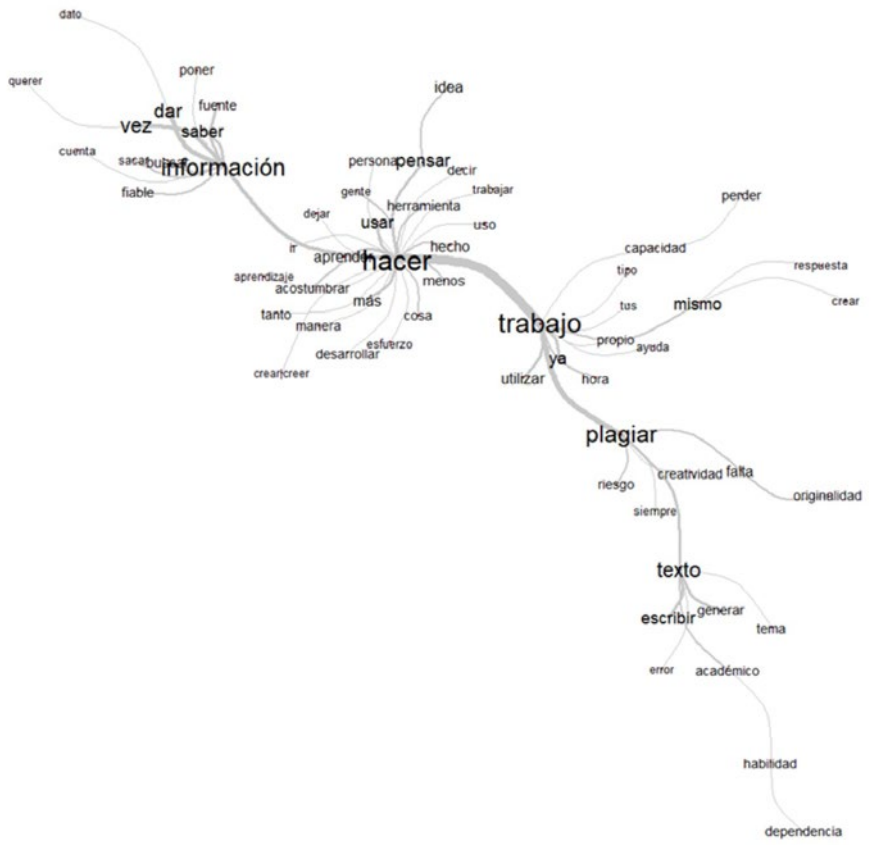
Complementarily, a lexical similarity analysis was performed to generate a picture reflecting the co-occurrences among all the words in the corpus beyond their division into classes. Its objective was to analyze how the words in the corpus were interconnected on a common plane. For this purpose, the lexical similarity

analysis was performed only with those words with a frequency higher than 25 (eliminating the word artificial intelligence since it is the elicitor), the results of which can be seen in Figure 2.

The results revealed that the corpus is divided into five cores. The first core, starting at the top, deals with the reliability of information and sources. The second core deals with what AI does and how people are increasingly accustomed to using it. The third core deals with the ability to work and the loss of the ability to work for oneself. The fourth core focuses on plagiarism linked to a lack of creativity and originality. Finally, the fifth core is identified with the dependence generated towards AI for writing academic texts.

**Figure 2**

*Graphical representation in the form of kernels of the co-occurrences with the highest frequency (> 25) of the study*



## DISCUSSION AND IMPLICATIONS

Studies agree that computer-assisted writing tools positively influence students' writing proficiency and self-efficacy (Gayed et al., 2022). Authors such as Bedington et al. (2024) group the potential uses of AI for academic writing into four types as listed in Table 1.

**Table 1**
*Potential uses of AI for the writing process. Translated from Bedington et al. (2024).*

| Creation | Editorial processes |
|---|---|
| Generate and explore ideas<br>Develop ideas and propose research directions<br>Participate in preliminary investigations<br>Summarize texts, articles, websites, etc. | Provide an outline from inventive notes.<br>Create a draft from notes<br>Write (quickly) several drafts<br>Show possible genres and styles<br>Provide writing tips |
| **Check** | **Text editing** |
| Show ways to reformulate and recast writing.<br>Provide evaluative feedback<br>Offer counterarguments | Providing corrections and explanations of editions<br>Offer choices of words, phrases and sentences |

However, the inexorability of technological progress demands a critical and participative approach from the academic community and society in general. In this context, the purpose of this work is to know university students' perceptions about using these tools for constructing academic texts and, therefore, the genesis of new knowledge, specifically in the field of Education. It has been of interest to identify the negative aspects to carry out pedagogical interventions that reverse these positions towards a constructive use of these tools.

Resistance to the adoption of new technologies is fruitless and potentially detrimental to the advancement of knowledge. In particular, the study and implementation of AI requires a holistic and interdisciplinary approach that transcends isolated technical analysis. It is necessary to contextualize AI within a broader framework that includes four fundamental aspects: (I) the interrelationship with other emerging and established technologies; (II) the rhetorical and discursive context in which it is developed and applied; (III) the ethical implications of its implementation and use; and (IV) the various epistemological paradigms that inform and are informed by AI (Bedington et al., 2024). However, to achieve this goal, the guidance of teachers remains essential, and, to this end, the results obtained in this study must be considered.

First, it is worth considering that the participants have identified AI tools as substitutes for their production. On the contrary, the aim is to understand them as resources to assist in writing. Their nature is to complement the work of the scribe and, therefore, AI-human collaboration is essential (Molenaar, 2022; Nguyen et al, 2024). That is, academic practices with AI must be understood as an experience of social interaction (Ou et al., 2024). Human intervention and decision-making must be present throughout the whole process. It will be people who provide rhetorical intelligence and who are responsible for ensuring that there is effective and empathetic communication (Bedington et al., 2024). Therefore, it will be the job of the teaching staff to create practices in which AI tools are introduced not as substitutes, but as supporting resources. For example, they can be used for creating texts that students will later have to critically review and correct.

This way of proceeding would also impact on the negative aspect identified by the students in this study, who considered that AI could lead to the loss of critical thinking skills. This fear coincides with the work of Tlili et al. (2023) and Nguyen et al. (2024), who warned that students delegated tasks involving intellectual effort or analytical skills to AI. However, training learners to use these tools in a proactive, adaptive, and critical manner would place considerable demands on the user's executive functions. But to achieve this goal, it will be necessary for technology to be integrated into the educational landscape, always with a prior understanding of its meaning and effects (Nguyen et al., 2023). This balance is crucial to ensure that, while AI brings efficiency and analytical capacity, it does not overshadow creativity and critical thinking inherent in human intelligence (Khalifa & Albadawy, 2024).

Another concern expressed by the participants in this study is an inversely proportional relationship between the use of AI for the construction of academic texts and the development of written communicative competence. Kruse and Anson (2023) already pointed out that digital writing could have detrimental effects on the development of skills associated with this competence, such as the loss of linguistic skills, register identification, lexis, etc.

From a pedagogical point of view, it seems a possible solution to rethink the methodology with which the tools are integrated to generate tasks that require critical thinking and problem solving; that is, tasks that go beyond what AI can do (Dergaa et al., 2023). In this sense, studies have shown that AI can offer a reductive view of reality. Thus, novel and enriching ideas that lead to novel results and arguments should be rewarded in the classroom. In other words, it is essential to seek novelty and discourage redundancy (Friederich & Symons, 2023) and to generate educational challenges in which it is necessary to have skills for the communication of knowledge. It will be the teacher's task to check whether the tasks they propose prepare for the development of the competencies or whether, on the contrary, they can be performed automatically.

Another aspect that acquires relevant weight in the results of this study has to do with academic ethics. As previous studies (Kasneci et al., 2023; Lund & Wang, 2023) have shown, issues associated with ethics, originality, integrity and authorship come to the fore when talking about these tools. Ethical and transparent use of AI is paramount. Students must be committed to using these tools in a way that maintains the integrity and originality of their text and avoid any misuse that may undermine academic standards (Khalifa & Albadawy, 2024). This will require faculty to raise awareness of productions with little or questionable credibility (Ansar & Goswami, 2021).

University faculty play a key role in all these initiatives. Therefore, in addition to training this staff, it would be worthwhile investigating teaching staff perceptions about AI tools for academic writing. As previously mentioned, this study is part of a broader investigation that also contemplates this objective.

## CONCLUSIONS

This study focused on analyzing the negative aspects identified by undergraduate and graduate students specialized in the field of Education, in relation to the use of AI for writing academic texts. For this purpose, the opinions of 314 students were collected, and a lexical analysis of their contributions was carried out.

The results have yielded consensus in identifying five axes grouped into three subgroups. The first is related to academic ethics. The participants value issues associated with authorship and originality and identify these practices as fraudulent that could impact their grades. The second subgroup is linked to developing transversal competencies such as critical thinking or creativity. It is considered that the use or abuse of these tools may result in a loss of skills necessary at the educational stage they are in. Thirdly, it is noted that AI can negatively affect the development of academic writing competence in general, as well as its associated subcompetencies.

This study also aimed to reflect on the didactic implications derived from these results. First, it has been observed that, although the benefits of AI for academic writing are numerous, teaching intervention will be necessary to maximize these potentialities and avoid the risks identified by students. Secondly, it seems key that the tools are used proactively and always as resources to help and not to replace them. To this end, it will be necessary that the tasks requested of students require skills such as creativity or critical thinking. Likewise, ethics is an important issue that should be expressly addressed in the classroom but should also be orchestrated by higher education institutions.

In short, these results show that it is necessary for the university to be aware of the concerns of the student body to implement policies aligned with them (Ou et al., 2024). This paper seeks to contribute to this direction.

Finally, it should be added that this study has some limitations that should be considered when interpreting the results. Firstly, the sampling used was non-probabilistic using the snowball technique, which implies a possible self-selection bias, given that the participants were accessed voluntarily through contact and dissemination networks. This type of sampling may reduce the heterogeneity of the sample and limit the generalizability of the results to the entire student population. In addition, the overrepresentation of first-year students and certain degree programs may have influenced the perceptions collected, especially about experience and familiarity with academic writing. Finally, the cross-sectional design of the study allows us to describe perceptions at a particular point in time but does not allow us to establish causal relationships or observe changes over time. Future research could address these limitations by incorporating random sampling, longitudinal designs, and methodological triangulation.

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