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In memoriam

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A Systems Approach to Technology Integration: The SETI Framework

Un enfoque sistémico de la integración de tecnología: el marco SETI

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Abstract:

The Socio-Ecological Technology Integration (SETI) framework offers a systems-oriented perspective on effective technology integration in education. Unlike earlier models that primarily focus on teacher practice, such as TPACK and SAMR, the SETI framework situates the educator within a complex set of socio-ecological systems, including the microsystem of school environments, the exosystem of district-level support structures, and the macrosystem of national policies and cultural norms. This paper builds upon prior conceptualizations of SETI by unpacking it further in terms of how educators and educational leaders can utilize SETI, and also presents a set of newly developed practical resources that support its implementation. These resources include reflection tools, integration checklists, and strategic planning guides that help educators and educational leaders examine the multiple interdependent factors necessary for successful technology integration. The SETI framework offers a significant contribution to the educational technology literature by repositioning effective integration as a systemic responsibility rather than an individual task. In doing so, it enables educators and leaders to identify barriers, coordinate strategic responses, and promote sustainable, equitable technology use aligned with institutional and policy contexts.

Keywords: SETI, socio-ecological technology integration, socio-ecological, technology integration, education, frameworks, TPACK, SAMR

Resumen:

El marco de Integración Socioecológica de la Tecnología (SETI, por sus siglas en inglés) ofrece una perspectiva sistémica de la integración eficaz de la tecnología en educación. A diferencia de otros modelos anteriores que se centran en la práctica docente —como TPACK y SAMR—, el marco SETI sitúa al educador en un conjunto complejo de sistemas socioecológicos, incluido el microsistema de los entornos escolares, el exosistema de las estructuras de apoyo a nivel de distrito y el macrosistema de las políticas nacionales y las

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normas culturales. Este artículo parte de conceptualizaciones previas de SETI y desarrolla el marco para mostrar cómo pueden utilizarlo tanto los educadores como los responsables educativos, además de presentar una serie de recursos prácticos de reciente desarrollo que respaldan la implementación. Estos recursos incluyen herramientas de reflexión, listas de control de la integración y guías de planificación estratégica que ayudan a los educadores y los responsables educativos a examinar los múltiples factores interdependientes necesarios para la integración exitosa de la tecnología. El marco SETI contribuye a la literatura sobre tecnología educativa al reposicionar la integración eficaz como una responsabilidad sistémica, en lugar de una tarea individual. De este modo, permite a educadores y responsables identificar posibles obstáculos, coordinar respuestas estratégicas y promover un uso sostenible y equitativo de la tecnología en sintonía con los contextos institucionales y políticos.

Palabras clave: SETI, integración socioecológica de la tecnología, socioecológico, integración de tecnología, educación, marcos, TPACK, SAMR

"No one can whistle a symphony. It takes a whole orchestra to play it."

H. E. Luccock

1. Introduction

Digital technologies are now a central feature of contemporary education systems. Their integration into instructional practice has been linked to a range of cognitive and affective outcomes, including increased knowledge acquisition (Saltan & Arslan, 2017), improved academic performance (Yilmaz, 2018), and heightened learner attention and motivation (Ibáñez et al., 2020). In online and blended learning environments, the use of technology is often embedded by necessity; however, the nature and quality of integration vary considerably, ranging from transmissive content delivery to interactive and collaborative engagement formats (Ivone et al., 2020).

Policy frameworks and professional standards have consistently emphasized the importance of integrating technology in ways that are pedagogically purposeful and contextually appropriate (ISTE, 2016). Nevertheless, empirical research indicates that technology is not always implemented in ways that align with these aims. Studies have documented a prevalence of low-level usage, such as repetitive skill drills or unstructured free-time applications, particularly in K–12 settings (Chen et al., 2014; Kurt et al., 2013; Tondeur et al., 2012).

In recent years, the lack of preparation for using technology has been highlighted during the transition to online learning during the COVID-19 pandemic (Crompton et al., 2023) and the recent acceleration in the use and development of generative artificial intelligence in education (Crompton & Burke, 2024; Xiao et al., 2025). Several frameworks have been developed to support educators in conceptualizing and improving technology integration. Among the most widely cited are the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) and the Substitution, Augmentation, Modification, Redefinition (SAMR) model (Puentedura, 2009). These models provide structured approaches to aligning technology with pedagogy and content. However, their focus is predominantly on what the educator is doing with technology within the classroom, with less attention to the broader ecological factors influencing integration processes.

This paper highlights the Socio-Ecological Technology Integration (SETI) framework, which extends beyond the educator to offer a systems-level perspective on the use of technology in education. SETI is informed by socio-ecological theory (viz., Bronfenbrenner, 1979), and emphasizes the dynamic interrelations among individual, institutional, and societal influences. The study outlines the conceptual foundations of the framework, situates it in relation to established models, and introduces a set of applied resources and illustrative use cases. The intent is to contribute to the research literature on technology integration by offering a model that accounts for multi-level contextual variables and supports a more comprehensive analysis of integration practices.

2. Literature review

The integration of digital technologies into teaching and learning has been a persistent area of focus in both K–12 and higher education. As technological tools continue to evolve and expand in capability, the question of how to integrate them effectively remains a central concern in instructional technology research and practice (Bakir, 2016). Despite increased attention to technology integration, many educators across sectors continue to report uncertainty or lack of readiness when it comes to implementing technology in the classroom, even those who identify as technologically literate (Bakir, 2016; Dinçer, 2018). These findings suggest that the gap is not only about access or awareness, but also about the availability of clear, actionable frameworks to guide integration efforts in diverse educational settings. The next sections examine existing models that have been widely adopted to support this work and consider how they conceptualize the role of the educator in the technology integration process.

2.1. Extant frameworks

Numerous frameworks have been developed to support the integration of digital technologies into educational settings. Their underlying conceptual structures continue to inform broader understandings of technology-enhanced education. Some early efforts focused on technologies, such as the MIT Mobile Framework (Yu, 2009) and the Moodbile framework (Casany et al., 2012), and were designed to guide the incorporation of mobile applications within institutional technology infrastructures, particularly in higher education. These models offered valuable guidance for aligning mobile tools with learning management systems and institutional platforms, but were not primarily intended to support curriculum-level instructional design.

Other frameworks adopted a pedagogical orientation. For instance, Park (2011) proposed a framework that categorized learning activities based on their capacity to support distance education, focusing on the spatial and communicative distance between instructors and learners. While insightful, the framework's emphasis remained on mobility and learner distribution rather than curriculum integration.

Several scholars have also drawn upon activity theory to develop models that address socio-cultural and cognitive dimensions of technology use. Koole's (2009) Framework for the Rational Analysis of Mobile Education (FRAME) explicitly incorporates constructs from Vygotsky's theory of mediated learning and the zone of proximal development, offering a lens through which to consider how learners interact with content, technology, and context. Similarly, Uden (2007) and Zurita and Nussbaum (2007) developed frameworks to analyze learning activities, design requirements, and developmental processes, emphasizing the social and situational influences that shape educational practice.

Despite their contributions to research, these frameworks provide limited direct guidance for classroom educators seeking to integrate digital technologies into subject-specific instruction. In contrast, two models have gained prominence for their explicit focus on technology integration in curriculum design: the Technological Pedagogical Content

Knowledge (TPACK) framework and the Substitution, Augmentation, Modification, Redefinition (SAMR) model.

2.1.1. TPACK

The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) extends Shulman's (1986) concept of pedagogical content knowledge by introducing a third essential domain, technological knowledge. The framework consists of three core knowledge areas: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). The model emphasizes that effective technology integration arises when these domains intersect meaningfully. For instance, an educator designing a lesson must consider the most appropriate content, the instructional strategies that best facilitate learning that content, and the technological tools that align with both. The intersection of all three, TPACK, represents a dynamic knowledge space where technology is used in coordination with pedagogy and disciplinary understanding rather than in isolation. Rather than prescribing specific tools or techniques, the framework highlights the contextual decision-making required of educators as they adapt their practice across different learning environments. TPACK has been widely used in teacher education and professional development as a conceptual tool for designing, evaluating, and refining the integration of digital technologies into instructional practice.

2.1.2. SAMR

The Substitution, Augmentation, Modification, Redefinition (SAMR) model (Puentedura, 2009) offers a taxonomy for categorizing how digital technologies are employed to support or transform learning activities. It is organized into four hierarchical categories. At the base is substitution, where technology replaces a traditional tool without functional improvement, for example, using a digital device instead of a pen and paper. The second level, augmentation, includes minor functional improvements, such as using word processing features like spell check or voice typing. These two levels are collectively referred to as enhancement, as the technology supports but does not fundamentally alter the task.

The third level, modification, involves a significant redesign of the learning activity made possible through technology. An example is students using collaborative platforms to co-author documents in real-time, enabling feedback and iterative development. The highest level, redefinition, describes tasks that were previously inconceivable without the technology. For example, students might create a multimedia documentary and publish it online for global peer review. This level of integration facilitates learning experiences that extend beyond traditional classroom boundaries, often involving authentic audiences and complex, student-driven inquiry. The upper two categories are classified as transformation, indicating the degree to which technology enables novel pedagogical opportunities. The SAMR model is frequently used in professional development to support educators in critically reflecting on their use of technology. It offers a structured approach to analyzing instructional choices, although it does not explicitly address content alignment or pedagogical theory. As such, it is often employed in conjunction with other frameworks, such as TPACK, to provide a more comprehensive understanding of effective technology integration.

While earlier frameworks have contributed foundational insights, particularly in relation to design, activity, and learner context, TPACK and SAMR remain the most widely applied models for guiding educators in integrating digital tools into curriculum and pedagogy. Nonetheless, TPACK and SAMR operate by placing the educator as the only person responsible for technology integration. Such a perspective places an undue burden on individual educators, failing to acknowledge the essential roles of other stakeholders, including instructional designers, school leaders, IT professionals, and policymakers, whose expertise and decisions significantly shape the conditions under which integration occurs. By overlooking these

collaborative and systemic dimensions, the frameworks present an incomplete account of how technology is adopted and sustained in educational environments. A more accurate and equitable model must recognize that effective integration is not the product of individual effort alone, but the outcome of coordinated support across multiple levels of the educational system.

2.1.3. Purpose

The purpose of this paper is to review the more recent SETI framework, which reconceptualizes technology integration as a systems-level process shaped by multiple, interacting influences. This paper demonstrates its practical relevance in K-12 and higher education through the presentation of utilize cases for educators and educational leaders, resources to use with SETI, and applied examples. In doing so, it aims to provide a more comprehensive and context-responsive approach to supporting effective and sustainable technology integration in educational practice.

3. Socio-Ecological Technology Integration Framework

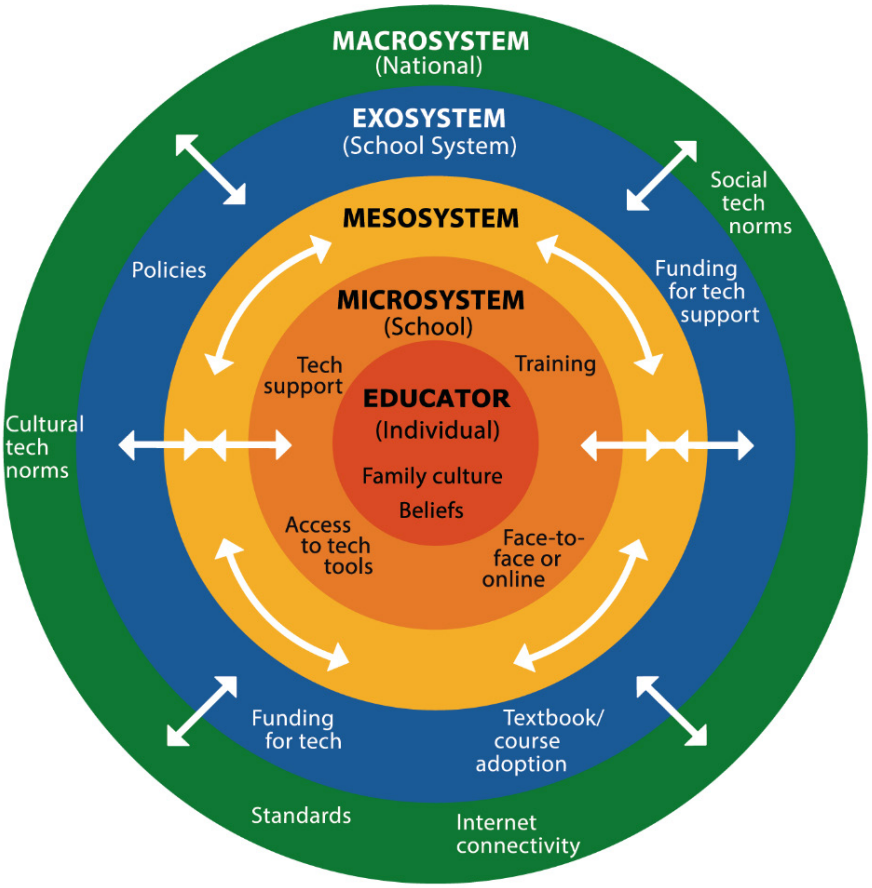
The Socio-Ecological Technology Integration (SETI) framework (Crompton et al., 2024) is a systems-level approach to understanding how technology is integrated in educational contexts. Unlike earlier models such as TPACK and SAMR, which center the educator as the only person involved in technology integration, SETI situates the educator within a network of interacting ecological systems. The framework emphasizes that technology integration is influenced not only by an educator's beliefs and practices, but also by the structures, relationships, and norms that exist at the school, district, and national levels. The socio-cultural impact has been well-documented by scholars in the use and development of technologies (e.g., Gorlacheva et al., 2019). In SETI, elements such as institutional support, policy environments, cultural expectations, family dynamics, and infrastructure are incorporated, factors that are typically underrepresented in educator-focused models of integration.

SETI builds upon an earlier model developed from a thematic systematic review of the literature on mobile learning integration (Crompton, 2017). That review identified four interrelated domains—beliefs, resources, methods, and pedagogical purpose—that are necessary for effective integration. These elements formed the initial socio-ecological framework, which has since been expanded through empirical research, including a comparative study of teacher resilience during COVID-19 in the United States and South Africa (Crompton et al., 2023). Insights from this work led to refinements of the framework, such as the explicit inclusion of families, school systems, district leadership, and national-level actors as integral to the technology integration process.

Structurally, the SETI framework is organized into concentric circles that radiate outward from the educator (see Figure 1). The innermost circle includes the educator's beliefs and family context. Surrounding this is the microsystem of the school environment, which encompasses leadership, students, and immediate technological supports. The exosystem encompasses the district-level influences, including funding, training, and local policies. The macrosystem refers to national and cultural influences, including government ICT policies and societal attitudes toward digital learning. Interconnections between these levels are acknowledged through the mesosystem, which highlights the overlapping and dynamic interactions among systems.

At its core, SETI shifts responsibility from the individual to the collective, emphasizing that effective and equitable technology integration is the result of a coordinated effort across the entire educational ecosystem.

FIGURE 1. Socio-Ecological Technology Integration.



Source: Crompton et al., 2023.

4. SETI for educators

Educators in K-12 and higher education can use the SETI (Socio-Ecological Technology Integration) framework as a strategic tool to contextualize their experiences and advocate for the systemic support necessary for effective technology integration.

4.1. K-12 Educators

This framework allows educators to articulate technology integration challenges as issues embedded in a complex network of influences, including infrastructure, policy, professional development, and sociocultural norms. Such a shift in perspective is instrumental in transforming individual frustrations into well-structured requests for institutional change. SETI can be used to empower educators to identify and communicate the limitations of their technological ecosystem in a structured, evidence-informed manner. For example, when educators experience inconsistent access to professional development in digital pedagogies, the SETI framework enables them to demonstrate how this shortfall is not merely a matter of personal preparedness but a systemic gap at the school or district level. By mapping such needs within the framework's concentric layers, from classroom to national policy, educators

can frame their professional needs in ways that compel attention from school leaders, district authorities, and policy-makers. Teachers can encounter obstacles such as a lack of support and limited knowledge about advocacy; yet, overcoming these obstacles is crucial for fostering teacher autonomy, relatedness, and competence (Raymond, 2024). SETI helps by functioning as a diagnostic and advocacy tool, aligning educators' experiences with the structural dimensions to support their advocacy to help them gain what is needed to effectively integrate technology.

SETI enables reflection on individual belief systems, as well as community and national norms. In the research that led to the development of the first version of SETI, when the factors influencing technology integration were examined, one factor stood out above all others: the educator's personal beliefs about the use of technology in education (Crompton, 2017). The educator may have all the resources and support, but if that educator believed that technology was not an effective tool to use, they would not use it, or use it in an ineffective way. SETI provides a reminder to educators to begin in the center of the framework and reflect on their thoughts and beliefs. Educators can also use the framework to examine how cultural attitudes toward digital learning, such as parental skepticism about screen time or assumptions about student autonomy, intersect with institutional mandates and digital initiatives. For instance, if educators notice that parental resistance to online learning platforms limits home engagement, they can use SETI to identify the underlying issue, such as cultural norms or communication policies, which may prompt responses like parent workshops or translated guides. This application of SETI situates the educator as both agent and advocate within an ecosystem that must function collectively to support student learning outcomes.

4.2. Higher education faculty

Higher education faculty can again utilize the SETI framework as a reflective and strategic tool to guide their technology integration practices within the complex university ecosystems. By mapping their own experiences onto the layers of the framework, faculty can identify which barriers stem from personal beliefs or teaching strategies and which are rooted in systemic constraints such as limited access to instructional design support, inflexible curriculum structures, or insufficient policy guidance on digital ethics.

The SETI framework equips faculty to advocate for necessary supports by repositioning challenges as collective, institutional concerns rather than individual shortcomings. For instance, if a faculty member struggles to implement online learning due to outdated classroom technologies or inconsistent technical assistance, SETI offers a structured rationale to bring these issues to the attention of department chairs, teaching and learning centres, or governance committees. This can lead to more informed conversations about resource allocation, workload planning, and long-term infrastructure development, all of which are crucial for sustaining effective digital pedagogy.

Additionally, faculty can utilize SETI to engage more intentionally with the broader academic and cultural environment that influences teaching and learning. This includes recognizing how student access, institutional policies, disciplinary norms, and even family expectations influence the uptake and effectiveness of technology in the classroom. By situating their work within the socio-ecological systems of the institution, faculty are better positioned to contribute to collective initiatives, shape departmental conversations about innovation, and ensure that their pedagogical choices align with both institutional goals and student needs. SETI thus supports faculty not only as educators but as active participants in shaping the university's digital learning ecosystem.

5. SETI for educational leaders

Educational leaders can use the SETI framework to strategically support educators by identifying and addressing the multi-layered conditions necessary for effective technology integration.

5.1. K-12 Education leaders

In K-12 education, rather than focusing solely on classroom-level interventions, leaders can utilize SETI to examine the structural and cultural elements within the school environment that either enable or constrain the use of technology. For example, if educators are hesitant to experiment with digital tools due to a lack of just-in-time technical support, leaders can interpret this through the SETI lens as a systemic issue within the school's microsystem, requiring structural solutions such as staffing adjustments or reallocating professional learning time.

SETI also provides a mechanism for K-12 leaders to advocate upwards, to district administrators, policy-makers, and funding agencies, by demonstrating how technology integration is contingent on coordinated support across all levels of the educational system. School leaders may be limited in their authority to influence funding models, infrastructure upgrades, or policy development, yet they can use SETI to construct evidence-based arguments that link these macro-level decisions to observable outcomes in teaching and learning. For instance, a principal could use SETI to highlight how inadequate national broadband infrastructure is directly affecting student engagement and assessment in digital environments, thereby justifying requests for targeted investment.

SETI encourages educational leaders to recognize the dynamic interactions across systems and act as connectors within and beyond their institutions. This includes coordinating with families, community organizations, and regional stakeholders to build a coherent ecosystem that supports learning. Leaders can utilize the framework to guide reflective dialogue across departments or institutions, fostering a shared responsibility and promoting forward planning. By using SETI, leaders can position themselves not only as managers of immediate school needs but as system-level thinkers who anticipate barriers, broker cross-sector relationships, and pursue long-term solutions for sustainable technology integration.

5.2. Higher education leaders

SETI also enables higher education leaders to advocate within and beyond their institutions. Deans, provosts, and directors often negotiate with governing boards, accreditation bodies, funding agencies, and national ministries. The framework equips them with a structured rationale to articulate how local challenges—such as inequitable access to devices, inconsistent pedagogical support, or a lack of recognition for digital scholarship—stem from broader systemic issues. For example, a vice-provost for teaching and learning might use SETI to present evidence to a ministry of education on how rigid assessment regulations hinder the adoption of digital and hybrid teaching models, thereby justifying requests for regulatory reform or funding for pedagogical experimentation.

At the same time, SETI encourages leaders in higher education to foster coordinated efforts across interdependent systems. These may include partnerships between instructional technology units, academic departments, IT services, and student affairs, as well as engagement with external stakeholders, such as industry or community organizations. The framework underscores the importance of aligning institutional strategy with the beliefs and practices of faculty, the digital competencies of students, and the sociocultural context in which the university operates.

6. SETI resources

A set of practical resources has been developed to complement the use of the SETI framework. While educators and leaders can engage meaningfully with the framework on its own as an analytical and reflective tool, these additional resources are intended to support deeper and more sustained implementation across various contexts. The materials provide structured guidance for applying SETI principles in everyday practice, including planning, evaluation, professional reflection, and institutional advocacy.

6.1. SETI Systems Reflection Tool

The first resource is a systems reflection tool for educators and educational leaders in K-12 and higher education.

SETI Systems Reflection Tool: A Guide for K–12 Educators Supporting Technology Integration

A guide for educators in using the Socio-Ecological Technology Integration (SETI) framework to assess what support and resources you need to successfully integrate technology.

Educator Level (Individual Beliefs and Practices)

- ☐ Have you reflected on your personal beliefs about technology and how they influence your teaching?
- ☐ Are you aware of how family culture, traditions, and biases (your own and your students') may shape perceptions of technology in education?
- ☐ Are you integrating technology in ways that align with effective pedagogical strategies and curriculum goals?

School Level (Microsystem)

- ☐ Does your school provide adequate access to technology (devices, software, and internet connectivity) for both educators and students?
- ☐ Are you actively participating in professional development opportunities related to technology integration?
- ☐ Is there technical support readily available to help you troubleshoot and resolve challenges?
- ☐ Are you working with colleagues and school leadership to build a culture of effective technology use?
- ☐ Are there clear school policies guiding the safe, ethical, and effective use of technology, and are you following them?

School District Level (Exosystem)

- ☐ Are you provided with district-wide policies and guidelines to support technology integration?
- ☐ Does your district allocate funding and resources to ensure technology access, support, and training?
- ☐ Are you advocating for needed improvements by sharing challenges and successes with district leaders?
- ☐ Do you engage in professional learning communities or district-led technology initiatives to stay informed?

National Level (Macrosystem)

- ☐ Are you aware of national policies, political priorities, and education standards, and do they support effective and equitable technology integration?

- □ Are you aware of how cultural, social, and political factors influence how technology is valued and adopted in education, and are you considering these influences in your practice?
- □ Is the government ensuring equitable access to technology, internet connectivity, and digital resources, and are you advocating for these needs in your school or district?
- □ Are you engaging in national conversations and professional networks to stay informed, share insights, and contribute to policy discussions on technology integration?

Cross-Cutting Elements (Mesosystem)

- □ Are policies and support structures aligned across school, district, and national levels to ensure consistency?
- □ Are all stakeholders, educators, administrators, and policymakers actively working together to create a well-supported, technology-integrated learning environment?

SETI Systems Reflection Tool: For School and District Leaders Enabling Effective Technology Integration

A guide for educational leaders in using the Socio-Ecological Technology Integration (SETI) framework to assess whether the necessary policies, resources, and support structures are in place to facilitate effective technology integration.

Leadership in Supporting Educators (Educator Level)

- ☐ Are you ensuring that educators have access to training and professional development to integrate technology effectively?
- ☐ Are you fostering a culture where educators feel supported in exploring and reflecting on their beliefs about technology in learning?
- ☐ Are you providing opportunities for educators to collaborate, share best practices, and learn from one another?

Leadership at the School Level (Microsystem)

- ☐ Are you ensuring that educators and students have equitable access to technology, including devices, software, and reliable internet connectivity?
- ☐ Are school policies in place to guide the safe, ethical, and effective use of technology in learning?
- ☐ Is there a system for providing timely and effective technical support to educators and students?

Leadership at the School District Level (Exosystem)

- ☐ Are district-wide policies and guidelines in place to support and standardize technology integration across schools?
- ☐ Are there mechanisms for educators to provide feedback on technology-related challenges and successes?
- ☐ Are you staying current and ensuring sufficient funding and resource allocation for technology access, training, and support?

Leadership at the National Level (Macrosystem)

- ☐ Are you staying informed about national policies, political priorities, and education standards related to technology integration?
- ☐ Are you advocating for government policies and funding that ensure equitable access to technology and digital learning resources?
- ☐ Are you addressing how cultural, social, and political factors influence technology adoption and integration in education?

Cross-Cutting Responsibilities (Mesosystem)

- ☐ Are you aligning policies and support structures across school, district, and national levels to create a consistent and effective technology integration strategy?
- ☐ Are you facilitating collaboration among educators, administrators, and policymakers to build a well-supported technology ecosystem?

SETI Systems Reflection Tool: A Guide for Higher Education Faculty Advancing Digital Teaching

A systems guide for educators in higher education using the Socio-Ecological Technology Integration (SETI) framework to assess what support and resources you need to successfully integrate technology.

SETI Checklist for Higher Education Faculty

A guide for university faculty using the Socio-Ecological Technology Integration (SETI) framework to evaluate and strengthen supports for effective technology integration in teaching and research.

Faculty Level (Individual Beliefs and Practices)

- ☐ Have you reflected on your personal beliefs about digital technology and its pedagogical value in higher education?
- ☐ Are you aware of how your cultural background, academic discipline, and student diversity influence your approach to technology integration?
- ☐ Are you aligning technology use with course learning outcomes, evidence-based pedagogical practices, and institutional teaching goals?

Institutional Level (Microsystem)

- ☐ Does your institution provide equitable access to necessary technology resources for faculty and students (e.g., hardware, software, bandwidth, digital library tools)?
- ☐ Are there professional development opportunities available to support pedagogical uses of technology in teaching and supervision?
- ☐ Is there dedicated technical and instructional design support for integrating technology into courses and research dissemination?
- ☐ Are academic departments and leadership fostering a culture that values and supports innovative and responsible technology use?
- ☐ Are institutional policies in place to ensure the ethical, accessible, and secure use of educational technologies?

University System and Regional Context (Exosystem)

- ☐ Are there coordinated efforts across faculties, campuses, or university systems to support scalable and consistent technology integration?
- ☐ Are you aware of system-wide investments in infrastructure and faculty development for digital teaching and learning?
- ☐ Are you contributing to or benefitting from faculty networks, cross-institutional initiatives, or regional consortia focused on educational technologies?
- ☐ Are you communicating needs or barriers to appropriate administrative leaders or committees to influence improvements?

National and Global Policy Context (Macrosystem)

- ☐ Are you familiar with national or international policies, funding streams, and quality frameworks that guide technology-enhanced higher education?

- ☐ Are you considering how national culture, higher education policy, and public attitudes influence institutional decision-making around technology?
- ☐ Are issues of digital equity and inclusion addressed in national initiatives, and are you advocating for these in your institution where needed?
- ☐ Are you participating in national or international communities of practice, policy consultations, or scholarly debates about the future of technology in higher education?

Cross-Cutting Considerations (Mesosystem)

- ☐ Are institutional strategies, policies, and supports aligned with system-wide and national policies to ensure coherent implementation?
- ☐ Are academic leaders, IT services, faculty governance bodies, and policy makers collaborating effectively to support meaningful and sustainable technology integration?

SETI Systems Reflection Tool: For Academic Leaders Building Institutional Support for Digital Learning

A guide for academic leaders (e.g., deans, provosts, vice chancellors) to evaluate and enhance the institutional systems and policies needed to support effective technology integration using the Socio-Ecological Technology Integration (SETI) framework.

Leadership in Supporting Faculty (Faculty Level)

- ☐ Are you supporting faculty in reflecting on their educational beliefs and how these influence technology use?
- ☐ Are you providing mechanisms for inclusive decision-making that consider diverse faculty perspectives on technology integration?
- ☐ Are professional development programs available that align digital tools with pedagogical innovation and disciplinary expectations?

Leadership at the Institutional Level (Microsystem)

- ☐ Is your institution ensuring equitable access to robust technology infrastructure and digital learning environments for both faculty and students?
- ☐ Are institutional policies in place that address digital equity, accessibility, ethical use, and data security in educational technologies?
- ☐ Are units such as centers for teaching and learning, IT services, and digital pedagogy teams adequately resourced and aligned in their support of faculty?
- ☐ Are you fostering a culture of innovation and continuous improvement in technology-enhanced teaching, learning, and research?

Leadership Across University Systems and Partnerships (Exosystem)

- ☐ Are you engaged in cross-institutional or system-wide strategic initiatives for digital transformation in teaching and learning?

- ☐ Are you gathering and responding to data and feedback from faculty and students on technology integration challenges and opportunities?
- ☐ Are you investing in shared platforms, cloud services, or open educational resources that extend institutional capacity?
- ☐ Are you supporting collaborative research or community-engaged scholarship initiatives that integrate educational technologies?

Leadership in National and Global Contexts (Macrosystem)

- ☐ Are you staying informed about national digital education policies, international quality frameworks, and regulatory standards affecting technology use?
- ☐ Are you advocating for policy reform or funding that supports inclusive, innovative, and sustainable educational technology initiatives?
- ☐ Are you representing your institution in national or global digital education networks, alliances, or policy forums?
- ☐ Are cultural, social, and economic factors in your national and international context considered in strategic decisions about digital transformation?

Cross-Cutting Leadership Responsibilities (Mesosystem)

- ☐ Are institutional strategies aligned with broader system-level and national policies to ensure coherence in technology adoption?
- ☐ Are you facilitating cross-role collaboration (faculty, IT, instructional design, student services) to support an integrated digital learning ecosystem?
- ☐ Are monitoring and evaluation processes in place to assess the impact of technology integration on student success, equity, and teaching quality?

6.2. Advocacy planning guide

Advocacy is greatly supported by the SETI framework, helping educators and leaders pinpoint where barriers exist within the broader educational system. This Advocacy Planning Guide provides a structured approach for translating those insights into concrete, system-level action (see Table 1).

Table 1: Advocacy Planning Guide

Section	Guiding Prompts	Example Response
1. Define the Challenge	What barrier are you experiencing in integrating technology?	Inconsistent access to functioning Wi-Fi in hybrid classrooms.
2. Identify the Systemic Level	Which level(s) of the SETI framework does this issue belong to? (Micro, Meso, Exo, Macro)	Inconsistent access to functioning Wi-Fi in hybrid classrooms.
3. Describe the Impact	How does this barrier affect teaching, learning, or equitable access for students?	Limits real-time collaboration, causes student disengagement, and disrupts instructional flow.
4. Evidence to Support the Case	What data, examples, or observations can you share to illustrate the problem?	Logs of outages across 4 weeks; 3 faculty members reporting disruption in hybrid instruction.
5. Stakeholders Involved	Who needs to be informed or involved in addressing this issue?	Department chair, IT services, academic technology office, associate dean.
6. Proposed Solution or Request	What are you asking for? Be specific and feasible.	Request a dedicated technology support person for the building and prioritization of Wi-Fi upgrades.
7. Alignment with Institutional Goals	How does your request align with broader institutional priorities (e.g., digital equity, retention, innovation)?	Enhances student success in hybrid delivery and supports inclusive digital learning environments.
8. Communication Plan	How and when will you raise this issue? What format will you use (e.g., memo, meeting, email)?	Prepare a short brief and request time on the agenda at the upcoming faculty tech steering committee.

6.3. Case studies

The case studies and vignettes included in this section illustrate how the SETI framework can be applied in real-world educational contexts to surface systemic barriers and opportunities for effective technology integration. Each scenario highlights a different layer of the socio-ecological system, allowing educators and leaders to analyze challenges not as

isolated incidents but as outcomes shaped by broader institutional, cultural, or infrastructural dynamics. These cases can be used in faculty development sessions, leadership retreats, or collaborative planning meetings to prompt reflection, guide discussion, and support collective problem-solving grounded in systems thinking.

Case Study A: Uneven Access and Equity in the Classroom

Scenario:

Professor Ndlovu teaches in a regional institution where many students rely on limited mobile data and shared devices. During the pandemic, she moved to asynchronous teaching but found engagement dropped significantly. Although she redesigned her courses using low-bandwidth tools, she remains concerned about the digital divide and feels unsupported in her efforts to address it institutionally.

Relevant SETI Layers:

Macrosystem (national infrastructure), Exosystem (institutional policy), Student experience (equity)

Reflective Question:

How can faculty surface digital equity issues as institutional priorities rather than isolated instructional problems?

Case Study B: Faculty Frustration with Support Gaps

Scenario:

Dr. Allen, a senior lecturer in a large urban university, has adopted a blended model for his introductory sociology course. Despite his interest in using video feedback and discussion tools, he finds himself repeatedly delayed by unresolved technical issues. The university's IT helpdesk is understaffed, and faculty training is only offered at the start of the academic year. As a result, he has reverted to more basic tools, compromising his original pedagogical goals.

Relevant SETI Layers:

Microsystem (access to support), Exosystem (institutional investment), Educator beliefs (adaptive practice)

Reflective Question:

What structural changes within the institution could be proposed to prevent skilled educators from scaling back innovation due to inconsistent support?

Case Study C: Cultural Perceptions and Parental Influence

Scenario:

Dr. Wang is a faculty member in a teacher education program that includes practicum partnerships with local schools. She noticed that student teachers report resistance from parents when using online tools in early childhood settings. Parents believe screen time is inappropriate for young learners, regardless of pedagogical intent. This resistance has led some schools to limit student teachers' use of digital platforms entirely.

Relevant SETI Layers:

Macrosystem (cultural norms), Mesosystem (school-university partnership), Family (external perceptions)

Reflective Question:

In what ways can faculty work with institutional and community stakeholders to address sociocultural beliefs that shape attitudes toward educational technology?

6.4. SETI integration tracker

The SETI Integration Tracker is a practical tool designed to help educators and leaders monitor the conditions that support or hinder effective technology integration across the layers of the socio-ecological system. By regularly recording observations, identifying areas of strength or concern, and tracking actions taken, users can build a clear picture of how systemic factors influence digital teaching and learning over time.

TABLE 1. SETI integration tracker

SETI Domain	Indicator of Integration	Current Status(Red / Amber / Green)	Evidence or Notes	Action Taken / Planned	Date Reviewed
Educator (Core)	Educator beliefs and confidence in using digital tools		e.g., survey responses, reflection notes, observed practices		
Microsystem	Availability of reliable devices and infrastructure in immediate teaching context		e.g., classroom audits, reported incidents, access logs		
Microsystem	Access to real-time technical and pedagogical support		e.g., IT response time, staff feedback		
Microsystem	Alignment of tools with course-level teaching objectives		e.g., LMS usage reports, curriculum mapping		
Mesosystem	Coordination of tools, policies, and practices across departments or programs		e.g., use of shared platforms, consistent guidelines		

Exosystem	Institutional support (e.g., PD opportunities, help desk, funding)		e.g., availability of workshops, budget allocations		
Macrosystem	National or institutional culture and policy alignment		e.g., curriculum flexibility, policy mandates, cultural attitudes		
Student Impact	Evidence of student access, participation, and engagement in technology-supported learning		e.g., LMS analytics, feedback surveys, attendance		
Advocacy Action	Has this domain required systemic advocacy or escalation?		e.g., memos, leadership briefings, departmental resolutions		

These tools offer practical mechanisms to support the implementation of the SETI framework across various educational settings. They facilitate structured reflection, enable the identification of systemic factors affecting technology integration, and support evidence-informed planning and advocacy aligned with institutional and policy contexts.

7. Conclusion

In this paper, the Socio-Ecological Technology Integration (SETI) framework is highlighted as a systems-level model for understanding and supporting effective digital integration in education. By situating the educator within a broader ecological structure, comprising classroom realities, institutional infrastructure, community expectations, and national policy, SETI expands the analytical lens beyond the individual practitioner. It addresses a longstanding limitation of earlier models by emphasizing that meaningful technology integration is not the sole responsibility of educators but a collective endeavor requiring systemic coordination. To support implementation, a set of SETI-aligned tools has been introduced, including the SETI systems reflection tool, advocacy planning guide, case studies, and integration tracker. These resources offer practical entry points for educators and educational leaders to identify systemic barriers, reflect on practice, advocate for necessary change, and align technology use with broader institutional goals. In doing so, they operationalize the theoretical dimensions of the SETI framework and promote its application in both K–12 and higher education contexts.

As educational systems worldwide continue to evolve in response to technological advancements, the SETI framework provides a timely and necessary perspective, one that acknowledges the complexity of technology integration and foregrounds the interdependence of actors and structures. Its application enables stakeholders at all levels to make informed, strategic decisions that support sustainable, contextually grounded, and pedagogically meaningful integration of digital technologies in education.

Author's contributions

Helen CROMPTON: Conceptualization, visualization, investigation, data processing, writing – original draft, review & editing.

Artificial intelligence (AI) policy

The author declares that no artificial intelligence (AI) tools have been used in the preparation process of this manuscript.

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Repensando el camino hacia el florecimiento: educación, epifanía y *Una vida que merezca la pena ser vivida*

Rethinking the Route to Flourishing: Education, Epiphany, and a Life Worth Living

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Abstract:

How can education contribute to human flourishing? In our previous work, we have argued that transformative methods of teaching and learning are the most compelling available for advancing the flourishing of young people in the classroom. Although the idea of an education for flourishing has been the topic of some controversy in the last few years, with some scholars forcefully defending and some rejecting the notion as a guiding aim of education, much of this discussion has occurred at a high level of abstraction, focusing on the philosophical foundations and ethical implications of flourishing as a concept. Parallel to this debate, there has been growing interest in an approach to education based on a popular course at Yale University called the "Life Worth Living" Framework, which has a stated focus on offering guidance to students for "defining and then creating a flourishing life." In this paper, we engage with the Life Worth Living framework, as it presents a provocative case study for examining the potential risks and rewards of educational programs designed to foster students' flourishing. At the same time, the framework raises important questions about what it means to teach for flourishing, since the way it understands how flourishing is advanced operates on several philosophical premises that, to our minds, deserve closer examination.

Keywords: well-being, education, transformative teaching, meaningful life, philosophy pedagogy

Resumen:

¿Cómo puede contribuir la educación al florecimiento humano? En nuestro artículo anterior, argumentamos que los métodos de enseñanza y aprendizaje transformadores son los más eficaces y convincentes para promover el florecimiento de los jóvenes en el aula. Si bien la idea de una educación orientada al florecimiento ha sido objeto de cierta controversia en los

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últimos años —con algunos académicos defendiéndola enérgicamente y otros rechazándola como objetivo pedagógico orientativo—, gran parte de este debate se ha desarrollado en un alto nivel de abstracción, centrado en los fundamentos filosóficos y las implicaciones éticas del florecimiento como concepto. Paralelamente a este debate, ha ido creciendo el interés por un enfoque educativo basado en un curso popular de la Universidad de Yale titulado *Life Worth Living* (Una vida que merezca la pena ser vivida), cuyo objetivo declarado es ofrecer orientación a los alumnos para «definir y posteriormente construir una vida floreciente». En este artículo nos centraremos en dicho enfoque, puesto que representa un estudio de caso sugerente para determinar los posibles riesgos y recompensas de los programas educativos orientados al florecimiento de los alumnos. Al mismo tiempo, el enfoque plantea importantes cuestiones sobre lo que significa enseñar para el florecimiento, ya que la forma de entender cómo se promueve este proceso se basa en varias premisas filosóficas que, en nuestra opinión, merecen un examen más detenido.

Palabras clave: bienestar, educación, enseñanza transformadora, vida significativa, filosofía, pedagogía

1. Introduction

How can education contribute to human flourishing? More importantly, how can our teaching contribute to the flourishing of the individual students currently sitting in our classrooms? In our previous work, we have argued that transformative methods of teaching and learning are the most compelling available for advancing the flourishing of young people. Transformative methods foreground the quality of students' everyday experiences, encouraging teachers to consider how their subject matter illuminates the world outside and how it can make students' conscious experiences more enriching and inspiring. Our claim is that the academic disciplines provide the conceptual and phenomenological material to enable this enrichment of experience, provided teachers can demonstrate—through their own example—how it has contributed to their own growing understanding, appreciation, and passion for the phenomena involved. With this orientation, transformative teaching and learning are not just about increasing students' sense of subjective well-being; it is about cultivating students' capacity and confidence to create a flourishing life (Jonas & Yacek, 2024; Yacek, 2021, 2020; Jonas & Nakazawa, 2020; Yacek & Gary, 2020; Yacek & Ijaz, 2020).

Over the last decade or so, there has been a growing interest in an approach to education for flourishing that differs in key ways from the transformative view we have previously advanced. Based on a popular class at Yale University, this approach is known as the "Life Worth Living" Framework, with its stated focus on offering guidance to students for "defining and then creating a flourishing life" (Volf, Croasmun, McAnnally-Linz, 2023, inside cover). This framework draws on key insights from the world's most influential philosophical and religious traditions to prompt personal reflection on how, or whether, the everyday shape of one's life is connected to the acquisition of genuine human goods, as outlined by these traditions. Students are to explore these sources for the guidance they can provide in pursuing meaningful vocations and life goals, grappling with personal failure and suffering, and confronting death and the process of self-transformation. The Life Worth Living framework does not stipulate which traditions or strategies are most helpful for addressing each of these aspects of human flourishing. Rather, it encourages students to ask and answer for themselves what it calls the Question:

> There are countless ways to try to express it: What matters most? What is a good life? What is the shape of flourishing life? What kind of life is worthy of our humanity? What is true life? What is right and true and good? None of these phrasings captures it completely… Hard as it is to pin it down, it is the Question of our lives. The Question is about worth, value, good and bad, and evil, meaning, purpose, final aims and ends, beauty, truth, justice, what we owe one another, what the world is, and who we are and how we live. It is about the success of our lives or their failure. (p. xv)

The Life Worth Living framework is unique because it constitutes a particularly explicit effort to make personal flourishing and reflection on the good life a central organizing feature of the learning environment. In fact, it is one of the most concerted efforts to shape the educational experience around student flourishing that we have come across to date. Its success as the basis of a popular course at Yale University makes it all the more compelling an object of scholarly attention.

Of course, the idea of an education for flourishing has been the topic of some controversy in the last few years, with some scholars forcefully defending (Kristjánsson & VanderWeele, 2024; cf. Brighouse, 2006; De Ruyter, 2004; De Ruyter & Wolbert, 2020; Reiss & White, 2013; Schinkel et al. 2023; White, 2006; Wolbert, De Ruyter & Schinkel 2015) and some rejecting (Carr, 2021; Hand forthcoming; Siegel forthcoming) the notion as a guiding aim of education. Much of this discussion has taken place at a high level of abstraction, focusing on the philosophical foundations and ethical implications of the concept of flourishing. Engaging with the Life Worth Living framework offers a helpful contrast to this discussion, we believe, since it constitutes a kind of case study for determining the potential risks and rewards of educational programs conceived in this manner. At the same time, the framework raises important questions about what it means to teach *for* flourishing, since the way it understands how flourishing is advanced operates on several philosophical premises that, to our minds, deserve closer examination.

Our argument in the paper proceeds in several steps. First, we briefly discuss the recent debate on flourishing as an educational aim in the scholarly literature. Here we concentrate on Kristjánsson's insightful treatment in his 2021 book, *Flourishing as the Aim of Education*, arguing that much of Kristjánsson's vision constitutes a compelling approach for the flourishing classroom, though his stance on the role of epiphanies in this endeavor is partially mistaken. Against this backdrop, we then consider the Life Worth Living approach to teaching for flourishing in some depth. Here, too, we find some aspects of the program to be very promising for supporting students' flourishing, and some to need correction and augmentation if it is to fulfill its stated purpose. In closing, we turn back to a transformative account of education for flourishing, outlining the several tasks that teachers will need to accomplish in the classroom if their efforts are to advance students' flourishing.

2. Making Flourishing Matter

That flourishing constitutes a legitimate aim of education has been the subject of debate over the last few years. Scholars such as Hand (forthcoming), Siegel (forthcoming) and Carr (2021) have argued that flourishing is not what we should be after, citing (among other things) argumentative lacunae in the defense of flourishing as an educational aim, lack of specificity regarding the constituents of flourishing, issues concerning student autonomy, and, perhaps most troublingly, oversights concerning the degree to which the constituents of flourishing are practically teachable or even educable in theory.

In a recent article, Kristjánsson and VanderWeele (2024) have rejoined that flourishing rightly constitutes an "overarching educational aim" (p. 4; cf. Kristjansson, 2021), arguing compellingly that appropriate conceptual refinements can alleviate each of the proposed problems. Their main line of argument is that flourishing as an aim of education indeed contains non-educable aspects, but *not all* constituents of flourishing are non-

educable. Moreover, many of the *preconditions* necessary for flourishing—such as various cognitive, emotional, and conative dispositions—constitute important outcomes of educational processes and can be taught. Regarding issues of autonomy, Kristjánsson and VanderWeele point out that flourishing, though it presupposes a conception of the human good, is not only sufficiently broad to garner wide consensus across philosophical and religious boundaries; it provides a compelling alternative to the reigning conception of well-being embodied in current educational systems—viz. human capital theory. At root, the authors show that introducing flourishing as a guiding educational aim allows us to move past reductive accounts of what is worth striving for in education and allows both theorists and practitioners to bring "at least certain aspects of happiness, health, purpose, character, social relationships, and financial self-sufficiency" (p. 14) into the educational fold.

With this contribution, Kristjánsson and VanderWeele provide a much-needed corrective to the debate concerning flourishing as an educational goal. As we see it, none of the issues raised by critics seriously undermines the notion of flourishing as a regulative ideal of education. At the same time, Kristjansson & VanderWeele make a practical case for flourishing at a systemic level, discussing the broad areas of educational practice that contribute to flourishing, but not the forms of classroom engagement that would advance the aim. For example, they argue that education for flourishing involves "[p]rogrammes specifically focused on character development, social-emotional learning, well-being enhancement, or practical skills like nutrition and financial management" and belongs together with efforts to foster "students' knowledge, understanding, and the cognitive skills and epistemic virtues that facilitate knowledge and understanding" (p. 9). However, the authors do not specify whether flourishing as an educational aim *changes the character of how these educational practices are conducted in the classroom*.

It is precisely here that Kristjánsson's (2021) previous book-length treatment of flourishing offers some further guidance. One of the most significant contributions of this book, to our minds, is its demonstration of how an orientation towards flourishing alters pedagogical goal-setting and decision-making. In essence, Kristjánsson argues that a host of sources, which have engaged with human flourishing—from empirical psychological studies to philosophical treatments and religious thought—point to an oft-overlooked set of emotional dispositions and virtues that teachers devoted to flourishing cannot afford to ignore in the classroom. Contemplation and wonder, awe and enchantment, elevation, and "love of the transcendent" (p. 109) are crucial components of a flourishing human life, says Kristjánsson, and therefore our classrooms should be places where these experiences are cultivated. To use an example that Kristjánsson discusses, science teachers should not just seek to transmit cognitive skills, intellectual capacities, and scientific facts that often exhaust the curriculum in these spaces. These are essential, of course. However, if teachers are truly to take the full psychological spectrum of flourishing seriously, they should also create opportunities to *marvel* at the phenomena of science—to feel a deep appreciation, meaning, and personal elevation when studying them. The same goes, Kristjánsson argues, for contexts of moral education. Even here, in what appear to be straightforward processes of emulation and admiration, awe and the capacity to marvel at moral beauty play a significant role. For Kristjánsson, art has a special power to motivate such experiences, and in the final lines of the book, he makes a spirited case for incorporating more of it into the classroom.

We could not agree more with Kristjánsson's appeal for flourishing in the classroom, and particularly his insights into how an orientation towards flourishing transforms the mundanity of typical teaching and learning. Much of what we have argued for under the heading of transformative education is closely aligned with Kristjánsson's proposal, and we, too, believe art has an important role to play in the classroom. In our work, we tend to emphasize the power of disciplines themselves in bringing about the experiences and virtues he highlights. Similar to Kristjánsson's discussion of science, we argue that academic disciplines embody unique forms of life that are in themselves sources of fascination and awe; thus, part of education

for flourishing is an initiation into these forms of life. However, the value of such disciplinary initiation ultimately resides in its capacity to enrich our experience and our lives, making them richer and more flourishing; therefore, our position ends up quite close to what Kristjánsson hopes to advance.

One point of difference does remain when comparing Kristjánsson's and our own approach to education for flourishing. In our view, epiphanies are absolutely central to any educational space aimed at students' flourishing. There are two main reasons for thinking so. The first is that occasions of the various emotions and experiences described above are arguably only morally desirable when they are coupled with psychological restructurings that cause us to desire the Good more firmly, i.e., when they occasion *epiphanically*. As Kristjánsson himself points out, experiences like awe and wonder are not inherently moral; moral educators should strive for "virtuous awe" (Kristjánsson, 2021, p. 133), which encompasses wonder, elevation, and love of the transcendent. This dimension—in our view—is secured by the concept of epiphany, since epiphanies are by definition connected to a desire for the Good. Secondly, because such emotions and virtues are at odds with students' typical ways of navigating the world, particularly with the sensational media that young people are consuming at an alarming rate, they are likely to emerge through more sudden or powerful experiences. Epiphanies, therefore, also play an important role in priming students for developing the moral habits that we, and Kristjánsson himself, hope will result in the long run. Although epiphanies are by no means easy to bring about in the classroom, teachers' passion, purpose, and integrity with respect to the subject matter can serve as a helpful foundation for students to begin seeing the value of new moral perspectives and practices in epiphanic moments and to cultivate these insights in their lives thereafter. (We will go into this point more fully when we turn to the Life Worth Living framework below.)

Although Kristjánsson devotes an entire chapter in the book we have been describing to the notion of epiphany, he arrives at a rather cautious conclusion about its role in the classroom. Kristjánsson appears to be concerned about *intentionally* seeking epiphanic experiences in pedagogical spaces. For example, he suggests that contexts such as "adventure education" and "service learning" may be able to provide conditions "in which the sudden epiphanic growth would be stimulated obliquely through the challenges of the experience itself, rather than aimed for directly" (p. 133). Although Kristjánsson points out, referring to Jonas (2015), that Plato's works provide provocative examples of epiphany-inducing dialogues and therefore potentially a classroom-friendly methodology for epiphanic growth "without dictating the way" (ibid.), he ends the chapter in an ambiguous vein:

> I am tempted to conclude [...] that schooling which forecloses the option of an epiphanic moral conversion does not constitute good education. ... To what extent this option should be buttressed and stimulated in the classroom is another question, however, and answering it will require not only a much fuller, empirically informed theory about moral conversions and their role in student flourishing, but also considerable educational *phronesis* on the part of the teacher. (p. 134)

In a recent paper, Kristjánsson (forthcoming) takes up precisely this open question again. Although the ambiguity in his previous work allowed room to imagine a pedagogy of classroom epiphanies, his tone in the later piece has markedly changed. His tack here is to offer several criteria for an experience to count as epiphanic, and then, based on these criteria, to show that two paradoxes arise when we attempt to induce epiphanies in the classroom—the "psycho-epistemic" and "psycho-moral" paradox. He considers these paradoxes troubling and even fatal to the use of epiphanies in the classroom.

Kristjánsson defines the psycho-epistemic paradox in this way: "The epistemic factor here is the antecedent grasp of a plan, which presumably involves knowledge about V and how to get to it, combined with the psychological fact that no definite psychological evidence exists about how this is best accomplished, or even accomplished at all" (n. p.). To restate it more simply: teachers need a plan for creating an epiphany, but since they lack the relevant

psychological knowledge to devise a foolproof plan for epiphanic change, they are unable to create one.

To our minds, this argument does not yield a genuine paradox, since "planning" for epiphanies need not be understood in the strong sense of *guaranteeing* its success. Teachers can, and do, follow certain strategies to create epiphanies that have proven successful in the past. As they improve as educators, so will their strategies for creating epiphanies. They will never be able to create a *foolproof* plan, of course, since even the most skilled educators cannot control the complex inner workings of students' minds and souls (and they would not want to do so anyway), but they *can* create a plan for epiphanies with increasing success.

Regarding the psycho-moral paradox, a similar issue of language seems to be at work. Kristjánsson writes:

> A dedicated teacher has a moral duty to help a student enact radical self-change in order to overcome developmental and existential challenges to her wellbeing. A dedicated teacher is not morally entitled to set in motion any interventions unless she is reasonably confident about the outcome and can plan it beforehand. However, by definition, radical self-change is (typically) epiphanic and spontaneous and cannot be preplanned. Hence, paradoxically, *the teacher both has and does not have a moral duty to set this process in motion* (n. p.; italics in original)

This definition can, if certain words are interpreted in a specific way, appear paradoxical. But the paradox found in them is dependent upon a narrow interpretation of the second premise—viz. The idea is that teachers can pursue only those pedagogical courses whose outcomes are measurable and consistently achievable. On the one hand, it is true that teachers, of all ages and disciplines, should have "reasonable confidence in the outcomes" of the pedagogical strategies that they use. But this does not mean that only those pedagogical strategies are allowable whose outcomes can be guaranteed. Such certainty in education is impossible. So, the question then becomes: what constitutes reasonable confidence? This confidence stems from teachers' own psychological acumen, their prior pedagogical experiences, and their understanding of the importance of helping students overcome their deficiencies and support their moral aspirations. In these ways, teachers can act in a morally directed manner—i.e., to bring about experiences of awe, elevation, and so on—and do so with a well-reasoned plan, even though the outcomes cannot be guaranteed.

Behind this issue are concerns, it seems, about the potentially negative outcomes of epiphanies, which, particularly when only half-completed, do come with certain moral risks. We have argued in the past that educators interested in the transformative project should be aware that deep psychological restructurings can throw students into an existentially precarious position, weakening ties to meaningful communities and forms of life, undermining their sense of self, and questioning their previous ways of formulating worthwhile life goals and projects (Yacek, 2021; Yacek, 2020). However, it is precisely for this reason that teachers need to understand their transformative efforts in a certain way. The goal is not to simply "call into question" what students hold dear, as some scholars, all too committed to the critical project in education, have suggested; to "emancipate" students from roles the educator finds restrictive; or to "convert" students to some preferred ideology or way of life. Rather, the goal of the transformative classroom is to demonstrate through epiphanies that the world is richer, more exciting, and more awe-inspiring than one thought it to be, and to point to communities (e.g., disciplines) in which this kind of experience can be further cultivated and appreciated. Frankly, we think Kristjánsson's second paradox can only provide critical force if we are operating on a reductive, or inherently flawed view of personal transformation and epiphany, and dissolves when the proper aims and methods of the transformative classroom are adopted (for a fuller discussion, see Jonas, forthcoming; Yacek & Gary, forthcoming).

3. Foregrounding Flourishing

To summarize the discussion so far, education for flourishing encompasses at least these four unique domains of pedagogical initiative:

1. Teachers go beyond a reductive view of education's relationship to student well-being and recognize the educational importance of experiences of awe, enchantment, beauty, and wonder.
2. Teachers prime students to have such experiences by modelling their own encounters with them and working against psychological habits that may prevent them.
3. Teachers create conditions for epiphanies to occur in the classroom, understood as moments in which experiences of awe, enchantment, beauty, and wonder arise.
4. Teachers help students work out the implications of such epiphanies for their lives.

This "meta-curriculum" of education for flourishing is, of course, not exhaustive. As we have already mentioned, there are countless tasks that teachers and students will need to perform that have less to do directly with these kinds of experiences and more to do with acquiring disciplinary acumen and an appreciation of disciplinary learning. The four domains are important to mention here, however, because they give such tasks their deeper, existential importance. After all, students learn within the disciplines not merely to acquire disciplinary knowledge, but because having this knowledge introduces them to forms of life that are exciting to be a part of and enrich their experience of the everyday world.

Although the four domains cover a fair bit of ground in determining the content and aims of a flourishing classroom, there may still be something missing. What Kristjánsson and we seem to have overlooked are more explicit attempts to address the issue of flourishing in the classroom. In a sense, we tend to see flourishing as something that *results* from various experiences with subject matter, experiences which are orchestrated and guided by the teacher. However, we know that the project of creating a flourishing life for oneself is wrapped up in countless decisions in everyday life—both big and small—that can detract from or contribute to our flourishing, even if we have had powerful moral experiences that have put us on the right path. Put differently, since human beings possess a unique degree of self-determination, they bear the special burden of planning, executing, and then assessing the moral quality of their actions so that they can steer their lives toward flourishing-conducive ends. While experiences and emotional responses, such as the ones just mentioned, clearly play an important role here, so do more explicit forms of reasoning and reflection on the Good life.

Enter the Life Worth Living approach. This approach is expressly designed to support young people's quests to lead a flourishing life, particularly by encouraging explicit reflection on ultimate aims and purposes and how these come to bear in their daily lives. The proponents of this approach argue that flourishing requires concerted personal engagement, and they have developed a compelling structure to foster it in the college classroom (Volf, Croasmun, & McAnnally-Linz, 2023).

The Life Worth Living approach is structured by four guiding principles, if we are correct in our understanding of the program. The first principle concerns how we can grasp the concept of flourishing in the first place. The authors argue that the question of one's flourishing should be broken down into several subquestions that speak to various domains of life and common human experiences that directly impact our flourishing. In a word, the Life Worth Living framework emphasizes *flourishing-related decision-making* as it appears in daily life. In our accounting, there are seven questions that the program framers take to derive from the general question, "How can I flourish?" We have listed these below in their original form, as well as our translation into more systematic terms in relation to the principle of decision-making for flourishing.

Table 1. A catechism of flourishing

LWL approach question	**Translation into questions of flourishing-related decision-making**
Whom do we answer to?	What people or groups are we most concerned about doing right by when we make flourishing-related decisions?
How does a good life feel?	What emotional states are prioritized when we make flourishing-related decisions?
What should we hope for?	What future emotional states, personal achievements, or states of affairs are our flourishing-related decisions meant to help bring about?
How should we live?	What principles and values (should) govern our everyday lives?
What do we do when we (inevitably) botch it?	How do our flourishing-related decisions account for (the possibility of) failure?
What do we do when life hurts and there's no fixing it?	How do our flourishing-related decisions account for unavoidable suffering?
What do we do when life ends?	How do our flourishing-related decisions account for our death?

We find this "catechism of flourishing" very helpful for guiding both teachers and students in systematic reflection on the moral quality of their lives, since it touches on so many domains of flourishing-related decision-making: (1) social responsibility, (2) emotional life, (3) moral ideals, (4) life goals, (5) bedrock values, (6) failure, (7) suffering, and (8) mortality. Just about anything we might experience or strive for in life can be assigned to one or more of these categories; thus, the framework possesses tremendous potential for highlighting issues that matter most to students. The focus on how students make their regular, everyday decisions further increases the potential impact of the approach, since the results of one's reflections can—theoretically at least—be applied immediately. It is rare to find an educational program that takes the lives of students seriously right now.

The second principle of the Life Worth Living approach pertains to how engagement with questions like these is conducted in the classroom. In a word, the framers of the approach recommend *first-hand, personal engagement* with the questions listed above. Pedagogically speaking, this means that courses using the approach involve an eclectic variety of classroom and extra-curricular activities in which the individual student is called on to share personal experiences, aspirations, fears, and struggles. Students are also encouraged to consider the media and texts used in class, always in reference to how they construct their everyday lives and how their lives would have to change if the text or medium under discussion were true. These engagements take place in various forms, including small and large-group discussions, retreats, visits to museums or places of worship, and memoir-style writing assignments or auto-ethnographic accounts of one's daily routines. This principle, like the first, makes the approach particularly compelling as a means of engaging students in concerted reflection on the moral quality of their everyday existence.

The third guiding principle of the Life Worth Living approach gives it its special character and feel. According to the authors, it is first and foremost *traditions*, and in particular, the Big Six religious traditions (Judaism, Christianity, Islam, Hinduism, Confucianism, and Buddhism) plus secular Utilitarianism, that help us get answers to these questions off the ground. By and large, the media used as the foundations of classwork and discussion descend from one of these traditions, typically less from latter-day theologians and interpreters than from the central texts that guide these traditions. The framework follows a principle of *prioritizing tradition* in constructing inquiries into the moral quality of one's life. In doing so, the framework advances a kind of perennialism regarding inquiry into the good life, according to which questions of how to flourish and exemplars of flourishing human lives are considered to be central to the main religious and philosophical traditions. That said, the authors reject a thoroughgoing philosophical perennialism that would suggest these various traditions come to the *same* answers about how to lead a good life.

Finally, a fourth principle of the Life Worth Living approach pertains to the manner in which directive or non-directive teachers should approach questions of such existential importance. Also on this point, the framers are clear: teachers should *not* recommend any one tradition over another; they should not provide particular answers to any of the questions for students to adopt; instead, they should leave the answering of these questions up to the students. In their own program documentation, the framers of the program use the term "truth-seeking pluralism" to describe their efforts in this sense; however, we believe this fourth principle is better captured by the concept of *existential non-directiveness*.

Take a typical example from their book. At the end of a chapter devoted to overarching ideals of a flourishing life, the authors turn to the question, "So how should we live?" They have just surveyed the thoughts of James Madison, Nietzsche, the Bhagavad Gita, Jeremy Bentham, the Torah, Mencius, Confucius, and Jesus, and here is how they respond to the ultimate question on which these sources have weighed in:

> You know by now that we're not going to give you a straight answer. Here, of all places, it's your job to discern the answer as best you can. (We're doing our best to answer the question for ourselves too.) But what can you take with you from the voices you've heard in this chapter? First, keep an eye on ends. Think seriously about what a well-lived life is after. Don't just assume it's after

> happiness. … Second, make sure to answer the forest question [concerning how wide the circle of moral responsibility extends]. Third, get comfortable with being unsure. Any of these options will leave you in a place where it's really difficult to be certain about how to live. … Finally, you can't give a good answer to the question of how to live without answering the questions from the other chapters. … In fact, the intertwining of these questions and their answers goes a long way toward making a real *vision* of true, flourishing life. (pp. 99-100)

There is clearly much to be said for an approach that places so much trust and agency in students. In fact, on such questions, it would seem that we as educators would want to leave as much agency as is pedagogically appropriate, given how personal these questions are for one's sense of existential purpose and meaning. And yet, we think this degree of nondirectiveness may lead us towards the same issues that arose when discussing the (not quite paradoxical) paradox concerning epiphanies above. To recall, Kristjánsson's concern was directed at the moral duties that contradict one another in the transformative classroom, particularly the students' need for transformation on the one hand and the moral damages that such transformations can bring about. Kristjánsson and the framers of the Life Worth Living approach seem to want to err on the side of caution: Since there are moral hazards here, and since our democratic *ethos* holds personal autonomy in such high regard, better to leave the moral insights to students, while the educators play the comparatively nondirective role of the discussion-shaper and text-suggester.

The problem with this strategy, and the nondirective principle of the Life Worth Living approach in general, is that it overlooks its own moral hazards. What we are concerned about is the combination of a dizzying array of ideas with a high degree of pedagogical abstemiousness on the part of the educator. This admixture can create almost perfect conditions for those "half-completed" transformations mentioned above—a "question-everything" mentality turned existential disorientation that can leave students unmoored from the value frameworks and communities that had hitherto given their lives meaning. Nicholas Burbules (1990) is particularly insightful on this point:

> We often find, for example, that helping students consider a radically different way of viewing their circumstances involves challenging their incoming pre-conceptions and frameworks of understanding. […] The problem here is that certain ways of viewing the world are invested with enormous significance (religious beliefs are a clear instance), and to challenge these is often to deprive students of an important source of security and significance in their lives. Another instance involves ethnicity, where cultural traits may constitute an impediment to learning; sometimes intentionally, sometimes not, we cause students to question habits and values that tie them to important communities within and outside the school. The losses here are real, and it is not enough to tell oneself that it is for the student's good. (p. 474)

We have quoted this passage in many of our writings on transformation for a simple reason: Burbules simply seems right to us about what is at stake if we want to be about transformation, but are not ready to truly offer students a vision of what is worth transforming *into*.

We are not claiming that developments of this kind are *necessarily* the outcomes we should expect from the Life Worth Living approach, nor are we suggesting that the authors of *Life Worth Living* are unaware of this issue. In fact, they begin their book with a section called "This Book Might Wreck Your Life" and offer various potential supports throughout the book, recommending friendship several times as an important context for pursuing such queries. Nevertheless, we do not think the seriousness of the issue we are raising is quite appreciated. For example, after the heading about how the book can wreck one's life, a description of three individuals follows who, though they faced tremendous hardship and "had their lives wrecked," ultimately became moral heroes: Gautama Buddha, Simon Peter, and Ida B. Wells. The authors write that each of their life stories has something in common: They "share […] an experience that put the shape of their lives into question. What had been normal and assumed became questionable. Something—maybe everything—had to change." Our point is that it is by no means certain that being thrown into such deep existential uncertainty will lead to moral

heroism. In fact, it may lead to the opposite of what the authors want: an enduring aimlessness, an inability to commit to a way of life that can increase their flourishing.

4. Rethinking Teaching for Flourishing

Where does this leave us, then? We believe the Life Worth Living framework, along with others like it, gets us halfway to the goal of transformation. They effectively bring the question of what it means to have a flourishing life into focus, and they provide suggestions of where to begin looking, but they do not provide sufficient support to help students overcome their situatedness in a late-capitalist liberal society. The Western cultural values of individualism and an insistence on radical self-determination have, ironically, conditioned students' conception of flourishing to such a high degree that most students are largely incapable of choosing alternative modes of flourishing. The authors of the Life Worth Living framework maintain that the goal of engaging with the great traditions is to raise questions about how to live: "There aren't many things the great religious traditions and philosophers mostly agree about. It turns out, though that this is one of them: when push comes to shove, the decisive facet of the question is: how should we live?" (p. xxx). In our view, however, the great traditions don't *ask us* how we should live; they *inspire us to live a certain way*.

This may seem like a subtle disagreement, but it captures our central concern about the overarching emphasis of the Life Worth Living approach: The authors focus their attention on encouraging young people to ask the right questions, and then insist they answer those questions in light of their own values. The problem is that students' values, and their intuitions about human flourishing in particular, have been profoundly influenced by contemporary Western culture. This culture has systematically conditioned students to prioritize material wealth, social status, individual pleasure, and personal comfort. Aristotle correctly argues that as students habitually pursue such ends, they will inevitably come to love these things and view them as essential components of a good life. As they grow towards adulthood, it becomes increasingly difficult to change their minds by merely exposing them to alternative traditions and asking them questions about their thoughts on those traditions. They have come to love these forms of flourishing and, as a consequence, really struggle to imagine how they could flourish without them at their core. Asking students to *consider* such alternatives is usually not enough to prompt them to want to radically alter their life trajectory for one based on virtue. The Life Worth Living framework instructs students to be mindful of these biases and think critically about them before making their decisions. But, here again, the mode of engagement is *thinking* through their biases. These biases reside in students' hearts and affections, and they will likely remain there unless they are directed towards something else entirely.

This is why we think epiphanies are so central to a transformative education. Students need to be helped to *experience for themselves the beauty and wisdom of the virtues*, not merely shown that certain people within certain (foreign) traditions consider them beautiful and wise. If this is correct, we believe a significant shift in our pedagogical efforts is necessary. It means organizing the classroom experience around inducing dramatic, emotionally-laden moral insights that cause a temporary reorientation of students' motivational structures—in a word, epiphanies. A student who has an epiphany about some moral issue sees the experience as a turning point of (potentially) significant proportions, in the sense that they now recognize a clear desire to live differently (Kristjánsson, 2020, p. 117). In our experience, insights of this sort rarely happen spontaneously, and almost never by simply asking students to reflect on perspectives or ways of life that are foreign to them. In fact, the average student's thinking is normally so conditioned by their cultural milieu that they need to have their current thinking temporarily *bypassed,* as it were, so that they can *feel* the force of the new ideas to be internalized. That is not to say that students will not or should not try to think about the insights they have gained, but rather simply that students' thinking often needs to be *first* inspired by a vision of a new good that they have previously overlooked or discounted before their reflections on the good life can take on meaningful moral substance. Of course, we realize that

our suggestions might seem difficult, impractical, or even impossible. And yet we have tried to show in our work over the years that teachers can follow simple and intuitive instructional steps—employing effective hooks, inspiring emotional appeals, and compelling follow-up tasks—to make such experiences possible in the classroom (Jonas & Yacek, 2025).

The problem, of course, is that creating epiphanies regarding religious traditions is generally antithetical to the values of institutions of learning in liberal democracies, except those that are religious themselves. When students enter a secular school, they do not expect, nor would they desire, their teachers to intentionally favor one religious view over another. However, nearly all schools these days aim not just to form students' intellects, but also to shape their characters as citizens of their society, and indeed, the world. Educators have increasingly recognized that students need to possess certain civic and moral virtues in order to contribute to their own flourishing and the flourishing of others around them. It is here that epiphanies become essential. If educational institutions are earnest in their desire to help form students' ethical characters, they must confront the fact that students' characters have already been formed by the culture around them, and *not* seek their own flourishing or the flourishing of others. In our view, teachers must find a way to help students *want* to cultivate virtues as a route to their own and others' flourishing, even when their previous acculturation encourages them not to develop these virtues.

The Live Worth Living framework does not go far enough to address the problem of the deep embeddedness of students' prior acculturation. They correctly acknowledge that students need to recognize and question the individualism that they have unconsciously adopted, and they recognize the power of traditions for breaking through such an ideology. However, *the pedagogical method* they propose—focused as it is on individual judgment and choice—potentially continues the logic of individualism it tries to avoid and may therefore lead away from the forms of life that are actually worth living. Ironically, this individualistic focus in the larger culture is likely one of the reasons why young people have ceased to take an interest in reflecting on the good life; thus, its presence in the Life Worth Living framework may seriously undermine its stated aims.

In our view, this critique leads back to where we began this paper. If we want to teach for flourishing, then we cannot get around employing transformative methods in the classroom. In the context of flourishing-related decision-making, we believe the questions and ideas recommended by the Life Worth Living framework can be particularly helpful in getting students accustomed to thinking about their lives in broader terms and in foregrounding flourishing as a moral ideal. However, we *also* believe that teachers must assume a special degree of responsibility when addressing students' flourishing directly. It is not enough for them to stand back and conduct a conversation; instead, they should encourage them to make a list of values and consider the consequences of those values. If a vision of a good life and a burgeoning commitment to virtue are to begin growing in students, then it must be the teachers themselves who help reveal this vision and exemplify virtuous commitment and conduct in the classroom.

5. Conclusion

In this paper, we argued that teaching for flourishing is a multifaceted pedagogical endeavor, one that requires a diverse array of experiences, forms of engagement, relationships, and reflections. Although programs like the Life Worth Living framework demonstrate a particularly well-adapted and compelling approach to supporting students' flourishing, it turns out that direct inquiry, reflection, and discussion of flourishing-related questions are not quite enough to advance students' flourishing. Teaching for flourishing requires a pedagogy of epiphany, in which teachers help students encounter the wondrous, awe-inspiring, uplifting, and beautiful aspects of the subjects and phenomena they are studying. Moreover, teaching for flourishing requires teachers to embody flourishing themselves: to lay bare how their lives have been enriched, made more meaningful, satisfying, and joyful by their pursuit of virtue and a good human life.

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Student-Centred Teaching Competencies in Innovative and Traditional Learning Environments

Competencias docentes centradas en el alumnado en entornos de aprendizaje innovadores y tradicionales

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Abstract:

The study aims to analyse the use of student-centred methodologies and teaching professional competencies in Innovative Learning Environments (ILE) versus traditional spaces. The sample consists of 782 teachers who responded to a structured questionnaire covering five areas, evaluating aspects from methodological approaches to use of technology and interest in educational innovation. Using a quantitative approach and analysis with IBM SPSS, differences were explored between teachers working in ILEs and those in traditional settings. The results indicate that 95.26% of teachers use student-centred methodologies, with these practices being more prevalent in ILEs. Significant differences were observed in the planning of learning experiences and in the integration of pedagogical strategies that promote student participation. Additionally, there was a greater use of technology in ILEs, highlighting digital collaboration and content creation. The conclusions suggest that ILEs encourage a more dynamic, student-centred approach to teaching, motivating teachers to use advanced methodologies and digital resources. This reinforces the need to design training programmes that promote professional teaching competencies for working in innovative learning environments, thus helping to adapt the educational system to current challenges.

Keywords: educational environment; methodology; competency-based teaching; digital technology; professional teaching competences; innovative learning environments.

Resumen:

El estudio tiene como objetivo analizar el uso de metodologías centradas en el alumnado y de competencias profesionales docentes en los Entornos Innovadores de Aprendizaje

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(EIA) frente a los espacios tradicionales. La muestra se compone de 782 docentes, quienes respondieron un cuestionario estructurado en cinco áreas que evaluaba aspectos metodológicos, el uso de la tecnología y el interés del profesorado por la innovación educativa. Mediante un enfoque cuantitativo y el análisis con IBM SPSS, se exploraron las diferencias entre docentes que trabajan en EIA y los que lo hacían en entornos tradicionales. Los resultados indican que un 95,26 % del profesorado consultado confirma emplear metodologías centradas en el alumnado, siendo el uso de estas prácticas mayor en los EIA. Se observaron diferencias significativas en la planificación de las experiencias de aprendizaje y en la integración de estrategias pedagógicas que promueven la participación estudiantil. Además, se encontró una mayor utilización de tecnología en los EIA, donde destaca la colaboración digital y la creación de contenido. Las conclusiones sugieren que los EIA favorecen una enseñanza más dinámica y centrada en el estudiante, lo que motiva a los docentes a utilizar metodologías y recursos digitales avanzados. Esto refuerza la necesidad de diseñar programas de formación que impulsen las competencias profesionales docentes para trabajar en entornos de aprendizaje innovadores, contribuyendo así a la adaptación del sistema educativo a los retos actuales.

Palabras clave: entorno educacional; metodología; educación basada en las competencias; tecnología digital; competencias profesionales docentes; entornos innovadores de aprendizaje.

1. Introduction

The research here presented is related to teachers' professional competences. This topic is of great interest to the educational community, as is evident from the fact that various ministries of education and other major institutions are working on defining them.

There are several interrelated factors that are changing the educational context we used to know. Institutions responsible for teacher training must rethink what competences teachers need to develop in order to effectively face these changes. We can summarise these factors in five main ideas. First, with the rise of digital learning tools and online resources, teachers need new competences to be able to integrate these tools and resources effectively (Casillas Martin *et al.*, 2020). This explains the development of digital competence frameworks for teachers and an integral system to train and certify the different levels.

Second, current classrooms are increasingly diverse in terms of ability and learning needs, but also on cultural backgrounds. Therefore, there is a need of a reflection on what competences must teachers develop to be able to provide inclusive and differentiated instruction.

Third, there is a growing recognition of the importance of social-emotional skills in education, requiring teachers to develop competences in emotional intelligence, relationship-building and mental health awareness.

Fourth, international reports point to the importance of students developing 21st-century skills like critical thinking, creativity and adaptability. Here, the teacher's role shifts from rote learning or theoretical work to a more practical, divergent way of looking for solutions or designing projects. This approach fosters students' lifelong learning skills by enabling them to decide what to learn and how to do so.

Fifth, all these factors imply that teachers must not only plan and perform differently, but also assess differently—both their students and themselves. Such an important shift in the teaching experience must be accompanied by training and research to try to minimize the stress caused by a mismatch between teacher competences and the demands of modern classrooms and society.

In this regard, the report *Reimagining our futures together: A new social contract for education* (International Commission on the Futures of Education, 2021) emphasises that teaching must be redefined as a collaborative profession and that education must become a shared societal project and a common good. It calls for teachers to be recognized as key knowledge producers and agents of educational transformation, whose continuous professional development must be linked to broader goals of justice, equity and sustainability. This perspective reinforces the urgency to rethink teacher competences in light of global challenges and future-oriented education.

Therefore, teacher training institutions have the responsibility of determining what competences are required and how to foster teachers' acquisition and implementation. This is what makes this research crucial. Through our work we have identified some competences that can be linked to the concept of Innovative Learning Environments (ILE). Similarly, we have tested if they are used more frequently in these environments than in traditional settings to determine whether these ILE could be fostered to develop certain teaching competences.

European Union members have not yet established a list or framework of the teacher's required competences. In 2014, a number of conclusions related to this topic were adopted in a European Council meeting held in Brussels, Belgium. "Improving teacher education programmes and recruitment processes requires the prior identification of the professional competences needed by teachers at different stages of their careers. Professional competence frameworks can be used to raise quality standards, by defining the knowledge, skills and attitudes that teachers, including in the fields of vocational education and training (VET) and adult learning, should possess or acquire" (Council of the European Union, 2014, p. 2). Considering this statement, the Council invited the member states to develop and establish a comprehensive professional competence framework for teachers, "which defines the competences and qualities they require at different stages of their careers or in different teaching situations" (p. 4). Some countries have already started working on their own frameworks, although in most cases they have not yet been published. In Spain, we have found a number of frameworks developed by autonomous communities which have been used to define the constructs of this research.

First of all, the concept of competence must be defined in order to understand the research undertaken. Perrenoud (1999) defined competence as the capacity to act efficiently in a given situation based on knowledge, yet extending well beyond it. Cabero *et al.* (2006) enriched this definition stating that a competence embeds knowledge, performance and attitude. For this research, we refer to teaching competences focused on the role of the teacher performing in the classroom (Hagger & McIntyre, 2006).

Teachers, as we have already stated,must develop several competences in order to deliver high quality teaching; thus, we have chosen the ILE context as the framework for our research. It is unlikely, however, that a single teacher will possess all 21st-century teaching competences, or at least, he or she cannot develop them all to the same high degree (European Commission, 2013). Additionally, we have also taken into account that teachers must not only teach most competences to students, but model them as well.

An Innovative Learning Environment (ILE) is a construct that can be defined as highly flexible spaces, with specifically-designed furniture and ubiquitous technology, used in an innovative way, thus facilitating a student-centred learning experience (Blannin *et al.*, 2020). Under this model, the teacher's methodology shifts from a teacher-centred approach to a more student-centred approach (Byers *et al.*, 2018b; Cleveland, 2016; Granda-Piñán & Rojo-Bofill, 2024; Jorion *et al.*, 2016). Teachers in this context are invited to use several competences or focus on different aspects of the teaching process. To perform this study, we have matched the competences commonly fostered in ILEs with the competences defined as research construct to highlight the common ones.

Following the example of international recommendations, academic literature statements and the different frameworks analysed, we have organised the competences into four areas:

a) Learning and teaching competence

b) Teaching performance

c) Professional commitment

d) Cross-cutting competences

The first area compiles all the competences related to planning, implementing and assessing learning and teaching processes. Planning is related to taking into account students' needs (Hatano & Oura, 2003; Vogt & Rogalla, 2009) and designing the learning experiences according to a competence model of teaching (European Parliament and Council of the European Union, 2006; Council of the European Union, 2018). The implementation refers to the design of situations in which student-centred approaches are used, fostering students' participation (Byers *et al.*, 2018a) and coping with diversity through personalisation (Council of the European Union, 2014; European Commission, 2013; Granda-Piñán *et al.*, 2024; McDiarmid & Clevenger-Bright, 2008). Concerning assessment, there is a highlight on the use of varied instruments and the use of feedforward to help students learn (Council of the European Union, 2014).

The second area refers to the teacher's capacity to implement educational strategies that promote comprehensive student development. This is related to creating a safe, inclusive and stimulating learning environment that promotes the students' social, emotional and moral development, as well as their physical wellbeing (European agency for Development in Special Needs Education, 2012; Granda-Piñán & Rojo-Bofill, 2024; Noriega *et al.*, 2016; Organisation for Economic Co-operation and Development [OECD], 2017; Pericacho, 2023; Scheerens, 2007, Tanner, 2014; Teruel, 2000). This area also includes other aspects linked to the learning process, such as tutoring and student involvement in the organisational structures of the institution. We have decided not to consider these two aspects, however, as they are not specific competences fostered in an ILE, even though they are closely related and indirectly addressed.

The third area refers to the teachers' commitment in terms of participation and involvement in their school, improved educational quality and ongoing professional development. Although we consider these three aspects to be of great importance, we have elected to survey only the first, focusing on collaboration among teachers to design learning situations (OECD, 2009).

Finally, the fourth area is related to cross-curricular competences, including communication skills, digital proficiency and competence in research and innovation. We have selected the second and third groups, i.e. digital competence and research and innovation, focusing on how teachers use ICT in the classroom, what they ask students to do with these technologies (Council of the European Union, 2014; European Commission, 2013; Mishra & Koehler, 2006), and teachers' interest in new methodologies, resources and pedagogical approaches (Hagger & McIntyre, 2006).

The central hypothesis of this research is that teachers working in ILEs activate a series of competences more often than in traditional settings. If confirmed, it could help authorities and teacher trainers to design both an initial and a lifelong learning plan, and provide teachers with opportunities to design and implement such environments in their schools. The research questions of this study are:

1. Do teachers use student-centred approaches?
2. Which competences do teachers activate when planning a learning experience?
3. Which pedagogical and spatial strategies are employed by teachers in their classrooms?
4. What is the role of digital technology when implementing learning experiences?
5. In which areas do teachers wish to gain deeper knowledge to enhance their future professional practice?

2. Method

2.1. Sample

The questionnaire was administered online by sending a message to teachers and schools explaining the purpose of the research. The sampling method was non-probabilistic, specifically, a convenience sampling. The sample was obtained by disseminating the questionnaire through different channels to various groups of teachers, and participation was voluntary. A total of 786 answers were received, although four responses were excluded during the analysis phase due to a lack of validity. Table 1 shows the characteristics of the study sample.

TABLE 1. Sample. Distribution of background characteristics of respondents (*N* = 782)

Aspects		**Frequency (*n*)**	**Percentage (%)**
Gender	Female	549	70.2
	Male	232	29.7
	Other	1	0.1
Educational stage	Early Childhood Education	64	8.2
	Primary Education	249	31.8
	Compulsory Secondary Education	239	30.6
	Post-compulsory secondary education	85	10.9
	Vocational training	124	15.9
	Other	21	2.7
Innovative Learning Environments	Yes	65	8.3
	No	717	91.7

Source: Prepared by the authors based on data supplied by respondents

The responses were anonymous and were collected during the months of April and May 2024.

2.2. Instrument

To conduct the research, we developed an *ad-hoc* questionnaire aimed at answering the questions posed in the introduction.

First, the research team carried out a review of different documents where teachers' professional competences were a key focus (Table 2).

Table 2. Documents consulted

Document title	**Authorship**
Las competencias profesionales docentes. Modelo competencial de la Red de Formación del Profesorado	Xunta de Galicia (s.f.)
Competencias profesionales docentes. Orientaciones para el profesorado del futuro	Comunidad de Madrid (2022)
Documento para debate. 24 propuestas de reforma para la mejora de la profesión docente	Ministerio de Educación, Formación Profesional y Deportes (2022)
Marco común europeo de competencias profesionales docentes	CAFI, Consellería de Cultura Educación e Ordenación Universitaria, Xunta de Galicia. LFEE Europe. Ugdymo Plėtotės Centras. IPL Instituto Politécnico de Leiria. Junta de Castilla y León. PHW Pädagogische Hochschule Wien (s.f.)
Análisis de percepciones del estudiantado del Máster de Secundaria respecto a las competencias profesionales del docente	José María Sola Reche, José Antonio Marín Marín, Santiago Alonso García y Gerardo Gómez García (2020)
Developing teaching competences with service-learning projects	Andresa Sartor-Harada, Juliana Azevedo-Gomes, Ester Torres-Simón (2022)
Modelo de competencias profesionales del profesorado	Red de Formación del Profesorado de Castilla y León. (2010).
Conclusions on effective teacher education	Council of the European Union (2014)
Supporting teacher competence development for better learning outcomes	European Commission (2013)

Based on the review, four areas were defined with varying levels of detail, from which a proposal of items was developed. These items were structured in five areas within the questionnaire, including an introductory section that gathered demographic information (gender, educational stage...). The questions in this first section had different formats, the most common being short answers or yes/no questions. The other four sections were designed using Likert scales to express the degree of agreement with different statements. The questionnaire was anonymous, although participants could include their email address if they wished to receive the results of the study.

Next, a group of seven experts were asked to evaluate two aspects for each item following Lawshe's guidelines (1975), with modifications by Tristán López (2008): the clarity of the wording and its importance, defined as the degree of significance the item had within the study. To assess the clarity of each item, a Likert-type scaling technique was employed with four response categories ranging from 4 to 1, where: 4 = Very high, 3 = High, 2 = Low, and 1 = Very low. To evaluate importance, experts were provided with three options: 1) Essential, 2) Useful but not essential, and 3) Not important. There was also an open-ended section for observations and alternative wording. Based on the experts' ratings, the Content Validity Ratio (CVR) was calculated for each item to assess its quantitative content validity, following

Lawshe's method. Items with low CVR (< 0.62) were reviewed or eliminated. On a second round of expert validation, all the items received a CVR > 0.62.

Each expert was selected based on their knowledge and experience in the field. All participants are in-service teachers with specific training in Future Classroom Lab or Innovative Learning Environments, also serving as teacher trainers in these areas. Among the participants are three PhD holders and four university professors.

Comments and suggestions were gathered and a total of 12 questions were improved; one question was eliminated and one was added. The final result was a questionnaire comprising five sections and a total of 40 items administered electronically through an online platform.

2.3. Procedure

The study was carried out between October 2023 and June 2024 as an exploratory and descriptive study with a non-experimental design. A quantitative methodology was used for data analysis, relying on the responses collected from the *ad-hoc* questionnaire described above.

This questionnaire was administered online. Responses were sent via email, primarily from public teacher training centres in Valencia, Spain. However, the link to the questionnaire was shared on social media platforms created for teachers (like specific groups on social networks), not limited to Valencia.

The questionnaire header indicated its anonymous nature of it in the header, as well as the consent acceptance of the use of the data obtained for research purposes.

2.4. Data analysis

The data obtained was analysed using the IBM SPSS 29 statistical package. Measures of central tendency and dispersion were employed to analyse the responses made by the sample to different items on the scale. Subsequently, after checking for normal distribution and homogeneity of variances, a non-parametric test was selected for the independent variables: Mann-Whitney U test.

3. Results

Results are organized according to the study questions.

3.1. Do teachers use student-centred approaches?

First, we addressed the question of whether teachers use a series of student-centred methodologies. In this regard, we found that 95.26% of participants use them (n = 745), while 4.73% do not (n = 37). Those who do not are distributed across all educational stages, and all expressed that they do not work in an innovative learning space (ILS). Another related finding is that all individuals who work in this type of space use at least one type of student-centred methodology.

Usin g the Mann-Whitney U test to compare teachers working in an innovative learning space with those who work in a traditional one, we found statistically significant differences (p > .05) in all methodologies but one (Problem-based learning). This means that teachers using an ILS in their teaching are more likely to answer "yes" when being asked about using a student-centred methodology than those who work in a traditional setting.

3.2. Which competences do teachers activate when planning a learning experience?

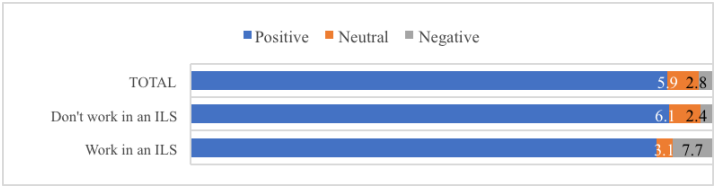
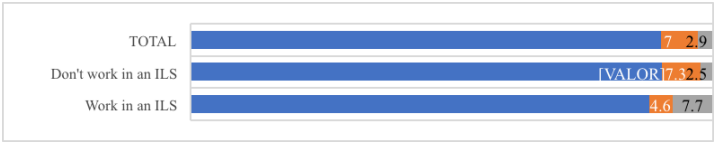
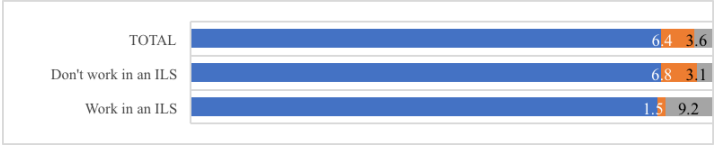
The second part of the test was related to different aspects that teachers may consider when planning the learning experience. As was previously explained, all items in this section were identified as aspects that teachers should take into account when planning their lessons, as well as the method they will use. The purpose of this section was to analyse whether

teachers working in an ILS take these aspects into account more than those teaching in a traditional environment.

Of the sample, 333 teachers rated all items as 4 or 5 on the Likert scale, representing 42.58% of the total. Of the 65 teachers who reported using an ILE, 35 rated all items as 4 or 5, accounting for 53.84% of that group.

Comparing means using the Mann-Whitney U test revealed no significant differences, which means that a higher or lower rating was not conditioned by whether or not the respondent used an ILS. We then examined the frequencies, for which we grouped answers into three new categories: Negative (completely disagree, disagree), Neutral (neither disagree nor agree) and Positive (agree, completely agree).

TABLE 3. Number of responses and percentage for question 2

Item	Percentages according to place of work
b1: I identify the students' needs	
b2: I consider the development of competences as the primary objective	
b3: I design student work based on student-centred methodologies	
b4: I take into account adaptations to address student diversity	
b5: I select various assessment tools	

b6: I establish different stages of assessment	
b7: I include opportunities for constructive feedback for students	
b8: I collaborate with colleagues in planning learning situations	

Source: Prepared by the authors based on data supplied by respondents

Figures from Table 3 reveal that more than 80% of teachers working in ILS answer positively to all items but the last one, related to collaboration with other teachers when planning learning situations, which is the aspect with the least number of positive answers for each group of teachers. However, we can observe the same trend in teachers working in traditional settings, with even higher percentages in some of the items.

The items with the greatest number of positive answers are b1, related to identifying students' needs; b4, taking into student diversity to create adaptations to address differences; and b5, selecting a range of assessment tools to evaluate students.

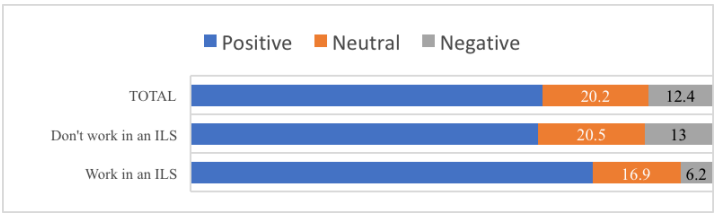
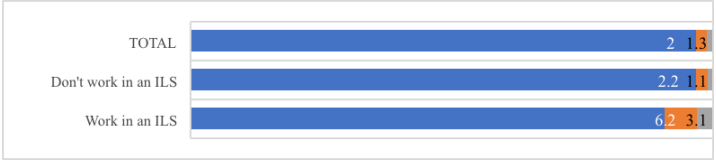
3.3. Which pedagogical and spatial strategies are employed by teachers in their classrooms?

The third section of the test explores strategies teachers can use in their classrooms on a daily basis. Extracting the teachers who answered positively to all the items of this section (n = 346, 44.24%), it can be observed that among the 65 who work in an ILS, 38 fall into this group, i.e., 58.46% of the total.

Comparing the answers between teachers who use an ILS and those who do not, the Mann-Whitney U test reveals significant differences in four of the items: c2 "I encourage student participation in decision-making regarding the learning process" (p = .023, U = 20283.000, Z = -2.272);"c5, "I foster respect for the classroom environment (furniture, resources, etc.)" (p = .042, U = 22355.500, Z = -2.037);"c7, "I support reaching agreements between teachers and students" (p = .050, U = 21330.000, Z = -1.961); and c11, "I allow students to use the space according to their needs" (p = 0.48, U = 20808.500, Z = 1.981). For these items, teachers using an ILS responded more positively than those who do not, except for item c5, to which they responded more negatively (mean ranges: teachers using ILS = 376.92, teachers not using ILS=392.82).

Table 4. Number of responses and percentage for question 3

TABLE 4. Number of responses and percentage for question 3

Item	Percentages according to place of work
c1: I reach a consensus with the students on classroom norms	
c2: I encourage student participation in decision-making regarding the learning process	
c3: I promote self-respect	
c4: I foster respect for others	
c5: I foster respect for the classroom environment (furniture, resources, etc.)	
c6: I promote dialogue within the classroom	
c7: I support reaching agreements between teachers and students	

c8: I ensure the environment has appropriate lighting	
c9: I ensure the ambient noise level is suitable	
c10: I adapt the space to meet the needs of the students	
c11: I allow students to use the space according to their needs	

Source: Prepared by the authors based on data supplied by respondents

From Table 4, it can be inferred that teachers working in an ILS have a higher tendency to reach a consensus with the students on classroom norms (c1), encourage student participation in decision-making regarding the learning process (c2), support reaching agreements between teachers and students (c7), ensure the ambient noise level is suitable (c9), adapt the space to meet the needs of the students (c10) and allow students to use the space according to their needs (c11). However, teachers working in more traditional settings expressed more often that they promote self-respect (c3), foster respect for others (c4), foster respect for the classroom environment (c4), promote dialogue within the classroom (c6) and ensure the environment has appropriate lighting (c8). Only items 2, 5, 7 and 11 registered significant differences.

3.4. What is the role of digital technology in the implementation of learning experiences?

The fourth section of the questionnaire focused on how teachers use technology in the classroom. 228 teachers expressed that they use technology for all the items explored, representing 29.15% of the sample. Among them, 37 work in an ILS, which is 56.92% of the teachers using ILS. Only 17 teachers (2.17%) expressed that they do not use technology for any of the aspects assessed, nine of whom work in early childhood education.

The Mann-Whitney U test shows significant differences in five of the items, as can be seen in Table 5.

TABLE 5. Mann-Whitney test for responses to question 4

Item	Mean ranges		U	Z	p
	Works in ILS	Doesn't work in ILS			
d1	402.20	390.53	22607.000	-.751	.453
d2	426.96	388.29	20997.500	-1.850	.064
d3	480.32	383.45	17529.500	-3.758	<.001
d4	494.16	382.19	16629.500	-4.139	<.001
d5	473.28	384.09	17986.500	-3.529	<.001
d6	430.71	387.95	20754.000	-1.992	.046
d7	421.25	388.80	21369.000	-1.544	.123
d8	448.24	386.36	19614.500	-2.496	.013

Note: d1= I present information to the students; d2= I encourage students to search for information; d3= Students collaborate with their peers (shared documents, chats, shared whiteboards, etc.); d4= Students design their own learning process (roles, phases, etc.); d5= Students create digital content; d6= Communication between students and myself; d7= Students submit or present completed work; d8= I share the evaluation process and results with the students.

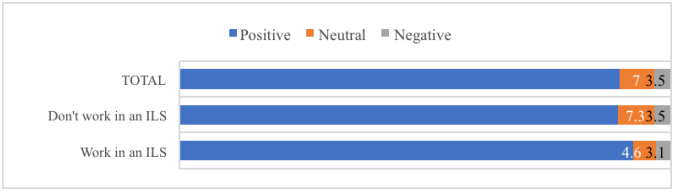
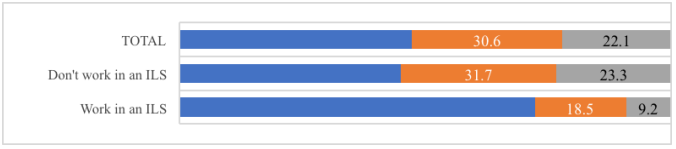
Source: Prepared by the authors based on data supplied by respondents

From these data, it can be seen that teachers who work in an ILS responded more positively to the following questions:

- use of technology for peer collaboration
- students design their own learning process
- students create digital content
- communication between students and the teacher
- sharing the evaluation process and results with the students.

No significant differences were observed for the items related to the use of technology to present pupils with information, for pupils to search for information, or to present or submit completed work.

TABLE 6. Number of responses and percentage for question 4

Item	Percentages according to place of work
d1: I present information to the students	
d2: I encourage students to search for information	
d3: Students collaborate with their peers (shared documents, chats, shared whiteboards, etc.)	
d4: Students design their own learning process (roles, phases, etc.)	
d5: Students create digital content	
d6: Communication between students and myself	
d7: Students submit or present completed work	
d8: I share the evaluation process and results with the students	

Source: Prepared by the authors based on data supplied by respondents

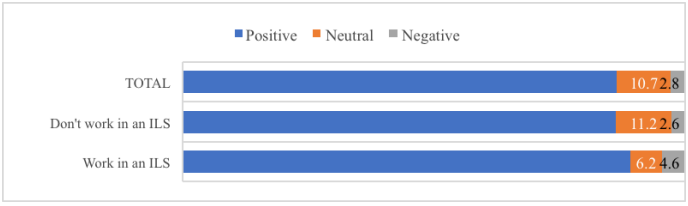
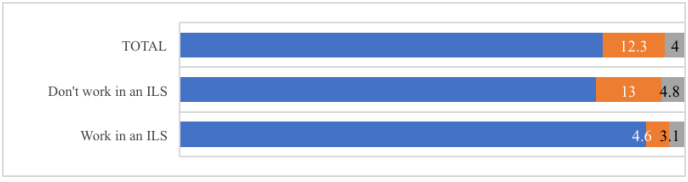
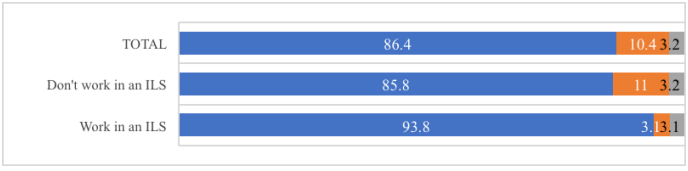
Observing the frequencies compiled in Table 6, it is significant to note that the number of positive answers is higher among the teachers who work in an ILS for all items.

3.5. In which areas do teachers wish to gain deeper knowledge to enhance their future professional practice?

The fifth and final section explored teachers' interests in looking for new strategies for methodologies, spaces or use of technology. A total of 63.04% of the sample stated that they were interested in all six aspects included in this section.

When using the Mann-Whittney U test to compare means, we obtained significant differences for items e5 (New approaches to redesigning educational spaces, p = .007, U = 19658.500, Z = -2.690) and e6 (New ways of utilizing educational spaces, p = 0.18, U = 20177.500, Z = -2.372), with teachers who work in an ILS showing a higher interest in these aspects (Table 7).

TABLE 7. Number of responses and percentage for question 5

Item	Percentages according to place of work
e1: New active methodologies or strategies	
e2: New ways of using educational technology/ digital tools with students	
e3: New ways of using educational technology to create resources	
e4: New ways of using educational technology to accommodate all types of students	
e5: New approaches to redesigning educational spaces	

e6: New ways of utilizing educational spaces	

Source: Prepared by the authors based on data supplied by respondents

Once more, there are proportionally more positive answers among the teachers who work in an ILS for all of the items explored.

4. Discussion

Through the research presented here, we have been able to compare the answers of 65 teachers who work in an ILS to those of 717 who do not. Participants responded to various questions concerning the use of student-centred methodologies, planning considerations, daily classroom strategies and use of technology. Additionally, we have also gathered information about their interest in the three aspects identified as the core of ILEs.

From the results presented above, we can first identify a strong trend toward the adoption of student-centred methodologies, as the majority of the teachers surveyed (95.26%) reported the use of at least one of these methodologies. This is a highly significant finding, as it reflects a widespread acceptance of pedagogical approaches that position students at the centre as active agents with responsibility in their learning process, taking part in more dynamic and participatory learning practices.

Among the teachers who reported not using these methodologies (4.73%), it is revealing that they are distributed across all educational stages, making it impossible to attribute their lack of use by the specific characteristics of the stage in which they teach. It is also significant that all of these respondents expressed that they do not work in an ILS.

When analysing the information provided by teachers working in an ILS, it is noteworthy that all of them employ some form of student-centred methodology. This suggests a potential correlation between the educational space and the willingness to implement these methodologies. This correlation can be interpreted in both directions: teachers working in these spaces utilize more student-centred methodologies, or teachers who employ such methodologies create and work in such spaces. Therefore, these findings could reinforce the idea of educational setting influencing pedagogical practices (Byers *et al.*, 2014), more concretely encouraging the flexibility and freedom to incorporate a variety of pedagogical practices, enabling student-centred learning (Charteris & Smardon, 2019).

When comparing the responses of both groups, statistically significant differences were found in almost all methodologies, with the exception of problem-based learning. This indicates that teachers in ILSs tend to use these methodologies more frequently than those in traditional settings. Problem-based learning may be an exception due to its applicability in various contexts, regardless of the type of space.

The second section of our research studied various planning aspects fostered by ILEs. A positive trend was noted, but no significant differences were found between the group of teachers using an ILE and those who do not. In general, teachers surveyed answered positively to all aspects, and it is interesting to note that the items with a higher number of positive responses were related to student diversity and the strategies used to cope with it (taking into account their needs, creating adaptations when needed and using a range of assessment tools). This suggests a general professional awareness of the importance of inclusive practices, as well as a prioritization of inclusive practices in planning. The results align with broader educational trends that emphasize the importance of developing teaching competence to provide equity and

personalized learning (European Agency for Development in Special Needs Education, 2012; United Nations, n.d.). Previous studies have highlighted the positive effect of ILEs in successfully implementing an inclusive educational environment, as inclusive education is most effective in a learning context in which each student is the centre of their own learning, autonomy is encouraged and socialisation is facilitated (Harris *et al*., 2013; Thomas, 2013).

When exploring some aspects to be considered during the development of the classes in the third section, we found significant differences in some of them. Teachers working in an ILS showed a greater propensity toward encouraging student involvement in decision-making regarding their own learning process, fostering teacher-student agreements and allowing students to use the space to fit their needs. These three aspects are an example of how to provide a student-centred experience, which is one of the basic features of the work that must be developed in an ILS. Therefore, these findings reveal that working in such spaces indeed fosters or permits student-centred learning. It was also reported that there was less encouragement of respect for the classroom space, which can be interpreted by the fact that innovative spaces are intentionally designed to be more interactive, flexible, changeable and manageable than traditional ones. In conclusion, these findings highlight a relationship between innovative spaces and student-centred strategies. This relationship has already been described in previous studies using other research methods (e.g. Mahat *et al*., 2018).

Regarding the use of technology, an aspect explored in our fourth section, 29.15% of teachers use it for all of the aspects explored, with 56.92% of ILS teachers consistently doing so. Having found significant differences between both groups, the results suggest a deeper integration of technology into innovative spaces, where it is used not only for presenting information, searching for it and submitting the final product, but also for providing students with opportunities to create digital content, facilitating peer collaboration and encouraging two-way communication between teachers and students, including the former sharing the evaluation process and results with the latter. These findings support the important role of educational technology in such environments (Gonzalez-Mohino *et al*., 2023; Granda-Piñán *et al*., 2024; Rivera-Vargas *et al*., 2024).

The fifth and last section was related to the teachers' interest in exploring new strategies, both methodological and technological. A high interest was expressed, with 63.04% of the surveyed teachers showing interest in all areas examined. These results are consistent with previous studies that gathered teachers' training interests (Lozano *et al*., 2024). This high level of engagement suggests that teachers are generally open to innovation and eager to improve their practices, both in terms of pedagogical approaches and the integration of technology into the learning process. Results revealed a stronger interest, with proportionally more positive answers, among the teachers who work in an ILS for all the items explored. Significant differences were also found in the two points related to the redesign and utilization of educational spaces, in which they showed more interest than traditional teachers. This suggests that these environments can have an impact on fostering an innovative mindset or that they are a result of the latter. The significant differences found in areas related to the redesign and utilization of educational spaces suggest that teachers in ILS are more attuned to the importance of adapting physical learning spaces to enhance learning. This could be due to the flexibility and opportunities for experimentation that these spaces offer, which likely make teachers more conscious of their potential, or due to the teachers' previous concern about how space educates and fosters learning, which makes them work or create such spaces. What seems clear is that teachers working in ILSs recognize the critical role the learning space plays in student engagement and outcomes. This suggests that innovative spaces not only support more dynamic teaching methods, but also encourage teachers to continuously rethink and improve their physical teaching environments to better support learning experiences.

From all that has been mentioned, it can be stated that innovative learning spaces seem to foster, or at least facilitate, the use of student-centred approaches and their integration with technology. This confirms our previous hypothesis, always taking into account that some modern pedagogical principles are present in both innovative and traditional settings.

Nevertheless, some limitations of this study should be acknowledged. First, the use of a non-probabilistic convenience sampling method, based on voluntary participation, may

introduce self-selection bias and limit the transferability of the findings to the wider population of teachers. Second, although significant differences have been found between the groups compared, the cross-sectional and descriptive nature of the research does not allow for causal inferences. Future studies using probabilistic samples, mixed methods or longitudinal designs could provide deeper insights into the relationship between innovative learning spaces and teaching competences.

In conclusion, this study has contributed to understanding how teachers working in Innovative Learning Spaces tend to apply more student-centred methodologies, integrate digital tools more extensively, and show a greater awareness of the potential of the learning environment. These findings reinforce the idea that the educational setting can act as a catalyst for pedagogical change.

However, while our results suggest a strong association between ILEs and innovative practices, they must be interpreted in light of other sources of research. For example, some studies (Byers *et al*., 2014; Cleveland, 2016) have also found that spatial design can foster active pedagogies, although they caution that without specific training, the mere existence of flexible spaces does not automatically lead to innovative teaching. Therefore, our results may reflect a favourable alignment of space and teacher mindset, rather than the effect of the physical environment alone. Coherently, some educational systems, including for example Singapore, are investing in learning spaces with the intention of promoting diverse pedagogical approaches and student-centred learning (Fan & Popkewitz, 2020). Further cross-national studies are needed to clarify how cultural and systemic factors mediate the impact of ILEs on teaching practices.

Based on the results, it would be advisable to incorporate these insights into both initial and ongoing teacher education programmes. For example, teacher training curricula could include practical modules focused on the design and use of flexible learning spaces, as well as training in co-teaching models and active methodologies. Institutions could also redesign practicum experiences to take place in innovative environments, allowing future teachers to experience and reflect on student-centred practices in context. Furthermore, continuous professional development initiatives should provide structured opportunities for teachers to redesign their classrooms and share innovative strategies within professional learning communities. This last idea is fully aligned with the ones stated by the International Commission of the Futures of Education (2021) concerning how teachers should develop their competences. These actions would help educational institutions not only to promote innovative learning environments, but also to consolidate the professional competences needed to make the most of them.

Finally, this research opens the door to further investigation. Future studies should explore the causal relationship between space and pedagogy through longitudinal or experimental designs. It would also be relevant to examine how specific components of ILEs (such as furniture flexibility, technological infrastructure or co-teaching) contribute independently to teacher practice. Additionally, qualitative approaches could help uncover the underlying beliefs and motivations behind teachers' decisions to innovate, offering a more nuanced understanding of the interaction between space, mindset and professional development.

Author Contributions

Amelia-R. GRANDA-PIÑÁN. Conceptualization, methodology, project administration, data curation, formal analysis, investigation, writing – original draft.

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IA statement

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How, where, when and by whom is Service-Learning assessed? A systematic review

¿Quién, cómo, dónde y cuándo se evalúa el aprendizaje-servicio? Una revisión sistemática

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Abstract:

This research was prompted by the need to develop sounder, more consistent assessment systems to effectively assess Service-Learning (SL hereinafter) interventions at higher education institutions, with a view to training professionals committed to the transformation and well-being of society. To address this need, the study presents a systematic review of the assessment systems used to assess learning outcomes in SL interventions in university settings. A total of 56 papers are analysed, selected from the WoS, Scopus and ERIC databases according to the criteria set out in the PRISMA statement. Our findings provide insight for the educational community as to how SL interventions are being assessed in a university context. They also serve to orient future teaching actions by highlighting elements that refer to the learning outcomes, criteria, techniques, actors and types of assessment used in such interventions. Different learning outcomes are assessed through SL interventions and a variety of instruments are used for that purpose. Some assessment systems are found to be incomplete and some contain inconsistencies, so it is concluded that in spite of the efforts observed in most of the papers reviewed, there is still considerable room for improvement in assessment SL systems.

Keywords: Service-Learning; evaluation; assessment; higher education; university; systematic review.

Resumen:

Este trabajo de investigación surge de la necesidad de desarrollar sistemas de evaluación más sólidos y coherentes, que faciliten una evaluación efectiva de las experiencias de aprendizaje-servicio (ApS) en el ámbito universitario, con el propósito de fomentar la formación

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de profesionales comprometidos con la transformación y el bienestar de la sociedad. Para colaborar a cubrir esa necesidad, este estudio presenta una revisión sistemática de los sistemas de evaluación utilizados para medir los resultados de aprendizaje en experiencias de ApS en entornos universitarios. Se analizaron un total de 56 artículos seleccionados siguiendo los criterios elaborados por la declaración PRISMA y utilizando las bases de datos de WoS, Scopus y Eric. Los resultados obtenidos en este trabajo arrojan luz a la comunidad educativa sobre cómo se están evaluando las experiencias de ApS en el contexto universitario. Asimismo, permiten orientar la futura acción docente señalando aquellos elementos referidos a los resultados de aprendizaje, criterios, técnicas, agentes y tipos de evaluación empleados en estas experiencias. Se detectan algunos sistemas evaluativos incompletos y también algunas incoherencias, por lo que se concluye que, a pesar de los esfuerzos observados en la mayoría de los artículos revisados, existen importantes áreas de mejora en los sistemas de evaluación.

Palabras clave: aprendizaje-servicio; evaluación; educación superior; universidad; revisión sistemática.

1. Introduction

In recent decades, universities are called on to respond to social, environmental and financial challenges and to technological advances, particularly in data science and artificial intelligence (AI), in the context of their higher education mission. More specifically, universities must take on the responsibility of preparing and educating future generations by giving them the skills that they will need to act as active, responsible citizens (Marco-Gardoqui, et al., 2020). In this context, Service-Learning (hereinafter called SL) has emerged as a suitable methodology for tackling this challenge.

As a methodology, SL seeks to provide a practical learning experience that blends academic learning and community service (Bringle & Hatcher, 1995). It thus stands out as an experience-based learning method that addresses certain needs of the community by fostering a sense of civic responsibility among students. At the same time, it enriches participants' understanding of certain subjects and matters by providing a holistic view of the relevant disciplines (Alaez et al., 2022).

SL interventions go beyond the confines of conventional classrooms and apply academic content to real-life contexts with a view to responding to specific challenges facing the community (Hart, 2015). As a result, more and more research (Díaz-Iso et al., 2023; Mota Ribeiro et al., 2023) is highlighting this methodology as a learning strategy in which students can develop practical skills along with knowledge and ethical values with a view to becoming active citizens who help build fairer communities where people can live in greater harmony. But one of the main uncertainties faced by teaching staff when they implement SL interventions lies in how best to assess them (Gibson et al., 2011; Samino García, 2023).

This is a worrying shortcoming, because assessment plays a crucial role in guiding learning and in understanding and improving the processes and outcomes of SL interventions. The right assessment not only confirms the effectiveness, functionality and impact of educational interventions but also provides information for optimising them. So to ensure that an SL intervention is effective it is essential first to define the precise goals of the intervention and the outcomes expected, linking the service to be provided with the curriculum for the relevant subject. Students thus give academic meaning to the service experience, which becomes the focal point of their learning. Secondly, suitable assessment must be designed and planned. This means drawing up an assessment methodology that fits in with the nature of the goals assessed and provides guidelines for moving forward and consolidating the envisaged learning (Aramburuzabala et al., 2019).

Scientific literature includes a number of studies that address the assessment of SL interventions. Some of them (Nickman, 1998) are based on envisaged learning outcomes,

while others (Griffin et al., 2011) make no mention of such outcomes; some detail the type of assessment used in the intervention (Casile et al., 2011), some consider the need for different actors to be involved in assessing interventions (Nikolova & Andersen, 2017), and others describe the various assessment tools used (Gómez & Bartoll, 2014). However, to date there has been no exhaustive, systematic review of this matter. Therefore, there is a lack of knowledge on this topic to support teachers' assessment practices. Such a review would have many benefits, such as showing teaching staff involved in SL interventions how others assess them and what they themselves can learn from those assessments.

This study sets out to fill that gap, which is a necessary task given the systematic, multifaceted nature of the assessment process. More specifically, the goal of this research study is to deepen knowledge on the assessment systems used to measure the learning outcomes envisaged in SL interventions at universities, through a systematic review of the related literature. The aim is to identify what learning outcomes are assessed, what assessment techniques and tools are used, what actors are involved and what type of assessment is used (formative or summative; continuous or final).

2. Method

This systematic review was conducted in compliance with the criteria set in the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Page et al., 2021). The research question, the search strategy and the inclusion and exclusion criteria were all designed according to the principles set out in that statement. The reference point taken in compiling and interpreting the results of the studies included is the paper by Lockwood et al. (2015), which provides methodological guidance for qualitative evidence synthesis. In particular, we adopted their meta-aggregative approach, emphasizing the faithful representation of study findings and avoiding reinterpretation, thus ensuring transparency and applicability to practice.

2.1. Research question

Following the PICO strategy (Population, Intervention, Comparison and Outcomes) (Santos et al., 2007), the research question that served to guide this study is the following: How are the learning outcomes (outcomes) of university students (participants) assessed in service-learning (intervention)?

2.2. Search strategy

The search for papers related to the topic addressed here was conducted in November 2022 using the Scopus and ERIC databases and the main collection of the Web of Science (WoS) as its sources. Books, book chapters, reports and minutes of scientific congresses were excluded from the search. Papers were identified on the basis of a systematic search for keywords in English designed according to the PICO strategy (See Table 1).

Table 1. Key words formulated with the PICO strategy.

	Participants [1]	**Intervention [2]**	**Outcomes [3]**
Keywords	"higher education" OR universit* OR college*	"service learning" OR "service-learning"	Assess* OR evaluat*
Searches	In Scopus: TITLE/ABS/KEY [1] AND TITLE/ABS/KEY [2] AND TITLE/ABS/KEY [3] In WoS: TOPIC [1] AND TOPIC [2] AND TOPIC [3] In ERIC: ABSTRACT [1] AND ABSTRACT [2] AND ABSTRACT [3]		

Source: Own work

2.3. Inclusion & exclusion criteria according to the content of the articles

This review focuses on research papers that provide information on the process of assessing the learning outcomes of Service-Learning interventions. With that initial premise, the inclusion and exclusion criteria were also designed taking into account the PICO strategy (see Table 2).

Table 2. Inclusion & exclusion criteria formulated with the PICO strategy.

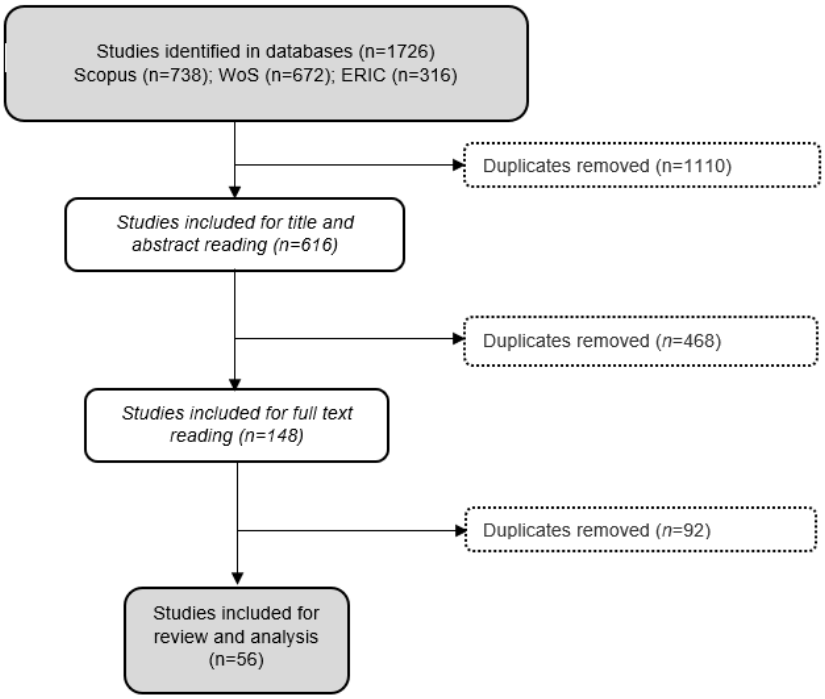
	Population	Intervention	Outcomes
Inclusion criteria	Higher education students	Curricular & extracurricular Service-Learning	Provision of information on the assessment system for rating the learning outcomes of the intervention.
Exclusion criteria	Infant, primary, lower secondary, upper secondary, vocational training and non-formal education students.	Volunteering; community experiences with no academic component Work experience and other methods	Information on SL interventions but no mention of the assessment of learning outcomes Provision of information on tools for rating the perception of the various actors concerning the intervention Provision of information on the impact of the intervention on the community

Source: Own work

2.4. Selection process

The process of selecting studies comprised several steps, and was conducted by all four researchers responsible for the study (Figure 1). In step one, 1726 studies were identified in the Scopus, WoS and ERIC databases. The bibliographical references were exported to Excel, and duplicate documents were eliminated (n=1110). This left a total of 616 studies to be reviewed. In line with the inclusion and exclusion criteria set (see Table 2), the titles and abstracts of all 616 papers were reviewed at the screening stage and 468 of them were excluded on the grounds that they did not meet the inclusion criteria. This left 148 papers, the full texts of which were then analysed. Finally, 56 of those papers were selected for inclusion in this systematic review.

FIGURE 1. Flow diagram of the selection process of studies as per PRISMA.



Source: Own work.

2.5. Data extraction process

Relevant information from the studies selected was collected systematically via a number of variables grouped under these headings: context variables (year and country of publication), methodological variables (purpose and methodology), sample variables (sample size), intervention variables (learning outcomes, actors, tools, criteria and types of assessment) and extrinsic variables (publication of studies).

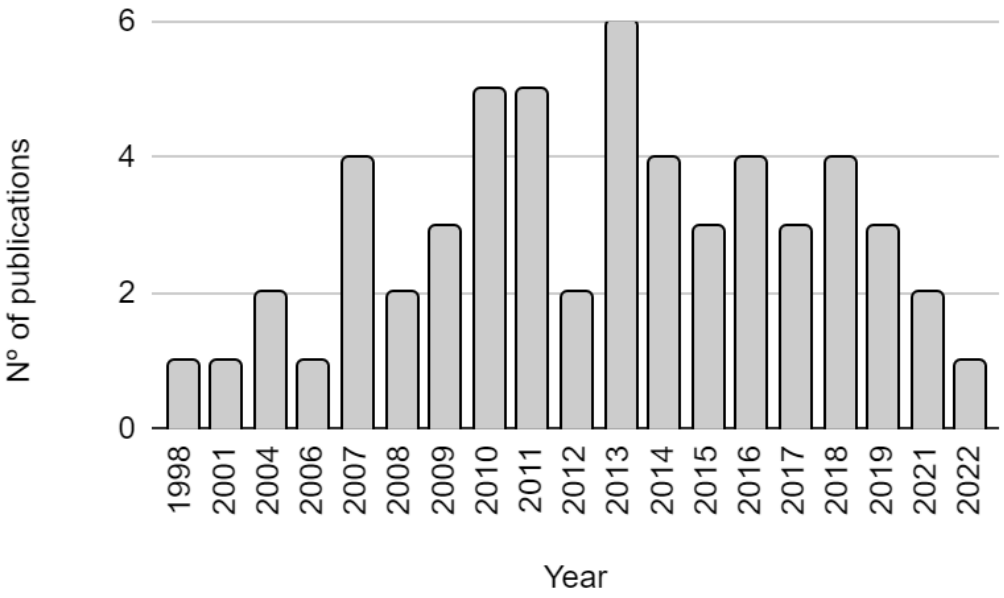
3. Results

3.1. Descriptive analysis of the publications studied

The research papers selected cover a number of areas. In all, 14 different areas were identified: Natural science (15 papers), health (10), education (9), engineering (4), communication (3), psychology (3), economics (3), management (2) and urban studies (2). Areas identified in fewer cases were history (1 paper), fine arts (1), political science (1) and languages (1). A further 3 studies were classed as interdisciplinary.

The earliest publication identified as dealing with the assessment of learning outcomes in SL interventions dates from 1998 (Figure 2). Some relevant papers on the topic were found dating from then to 2007. But from 2007 onwards a trend is observed of at least one paper per annum, marking continuous, systematic interest in the topic. It is also worth noting that the year from which most publications were identified is 2013, and the years with the fewest are 1998, 2001, 2006 and 2022. As a caveat, it must be noted that our search took place in November 2022, which limits our ability to conclude whether the trend persisted or decreased in that year.

FIGURE 2. Nº of publications per year.



Source: Own work.

The studies selected came from several countries and continents: 40 were from the Americas (32 from the USA, 7 from Canada and 1 from Columbia), 5 from Europe (3 from Spain, 1 from Ireland and 1 from the UK), 3 from Africa (all 3 from South Africa), 2 from Asia (both from China) and 1 from Oceania (Australia). 5 papers did not indicate where the research examined was carried out.

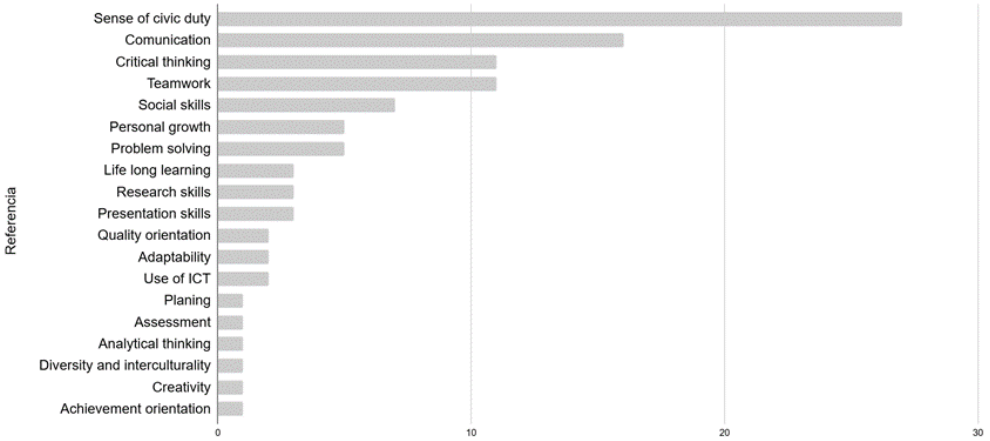
3.2. Content results

3.2.1. Learning outcomes assessed in SL interventions.

Of the 56 papers studied that report on SL interventions in which students are awarded grades in the relevant subject, 5 fail to mention what learning outcomes were worked on. Of the remaining 51, 8 deal solely with specific competencies within the knowledge area of the subject, 4 solely with general competencies and 39 with both specific and general competencies.

The main general competencies covered are the following: a sense of civic duty, community, justice and cooperation (27 interventions); oral and/or written communication (16); critical thinking (11); teamwork (11); social and interpersonal skills (7); problem solving (5); self-awareness and personal growth (5). The following competencies were covered in 3 interventions or fewer: learning orientation and life-long learning (3); research skills (3); presentation skills (3); quality orientation (2); adaptability (2); use of ICT (2); diversity and interculturality (1); achievement orientation (1); planning (1); assessment (1); analytical thinking (1); creativity (1); and finally "professional skills" (2) and "practical skills" (1) without further specification.

FIGURE 3. Nº of publications per generic competency.

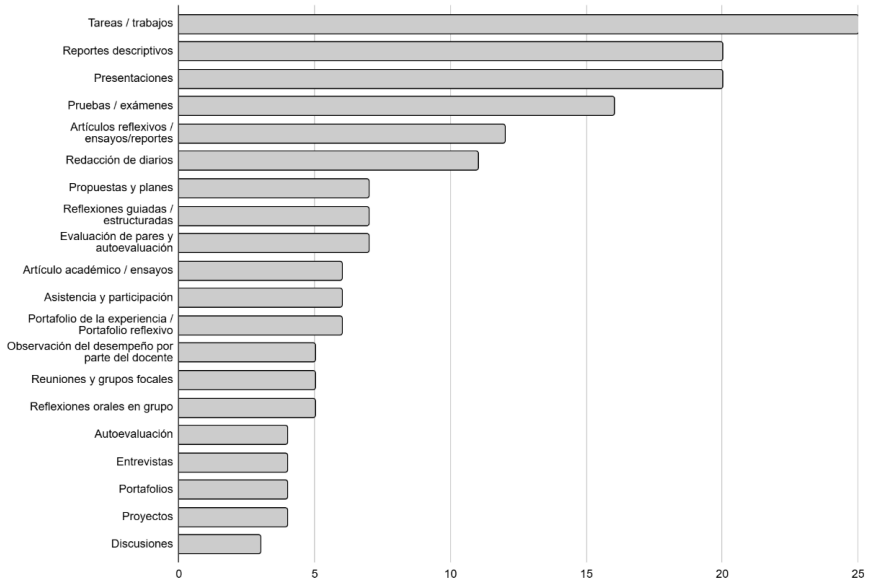


Source: Own work

3.2.2. Assessment tools and criteria used to assess learning outcomes.

The literature review carried out reveals that students on SL projects are assessed via a wide range of assessment tools and techniques. The graphic below (see Figure 4) shows the various assessment techniques found in the literature, as named in each of the studies analysed.

FIGURE 4. Nº of publications per assessment instrument used.



Source: Own work.

However, a detailed look reveals synergies between many of them so they can be grouped into broader categories. Thus, 6 main categories of assessment tools can be identified, as shown in Table 3:

Table 3. Nº of publications per type of assessment activity.

Type of activity	Description	Number of papers
Reflection activities	Activities and tasks in which the emphasis is on reflection. They include reflective papers, reflective essays and reports, guided/structured reflection, journalling and diaries, reflective journals, reflective writings in blogs, portfolios, oral/group reflections, etc	36
Tasks/ assignments	Activities and tasks of all kinds, such as lesson planning, writing letters, microteaching, analysis tasks, academic papers, preparing materials, etc	31
Project reports / projects	Service-learning projects and assignments that students normally hand in at the end of the intervention and which detail, analyse and assess the activities carried out. They may include descriptive reports, project proposals and plans, technical and research reports, service-learning projects, etc	31
Presentations, oral presentations via slides, posters, etc	Includes feedback & subsequent discussion	20
Exams and tests	Open-form exams, multiple-choice tests, quizzes, etc.	16
Others	Attendance & participation, observation, interviews and focus groups, etc.	19

Source: Own work

Reflection activities are the most commonly mentioned method for assessing learning outcomes linked to SL interventions. 36 of the 56 papers reviewed include student assessment activities of this type. The second most commonly mentioned method is that of specific tasks and assignments, which is mentioned in 31 papers. Oral presentations (20 papers) and exams (16) are also quite widely mentioned. Interviews, direct observation and other techniques appear less frequently.

All 56 papers analysed specify in greater or lesser detail what assessment tools are used, but only 26 set out the criteria and/or indicators for assessment applied. The assessment criteria and/or indicators refer to the learning outcomes set in each case but are frequently linked to assessment tools, so the results found when taking both points into account are presented below.

13 of the 26 papers include criteria for assessing reflection activities. The most commonly mentioned of these criteria are the following: evidence of learning achieved (specific, generic and concerning SL) and of personal and occupational growth achieved (self-awareness) (12 papers); in-depth analysis (reflection) (7); writing skills (5); level of detail in describing contributions, tasks and activities carried out (and those deferred or not completed) (5); criticism or critical thinking (5); evidence of having read the relevant theory, and knowledge of and connection with that theory (5). Other criteria featured include commitment to the project and the team (2); adaptation to the structure proposed (1) and to length (1), accuracy (1), importance (1), ability to summarise (1), correct use of APA standards (1) and satisfaction with the results obtained (1).

6 of the 26 papers set out criteria for assessing projects. The criteria mentioned are the following: learning achieved (2); soundness, significance and implementability of recommendations and proposals for improvement (2); use of content seen in class & links with theory (2); effectiveness of teamwork (2); quality of the data collection and analysis process (1); interpretation of data (1); structure and logical sequence (1); professional presentation (1); ability to assess impact and limitations (1); task & time management (1); details of observations on professional conduct and ethical aspects (1); standard of technical writing: analysis & synthesis, defence of a position and clear communication (1); acquisition of basic concepts (specifying the key concepts that must be analysed in the project) (1).

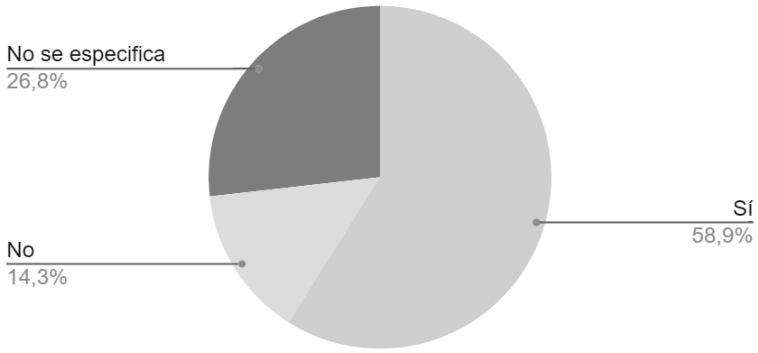
8 of the 26 papers that give assessment criteria mention criteria for assessing final oral presentations (presentation skills). The main criteria mentioned are the following: content (quality and accuracy of information presented, completeness of content and whether it responds to requirements and includes quality references) (5); organisation (presentation of content in a clear, logical fashion, ensuring that listeners can follow the message) (5); oral expression skills and suitability for public events, i.e. whether the speaker speaks clearly and securely, captures the attention of listeners and awakens their interest, speed of exposition, volume, rhythm, not resorting to crotch-words, appropriate language and grammatical correctness, non-verbal communication such as body language and eye contact (5); visual aids (quality of signs, posters, presentations), technical level of the presentation, structure and organisation of the sequence of slides, appearance (4); adjustment to the time available (2); participation (the level of engagement elicited from listeners via questions, interactive activities, etc.), i.e. the degree to which the presentation sparks participation and interaction in its audience (2); general impact and effectiveness in conferring the importance and relevance of the SL. Students are expected to evidence their passion, commitment and understanding of the needs (for health) of the community (1); suitability of answers to questions (2); attitude towards criticism (1).

2 papers mention criteria for assessing exams. Specifically, they focus on understanding of concepts (1) and the ability to define, analyse and link ideas concerning the content of the subject (1).

3.2.3. Types of assessment used to assess learning outcomes.

In the 56 papers reviewed, differences can be seen in the ways in which students' learning outcomes in SL projects are assessed. 33 papers clearly indicate that SL projects are graded, highlighting the importance attributed to quantitative assessment in the context of education. 8 papers state that participants are not graded, and 15 give no information as to whether they are graded or not.

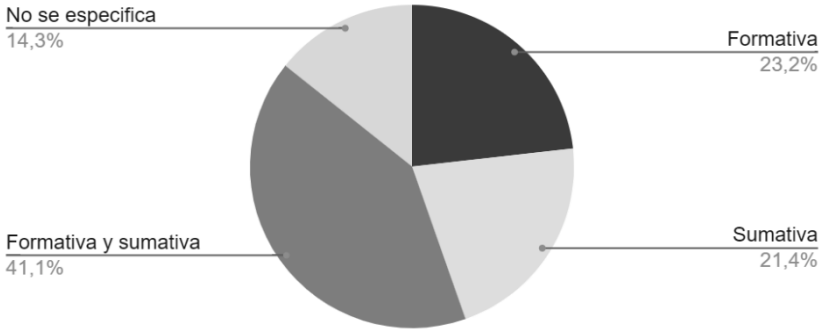
FIGURE 5. Percentage of studies for which SL interventions are graded and not graded.



Source: Own work.

As for the nature of assessments, 13 of the papers reviewed mention entirely formative assessment, in the form of formative continuous assessment of the progress of students throughout the project. 12 papers refer to entirely summative assessment, carried out at the end of the project and providing an overall assessment of students' performance. Interestingly, 23 papers mention hybrid approaches blending formative and summative assessments to provide an integrated understanding of students' performance. This highlights the importance attributed to both the continuous development of skills and the overall assessment of progress achieved. It is worth noting that 8 papers fail to specify the type of assessment used in their SL projects, which suggests a lack of clarity in communicating assessment practices.

FIGURE 6. Percentage of studies in which the assessment used is exclusively formative, exclusively summative and both.



Source: Own work.

3.2.4. .Actors involved in assessing interventions.

Only 3 of the 56 papers reviewed fail to specify who assesses Service-Learning projects.

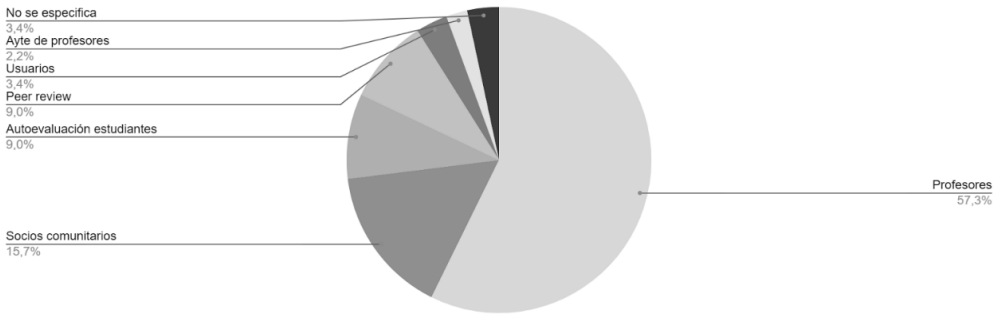
In 34 papers teachers are the only assessors, while in 20 multiple assessors are identified. In all but two of the papers that indicate multiple assessors, the teacher or instructor in charge of the university project assesses students' learning outcomes, but there are also clear indications of other assessment actors being involved.

In some studies, a colleague on the faculty with experience in community service is asked to cooperate with the teacher of the relevant subject in carrying out the assessment (Shapiro, 2012). Several papers also indicate that teachers are supported by specialist instructors and facilitators in the relevant matter to provide guidance in both the teaching of students and the assessment process (Bheekie et al., 2007; Nickman 1998; Staton & Tomlinson, 2001).

14 papers indicate that community partners are charged with assessing students' performance in the SL intervention, thus providing feedback on their progress. One study also states that community partners also draw up written assessments of students' work (Ebacher, 2013). Three papers indicate that the service recipients in the SL projects play an active part in assessing students' performance.

16 papers observe that students themselves play a significant role in the assessment process, via self-assessment or peer assessment. In 8 of these papers, students carry out an independent assessment of their own experience and performance, focusing mainly on their strengths and on areas for improvement (Kemper et al., 2004). A further 8 indicate that students' performance in the SL intervention or in the assignments submitted is assessed by their peers.

FIGURE 7. Percentage of studies as per the types of assessor involved.



Source: Own work.

4. Discussion & conclusions

The goal of this study is to carry out a systematic review of the assessment systems used to rate the learning outcomes envisaged in SL interventions at universities. Our findings, based on a search by keywords, show that most of the papers detected assess the process of the intervention via the perceived satisfaction levels of the stakeholders (students, teachers, the community), rather than the learning outcomes of students. This is the main reason why the 1110 papers initially identified were reduced to 56 in the systematic review conducted.

Studying the assessment systems used has led us to identify the knowledge areas in which SL has been assessed, the intended learning outcomes for each intervention, the assessment techniques and tools used, the actors involved, the indicators or criteria used (and their weighting) and the forms of assessment (formative, summative, continuous, final).

To begin with, it is important to note that most interventions analysed focus on the training of health professionals, while the methodology remains less present in teacher education—an area where one would expect the development of learning experiences aimed at strengthening future educators' social and community engagement.

A second point that stands out in an overall look at general learning outcomes (rather than specific outcomes for a specific subject) addressed in interventions is how many there are. 102 general competencies were found to be addressed in a total of 51 papers that specified this information. This gives the reasonable average of two competencies addressed in each case. However, a more detailed analysis reveals 13 cases in which three or more generic

competencies are mentioned, which makes it difficult to believe that systematic, explicit work is carried out to achieve them, especially since 2 of the 13 cases mention 7 competencies: Flannery & Pragman (2010) and Sewry & Paphitis (2028). 5 papers mention 5 competencies: Drab et al. (2006), Gómez & Bartoll (2014), Kemper et al. (2004), Sharif et al. (2009) and Wiese et al. (2011). Finally, 2 cases indicate 4 competencies: Hellwege (2019) and Ming et al. (2009).

It is evident that Service-Learning fosters the development of various general competencies, going beyond the scope of responsible citizenship (what many would expect to be the main focus of SL projects). This diversity of outcomes suggests that SL has significant potential to enrich teaching and learning across disciplines, encouraging other educators to adopt the methodology. However, it may also reflect challenges educators face in integrating global citizenship as a clearly defined and targeted competency within their projects.

It is also noteworthy that 8 of the interventions presented address only specifics and do not touch on any general competency for which SL may serve: Casile et al. (2011), Staton & Tomlinson (2001), Littlefield et al. (2016), Bheekie et al. (2007), Dewoolkar et al (2009), Moulton & Moulton (2013), Bheekie et al. (2011), Chrispeels et al. (2014); and 3 more interventions refer to specific knowledge areas: chemistry in the case of Mcgowin & Teed (2019) and Najmr et al. (2018), and pharmacy in the case of Drab et al. (2006), working to obtain general learning outcomes and not focusing on any specific aspect of the knowledge area of the subject.

As expected, the general competency that is most often approached is a sense of civic duty, which is consistent with the contribution of SL to forming responsible citizens (Alaez et al., 2022; Díaz-Iso et al., 2023); along similar lines we find the development of critical thinking (11 cases), the personal growth of students (5) and adaptability (1). As observed, in the papers studied SL facilitates the development of many other general professional competencies including teamwork (11), interpersonal skills (7) and problem solving (5). It is striking that in 21 of the 51 interventions for which the intended learning outcomes are specified, those outcomes are limited exclusively to competencies (specific and/or general) which are not directly aligned with the formation of responsible citizens, which, as stated above, is seen as an intrinsic basic goal of the Service-Learning methodology. This objective may also be implicit in many of the interventions studied, e.g. in the case described by Brand, Brascia & Sass (2019), who do not specifically set it out as a learning outcome but show teaching and learning strategies clearly intended to achieve it. However, if it is not seen as an explicit goal then it is not assessed. This decreases the potential of projects, reducing them to something similar to volunteering or work experience rather than SL per se.

It is also striking that only 22 of the 30 cases in which learning outcomes aligned with the civic development of students and the formation of critical thinking are established specify the use of reflection by students as an assessment tool. The tools specified in the remaining 8 cases are not consistent with the assessment of these points. These last cases include Hellwege (2019), who rates achievement via forms, Hébert & Hauf (2015), who use multiple-choice exams, and Nikolova & Andersen (2017), who use a project report and a final presentation.

14 of the 16 cases that mention communication in some form (oral or written) as a competency to be developed mention consistent tools for assessing it (oral presentations, written reports, etc.). The 2 cases which do not are Kemper et al. (2004), who use forms as their only assessment tool, and the case analysed by Sewry & Paphitis (2018), in which communication is addressed in the field of chemistry, interpersonal relationships and teamwork, using reflection as the only assessment tool.

Most of the cases that seek to develop teamwork (11 papers) and/or interpersonal skills (7) mention consistent assessment tools, mostly direct observation by instructors, community partners or peers. However, four of them do not mention tools consistent with assessing teamwork: Wiese & Sherman (2011) use individual written reports, class discussions and direct observation at an event; Evans et al. (2010) use a reflection test; Sewry & Paphitis (2018) use a reflective diary; and Ebacher (2013) uses oral and written reflections and translations. 3 cases do not use tools consistent with assessing interpersonal skills: Braunsberger & Flamm (2013) use a final research project report and a self-perception survey; Sewry & Paphitis (2018) use

a reflective diary; and Hébert & Hauf (2015) use multiple-choice tests. All these cases cast doubt on whether they are actually addressing learning outcomes and on whether their assessments are based on criteria set to achieve such outcomes. Developing teamwork and/or interpersonal skills seems rather to be considered as a by-product of the intervention, so that there is no planning for these points as goals.

The preparation of a research proposal is a consistent way of rating research skills (in Wiese & Sherman, 2011 and in Ming et al., 2009). The case described by Kemper et al. (2004) stands out in the opposite sense: it measures this competency using forms completed based on direct observation by the teacher and self-assessment by students. Nor can these tools be considered suitable for measuring planning and assessment skills as also sought in Kemper et al. (2004).

The goal of developing analytical thinking pursued in Wiese & Sherman (2011) may be correctly rated via the tools proposed (written reports, discussions & oral presentations, among others). The same goes for assessing diversity and interculturality (Sewry & Paphitis, 2018) via reflective diaries and a rubric for the relevant criteria; for creativity (Ming et al., 2009) assessed via research proposals; for assessing presentation skills via a presentation based on a rubric in the case reported by Muñoz-Medina et al. (2021); for the case reported by Gorman (2010) via the preparation of a poster also based on a rubric; and for that of Sharifi et al. (2009) using various presentation activities. Similarly, ICT use can be seen as assessed consistently via presentations and written assignments (Flannery & Pragman, 2010) and via posters based on a rubric in Gorman (2010). The same goes for assessing quality orientation (LaRiviere et al., 2007 and Cadieux et al., 2016) via suitable planning of teaching units in the first case and via the materials prepared by the teacher in the second. Finally, written essays, diaries and written reports can be seen as a consistent form of assessing lifelong learning in the interventions reported by Santanello & Wolff (2007) and Drab et al. (2006).

Although ApS is conceptually grounded in a participatory and reflective pedagogy — implying the need for continuous and shared assessment processes— only 41.1% of the interventions described use both continuous and final assessment. Furthermore, in 34 (64.2%) of the 53 papers that specify who the assessor is, the teacher is the sole assessor. This indicates that the potential contributions of other actors—such as community partners, service recipients, and peers—to the assessment of learning impacts are largely absent. All these actors are mentioned in only one intervention: Flannery (2010).

The systematic review conducted provides a detailed vision of the academic literature on the systems used to assess Service-Learning interventions. This analysis not only provides an in-depth understanding of scientific publications in this area but also sheds light on some pedagogical implications associated with it. It identifies crucial elements for future action by teachers, highlighting actors, types of assessment, learning outcomes and the assessment techniques and criteria used in assessing these interventions in recent decades.

Our findings provide the educational community with a view of how these interventions are being assessed and invites the various actors involved in assessment to strengthen the weak points identified and persevere with those points which are shown to be most effective. They also make valuable contribution in terms of enriching the SL methodology by facilitating interventions that enable students to become active citizens committed to their communities.

It can be concluded that much of the effort in terms of academic assessment observed in most of the papers analysed is incomplete, at least to judge from the cases reported here that mention assessment but do not assess the learning outcomes to be measured, from the inconsistencies detected between intended learning outcomes and the tools used, from over-reliance on teachers as the only assessors and from insufficient use of formative, summative, continuous and final assessment together in each intervention.

This study includes novel elements, but it has its limitations. To mention some, only papers published in Spanish and English are considered. In future studies it would be helpful to extend the review to include other languages. A further limitation comes from the use of only three databases in searches. It would be of interest in the future to include further national

and international databases. Finally, due to limited access to book chapters, this systematic review does not include this type of publication. Future studies could address this limitation by also examining valuable practices documented in books. Even so, we hope that this review will serve to help teachers and institutions interested in the SL methodology to review and strengthen their assessment systems, with a view to helping to form committed, responsible citizens.

Author contributions

Ariane Díaz-Iso: Conceptualization, data curation, formal analysis, methodology, supervision, validation, visualization, writing – original draft, writing – review & editing.

Luana Ferreira Lopes Silva: Conceptualization, data curation, formal analysis, methodology, validation, visualization, writing – original draft, writing – review & editing.

Marian Alaez: Conceptualization, data curation, formal analysis, methodology, validation, visualization, writing – original draft, writing – review & editing.

María José Bezanilla: Conceptualization, data curation, formal analysis, methodology, validation, visualization, writing – original draft, writing – review & editing.

AI Statement

The authors declare that they have not used any artificial intelligence (AI) tools in the preparation process of this manuscript.

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Design and validation of the Academic Writing Teaching Practices Questionnaire

Diseño y validación del cuestionario prácticas de enseñanza de la escritura académica

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Abstract:

Academic writing is a key skill in the university context. However, there is little evidence on how it is taught, especially in disciplinary subjects. Based on this need, the objective is to develop and conduct an exploratory validation of the psychometric properties of the subscales in the Academic Writing Teaching Practices Questionnaire (student version). The research employed an instrumental approach and involved 1,109 university students from Chile. The subscales were developed based on a previous qualitative phase and a literature review. To assess content and response validity, the instrument was reviewed by nine specialists and piloted with 30 students. An exploratory factor analysis and reliability analysis were performed to analyse its internal structure. The findings showed adequate indices, resulting in an instrument composed of 43 items distributed among seven dimensions/factors: 1) importance, 2) context, 3) planning, 4) implementation, 5) assessment, 6) feedback, and 7) self-learning. It is concluded that the instrument could provide information for the development of teaching in this area.

Keywords: teaching practices; academic writing; measurement subscales; higher education; psychometric properties.

Resumen:

La escritura académica constituye una competencia clave en el contexto universitario. No obstante, se cuenta con escasa evidencia sobre su enseñanza, especialmente, en asignaturas disciplinares. A partir de esta necesidad se plantea como objetivo la construcción y

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validación exploratoria de las propiedades psicométricas de las subescalas que conforman el Cuestionario de prácticas de enseñanza de escritura académica (versión para estudiantes). La investigación adoptó un enfoque instrumental e involucró a 1109 universitarios chilenos. Las subescalas se elaboraron a partir de una fase cualitativa previa y de la revisión de literatura. Para obtener evidencias de la validez de contenido y respuesta, el instrumento fue revisado por 9 especialistas y piloteado con 30 alumnos. Para analizar su estructura interna se llevó a cabo un análisis factorial exploratorio y también se efectuó un análisis de confiabilidad. Los hallazgos demostraron índices adecuados, resultando un instrumento compuesto por 43 ítems distribuidos en siete dimensiones/factores: 1) importancia, 2) contexto, 3) planificación, 4) implementación, 5) evaluación, 6) retroalimentación y 7) autoaprendizaje. Se concluye que el instrumento podría aportar información para el desarrollo de la didáctica en el área.

Palabras clave: prácticas de enseñanza, escritura académica, subescalas de medición, educación universitaria, propiedades psicométricas.

1. Introduction

As Navarro (2021) states, in higher education, writing serves different roles related to the construction of knowledge. It is a cross-cutting component of the teaching and learning processes in various subject areas. Thus, it is a key skill for students' academic and professional success (Sparks et al., 2014). It therefore requires an explicit teaching process, since at university writing acquires distinctive characteristics in relation to previous educational levels (Bazerman, 2019). Based on this differentiation, the concept of academic writing is used (Carlino, 2013), which takes into account its particularities, including its epistemic potential and its role as a facilitator of enculturation, understood as the process by which students join a disciplinary community and learn its specific ways of communicating and producing knowledge. Epistemic potential refers to the ability of writing to organise one's reasoning.

One of the variables related to the strengthening of writing in university students is the explicit teaching of such (Navarro, 2019). However, the absence of guidance in disciplinary courses is a common practice, based on the idea that it is not the university's role to undertake such a task. Furthermore, empirical evidence (Uribe-Gajardo et al., 2022) suggests that to foster the development of this skill, a pedagogical device that integrates writing instruction across the curriculum is necessary. The Writing Across the Curriculum (WAC) movement emphasizes the value of writing as a learning tool in all disciplines and subjects. From this perspective, the teaching of such skills should not be limited to specific academic literacy courses; instead, it should be integrated into various subjects that comprise the study programs.

Based on the above, we believe it is essential to highlight the approach to the teaching of academic writing from the conceptual framework of practices and from the viewpoint of the different actors in the teaching-learning process, in this case, from the perspective of students, which, in addition to contributing to the improvement of their performance, upholds their sense of agency. The theoretical perspective is linked to the shift in the English-speaking world towards practice theory as a key concept for understanding the social world (Ariztía, 2017). From this perspective, practices are understood as unitary activities that occur across space and time; thus, they are contingent and experience variations linked to their context. They are also defined as a multidimensional construct consisting of material and mental aspects. In the same vein, Shove et al. (2012) argue that competences, meanings, and materials, which in turn shape practices. Competences require the knowledge necessary to perform them; meaning

comprises the set of collective beliefs and meanings associated with a practice, which places it in a framework linked to opinion. Materials, on the other hand, refer to the resources and/or strategies necessary for the execution or implementation of teaching practices, such as the use of technological devices or text modeling.

For different authors (Cid-Sabucedo et al., 2013; Manrique and García, 2019), teaching practices constitute the operationalization of the knowledge that teachers possess, namely, disciplinary, pedagogical, and experiential learning. Some research (Pérez-Ornelas, 2016) suggests that practices extend beyond classroom interaction, as they encompass a dimension related to individual thought. Thus, the author understands them as complex processes that include the actions and meanings of the actors involved, namely, teachers and students. Additionally, practices are influenced by environmental factors, including cultural, social, political, and economic conditions.

Regarding the dimensionality of the construct, although there is no univocal definition, it is common to highlight three components (García-Cabrero et al., 2008). Cañedo-Ortiz and Figueroa-Rubalcava (2013) point out that teaching practices consider three stages: planning, which focuses on decision-making regarding teaching; the execution or interactive phase, when the teacher implements the teaching process; and assessment, which refers to how, with what, and when to assess. Similarly, Montes-Pacheco et al. (2017) distinguish between planning, execution, and assessment.

Several studies have investigated academic writing teaching practices from an empirical perspective. As a multidimensional construct, research tends to focus on one of these dimensions. For example, the importance of feedback is considered (Tapia-Ladino and Correa, 2022), a focus on assessment is emphasized (Meza et al., 2022), or effective strategies for guiding writing tasks are highlighted (González-Moreno and Mejía-Carrillo, 2023). Nevertheless, there are very few studies that have simultaneously addressed its different dimensions.

It is important to note that a previous phase of this research, of a qualitative nature conducted on the basis of Grounded Theory according to the guidelines proposed by Strauss and Corbin (2002), identified categories that were contrasted with the theory and made it possible to develop a tentative dimensionality of the construct that is academic writing teaching practices, which was modified based on the results of the Exploratory Factor Analysis (EFA). The final conceptualization involved interweaving the concepts of academic writing practices with teaching practices to develop an integrated operational definition of a new construct. This preliminary definition, subject to review, views academic writing teaching practices as a multidimensional construct comprising three components: thought, action, and environment. Within the action component, it is possible to differentiate five highly interactive dimensions: planning, implementation, assessment, feedback, and self-learning. The environment component refers to the context in which practices take place, which is linked to their conceptualisation, but also implies a socio-cultural approach to writing (Englert et al., 2006). Finally, thought is related to the system of representations and meanings that individuals possess.

Although the literature review brought to light different instruments focused on measuring constructs related to academic writing (Chitez et al., 2015; Castelló, 2015; Castells et al., 2022; Espinosa et al., 2024; Meza and González, 2020), it was not possible to identify an instrument that addressed the construct of academic writing teaching practices. Moreover, other cases demonstrated a restriction that they did not explicitly state the variables measured or provide evidence of validity.

Given the above, it was necessary to design and validate an instrument that would enable the comprehensive measurement of the construct under study, namely, one that would cover its various dimensions. It was also considered that the instrument could be a very useful tool in the educational setting, by providing information anchored in specific contexts, thus enabling the implementation of actions aimed at strengthening a key skill for students' academic performance.

2. Method

The study employs a quantitative approach with an instrumental design (Ato et al., 2013), which involves the construction and validation of the subscales that comprise the Academic Writing Teaching Practices Questionnaire (AWTPQ). The instrument enables the assessment of academic writing teaching practices, in terms of opinion and frequency, as reported by students from various subject areas.

2.1. Participants

Non-probability convenience or strategic sampling (Cea D'Ancona, 1996) was employed in two universities in the city of Concepción, Chile, in 2024. These institutions are private and have been accredited by the Chilean National Accreditation Commission (CNA) for 6 and 5 years, respectively.

The final sample consisted of 1,109 valid responses. 80.3% of the student body belonged to University 1 (n = 891), and 19.7% to University 2 (n = 218). In terms of gender, 62.8% identified themselves as female, 35.7% as male, 0.6% as non-binary, and 0.6% preferred not to say. In terms of subject area, 35% of the participants were studying degrees in the area of Medical and Health Sciences (n = 388), followed by 22.9% in that of Social Sciences (n = 254), 22.4% in Engineering and Technology (n = 248), and 19.6% in Humanities (n = 217). In terms of university stage, the majority of students (67.7%) were in the first year of their degree programmes (n = 751), while the rest were in the second (10.5%, n = 116), third (5.5%, n = 61), fourth (8.8%, n = 98), fifth (5.6%, n = 62), sixth (1.6%, n = 18) and seventh year (0.3%, n = 3).

2.2. Ethical aspects

Prior to its implementation, the research project was approved by the Ethics Committee of Institution 2 and endorsed by Institution 1. Accordingly, all participants signed an informed consent form that explicitly stated the voluntary nature of their participation, how their personal data would be stored, and that they would be protected against any harm. To ensure the protection of information, the research team signed a confidentiality agreement.

2.3. Procedure

Since no existing instrument was identified that measured what this research sought to measure, we developed a questionnaire in two mirror versions: one for teachers and one for students. It is important to note that this article focuses only on the student version.

Regarding its application, the questionnaire was administered online, with email used as the primary means of contact. In the case of Institution 1, authorization was required from both the Vice-Rector's Office for Undergraduate Studies and the Vice-Rector's Office for Research and Doctoral Studies. Subsequently, the implementation of the survey was managed by an internal unit. In the case of Institution 2, the relevant faculty authorities were contacted to request authorization, and, using the provided databases, communication was initiated with potential participants. Once the process was complete, the data were analysed using SPSS software. In order to develop the instrument and assess the evidence regarding validity and reliability of the subscales, the guidelines proposed by López-Pina and Veas (2024) and by Meza and González (2020) were followed, which involved 6 stages: 1) theoretical definition of the construct; 2) construction of the questionnaire; 3) content validation; 4) pilot; 5) estimation of psychometric properties; and 6) adjusted version of the scale.

The first phase involved a literature review to conceptualize the construct and its dimensions, as well as to identify instruments that address similar constructs. The results of the previous qualitative research phase, which included seven focus groups with students, were also reviewed and analysed using the Grounded Theory approach (Strauss and Corbin, 2002). The results meant that the construct could be defined using not only pre-existing theory, but also empirical data.

In the second stage, the items were developed and preliminarily grouped into dimensions that emerged from the qualitative analysis, although they required subsequent statistical validation to confirm their validity. The first version of the questionnaire comprised 61 items and was sent to 7 specialists who were selected based on their experience in the area of study and/or their expertise in assessing instruments to evaluate content validity (third stage). The assessment consisted of rating each item as essential, helpful but not essential, or not necessary at all. Furthermore, the experts were asked to provide suggestions regarding the dimensions comprising the construct, including any items that had not been considered or to suggest modifications to their wording. Based on the assessments, 18 items were revised to clarify the wording, and 3 items deemed irrelevant were eliminated. The Fleiss kappa value was 0.85, which indicates an adequate level of agreement among specialists.

Based on these adaptations, a pilot test (stage 4) was conducted with 30 students, with completion times ranging from 10 to 20 minutes. Subsequently, a cognitive interview was conducted with five students. Based on the comments, further adjustments were made to the instrument, especially to concepts or the wording of proposals that were ambiguous or difficult to understand. The research team then conducted a further review of the questionnaire; however, no inconsistencies were found, and no items were eliminated. At this point, we proceeded to stage 5, where an exploratory factor analysis (EFA) was conducted and Cronbach's alpha coefficient was applied, as detailed in the results section.

2.4. Instrument

The Academic Writing Teaching Practices Questionnaire, in its final version, includes, at the beginning, an informed consent form that participants must accept in order to proceed with the response process. The first section asks about personal and academic background. The second section comprises a total of 43 items grouped into 7 dimensions/factors, each represented by a five-point Likert subscale, which assess academic writing teaching practices. Finally, a multiple-choice question and an open-ended item were added, which, due to their nature, were excluded from the factor and reliability analyses.

For the design of the subscales, two instruments identified during the literature review were used as models: the European Writing Survey (EUWRIT) (Chitez et al., 2015) and the Academic Writing Questionnaire (Nuñez-Cortés and Muse, 2016). While these instruments were an important point of reference, they seek to measure constructs different from those stated in this study. The EUWRIT aims to capture self-perception of the level of competence in various aspects of academic writing from the students' perspective, while the Núñez-Cortés and Muse (2016) questionnaire focuses on aspects related to the teaching of writing. Specifically, the instrument developed in this research seeks to assess, in terms of opinion and frequency, academic writing teaching practices from the students' perspective. It should be noted that most of the items in the questionnaire were developed based on the results obtained in the qualitative phase, which enabled the construction of a substantiated description of teaching practices, including prioritization and the development of categories. This process facilitated the formulation of a first scale proposal consisting of nine dimensions: (1) meaning, (2) importance, (3) teaching, (4) context, (5) planning, (6) implementation, (7) assessment, (8) feedback and (9) self-learning, which was reformulated using the exploratory factor analysis (EFA).

3. Results

The psychometric properties of the instrument (stage 5) were estimated in two stages. First, the internal factor structure was assessed by means of an EFA, which was applied iteratively. Next, evidence of reliability for each factor and the overall scale was examined using Cronbach's alpha. Finally, a descriptive analysis was carried out to explore the factor scores and analyse their correlation using Pearson's coefficient.

3.1. Initial approach to factor creation

This study adopted the criteria proposed by Lloret et al. (2017) to perform the EFA. In this way, we worked with an appropriate sample size, which exceeds the suggested range. Through the EFA, we aimed to gather evidence of the exploratory validity of the instrument's internal structure, as no previous analysis had been conducted.

Although an initial dimensional framework for organizing the items was established based on the qualitative study conducted beforehand, this framework was merely provisional. Moreover, due to the need to provide more evidence for the theoretical construct (Mulaik, 1972), we decided to perform an EFA instead of a confirmatory factor analysis (CFA). This decision enabled us to identify latent patterns without imposing prior restrictions, which may not be suitable for the available data.

At the beginning of the process, the EFA included 58 items. The analysis was carried out iteratively to statistically establish the existence of dimensions or factors that grouped the items together and enabled the construct to be measured. In other words, this method enabled us to identify groups of variables with common meaning, thereby reducing the number of dimensions required to explain respondents' answers.

The data were tested for statistical suitability for factor analysis using the Kaiser-Meyer-Olkin (KMO) test (KMO = 0.95) and Bartlett's test of sphericity ($p < 0.001$). However, the first factor solution was not clear in terms of dimensional definition due to low or cross-loadings. Therefore, each factor was factorially assessed, considering that it should form a unidimensional subscale composed of items correlated with one another. Based on this statistical analysis, 9 items were eliminated as they did not significantly contribute to the measurement of the construct under study. Ultimately, a total of 49 items advanced to the next stage.

3.2. Final factory model of the scale

After the analysis described above, a new EFA was performed on the items as a whole. For this purpose, the principal axis method was used, as it enables us to extract factors considering only the common variance between items, making it more appropriate when the data do not comply with a normal multivariate distribution (Costello & Osborne, 2005). Following extraction, varimax rotation was employed to facilitate interpretation of the factors, as it maximizes the variance of the factor loadings (Field, 2018). Finally, the usual criteria (Lloret et al., 2017) were used for factor composition and retention (eigenvalue greater than 1; minimum saturation equal to or greater than 0.30 for the inclusion of an item in a factor).

Similarly, the KMO test was performed for the 49 items to justify the use of the EFA, and, in accordance with the categorisation proposed by Lloret et al. (2017), it indicated a satisfactory level (KMO = 0.96), further confirmed by Bartlett's test of sphericity ($p < 0.001$). During the initial exploration, it was observed that several items grouped in the "meaning" dimension/factor had factor loadings that were either cross-loadings or below the threshold of 0.30. As a result, we worked iteratively to progressively eliminate these items and analyse changes in the factor model. Nevertheless, this procedure negatively affected the model by reducing consistency and weakening other well-performing items, prompting us to eliminate six items that represented two dimensions.

The changes made it possible to clarify and measure the construct using specific dimensions, resulting in a factor model that matches the conceptual proposal. This enabled the creation of a scale and subscales to represent academic writing teaching practices. Consequently, 43 items remained from the original 61, grouped into 7 dimensions/factors that together explain 62.6% of total variance. The number of factors was based on the scree plot and the Kaiser-Guttman criterion (Hair et al., 2005).

Below is the final configuration matrix (Table 1), which identifies clear values for each component, meaning that all items load more heavily on a single factor, as indicated in italics. According to Tabachnick and Fidell's (2019) criteria, factor loadings of less than 0.30 were considered unacceptable. Conversely, loadings above 0.71 were considered excellent, 0.63 very good, 0.55 good, and 0.45 moderate.

TABLE 1. Configuration Matrix for factor loadings

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Item 12	*0,875*						
Item 13	*0,824*						
Item 14	*0,851*						
Item 15	*0,795*						
Item 16		*0,610*		0,357			
Item 17		*0,705*					
Item 18		*0,675*					
Item 19		*0,604*					
Item 20		*0,625*					
Item 21		*0,624*					
Item 22			*0,718*				
Item 23			*0,716*				
Item 24			*0,666*		0,308		
Item 25			0,367	*0,554*			
Item 26				*0,671*			
Item 27				*0,678*		0,369	
Item 28				*0,552*		0,458	
Item 29				*0,667*		0,394	
Item 30				*0,696*		0,353	
Item 31				*0,643*			
Item 32				*0,676*		0,436	
Item 33				*0,659*		0,436	
Item 34				*0,504*		0,333	

Item 35	0,302		*0,582*	0,301	
Item 36		0,392	*0,459*	0,389	
Item 37			*0,759*		
Item 38			*0,587*	0,358	
Item 39			*0,750*		
Item 40		0,358		*0,553*	
Item 41		0,346		*0,717*	
Item 42				*0,743*	
Item 43				*0,749*	
Item 44		0,330		*0,697*	
Item 45				*0,762*	
Item 46				*0,718*	
Item 47		0,311		*0,694*	
Item 48				*0,761*	
Item 49				*0,748*	
Item 50					*0,562*
Item 51					*0,731*
Item 52					*0,721*
Item 53					*0,492*
Item 54					*0,540*

Source: compiled by authors based on SPSS software

Based on the above, it can be stated that the EFA revealed that the initial group of items proposed for measuring academic writing teaching practices required modification. The iterative work resulted in a factor model with a total of 43 items, which meant that 15 of the items proposed prior to the EFA were eliminated. It is also important to note that the dimensions forming part of the final factor model confirm the multidimensionality of the construct proposed based on the results obtained in the qualitative stage. This aligns with the theoretical proposal of Shove et al. (2012) and various studies (García Cabrero, 2008; Pérez et al., 2016), in that practices encompass not only action but also components related to thought and the environment.

The final dimensions of the questionnaire, along with their conceptualization, are outlined in Table 2. At this point, it is essential to note that the dimensions in Table 2 correspond to the factors listed in Table 1.

Table 2. Conceptualisation of the dimensions in the questionnaire

Component	Dimension	Definition	No. of items
Thought	1. Importance of academic writing	Value placed on academic writing in the students' formative process.	4 Items
Environment	2. Context	Opinion regarding the curricular/ extra-curricular space where the academic writing learning experiences offered to students take place.	6 Items
Action	3. Planning	Frequency with which writing activities to be undertaken in the context of the subject are anticipated and described.	3 Items
	4. Implementation	Frequency of guidance actions, such as the use of pedagogical strategies and resources for teaching writing.	10 Items
	5. Assessment	Frequency with which competence development is measured.	5 Items
	6. Feedback	Frequency with which different strategies are employed to provide suggestions for improvement of texts produced by students.	10 Items
	7. Self-learning	Frequency with which students autonomously employ strategies to foster the development of their writing skills.	5 Items

Source: compiled by authors

The adjusted version of the questionnaire (stage 6) is presented in Table 3. The response options for dimensions 1 (importance) and 2 (context) are as follows: (5) strongly agree; (4) agree; (3) neither agree nor disagree; (2) disagree; (1) strongly disagree. The rest of the dimensions are also rated from 1 to 5 with the following options: (5) always; (4) frequently; (3) sometimes; (2) rarely; (1) never.

Table 3. Adjusted version of the questionnaire

Dimension	Description of the item
Dimension 1: Importance of academic writing	General instruction dimension 1 "I think academic writing is important for...: 12. My university education. 13. My academic performance. 14. My professional development. 15. To carry out research-related tasks.
Dimension 2: Context of teaching practices	General instruction dimension 2 "I received training in academic writing...": 16. In all my semesters of study. 17. By means of the teaching material provided by my subject-specific teachers. 18. In disciplinary subjects specific to my degree. 19. In research methodology courses. 20. In workshops or extracurricular activities. 21. At my university's student support centre (CEADE or CADA).
Dimension 3: Planning	General instruction dimension 3 "In the scheduling or syllabus of my subjects": 22. Academic writing assignments to be completed during the semester are included. 23. The academic writing activities included are clearly defined, for example, the type of academic text and mode. 24. Dates for the submission of drafts and/or final versions of academic texts are indicated.
Dimension 4: Implementation	General instruction dimension 4 "The teachers of my disciplinary subjects...": 25. Provide clear and detailed instructions when we are asked to write an academic text. 26. Include text planning activities that allow me to brainstorm ideas and/or order them, e.g., concept maps, schema, drafts, etc. 27. Provide practical tips on writing academic texts. 28. Ask me to rewrite my written work based on their corrections. 29. Explain the characteristics of the types of academic texts worked on in class. 30. Write fragments of academic texts with their students, similar to the ones they set as assignments. 31. Use digital platforms (Moodle, forums, wikis, etc.) to provide instructions on academic writing assignments. 32. Share examples of the same type of academic text they set as an assignment in their classes. 33. Provide support material related to writing academic texts (videos, glossaries, complementary texts, etc.). 34. Include practice with writing academic texts related to my degree (for example, a clinical record for the Nursing degree or drawing up a project on economics in Commercial Engineering).

Dimension 5: Assessment	General instruction dimension 5 "The teachers of my disciplinary subjects...": 35. Use assessment tools (rubrics, checklists, etc.) that include scored indicators related to academic writing. 36. Explain in detail the aspects of academic writing that will be assessed, which helps to guide my work. 37. Deduct marks for spelling mistakes in my academic assignments. 38. Assign marks for the organisation and development of ideas in academic assignments. 39. Assign marks for the structure (organisation into sections, for example, introduction, body, conclusion) of written academic assignments.
Dimension 6: Feedback	General instruction dimension 6 "The teachers of my disciplinary subjects...": 40. Use digital tools, such as Word comments or Speedgrader, to provide feedback on my academic texts. 41. Provide some kind of feedback on drafts or the progress of my academic texts. 42. Provide some kind of feedback on the final submission of my academic texts. 43. Provide individual feedback on my academic texts by means of written comments. 44. Provide individual feedback on my academic texts by means of oral comments. 45. Provide group feedback when I submit academic texts written with other classmates. 46. Provide general feedback to the whole course group in order to address the most frequent problems regarding academic writing. 47. Provide feedback on normative aspects of academic writing, for example, spelling and punctuation. 48. Provide feedback on the organisation of ideas in my academic texts (coherence). 49. Provide feedback on the structure of the academic texts I submit (organisation into sections, for example, introduction, body, conclusion).
Dimension 7: Self-learning	General instruction dimension 7 "I have learnt academic writing in the university context...": 50. Through autonomous review of material and/or literature. 51. Through the help of my university classmates. 52. Through the help of my family and/or friends. 53. Through the support requested from my teachers. 54. By reading articles or research written by my teachers.

Source: compiled by authors

3.3. Reliability analysis

Subsequently, Cronbach's alpha coefficient was calculated for each dimension (see Table 4) to assess the reliability of the measurement, specifically the internal consistency of the construct being measured.

Table 4. Cronbach's alpha coefficient values by dimensions

Factor	Cronbach's alpha
1: Importance	0,94
2: Context	0,92
3: Planning	0,86
4: Implementation	0,82
5: Assessment	0,78
6: Feedback	0,70
7: Self-Learning	0,.76

Source: compiled by authors based on SPSS software

Table 4 shows that the results fell within the ranges for acceptable and excellent reliability, with $\alpha > 0.70$ for all dimensions. Moreover, the coefficient value for the overall scale was $\alpha = 0.94$.

The relationship between the factors was assessed using Pearson's correlation coefficient. Interdimensional correlations showed positive and statistically significant ($p < 0.01$) associations for each pair assessed. In particular, the first factor (importance) showed lower correlations with the other dimensions ($r = 0.129$ to 0.205), while the fourth factor (implementation) was moderately to highly associated with the second (context) $r = 0.582$, with the third (planning) $r = 0.560$, and, especially, with the sixth (feedback) $r = 0.782$. These relationships suggest that, although each dimension provides specific information, there is a considerable degree of convergence among them, except for the importance dimension.

4. Discussion

The aim of this study was to develop and assess the psychometric properties of an instrument designed to measure academic writing teaching practices from the students' perspective. The resulting questionnaire comprises 43 items grouped into 7 dimensions and presents evidence of content validity (expert judgment), response validity (as demonstrated by a pilot test and cognitive interviews), and internal structure validity at the exploratory level (as assessed by an exploratory factor analysis, or EFA). It is worth noting that the subscales can be used simultaneously or separately to measure specific dimensions of the construct.

From a theoretical perspective, the EFA enabled us to explore the dimensionality of the construct of academic writing teaching practices and also to redefine it. The final factor model supports multidimensionality. In particular, the presence of dimensions such as planning, implementation, and assessment coincides with the findings of Montes-Pacheco et al. (2017), who identified these same stages in teaching practices. It also contributes to the conceptualisation of the construct through the inclusion of the context and self-learning dimensions, which reinforce the importance of self-management when learning academic writing. The above is linked to a gap in the teaching of this skill, which has been identified by previous research (Avila-Reyes et al., 2020). This presents an opportunity for higher education institutions to improve equity, as students with lower cultural capital may face greater difficulties when it comes to self-directing their learning.

It should be noted that the reliability coefficients obtained for each dimension were appropriate ($\alpha > 0.70$), indicating adequate internal consistency (Nunnally, 1967). Only the feedback subscale could be compared with a previous study (Castelló and Mateos, 2012); in both cases, the values were $\alpha = 0.70$.

Regarding the limitations of the study, it is worth noting that, as a self-administered questionnaire, there may be a certain subjective element in the answers. However, measures were taken to mitigate this bias, such as pilot testing with a group of individuals who had similar socio-demographic characteristics to those of the participants in the final sample. Another limitation is that non-probability sampling was used, which restricts the generalisability of the results and the estimation of the margin of error. Nevertheless, the sample size was large and fairly heterogeneous in composition, which suggests that the solution obtained is relatively stable. Further evidence of validity and reliability is required by applying the instrument to other populations, given that data collection was limited to one city.

It is relevant to note that, at the time of designing the questionnaire, the explicit inclusion of a gender perspective in the wording of all items was not considered. For future application and validation, it is proposed to adapt the wording of the items in line with current gender equity frameworks in educational research. Furthermore, the instrument, in its current version, does not include specific items for feedback regarding audience type or citation styles. Finally, it is necessary to confirm the factor structure obtained by performing a confirmatory factor analysis.

5. Conclusions

The study addresses a key issue in higher education: the teaching of academic writing, through the development and validation of a comprehensive questionnaire that links to existing instruments.

From the analysis performed it can be concluded that: 1) the subscales for measuring academic writing teaching practices are unidimensional, consisting of a total of 43 items accounting for 7 dimensions/factors; 2) there is evidence of content validity, response validity and internal structure validity of the measurement performed; 3) the factors showed correlations among themselves, which is theoretically expected, since they refer to a single construct; 4) the overall scale is available to the community and can be broken down into subscales to address specific aspects.

Moreover, while the EFA was appropriate at this exploratory stage, the next step in validating the instrument would be to conduct a confirmatory factor analysis to verify the model's fit and assess its replicability. This strategy would further strengthen the validity of the evidence from the questionnaire.

Author contributions

María Verónica Strocchi: Conceptualisation, data processing, writing (original draft).

Mónica Tapia-Ladino: Conceptualisation, drafting, review, and editing.

Pablo Fuentealba-Carrasco: Methodology, writing, review, and editing.

Artificial Intelligence (AI) Policy

The authors declare that they have not used Artificial Intelligence (AI) in the preparation of their articles.

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Innovative learning spaces for the university of the future: A bibliometric review (2011–2024)

Espacios de aprendizaje innovadores para la universidad del futuro. Revisión bibliométrica (2011-2024)

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Abstract

In recent years, innovative learning spaces have proliferated in the university setting, emerging as one of the foremost national and international trends. This study aims to analyse scientific output relating to the influence of these spaces in the university teaching and learning process between 2011 and 2024. A bibliometric and systematic review was carried out following the PRISMA guidelines, identifying 56 articles indexed in Web of Science with a high concordance index (k = 0.97). Descriptive analysis and co-citation cluster analyses of references, sources and authors were performed. The results show notable growth in studies focusing on these spaces, principally in Spain. They also reveal a clear structure in four thematic blocks: (a) Theoretical Fundations; (b) Impact; (c) Pedagogical Innovations and Educational Technologies; and (d) Social Context. Where appropriate, the sources were organised into four clusters: (a) Teaching and Learning in Higher Education; (b) Technology in Education; (c) Pedagogical Innovation; and (d) Health Sciences Education. The network of author co-citations reveals four main clusters: (a) Innovative Approaches; (b) Educational Technology; (c) Intercultural Approach; and (d) Experiential Learning. This work concludes that innovative learning spaces are an essential element, influencing the development of health sciences education.

Keywords: innovative physical spaces, virtual learning environments, educational technology, classroom of the future, higher education, educational trends

Resumen

En los últimos años, se ha producido un aumento de espacios de aprendizaje innovadores en el contexto universitario, convirtiéndose en una de las principales tendencias nacionales

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e internacionales. Este estudio tiene como objetivo analizar la producción científica sobre la influencia de estos espacios en el proceso de enseñanza y aprendizaje universitario entre 2011 y 2024. Se ha realizado una revisión bibliométrica y sistemática siguiendo las directrices PRISMA, identificando 56 artículos indexados en Web of Science con un alto índice de concordancia (k=0.97). Se llevaron a cabo análisis descriptivos y análisis clúster de co-citación de referencias, fuentes y autores. Los resultados muestran un crecimiento exponencial de estudios centrados en estos espacios, principalmente en España. Asimismo, se revela una estructura clara en cuatro bloques temáticos: (a) fundamentos teóricos, b) impacto, c) innovaciones pedagógicas y tecnologías educativas y d) contexto social. En su caso, las fuentes se organizan en cuatro clústeres sobre (a) enseñanza y el aprendizaje en educación superior, b) tecnología en educación, c) innovación pedagógica y d) educación en ciencias de la salud. La red de co-citaciones de autores revela cuatro clústeres principales: (a) enfoques innovadores, b) tecnología educativa, c) enfoque intercultural y d) aprendizaje experiencial. Se concluye que los espacios de aprendizaje innovadores son una parte fundamental, influyendo positivamente en el proceso de enseñanza y aprendizaje universitario.

Palabras Clave: Espacios físicos innovadores; entornos virtuales de aprendizaje; tecnología educativa; aula del futuro, enseñanza superior, tendencia educativa.

1. Introduction

University education requires an innovative focus that allows students to develop the skills and competencies needed to face current challenges. In this context, innovative learning spaces have become a topic of special interest in the educational field, both nationally and internationally (Desbrow & Domínguez, 2020; Weiss, 2019).

Innovative learning spaces are environments designed to improve the teaching and learning process by using educational technologies, innovative methodologies, adaptability of content or teaching, flexible furniture and collaboration between the stakeholders involved (Araiza-Vázquez et al., 2023; Bautista et al., 2019; OECD, 2015). However, it is essential to highlight that innovative learning spaces are not limited to physical classrooms but can also include digital and virtual spaces. Accordingly, in relation to physical spaces, their design has become one of the principal trends in Europe, prompted by European Schoolnet's Future Classroom Lab, which is divided into six learning areas that help to foster teaching and the development of student competencies, moving beyond content acquisition to become the core of the teaching process (Mahat et al., 2018; Shevchenko et al., 2021). This initiative has taken shape in Spain in the Aula del Futuro (Classroom of the Future), created by the Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado (National Institute of Educational Technologies and Teacher Training, INTEF) (Tena & Carrera, 2020), which is configured to promote active teaching through elements such as open areas, movable and flexible furniture, advanced technology, online collaboration tools, board walls, green areas and personalised teaching materials, among others (Díaz, 2022; OECD, 2015). These spaces promote active and participatory learning, involving students in activities based on collaboration projects, problem solving and interactive discussions (Johnson et al., 2016).

In addition, as Bolliger and Halupa (2018) note, digital spaces can be equally innovative and effective for learning, so long as they are suitably designed and incorporated with the other elements present in the learning environment. Fullan et al. (2021) maintain that these spaces promote collaboration, creativity and interpersonal and leadership skills, fostering peer-to-peer learning. (Johnson et al., 2016).

Traditional classrooms have been the physical space par excellence since the first schools were founded. However, thanks to the development of educational technology, more flexible teaching models that are adapted to current needs have emerged. According to Knezek et al. (2019), learning spaces have been in constant evolution over the last few decades. Open classrooms appeared in the 1960s, fostering collaboration and teamwork.

Thematic classrooms were then introduced, in which the space was tailored to the subject being taught, along with multimedia classrooms incorporating technological tools (Al-Lal, 2021). With the arrival of the 21st century came the emergence of innovative learning spaces, characterised by their flexibility and adaptation to students' needs, learning styles and the principles of Universal Design for Learning (UDL, Benade, 2019), creating an environment that is accessible and comfortable for students, where the elements can be reconfigured and reorganised in response to evolving needs and learning objectives (Parody et al., 2022). In the same vein, Yang et al. (2018) maintain that the integration of digital and technological tools has been the key factor in converting conventional and virtual classrooms into smart classrooms. Innovative learning spaces seek to break with the traditional teaching model and promote active and autonomous participation by students during the learning process (Carvalho & Yeoman, 2021; Divyashree, 2018; Rovai, 2018). As society changes, so do pedagogical theories and models, and implementing innovative learning spaces is essential to satisfy the demands of a changing society and provide students with a quality education (Baque & Marcillo, 2020). In this sense, the need to implement innovative learning spaces grounded in pedagogical models—principally Piaget's constructivist model (1977) and Vygotsky's sociocultural model (1978)—is well founded. Therefore, innovative learning spaces such as teamwork spaces and flipped classrooms provide a collaborative environment that fosters social interaction and knowledge exchange.

In recent years, research has been done on innovative learning spaces, exploring the different types and analysing their effects on learning. Current literature suggests that the implementation of innovative learning spaces has positive effects on the teaching and learning process and on students' motivation, well-being and academic performance (Düzenli et al., 2018; Granito & Santana, 2016).

Although there is growing awareness of the importance of innovative learning spaces in education, scarce research has analysed their actual impact on the teaching and learning process. The present study aims to analyse the available scientific literature on the influence of innovative learning spaces on university teaching and learning between 2011 and 2024.

The specific objectives are: to examine the chronological productivity of studies (2011–2024); to identify scientific output according to the author's country of publication; and to map the relationships and groupings among publications, sources and authors in the field of innovative learning spaces through co-citation analysis.

2. Method

A systematic review of the scientific literature was performed in response to the research objectives.

2.1. Protocol and registration

This work was done following the guidelines set out in the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Urrútia & Bonfill, 2010). This protocol provides a framework for conducting research into scientific output in a rigorous, thorough and systematic manner (Uman, 2011).

2.2. Eligibility criteria

Before searching for and analysing information, and with the aim of reducing the impact of the biases inherent in the selection process, the eligibility criteria for inclusion and exclusion were established to specify the characteristics of the studies (Table 1).

Table 1. Study eligibility criteria

Criteria	Search	Inclusion criteria	Exclusion criteria
Initial filters	Publication date	2011–2024	Prior to 2011
	Language	English and Spanish	Articles published in other languages
	Type of document	Empirical research articles	Books, doctoral theses, other academic works and conference proceedings
1	Type of publication	Published full-text articles in peer-reviewed journals	Abstracts and articles published in journals without peer review
2	Type of review	Green Published (published final versions hosted in an institutional repository or a thematic repository) and Green Accepted (final peer-reviewed resource, which might not have been edited).	No peer review
3	Educational level	University	Not university

Source: Prepared by the authors

2.3. Search methodology

Having established the eligibility criteria, the decision was taken to search for scientific contributions indexed in Web of Science.

A search strategy combining descriptors and Boolean operators in English was used, making it possible to generate the following reproducible and replicable search: (innovative) AND ("learning space*" OR "learning environment*" OR "Active Learning Classroom*") AND ("higher education" OR university) AND (educa*). Some descriptors were combined with the Boolean operator OR to expand the search among synonyms or equivalent expressions and AND as a connecting nexus with the aim of restricting the search. The asterisk (*) was used to search for expressions both in the singular and in the plural, and inverted commas (" ") were used to establish the set of words that should be returned in the search results.

With regards to the search phrase, the systematic process was divided into two phases: Phase I, which involved searching for and identifying registers, and Phase II, which consisted of their screening. Figure 1 summarises both phases.

Phase I, corresponding to the initial search for and identification of registers, returned 1,005 results, and several initial filters were used to characterise the selection of results.

Open-access studies from 2011 to 2024 and empirical research articles were selected, yielding 438 articles for the eligibility analysis.

Phase II was performed using the Covidence program, a software tool for analysing systematic reviews (Kellermeyer et al., 2018). The search results obtained in Phase I were uploaded into this tool. Each record was then reviewed individually by reading its title and abstract, applying the inclusion and exclusion criteria set out in Table I, and extracting the final results.

2.4. Bias and data analysis

The selection of the studies analysed was done independently in pairs with the aim of guaranteeing the quality of the research and avoiding bias. The Covidence tool, recommended by the Cochrane Collaboration, was used to make the selection and facilitate the revision and extraction of data in the systematic reviews. In this regard, cases where discrepancies arose were resolved by consensus, and Cohen's Kappa coefficient was calculated (k = 0.97).

$$k = \frac{p_0 - p_e}{1 - p_e}$$

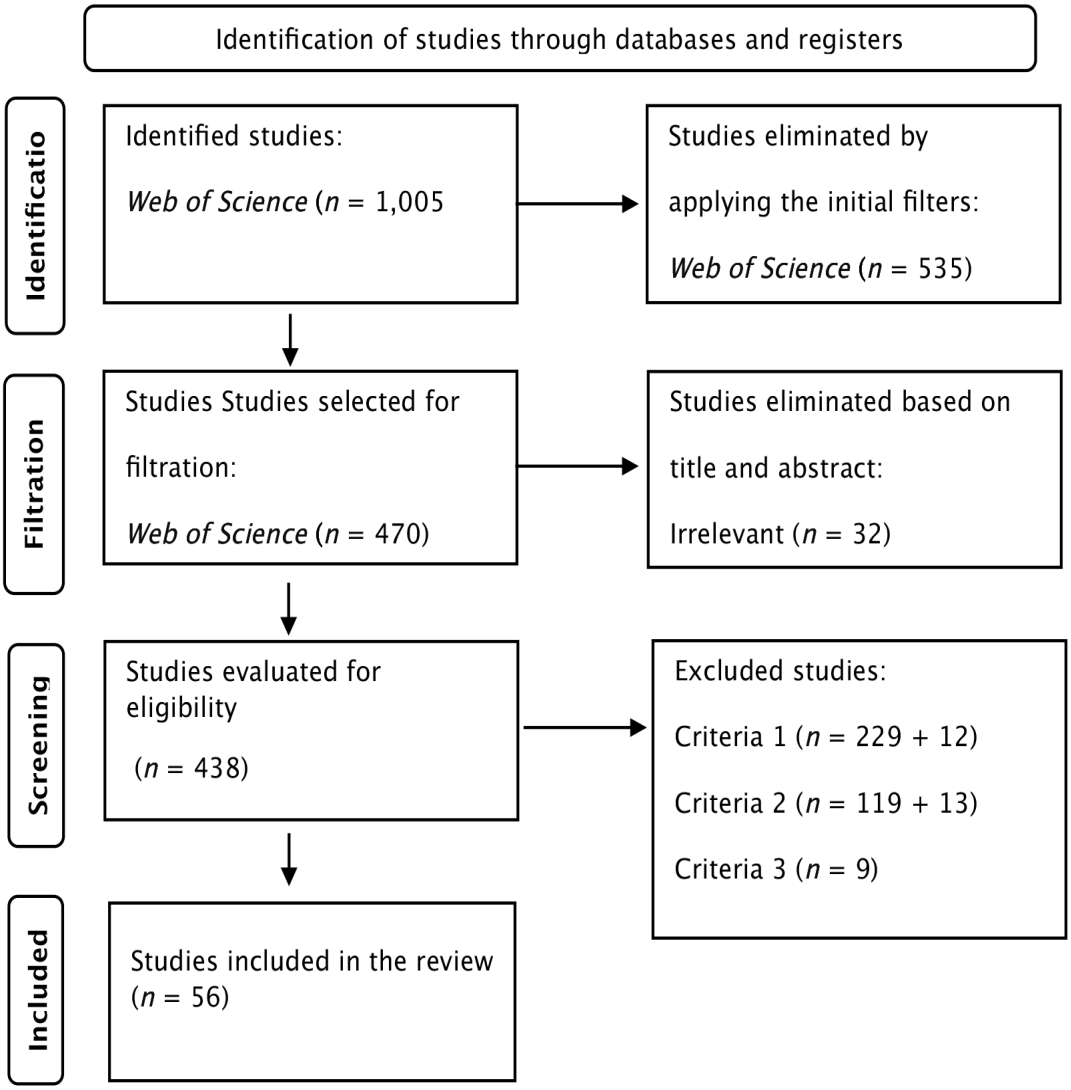
Note: P_0 is the relative agreement observed between evaluators and P_0 is the hypothetical probability according to chance. Finally, after the screening process, 56 articles meeting the established inclusion criteria were identified. Once the final selection of studies had been performed using the Covidence software, the data were exported to EzAnalyze (an Excel tool) to respond to specific Objectives 1 and 2 through descriptive statistics and figures that summarise the percentages of each variable. In response to specific Objective 3, a co-citation analysis of references, sources and authors was performed in order to identify the relations and citation patterns among the bibliographic references. This analysis offered insights into the structure of knowledge and the relationships among research areas. The co-citation analysis of authors yielded information about influence and collaboration among researchers in a specific field.

VOSviewer software was used for these analyses, using the "Association Strength" method to measure the strength of association based on citation weight and generating co-citation network maps to graphically illustrate the relations between the publications, sources and authors.

2.5 Flow chart

Figure 1 is a flow chart of the methodology used.

FIGURE 1. Flow chart



Source: Prepared by the authors, adapted from Page et al. (2021)

Note: The articles included in the review can be consulted at the following link.

Following the screening process, the outputs obtained were examined in relation to articles published in English and Spanish between 2011 and 2024, with full text available, on the role of innovative learning spaces.

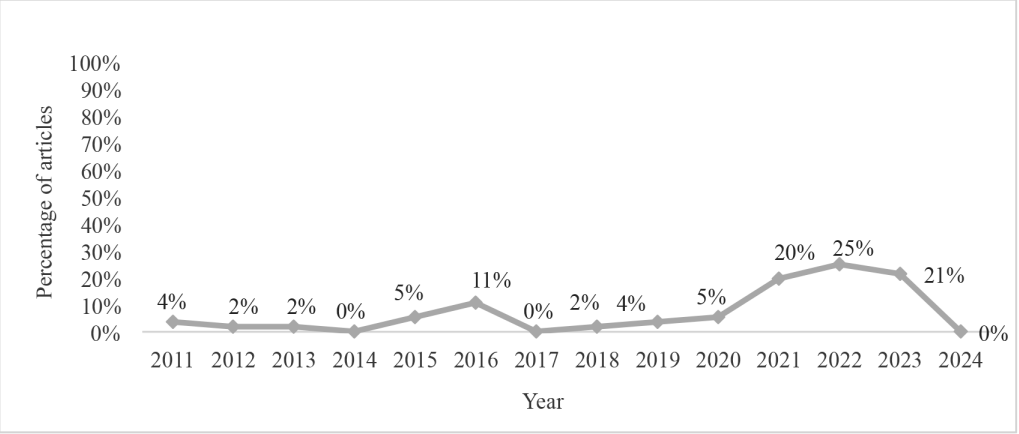
3. Results

The results obtained were then shown, organised according to the specific objectives of the study.

3.1. Results by chronological productivity

To analyse the chronological productivity of studies, 56 research articles published between 2011 and 2024 were reviewed (see Figure 2). Of the 56 studies identified, 66% (37) were published between 2021 and 2024, with 2022 accounting for 25% of the total output. The remaining articles are distributed across the years, with the highest output in 2016 (11%, 6 articles) and 2020 contributing three articles (5%). In general, the number of published studies has risen in recent years, reflecting a growing interest in this regard, although no articles were published in 2024.

FIGURE 2. Chronological productivity of studies from 2011 to 2024



Source: Prepared by the authors

Note: The descriptive statistics used to prepare this figure were calculated using the EzAnalyze tool.

3.2. Results by author's country of publication

Of the 82 authors included in the analysis, 13% (11 authors) are from Spain, followed by 10% (8 authors in each case) from the England and the United States. They are followed by 7% (6 authors) from the Netherlands, 6% (5 authors in each case) from Australia, China and Taiwan, and 5% (4 authors) from Mexico. Countries such as Canada, Finland, Pakistan, Portugal, South Africa, South Korea, Turkey and Venezuela each contribute with two authors, representing 2% per country. The remaining countries have one author each (Algeria, Argentina, Brazil, France, Germany, Ghana, India, Italy, Jordan, Nigeria, Norway, Qatar, Saudi Arabia, Sweden and Ukraine).

3.3. Results based on co-citation analysis

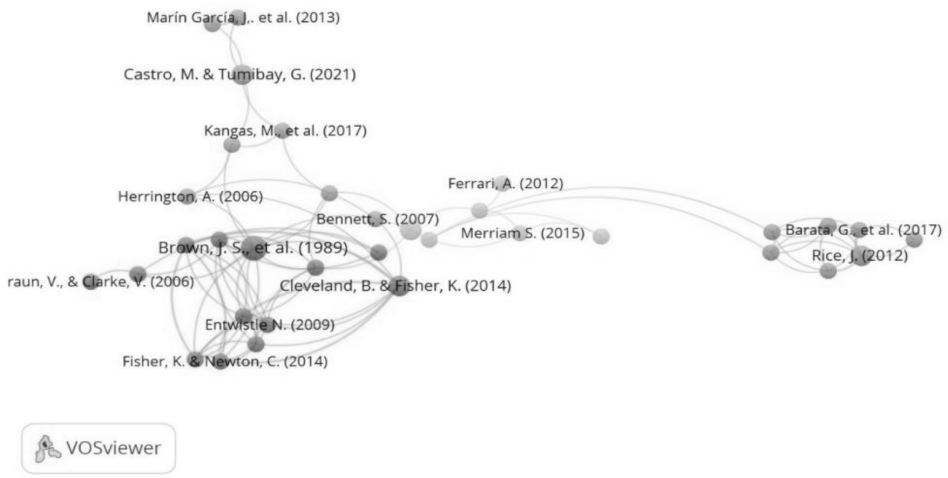
The results of the co-citation analyses are shown below, including references, sources, and authors.

3.4. Results of the co-citation analysis of references

Figure 3 shows the co-citation network map of the references cited in the 56 selected studies, using citation weight as the metric. From an initial set of 2,594 cited references, a cutoff threshold of 2 was applied, giving a total of 43 selected references.

An analysis of the co-citation network of references revealed four different groups of nodes.

FIGURE 3. VOSviewer co-citation map of references by number of citations



Source: Prepared by the authors

Table 2 provides a summary of the network and the thematic categories created.

TABLE 2. Thematic categories of the co-citation network map of references by

Cluster	Thematic categories	References with ≥ 2 citations
Cluster 1	Theoretical Foundation of Innovative Learning Spaces	Brown, J. S. et al. (1989) - 4 citations Cleveland, B. & Fisher, K. (2014) - 3 citations Braun, V. & Clarke, V. (2006). Entwistle, N. (2009). Fisher, K. & Newton, C. (2014) - 2 citations Fisher, K. (2005) - 2 citations Geitz, G. & de Geus, J. (2019) - 2 citations Jones, C. et al. (2010) - 2 citations Kirschner, P. et al. (2006) - 2 citations Lindblom-Ylänne, S. (2003) - 2 citations Lizzio, A. et al. (2002) - 2 citations Miles M. (1994) - 2 citations Vygotsky L. S. (1978) - 2 citations

Cluster 2	Impact of Innovative Learning Spaces	Castro, M. & Tumibay, G. (2021) - 3 citations Bennett, S. (2007) - 2 citations Herrington, A. (2006) - 2 citations Kangas, M. et al. (2017) - 2 citations Marín García, J. et al. (2013) - 2 citations Marin-Garcia, J. et al. (2016) - 2 citations Stone, C. (2016) - 2 citations Van den Akker, J. (1999) - 2 citations
Cluster 3	Pedagogical Innovations and Educational Technologies	Rice, J. (2012) - 3 citations Barata, G. et al. (2017) - 2 citations DeLone, W. & McLean, E. (2003) - 2 citations Ferguson, R. (2012) - 2 citations Hew, K. F. et al. (2016) - 2 citations Sousa-Vieira, M. et al. (2017) - 2 citations Viberg O. (2018) - 2 citations
Cluster 4	Situated or Contextualised Learning	Lave, J. & Wenger, E. (1991) - 3 citations Ferrari, A. (2012) - 2 citations Merriam, S. (2015) - 2 citations Spradley, J. (2016) - 2 citations Stake, R. (1995) - 2 citations Yin, R. (2009) - 2 citations

Source: Prepared by the authors

Cluster 1 references comprise key studies on learning theories and cognitive models that shape teaching and learning, with a focus on cognition and knowledge construction in education. According to its theme, this cluster has therefore been categorised as "Theoretical Foundation of Innovative Learning Spaces", as authors such as Brown et al. (1989), Fisher and Newton (2014), Fisher (2005), Vygotsky (1978) and others examine these fundamental aspects for understanding the influence of innovative learning spaces on university education.

Cluster 2 includes authors such as Castro and Tumibay (2021), Bennett (2007) and Herrington (2006), among others, whose central topic is the "Impact of Innovative Learning Spaces". These studies focus on analysing the impact of innovative learning environments on the teaching–learning process, specifically underlining the relevance of learning space design.

Cluster 3 includes references to "Pedagogical Innovations and Educational Technologies", and covers research into innovations in the university education environment. Authors such

as Rice (2012), Hew et al. (2016), DeLone, Ferguson and others investigate new pedagogical strategies, teaching methodologies and emerging technologies.

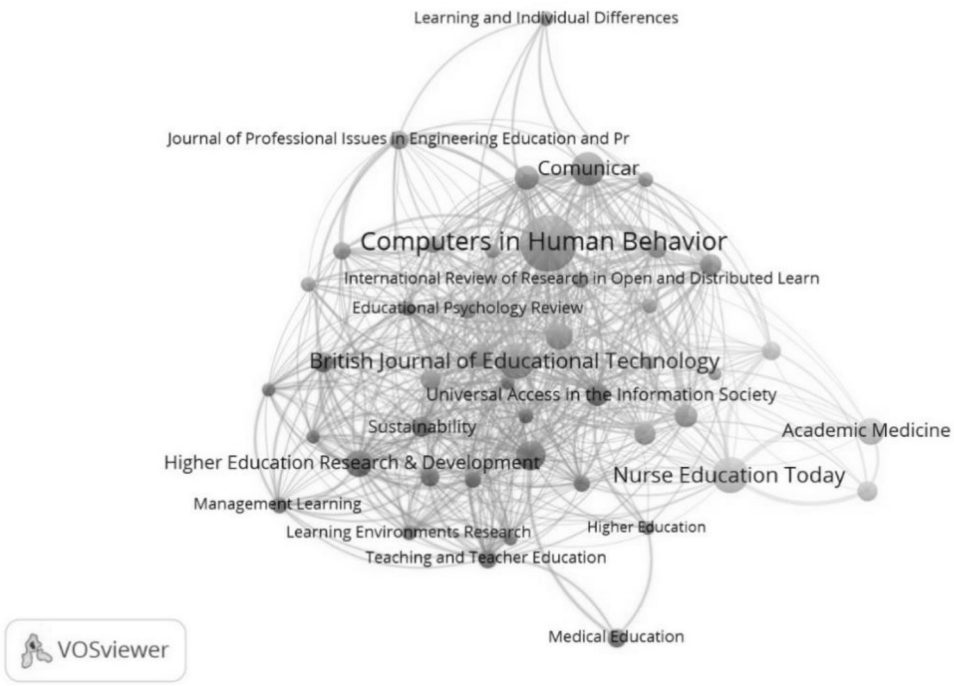
Finally, Cluster 4 includes authors such as Lave and Wenger (1991) and Merriam (2015), who have looked into the development of learning in real-world situations, underlining the importance of the environment, case studies and practice in higher education. Consequently, this cluster is referred to as "Situated or Contextualised Learning", and the included studies provide a valuable perspective on how learning spaces are adapted to the social context to favour meaningful learning.

3.5. Results of the co-citation analysis of sources

Figure 4 shows the co-citation map of the cited sources, once again using citation weight as the metric. For this analysis, an initial set of 1,742 cited sources was taken, and a threshold of 6 was applied, so that only sources that were cited at least six times were included to ensure representativeness on the topic. This resulted in a total of 46 sources selected for representation in the co-citation map.

In the co-citation network, four groups of nodes were created from the 46 sources with at least six citations.

FIGURE 4. VOSviewer co-citation network map of sources by number of citations



Source: Prepared by the authors

Table 3 provides a detailed summary of the network and the thematic categories that emerged from the analysis. Each group of nodes represents a common theme that covers various studies and discussions in the educational field.

Table 3. Thematic categories of the co-citation network of sources by number of citations

Cluster	Thematic categories	Name of the journals with ≥ 6 citations
Clúster 1	Enseñanza y aprendizaje en educación superior	Teaching in Higher Education (22 citas) Higher Education Research & Development (18 citas) Universal Access in the Information Society (14 citas) International Journal of Educational Technology in Higher Education (11 citas) Sustainability (11 citas) Assessment & Evaluation in Higher Education (10 citas) Medical Education (10 citas) Teaching and Teacher Education (10 citas) Educational Psychology (8 citas) Educational Technology & Society (8 citas) Management Learning (8 citas) Educational Science (7 citas) Learning Environments Research (7 citas) Thesis (7 citas) Educational Research Review (6 citas) Higher Education (6 citas) Learning and Instruction (6 citas) Studies in Educational Evaluation (6 citas) Studies in Higher Education (6 citas)
Clúster 2	Tecnología en educación	Computers in Human Behavior (68 citas) British Journal of Educational Technology (31 citas) The Internet and Higher Education (19 citas) European Journal of Engineering Education (14 citas) Journal of Engineering Education (14 citas) Proceedings of the Social and Behavioral Sciences (13 citas) Harvard Business Review (12 citas) Educational Psychology Review (10 citas) Journal of Educational Computing Research (10 citas) Australasian Journal of Educational Technology (8 citas) Education and Information Technologies (7 citas) Review of Educational Research (7 citas) Working Papers on Operations Management (7 citas) Thinking Skills and Creativity (6 citas) WPOM-Working Papers on Operations Management (6 citas)

Clúster 3	Innovación pedagógica	Comunicar (27 citas) Journal of Computer Assisted Learning (16 citas) Computers & Education (13 citas) Journal of Professional Issues in Engineering Education and Practice (10 citas) Frontiers in Psychology (9 citas) International Review of Research in Open and Distributed Learning (8 citas) Interactive Learning Environments (7 citas) Learning and Individual Differences (7 citas)
Clúster 4	Educación en ciencias de la salud	Nurse Education Today (31 citas) Academic Medicine (18 citas) Medical Teacher (12 citas) BMC Medical Education (10 citasPrincipio del formulario)

Source: Prepared by the authors

Cluster 1 comprises journals that cover fundamental aspects of "Teaching and Learning in Higher Education", with an emphasis on educational technology as a key component for improving the quality and accessibility of education at this level. Journals such as *Teaching in Higher Education* and *Higher Education Research & Development*, with the greatest number of citations (22 and 18 respectively), focus on teaching, learning, pedagogical strategies, improving the quality of education, and teacher training in university contexts. The journals *International Journal of Educational Technology in Higher Education* and *Universal Access in the Information Society*, with 14 and 11 citations, explore the use of technology in higher education, including the development and implementation of technological tools, online learning platforms, accessibility, and inclusive technologies for education.

Cluster 2, comprising fifteen sources, focuses on the topic of "Technology in Education". Relevant sources in this cluster include journals such as *Computers in Human Behavior* (68 citations), *British Journal of Educational Technology* (31 citations), and *The Internet and Higher Education* (19 citations), and cover topics relating to the use of technology to improve teaching, learning, and the educational experience in general.

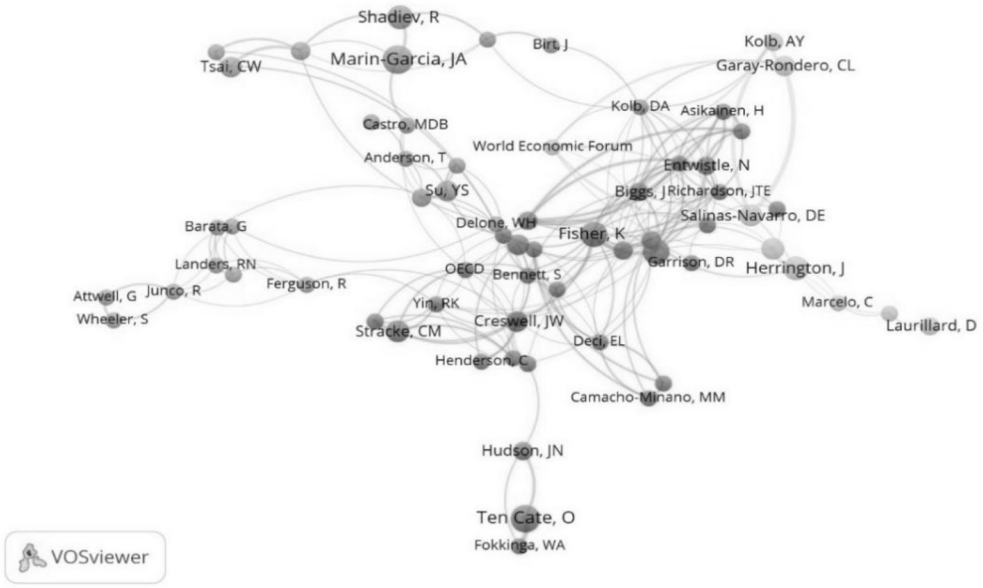
Cluster 3 comprises eight sources relating to "Pedagogical Innovation", which seek to enrich education in a variety of fields and contexts. The journals *Comunicar* (27 citations), *Journal of Computer Assisted Learning* (16 citations) and *Computers & Education* (13 citations) cover aspects relating to new practices, methodologies, technologies and strategies that contribute to the development and improvement of the educational field in general.

Finally, Cluster 4 comprises four sources centred on "Education in Health Sciences": *Nurse Education Today* (31 citations), *Academic Medicine* (18 citations), *Medical Teacher* (12 citations) and *BMC Medical Education* (10 citations). This group of common journals covers the training of healthcare professionals, clinical practice, educational methodology in the field of health and other aspects relating to health science education.

3.6. Results of the co-citation analysis of authors

Figure 5 shows the of co-citation network of the cited authors, once again with citation weight as the measure. A total of 2,191 cited authors were used for this analysis. A threshold of 3 was established, yielding a total of 68 authors to be represented on the map.

FIGURE 5. VOSviewer co-citation network map of authors by number of citations



Source: Prepared by the authors

Note: Web of Science only includes the first author cited in a document.

Note: The co-citation analysis includes references from any period, as it identifies the most often-cited theoretical influences in the selected articles from 2011–2024.

Within the co-citation network of authors who received a significant number of citations (at least 3 citations), four groups of nodes were identified, as shown in Table 4.

TABLE 4. Author co-citation network by number of citations (at least 3 citations)

Cluster	Thematic categories	Authors with ≥ 3 citations
Cluster 1	Pedagogical Focuses	Ten Cate, O. (9 citations); Fisher, K. (8 citations); Vermunt, J. D. (8 citations); Stracke, C.M. (6 citations); Creswell, J. W. (5 citations); Dillenbourg, P. (5 citations); Bandura, A. (4 citations); Biggs, J. (4 citations); Brown, J. S. (4 citations); Entwistle, N. (4 citations); Hudson, J. N. (4 citations); Miles, M. B. (4 citations); Asikainen, H. (3 citations); Bennett, S. (3 citations); Byers, T. (3 citations); Camacho-Minano, M. M. (3 citations); Deci, E. L. (3 citations); Fenwick, T. (3 citations); Fokkinga, W. A. (3 citations); Garrison, D. R. (3 citations); Henderson, C. (3 citations); Kember, D. (3 citations); Lave, Jean (3 citations); Lindblom-Ylänne, S. (3 citations); Nerantzi, C. (3 citations); OECD (3 citations); Parpala, A. (3 citations); Richardson, J. T. E. (3 citations); Ryan, R. M. (3 citations); UNESCO (3 citations); Van den Akker, J. (3 citations); Vygotsky, L. S. (3 citations); Yin, R. K. (3 citations); Zhu, C. (3 citations).
Cluster 2	Technology in Education	Tsai, C. W. (5 citations); Huang, Y. M. (4 citations); Attwell, G. (3 citations); Barata, G. (3 citations); Delone, W. H. (3 citations); Ferguson, R. (3 citations); Junco, R. (3 citations); Landers, R. N. (3 citations); Pekrun, R. (3 citations); Rice, J. W. (3 citations); Sousa-Vieira, M. E. (3 citations); Wheeler, S. (3 citations).
Cluster 3	Intercultural Focus	Marin-Garcia, J. A. (10 citations); Shadiev, R. (7 citations); Su, Y. S. (5 citations); Kangas, M. (4 citations); Anderson, T. (3 citations); Birt, J. (3 citations); Bower, M. (3 citations); Castro, M. D. B. (3 citations); Furman, M. (3 citations); Kolb, D. A. (3 citations); Krathwohl, D. R. (3 citations).
Cluster 4	Experiential Learning	Herrington, J. (7 citations); Jackson, D. (6 citations); Salinas-Navarro, D. E. (6 citations); Garay-Rondero, C. L. (5 citations); Kolb, A. Y. (4 citations); Laurillard, D. (4 citations); Koper, R. (3 citations); Marcelo, C. (3 citations); World Economic Forum (3 citations).

Source: Prepared by the authors

Cluster 1 comprises 34 authors and centres on “Innovative Focuses”. Notable authors here include Ten Cate, whose research examines medical education and teaching and learning in clinical settings, and Vermunt, whose research reviews the development of innovative teachers and the exploration of new pedagogies aimed at challenge-based learning, thereby seeking to promote more meaningful and effective learning experiences. These lines of work make it possible to understand how innovative learning spaces can be designed and used to improve

teaching and learning in university settings, whether this is by introducing effective learning strategies or by implementing innovative practices in education.

Cluster 2 comprises 12 authors and centres on "Technology in Education". Authors of note include Tsai, who directs his studies towards aspects like computational intelligence, data mining, cloud computing and the Internet of Things (IoT); Huang, whose works examine educational technology and the use of digital devices; and Attwell, who focuses on the implementation of technological tools to optimise learning and improve the efficacy of the educational process in different contexts. The perspectives provided by these authors are essential for understanding how to design and assess innovative learning spaces that make the best use of technology and ICT in higher education.

Cluster 3 comprises 11 authors and represents the "Intercultural Focus" category. Significant authors in this group include, among others, Marín-Garcia, who focuses on assessing performance and active learning in higher education, and Rustam Shadiev, who is interested in technology applied to language learning and intercultural education. These authors demonstrate the impact of intercultural collaboration and educational innovation on innovative learning spaces in university education.

Finally, Cluster 4 comprises nine authors and covers the category of "Situated or Contextualised Learning". Key contributors here include Jan Herrington, who focuses on promoting the effective use of educational technologies in school and university learning environments. In addition, Salinas-Navarro investigates experiential learning in spaces based on lean thinking. These authors underline the importance of experiential learning and knowledge management in improving university teaching and learning, key aspects in creating innovative learning spaces.

4. Discussion

The study has yielded evidence on the available scientific output available related to the influence of innovative learning spaces on teaching and learning in higher education between 2011 and 2024. The results obtained not only confirm the growth of academic interest in this field, but also advance scientific knowledge by identifying thematic patterns and co-citation relationships that enrich our understanding of how innovative learning spaces impact higher education. In comparison with previous reviews, such as Radcliffe's (2008), which examined the design of physical spaces, this study offers a more integrative perspective by combining theoretical foundations, measurable impact, technological innovations, and situated or contextualised learning, as reflected in the four established clusters. This integration enables progress in designing educational settings that meet the needs of the university of the future, aligning with global trends towards flexibility and the contextualisation of learning.

These same results allow us to reach a series of more specific conclusions. Based on the results obtained in relation to chronological productivity, we can first conclude that the amount of research published in recent years has risen significantly. This trend indicates that the academic community recognises the importance of exploring these spaces, thereby highlighting the relevance of this field of study (Vite, 2014).

Secondly, the results on authors' nationalities show that research in this field is not limited to a small group of countries, as contributions from a range of nations have been identified. It is interesting to note that Nordic countries, which are considered benchmarks in educational innovation, have limited representation, with only Finland contributing with 2% of the authors. This scant representation could be due to search biases, such as the exclusion of publications in Nordic languages or searches in alternative databases, or to a lower output of empirical articles that comply with the inclusion criteria, such as stage of education. Indeed, existing literature identifies the Nordic countries as leaders in innovative pedagogical focuses in the pre-primary education stage (Navarro-González, 2023). Future studies should explore additional sources to include these perspectives, as well as expand the educational levels at which the review is performed. Nonetheless, the results indicate that Spain, the United States

and England contribute with the greatest number of authors in this field. This geographic distribution emphasises the importance of adapting classroom design to different cultures and educational environments around the world, as observing the way in which environmental, physical or perceptive variables differ according to the social group (González-Zamar & Abad-Segura, 2020) is an important aspect, and these countries register a greater dedication to this focus.

Thirdly, the co-citation analysis identified four thematic clusters that structure knowledge in this field: Theoretical Foundations, Impact of Ipaces, Pedagogical Innovations and Situated Learning. These clusters provide an innovative vision, as they integrate perspectives that previous studies covered in isolation. For example, while Cleveland and Fisher (2014) focused on the physical impact of spaces, the situated or contextualised learning cluster (Lave & Wenger, 1991) highlights how real contexts promote meaningful learning. This multidimensional focus not only enriches the literature, but also provides a foundation for designing educational policies that combine physical, digital and contextual settings, responding to the needs of a more inclusive and adaptive higher education.

Although the 56 selected studies do not explicitly address the Covid-19 lockdowns, these had a marked impact on university learning spaces, accelerating the adoption of virtual environments and hybrid teaching models (Lozano-Díaz et al., 2020; Engel & Coll, 2022). This transition underlined the importance of digital spaces as innovative environments, capable of promoting collaboration and flexibility in learning, as mentioned in the introduction.

5. Conclusions

The relationships and groupings in the field of innovative learning spaces through co-citation analysis reveal a clear four-block structure: a) Theoretical Foundation of Innovative Learning Spaces; b) the Impact of Innovative Learning Spaces; c) Pedagogical Innovations and Educational Technologies; and d) Innovative Learning Spaces and Social Context. These results underline the complexity and importance of understanding innovative learning spaces in higher education, illustrating the diversity of focuses and their potential to exert a positive influence on the educational process.

The network of source co-citations is divided into four main clusters: the first, which examines "Teaching and Learning in Higher Education", covers journals related to higher education. Publications like *Teaching in Higher Education* and *Higher Education Research & Development* focus on pedagogical strategies, educational quality and teacher training. Other journals such as *International Journal of Educational Technology in Higher Education* and *Universal Access in the Information Society* centre on the use of technology, online learning platforms and accessibility for higher education. The second cluster, "Technology in Education", comprises journals that explore the use of educational technology, such as *Computers in Human Behavior*, *British Journal of Educational Technology* and *The Internet and Higher Education*. The third cluster examines "Pedagogical Innovation", underlining the importance of this aspect in innovative learning spaces with important journals such as *Comunicar*, *Journal of Computer Assisted Learning* and *Computers & Education*. The fourth cluster, "Education in Health Sciences" includes journals such as *Nurse Education Today*, *Academic Medicine*, *Medical Teacher* and *BMC Medical Education*, which focus on the training of healthcare professionals, clinical practice and the specific educational methodology in this field. Indeed, these clusters indicate the existence of a variety of journals focusing on higher education that address pedagogical strategies, educational quality, technology and teacher training.

Findings relating to the network of author co-citations reveal four principal clusters. The first relates to "Innovative Focuses", with authors such as Ten Cate and Vermunt. The second focuses on "Educational Technology", with researchers like Tsai, Huang and Attwell. The third cluster addresses the "Intercultural Focus", with influential authors such as Marín-Garcia and Rustam Shadiev. The fourth cluster relates to "Situated or Contextualised Learning", including

such distinguished contributers as Jan Herrington and Salinas-Navarro. These clusters highlight the importance of diverse focuses and perspectives in the creation of innovative learning environments in higher education.

In summary, these results emphasise the need to consider a variety of focuses and practices in order to promote more meaningful university education, while making full use of the wide range of resources, methodologies and technologies available for configuring these advanced learning environments. Consequently, innovative learning spaces are educational environments designed to improve skills development and student learning by creating flexible, collaborative, creative and adaptable environments. These spaces will be fundamental pillars of future education with the potential to enrich learning at all stages, from primary school through to university (Dede, 2010; OECD, 2015).

While this systematic review has identified a number of trends and patterns in innovative learning spaces, certain limitations must be acknowledged. These include potential bias in the selection of studies—despite the use of an exhaustive search strategy—and the constraints of VOSviewer, which does not allow the automatic integration of registers from multiple sources. Manual combination could have generated bias; therefore, a single database was used to ensure the consistency of the analysis. Although these restrictions do not compromise the validity of the results, future research could consider methods to combine multiple data sources, which would enrich the scope of the bibliometric analysis in this sphere.

Consequently, suggestions for future research would focus on the selection of studies to gain a better understanding of how innovative learning spaces can be effective in different educational contexts and educational stages. It would also be important to identify the factors that contribute to their success, as well as to explore tools complementary to VOSviewer for analysing semantic relations or temporal dynamics, thereby enriching understanding of the subject.

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Eva Jiménez-García: Conceptualisation; data curation; formal analysis; methodology; writing – original draft.

Judit Ruiz-Lázaro: Conceptualisation; writing – review & editing; data curation; supervision; project administration.

María Huetos-Domínguez: Writing – review & editing; research; supervision.

Artificial Intelligence (AI) Policy:

The authors state that they did not use artificial intelligence (AI) to prepare their articles.

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Proposed Didactic Model Using Genially and Kahoot Interactive Software for Critical Reading Comprehension in Primary School Students

Propuesta de modelo didáctico con software interactivo Genially y Kahoot para la comprensión lectora crítica para estudiantes de educación primaria

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Abstract:

In the current context of primary education, where the digital divide represents a significant challenge, a didactic model based on the use of interactive software—specifically Genially and Kahoot—was proposed to enhance critical reading comprehension. The main aim was to develop a proposal that leverages digital tools to enhance students' literal, inferential, and critical reading skills. To this end, prospective descriptive research was conducted, with a non-experimental approach, which included the development and validation of instruments to measure the usability of the software and the reading comprehension of the students. The execution of the model was structured in three phases: design and analysis of content, development of interactive materials, and organisation and application of activities through digital platforms. The findings revealed that the selected resources fostered active participation and critical thinking, combining pedagogical strategies such as pre-reading activities, guided readings, and gamified assessments. Expert validation reflected a high appraisal of the proposed model, highlighting its flexibility and adaptability to diverse educational contexts. The discussion underscored the importance of pedagogical mediation and teacher training to maximize the impact of the use of Genially and Kahoot, while also pointing out the limitations posed by reliance on technology and the need to ensure equitable access. It is concluded that the didactic model designed represents an innovative alternative for improving critical reading comprehension in primary school students, provided that it is accompanied by balanced pedagogical strategies and adequate training, with particular focus on overcoming any technological and contextual barriers that may arise.

Keywords: learning, basic education, teaching, reading instruction, teaching materials, educational technology.

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Resumen:

En el contexto actual de la educación primaria, donde la brecha digital representa un desafío significativo, se propuso un modelo didáctico basado en el uso de software interactivo, específicamente Genially y Kahoot, para potenciar la comprensión lectora crítica. El objetivo principal fue diseñar una propuesta que, a través de herramientas digitales, promoviera el desarrollo de habilidades lectoras en sus niveles literal, inferencial y crítico. Para ello, se realizó una investigación descriptiva prospectiva, con un enfoque no experimental, que incluyó la elaboración y validación de instrumentos para medir la usabilidad del *software* y la comprensión lectora de los estudiantes. La ejecución del modelo se estructuró en tres fases: diseño y análisis de contenidos, elaboración de materiales interactivos y organización y aplicación de actividades mediante las plataformas digitales. Los resultados indicaron que los recursos seleccionados fomentaron la participación activa y el pensamiento crítico, integrando estrategias didácticas como actividades de prelectura, lecturas guiadas y evaluaciones gamificadas. La validación de expertos reflejó una alta valoración del modelo propuesto, destacando su flexibilidad y adaptabilidad para diversos contextos educativos. La discusión subrayó la importancia de la mediación pedagógica y la capacitación docente para maximizar el impacto del uso de Genially y Kahoot, señalando además las limitaciones asociadas a la dependencia tecnológica y la necesidad de garantizar la equidad en el acceso. Se concluye que el modelo didáctico diseñado representa una alternativa innovadora para mejorar la comprensión lectora crítica en estudiantes de educación primaria, siempre que se acompañe de estrategias pedagógicas equilibradas y capacitación adecuada, con especial atención a superar las barreras tecnológicas y contextuales que puedan presentarse.

Palabras clave: aprendizaje, educación básica, enseñanza, enseñanza de la lectura, material didáctico, tecnología educacional

1. Introduction

Digital technologies and other online learning resources have become indispensable and present an opportunity in education due to their mediation between teaching and learning (Huntington et al., 2023). Similarly, a didactic model—a theoretical-formal construct—aims to interpret the school reality using these technologies and guide it toward specific educational goals; that is to say, a simplified representation of the educational reality that serves to plan and guide the teaching-learning processes (Romero and Moncada, 2007).

Since the pandemic, the use of gamification through digitalisation has had a significant impact on reading comprehension, supporting teaching and learning processes (Calderón et al., 2022). This strategy promotes motivation, concentration, problem solving and content recall, giving the student a leading role in their own learning (Mauri-Medrano et al., 2024).

One of these technologies is Genially, a digital platform or tool useful for game-based learning, which also features an attractive visual interface. It enables creative, interactive, animated and integrated content to be designed, thus improving reading skills (Cabrera-Solano, 2022). Kahoot, meanwhile, is an educational platform that integrates gamification, useful for reviewing learning and conducting online formative assessments. It can also help improve the understanding of concepts and learning experiences, in addition to designing quizzes, tracking response metrics for assessment, and using adaptable formats for tests, surveys or challenges (Balaskas et al., 2023).

In terms of reading comprehension, models such as the Reading Rope support the instructional approach, highlighting decoding and reading fluency to develop efficient reading skills (Kambach & Mesmer, 2024). Meanwhile, for the layered approach to reading, there are multiple levels, starting with initial interpretation and fluency and advancing toward inference

and critical analysis. The strong relationship between reader and text is emphasised in the transactional model, where comprehension emerges from personal experience, knowledge and emotions (Rosenblatt, 1978).

This study seeks to contribute to the use of digital and communication technologies (ICT) and the achievement of meaningful learning through the use of educational software to support reading comprehension, understood as a cross-cutting competency for social inclusion (Misari, 2023).

In this context, software, multimedia resources or online applications are tools for learning, assessment and feedback; their structure, content and quality for pedagogical use must be rigorously evaluated to create smart classrooms (Masneri et al., 2022). Therefore, computer-assisted reading has emerged as one of the key technologies for enhancing reading efficiency, comprehension and fluency (Nurmahanani, 2023).

Its innovative nature increases considerably once this technology is used in daily teaching practice, not as merely another resource, but as a critical resource for changing the way the classroom works (Escobar-Teran et al., 2025). With the help of tools such as Genially or Kahoot, teachers are able to shape the teaching-learning process more flexibly and in accordance with the requirements of each class group. In this way, they manage interactivity, creativity and critical thinking—key elements for the development of 21st-century skills (Castillo-Cuesta et al., 2024).

It should be noted that there is currently significant tension between digital and traditional reading, which has become a critical issue requiring in-depth analysis due to its implications for education. On the one hand, digital reading offers advantages such as interactivity, immediate access to a wide variety of resources and adaptability to different learning styles, which can increase motivation and personalise the learning experience (Wolf, 2018). However, traditional reading remains essential in education, since it fosters a more direct connection with the text, promotes concentration and is not dependent on technology, an aspect that is particularly relevant in contexts with a digital divide (Çoban et al., 2024). Despite these differences, there are still very few studies that systematically explore how digital and physical environments affect the reading experience and the development of critical comprehension skills.

In this sense, it is essential to consider the digital divide when addressing research on accessible and effective educational software, as its impact can be decisive in terms of equal opportunities. Thus, the study's main research question emerges: What would be the proposed didactic model, based on the use of interactive software such as Genially and Kahoot, to enhance critical reading comprehension in primary school students?

The aims of this research are, in general, to propose a didactic model with interactive software for critical reading comprehension in primary school students; and as specific objectives: to describe the validity and reliability of the instruments of the interactive software and critical reading comprehension; to assess the level of use of the interactive software and critical reading comprehension; and to validate the proposed didactic model with interactive software for critical reading comprehension.

2. Methodology

This research is classified at a descriptive-prospective level, since its main objective is to propose a didactic model based on the use of interactive software—specifically Genially and Kahoot—for the development of critical reading comprehension in primary school students. This indicates that it seeks not only to describe or analyse, but also to offer a concrete solution that contributes to improving educational processes (Lesko et al., 2022). Moreover, it is considered non-experimental, given that the study design does not involve the manipulation of variables, rather it is based on the observation of phenomena as they occur in their natural context (Arias et al., 2022).

Therefore, these characteristics allow for a comprehensive approach that combines objective analysis with the proposal of practical solutions in the field of education. The variables proposed were the interactive software platforms Genially and Kahoot, and critical reading comprehension. It should be noted that this model was developed in three phases:

The first phase was to define a proposal related to a didactic and interactive model, such as Genially or Kahoot, to which end an orderly process was followed to ensure the quality and proper functioning of the material to be used. First of all, an analysis and design stage was required in which the topics, competences and learning outcomes to be achieved were established. The most appropriate resources and interactive formats (presentations, infographics, games, quizzes) were then chosen and structured in the form of modules. The connection and sequencing of the content was also planned, determining its order in a non-linear way (in the form of modules, each with differentiated content) as well as its links. The necessary actions were developed to enable learners to participate actively and collaboratively in the learning process, incorporating multimedia resources and gamified challenges from reliable information sources to expand the available materials.

The second phase entailed the production of interactive content. The texts were edited and adapted so that they were clear, concise and suitable for viewing on screen, taking into account that digital reading takes longer and requires a lot of synthesis, thus images, videos, audios and interactive links were included in Genially to make the learning experience more dynamic, and quizzes, challenges and games were designed on Kahoot to assess learning in an engaging and motivating way. Furthermore, scripts were developed to ensure consistency and clarity in terms of navigation and interaction.

Finally, in the third phase, the content was organised. In Genially, the content was visually organised in the most attractive and accessible way possible, ensuring ease of navigation and interactivity. Additionally, in Kahoot, activities were set up to define rules, times and automatic feedback. Once the sequence of activities was complete, links to interactive resources were shared with students and teachers, ensuring access and availability on different devices. Finally, feedback from users was collected for future reviews or updates of the material.

MY READING / The best tales and stories for you! / Workshop 1 -2-3-4

It is worth noting that this study also involved the development of two response validity rubrics (see Table 1): the first instrument consists of 22 items measuring the usability (questions 1 to 9), functionality (10 to 17) and gamification (18 to 22) of the applications Genially and Kahoot. The purpose of this rubric is to observe and record students' performance and ability to use Genially and Kahoot to assess the feasibility of designing a reading comprehension programme using this interactive software. This rubric gives instructions and verifies the action requested of the students, which was applied in a computer room or pedagogical innovation classroom, by means of tablets or computers with internet access.

TABLE 1. Response validity rubric: provide the instruction and verify whether each student (S) performs it (1) or does not perform it (0).

Item	S1	S2	S3	S4	S5
1. Easily turns on the computer, tablet or laptop.					
2. Performs or executes prompts on the desktop.					
3. Views the main elements of the desktop.					
4. Opens the browser (Chrome) with ease.					
5. Copies the link into the browser.					
6. Locates and opens Genially.					
7. Knows their way around Genially.					
8. Locates and opens Kahoot.					
9. Enters the pin for Kahoot.					
10. Does some exploratory work.					
11. Shows that they can send and receive messages via WhatsApp or another application.					
12. Sends a message by e-mail.					
13. Uses the keyboard or mouse to move around Genially.					
14. Uses the keyboard or mouse to move around Kahoot.					
15. Answers questions on Kahoot.					
16. Answer multiple-choice questions on Kahoot.					
17. Reviews feedback on Kahoot.					
18. Does the student understand that they can personalise their participation on Kahoot?					
19. Does the student understand that correct answers are awarded points?					
20. Does the student notice that each question has a time limit for answering?					
21. Does the student understand that those who answer more questions get higher scores?					
22. Expresses motivation when working on Genially and Kahoot.					

The second instrument was to measure reading comprehension. For this purpose, a standardised and validated test was used, adapted from Sánchez & Reyes (2015). This instrument—specifically content A—consists of 20 items and is designed to assess the level of reading comprehension in primary school students. It is structured in three dimensions: literal (4 questions), inferential (14 questions) and critical (2 questions). In turn, this test consists of

2 to 4 reading passages that have been selected from short stories and works by Peruvian book authors, appropriate for the students' level of studies (supplementary material). The test contains 5 questions that are answered using four possible answers (A, B, C or D): the student must mark the letter preceding the answer they consider to be correct. The total expected score is 20 points and the minimum is 0.

Both instruments were tested for validity and reliability. In terms of the validity of the first instrument, an expert evaluation was carried out. The analysis was conducted using Aiken's V, which yielded an average consolidated value of 0.81.

The second instrument showed a good factor loading, with the exception of items 12 and 16, which correspond to the inferential level. This implies that the instrument may work better without these two questions. Regarding the literal level, all indicators obtained a statistically significant correlation with the factor ($p < 0.001$), while the estimators range from 0.107 to 0.208, which suggests that they positively support reading comprehension at this level. At the inferential level, the indicators are significantly correlated with the respective factor ($p < 0.001$), except for Q12 ($p = 0.045$) and Q16 ($p = 0.115$). At the critical level, the indicators also showed positive and significant correlations with the respective factor ($p < 0.001$), scoring 0.193 and 0.149 in the estimators.

Table 2. Confirmatory factor analysis (CFA): factor loadings at each level

Factor	Indicator	Estimator	Standard error	Z-statistic	p-value
Literal	Q2	0,1068	0,0291	3,67	<0,001
	Q3	0,2075	0,0325	6,38	<0,001
	Q4	0,1072	0,0178	6,01	<0,001
	Q17	0,1906	0,0275	6,92	<0,001
Critical	Q15	0,193	0,0501	3,85	<0,001
	Q8	0,1488	0,0393	3,79	<0,001
Inferential	Q1	0,1275	0,0302	4,22	<0,001
	Q5	0,1808	0,0263	6,88	<0,001
	Q6	0,141	0,0281	5,02	<0,001
	Q7	0,1555	0,0184	8,47	<0,001
	Q9	0,1863	0,0212	8,8	<0,001
	Q10	0,1883	0,023	8,18	<0,001
	Q11	0,1731	0,0293	5,9	<0,001
	Q12	0,0615	0,0306	2,01	0,045
	Q13	0,2622	0,0256	10,25	<0,001
	Q14	0,202	0,0182	11,08	<0,001
	Q16	0,0476	0,0302	1,57	0,115
	Q18	0,21	0,025	8,4	<0,001
	Q19	0,1197	0,0303	3,95	<0,001
	Q20	0,1926	0,0265	7,27	<0,001

Table 3 sets out the model quality indicators (goodness-of-fit), which make up the maximum likelihood model. The comparative fit index (CFI) and the Tucker-Lewis index (TLI) both score below 0.9, meaning that the three-dimensional model does not adequately fit the behaviour of the data. Meanwhile, the Standardized Root Mean Squared Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA) were below 0.05, indicating accuracy in the behaviour of the construct as a whole. Therefore, despite the aforementioned statistical values, the model can be considered to have an acceptable degree of fit.

TABLE 3. Model fit indicators.

				CI: 90% RMSEA	
CFI	**TLI**	**SRMR**	**RMSEA**	**Lower**	**Upper**
0,802	0,775	0,055	0,051	0,042	0,059

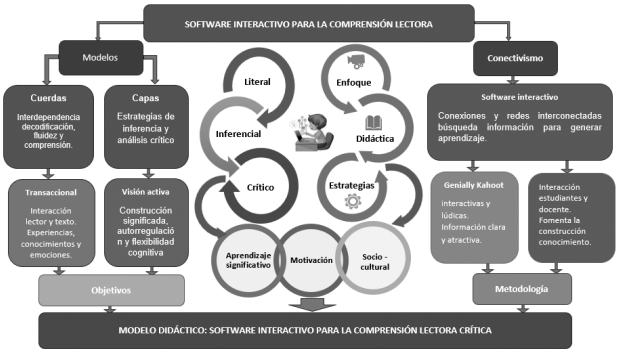
Regarding reliability, the full instrument, that is, the reading comprehension test, achieved a Cronbach's alpha of 0.73, an indicator of homogeneity suitable for measurement with this type of instrument. This indicates that the full instrument is more accurate and appropriate as a general measure of reading comprehension, enabling comparison of its scores between pre-test and post-test. Informed consent and the criteria set out in the Research Code of Ethics of Universidad César Vallejo were considered in this research.

3. Results

3.1. Proposed didactic model

For the didactic model, reading comprehension is defined as an essential skill to be developed at the primary stage of the educational process. The main objective of the proposal was to develop comprehensive reading competence in students through active, participatory and reflective teaching strategies, using Genially and Kahoot. In this way, skills at the literal, inferential and critical levels are enhanced, the capacity for inference is developed, and critical thinking and the identification of arguments are promoted by encouraging students to establish connections with their own knowledge and experience.

According to all of the above, by using Genially and Kahoot we sought to create interactive presentations that use images, videos and animations to explain concepts and stimulate interest, and also to carry out reading comprehension tests in a fun and competitive way, thereby assessing the understanding of the text. The proposed didactic model "interactive software for critical reading comprehension" can be found in full at the following link: https://view.genially.com/66f7945728333c3145d762d9/interactive-content-mi-lectura



After defining the learning objectives, we then select the texts chosen for the level of comprehension of the students, taking into account the genre and complexity. Next, the didactic sequence is designed and activities are planned for the pre-reading, reading and post-reading stages; and finally, the interactive tools are integrated, considering the characteristics of the features of Genially and Kahoot.

Pre-reading is used to activate prior knowledge through Genially, which enables the creation of interactive presentations that connect with students' experiences; regarding reading, guided and collaborative readings are implemented through interactive tools that facilitate interaction with the text; in post-reading, Kahoot can be used to create quizzes that assess the comprehension of the text, including questions of different levels of difficulty. Genially also facilitates the design of reflective and applied learning activities, allowing students to connect the content of the text with their own experiences, establish links with other texts or topics, and apply the knowledge gained to real-world situations. The methodology of the didactic model is flexible and adaptable, structured into reading workshop modules that include instruction on the use and functionality of these tools, along with a post-reading comprehension test.

Didactic strategies at the literal comprehension level seek to develop the ability to identify explicit information in texts. These strategies include the use of direct questions about the text, identification of key words, use of diagrams or summaries of the texts read, among others. This level encompasses students in the low- and mid-performing groups, who demonstrate lower achievement.

With regard to inferential comprehension, the aim was to improve students' ability to make inferences and deduce implicit information in texts. The strategy of inferential comprehension includes reading with open-ended questions that invite students to interpret situations or deduce non-explicit meanings, complemented by exercises in prediction and analysis of causes and consequences. This level encompasses all students, with a special emphasis on the low- and mid-performing groups, who have difficulties in this dimension.

In terms of critical comprehension, the aim was to foster the ability to analyse and evaluate texts. To this end, strategies such as debates and discussions on the content of texts were proposed, along with argumentation activities to present and defend points of view, or to analyse the author's intention. Its target group consisted of the lowest levels of the three groups to work with all students, however those in the high-performing group can be given more complex and challenging activities to further develop their critical skills.

The strategies proposed for assessment included systematic observation of the use of the platform, the application of pre- and post-intervention tests to measure improvement in reading comprehension, satisfaction surveys to assess students' perception of the model, analysis of participation data in Genially and Kahoot activities, and further interviews with students and teachers to obtain qualitative information about the learning experience.

The emerging concept of the proposed didactic model, based on the use of interactive software such as Genially or Kahoot, has proven to have significant pedagogical potential for the development of critical reading comprehension in primary school students. Its practical application, which aims to develop reading comprehension through a set of skills related to literal, inferential, and critical understanding, responds to a real need in classrooms: for students to not only read, but to read with comprehension, reflect, and generate their own thinking based on what they read.

This model responds to an active, participatory, reflective methodology that breaks with traditional didactic formats in the field of the teaching of reading. Thanks to visual resources, animations, interactive presentations, gamified assessments, and so on, students become the protagonists of their teaching-learning process. The use of Genially makes it possible to design immersive learning experiences that, starting from pre-reading, connect the content of the text with the students' previous experiences, thus activating their mental schemas and motivating engagement with the text.

The most interesting feature of this model is its structure based on levels of understanding. Regarding the literal level, strategies aimed at identifying explicit information are used: direct

questions, searching for key words, producing diagrams or summaries, etc. These activities are especially aimed at students who, due to their low performance, require reinforcement in basic skills. Regarding the inferential level, the aim is to consider non-explicit information, through open questions and exercises to predict or to determine causes and consequences. Therefore, it is possible to work across the board with all students and, in particular, those with lower proficiency in this skill. Finally, the critical level aims to develop students' analytical and evaluative abilities through debates, argumentation, and exploration of the author's intent, while always providing challenges tailored to the abilities of higher-performing students or to specific working groups.

3.2. Validation of the proposed didactic model

Table 4 shows the averages for each aspect obtained using Aiken's V, with an overall average of 0.956 for the proposed model. The averages for each aspect are as follows: the highest score was 0.96 for the general aspects, the content achieved an average of 0.955, and the lowest average, 0.952, was for the final score of the proposed didactic model.

TABLE 4. Expert judgement: validity of the proposed didactic model.

Aspects	No. of items	Averages
General aspects	05	0,96
Content	15	0,955
Final score	04	0,952
Average		0,956

4. Discussion

The development of comprehensive reading skills through active, participatory and reflective teaching strategies, using Genially and Kahoot, has made it possible to establish a methodological proposal with high pedagogical potential within the framework of a prospective descriptive study. This intervention was designed to address a clear educational need: to improve reading comprehension using an approach that not only stimulates the acquisition of information, but also promotes critical thinking and self-regulation of learning in primary school students.

The findings obtained confirm that the proposed model is characterised by its flexibility and adaptability, conditions that make it a replicable tool at different educational levels and in different school contexts. Thanks to its modular design, it can be implemented even in classrooms with a low level of technological integration, due to the ease of use of the chosen platforms. In this sense, technology does not act as an end in itself, but rather as a means that favours a learner-centred pedagogy, oriented towards the development of autonomous thinking, argumentation and the ability to relate what is read to one's own experiences and realities.

This approach is in line with Sanchez and Pascual (2022), who state that computer-assisted reading has positive effects on reading skills, although they stress the importance of familiarity with digital platforms to achieve optimal results. In turn, Serrano-Mendizábal et al. (2023) highlight the relevance of human mediation and metacognitive skills for achieving meaningful digital learning. Both approaches reinforce the idea that the effectiveness of virtual learning environments depends not only on their interactive design, but also on pedagogical support and on the student's ability to self-regulate their learning process.

The literature available shows diverse perspectives on preferences between digital and print. Some studies (Onieva et al., 2021; Tabernero et al., 2020) warn about certain limitations of the digital environment, while others (Roth et al., 2020; Pérez and Ricardo, 2022) report positive perceptions of the use of virtual platforms, provided they are accompanied by appropriate

pedagogical strategies. This shows that, regardless of the platform or format, the key aspect is the didactic intention with which the technology is used.

Recent studies (Segers et al., 2023; Nurmahanani, 2023) have shown that familiarity with digital materials acts as a facilitator of reading performance by promoting a more active relationship with texts and facilitating comprehension through visual and dynamic resources. This is in addition to the contribution of Yirssie et al. (2023), who insist that explicit vocabulary instruction is crucial for strengthening comprehension, especially for students with difficulties at the inferential and critical levels. Similarly, Gutiérrez (2022) stresses the importance of deep cognitive operations to achieve comprehension of expository texts, which aligns with the objectives of this model.

The evidence gathered also confirms that a significant proportion of students are below average in their reading literacy, a situation which validates the need to implement specific intervention programmes. In this regard, the ideas of Calderón et al. (2022) are relevant, as they indicate that teaching and learning can be enhanced through gamification and the use of digital technologies, provided that a critical and strategic view of the process is maintained.

Other authors (Nurwahidah et al., 2023; Segers et al., 2023; Roth et al., 2020) likewise acknowledge the potential value of digital platforms for enhancing reading skills. Nevertheless, it is imperative to carefully monitor the pedagogical quality of the content, as well as its alignment with the diagnosis of the target group (Gnambs and Lenhard, 2024). In this same vein, the proposed didactic model includes resources such as Genially and Kahoot to foster active mediation, as argued by Mauri-Medrano et al. (2024), who point out that these tools increase student motivation and engagement, two decisive factors in achieving meaningful learning.

The model also contemplates formative assessment through Kahoot, which allows teachers to access the results in real time and adjust their intervention based on the reading performance of each student, following Corbett and Spinello's (2020) approach on the importance of feedback in the educational process. However, it is necessary to recognise that one of the model's weaknesses lies in its dependence on technology, which can create barriers in contexts with limited connectivity or a shortage of devices.

Although the proposal is in line with innovative trends in education, its sustainability requires an investment in teacher training regarding digital skills, as the success of these tools depends on the pedagogical management of the teacher. As Balaskas et al. (2023) and Cabrera-Solano (2022) point out, Genially offers a visually appealing environment, while Kahoot promotes participation and information retention through play. Nonetheless, excessive or misguided use of gamification can shift the focus away from deep learning, as Duke and Cartwright (2021) warn. This is a latent risk that must be avoided through conscious planning, balancing game-based motivation with the actual development of reading skills.

It is also necessary to consider the structural factors that affect equity of access to this model. Al-Mutairi and Bin (2021) point out that the digital divide, especially in terms of connectivity and school resources, represents a barrier that can limit the impact of the model on vulnerable populations. This is compounded by the potential inadequacy of the model in addressing diverse learning needs in a differentiated manner, which requires additional adjustments and cultural and social contextualisation of the content. From a connectivist perspective, such as that proposed by Joshi et al. (2024), learning is a social process that must incorporate and value the student's personal experiences as part of the act of understanding.

5. Conclusions

The study achieved its general aim by proposing a didactic model based on the use of interactive software for critical reading comprehension in sixth grade primary school students. This approach, developed with Genially and Kahoot, is grounded in an innovative framework that combines various pedagogical strategies, such as interactivity, gamification and formative assessment. These elements aim not only to stimulate students' interest, but also to promote a significant improvement in critical reading skills, a key aspect of autonomous learning and

analytical thinking. However, it should be emphasised that, although these platforms are useful tools, their effectiveness depends on the appropriate design of the accompanying pedagogical activities and on teacher training focused on digital competencies. This highlights the need to implement specific actions to familiarise students with digital environments, thus ensuring the accessibility and functionality of these tools for all involved. Moreover, the socio-economic context plays a crucial role in this regard, since limitations related to technological resources and connectivity disproportionately affect the most vulnerable sectors (Al-Mutairi and Bin, 2021).

The proposed didactic model with Genially and Kahoot is underpinned by key pillars, namely interactivity, gamification, personalisation, and formative assessment. For example, Kahoot allows teachers to see results in real time, which facilitates immediate adjustments in the teaching process. Nevertheless, it is important to note some critical aspects. Technological dependence can become a barrier, particularly in contexts marked by unequal access to resources, and an excessive focus on technology may divert attention from critical reading comprehension, which is the primary objective of the model (Duke and Cartwright, 2021). It is therefore imperative to accompany the implementation of these tools with balanced pedagogical strategies that prioritise deep learning over the mere acquisition of digital skills.

Sánchez (2020) researched the usefulness of technological tools for teaching mathematics by conducting a review in databases such as EBSCO, Scopus and Google Scholar. The findings highlight that teachers' digital competencies are essential to ensure appropriate use of technology platforms. According to the study, these tools are particularly useful for combining synchronous and asynchronous methodologies, thus fostering not only teaching, but also the autonomous learning of the students, who can practise the subjects studied at their own pace.

In turn, Bonilla et al. (2023) analysed how technological innovation contributes to the improvement of mathematics learning through a literature review. This study highlights that technology, through games and interactive activities, stimulates students' attention and participation. By fostering a collaborative and engaging environment, these tools not only enhance learning, but also promote greater interest in the subjects, thus creating a meaningful connection with students.

Finally, Cáceres (2021) underscores the many technological innovations available in virtual programmes and environments that allow students to access workshops, activities and forums. These tools not only reinforce learning, but also encourage students to create and share resources, thereby enriching their learning experience. This approach, beyond facilitating the acquisition of knowledge, promotes active interaction that enhances meaningful learning.

In conclusion, while technology tools such as Genially and Kahoot have great potential to transform the educational landscape, their effective implementation requires a critical analysis of their strengths and limitations. Teacher training, equitable access to technology and the design of pedagogical strategies that prioritise critical learning are essential elements to maximise their impact and ensure inclusive and quality education.

Author contributions

Eleodoro Huaman Baldeón: conceptualisation, data processing, drafting, formal analysis, methodology and validation.

Oscar López Regalado: visualisation, validation, conceptualisation and supervision.

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The effect of the learning environment on students' self-perceived digital and sustainability competencies

El efecto del entorno de aprendizaje en las competencias digitales y de sostenibilidad autopercibidas de los alumnos

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Abstract:

This study investigates the impact of students' perceptions of the learning environment on their self-assessed digital and sustainability competencies. The study involved 433 final-year students in Slovenian wood science and technology educational programs. We distinguished between generic competencies, which were assessed using the DigComp and GreenComp frameworks, and profession-specific competencies. Learning environment factors were assessed using the "What Is Happening in This Class?" (WIHIC) questionnaire. Linear regression analysis revealed that the factor 'Investigation' predicted both Generic and Profession-Specific Digital and Sustainability Competencies, and that 'Involvement' predicted Generic Digital Competencies, while 'Teacher Support' had a negative effect on both Generic Digital and Sustainability Competencies. Paired t-tests showed significant discrepancies between students' actual and preferred learning environments. The results highlight the importance of promoting inquiry-based and active learning, while supporting student autonomy and individualization, as well as considering students' preferences regarding the learning environment to facilitate the better development of students' digital and sustainability competencies.

Keywords: learning environment, sustainability competencies, digital competencies, education, learning outcomes, self-assessment.

Resumen:

Este estudio investiga el efecto de las percepciones de los alumnos del entorno de aprendizaje en sus competencias digitales y de sostenibilidad según su propia autoeva-

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luación. En el estudio participaron 433 alumnos de último curso de programas educativos de Ciencia y Tecnología de la Madera de Eslovenia. Distinguimos entre competencias genéricas, que pueden evaluarse con los marcos DigComp y GreenComp, y competencias específicas de la profesión. Los factores del entorno de aprendizaje se evaluaron utilizando el cuestionario «What Is Happening in This Class?» o WIHIC (¿Qué está pasando en esta clase?). El análisis de regresión lineal reveló que el factor 'Investigación' predecía tanto competencias digitales y de sostenibilidad genéricas como específicas de la profesión, y que 'Implicación' predecía competencias digitales genéricas, mientras que 'Apoyo del profesor' tenía un efecto negativo en las competencias digitales y de sostenibilidad genéricas. Las pruebas t pareadas mostraron discrepancias significativas entre el entorno de aprendizaje real y el entorno preferido por los alumnos. Los resultados destacan la importancia de promover el aprendizaje activo y basado en la investigación, apoyando la autonomía del alumno y la individualización, y de tener en cuenta las preferencias de los alumnos respecto al entorno del aprendizaje para facilitar un mejor desarrollo de sus competencias digitales y de sostenibilidad.

Palabras clave: entorno de aprendizaje, competencias de sostenibilidad, competencias digitales, educación, resultados de aprendizaje, autoevaluación.

1. Introduction

Until now, society has been driven by socio-economic development efforts, hoping that increasing productivity and income would solve other development problems (Vintar Mally, 2020), which has led to significant environmental consequences (UNEP & IRP, 2024). As a result, the imperative of sustainable development has gained prominence over the past three decades and was formally articulated in the 1987 Brundtland Report of the World Commission on Environment and Development (WCED, 1987). Since then, sustainable development has become an integral part of many development agendas (Vintar Mally, 2021) and received further impetus in 2015 when the United Nations (UN) adopted the 2030 Agenda for Sustainable Development (UN, 2015). Alongside sustainability, digitalization has become a crucial concept for operating in today's modern information society (Rachinger et al., 2019) and is a key element for achieving sustainability (Xu et al., 2022).

Despite growing awareness and progress in some areas, the world remains off course, particularly in relation to social and environmental challenges (Halkos & Gkampoura, 2021). Addressing these challenges effectively requires not only a shift in values (Whitley et al., 2018) and attitudes (Zsóka et al., 2013), but also recognition of the crucial role of education (Blais et al., 2011). The belief that education can change nations has been a fundamental principle of pedagogical theory since the early 20th century (Verhaeghe, 2016). Therefore, it is essential that education, as one of the fundamental factors of development (Ozturk, 2008), fosters students' identities, including self-knowledge, values, goals, orientation, and competencies for personal and social transformation, as suggested by Kaplan and Flum (2012). Although education can be provided by many institutions and through various life experiences, systematic education is most commonly offered by schools and universities (Bloom, 1976). These are vital for generating knowledge, cultivating innovative ideas, and developing the minds and attitudes of individuals (Roos et al., 2020). However, effective learning requires consideration of various factors that impact learning outcomes (Chaudhary & Singh, 2022).

This study examines how students' perceptions of the learning environment affect their self-assessed digital and sustainability competencies. In the following section of the literature review, we therefore focus on various factors that influence the development of digital and

sustainability competencies, examining the impact of the learning environment, with a particular emphasis on psychosocial aspects, on students' learning outcomes.

1.1. Literature review

In line with competence-based education, two important European frameworks have been developed, the Digital Competence Framework for Citizens (DigComp) and the European Sustainability Competence Framework (GreenComp). DigComp defines digital competence as the safe, critical, and responsible use of digital technologies for learning, work, and participation in society (Vuorikari et al., 2022), while GreenComp outlines a set of sustainability competencies aimed at fostering empathy, responsibility, and care for the planet, social equity, and public well-being (Bianchi et al., 2022). Both frameworks provide structured, widely recognized definitions of key competencies relevant to the so-called "twin transition", the simultaneous societal shift towards digitalization and sustainability. These frameworks serve as the basis for ongoing curriculum renewal efforts in Slovenia, where digital and sustainability competencies are prioritized alongside other areas at all levels of education, including VET (Ahačič et al., 2024; Skubic Ermenc et al., 2024), higher VET (Mali et al., 2025), and higher education (Vlada Republike Slovenije, 2022).

These ongoing reforms are based on the principles of competence-based education (CBE), although it is unrealistic to expect success solely through the formal implementation of CBE at the national or institutional level or by simply transferring existing didactic practices to this new paradigm. CBE also represents a comprehensive pedagogical approach that requires significant changes and adaptations in both curriculum design and classroom implementation (Makovec Radovan, 2025). Importantly, CBE does not view the development of competencies from different areas as separate, but as developing simultaneously, often within the same learning activities.

In the following subsections of the literature review, we first examine specific factors that influence the development of digital and sustainability competencies. We then turn to the learning environment, which is also a crucial factor in the context of competence-based education and is the central focus of this article, particularly in terms of its effect on students' self-perceived digital and sustainability competencies.

1.1.1. Influences on Students' Digital and Sustainability Competencies

Differences in the self-perception of students' digital competencies were found to vary according to gender, educational level, place of residence, previous education, and age (Schmölz et al., 2023; Zhao, Sánchez Gómez, et al., 2021), with younger students generally overestimating their competencies. Similarly, Draganac, Jović, and Novak (2022) reported that high school students rate their competencies higher than university students. López-Meneses et al. (2020) report varying levels of competence at European universities. Personal innovation and digital competence (He & Zhu, 2017), as well as cultural differences (He & Li, 2019), influence digital informal learning. Students' digital competencies also correlate with digital informal learning, academic engagement (Heidari et al., 2021), prior experience (Martzoukou et al., 2020), motivation, family background, mastery orientation, books at home, teachers' professional development culture (Hatlevik et al., 2015), personal factors, learning structure, teachers' digital competence, and external conditions (Litiņa et al., 2022). However, despite the importance of these factors, only 15% of studies examine their influence on digital competencies (Zhao, Pinto Llorente et al., 2021).

Researchers are also increasingly focusing on sustainability competencies. Chaikovska et al. (2024) used facilitation methods in English classes to successfully improve both sustainability competencies and English language proficiency. This shift towards sustainability education aligns with the work of Lozano et al. (2019) and Lozano et al. (2022), who emphasize the importance of adapting traditional pedagogical approaches to achieve sustainability. Several studies have investigated the influence of disciplinary background on sustainability learning. Sánchez-Carracedo et al. (2022) found

that although education students initially reported more knowledge, by the end of their studies, both education and engineering students achieved similar levels of sustainability competencies. Similarly, Leal Filho et al. (2021) investigated how higher education teachers in various institutions perceive the importance of sustainability competencies, whereas Cebrián et al. (2019) found no significant difference in students' perceived competencies across different disciplines. Several studies highlight factors that influence the development of sustainability competence. Savage et al. (2015) found that personal reflection and exploration significantly improved student learning in the Sustainability Leadership Certificate program. Remington-Doucette & Musgrove (2015) reported that the development of sustainability competencies is influenced by gender, disciplinary background, and age. In terms of motivation and attitudes, Zsóka et al. (2013) found a strong correlation between participation in environmental education and positive environmental attitudes, attributing this to the intrinsic motivation of committed students. Finally, Lambrechts et al. (2018) classified students into four groups based on their sustainability beliefs and attitudes, emphasizing the need for diverse teaching approaches.

1.1.2. The Influence of the Learning Environment on Learning Outcomes

The study of learning environments has been a focus of educational research for many decades, drawing primarily on psychology, such as Lewin's (1935) force field analysis and Murray's (1938) personality research. However, given the importance of the (educational) environment for learning, the term "learning environment" only gained prominence in educational literature a few decades ago (Radovan & Makovec, 2015). Its emergence is often attributed to Walberg, who developed the Learning Environment Inventory (Walberg & Anderson, 1968), and Moos, whose research on human environments (including education) led to the Classroom Environment Scale (Moos, 1974). Research on the learning environment is quite interdisciplinary and refers to all aspects that promote learning (Joyce & Calhoun, 2024), e.g. pedagogical approaches (Hao et al., 2021), social interactions (Morin, 2020; Olofsson & Lindberg, 2006; Walberg, 1969), psychological factors (Maslow, 1943), psychosocial dynamics (Fraser & Treagust, 1986; Moos & Trickett, 1974), and also the physical environment (Tanner, 2008; Weinstein, 1981).

Over the years, researchers have not only identified the psychosocial factors that influence the learning environment and student learning outcomes but have also made significant methodological advances in understanding the complex relationships between student perceptions of classroom climate, student learning outcomes, and innovative teaching practices (Khine, 2021). They have also shown that participants' perceived learning environment can be reliably measured and that fostering a positive classroom environment significantly improves student learning outcomes (Zandvliet & Fraser, 2018). In the field of learning environments, a variety of valid and widely applicable questionnaires exist that can be used to assess students' perceptions of the classroom environment (Fraser, 1998). One of the most commonly used questionnaires is What Is Happening In This Class? (WIHIC) (Brito Santiago & Silva, 2023), which not only incorporates the dimensions of previous instruments, but also addresses other aspects of classroom learning, such as Equity and an emphasis on comprehension over memorization (Fraser et al., 1996).

Numerous studies emphasize the relationship between the learning environment and educational outcomes. Fraser & Fisher (1982) and McRobbie & Fraser (1993) confirmed the relationship between students' perceptions of the classroom environment and their cognitive and affective learning outcomes. A study conducted at a Canadian university found that cognitive demands and social support significantly influenced students' perceived academic control and coping strategies, which, in turn, affected their academic performance (Clifton et al., 2004). Similarly, a study of fifth-grade mathematics classes in Singapore found a correlation between perceived psychosocial climate and student outcomes (Goh et al., 1995). A meta-analysis found that students with learning difficulties in inclusive settings had cognitive advantages, although psychosocial outcomes were not significantly affected

(Krämer et al., 2021). Psychosocial factors, including self-efficacy, social support, and self-regulated learning, were correlated with academic success in medical education, with no significant differences observed between traditional and problem-based curricula (Schauber et al., 2015). Galán-Casado et al. (2020) found that New Environment Learning improves student engagement and visual appeal compared to traditional classrooms, contributing to education for sustainable development. Studies have also found links between the learning environment and non-cognitive factors such as students' epistemological beliefs, self-efficacy, and anxiety (Ali et al., 2023). Jennings & Greenberg (2009) emphasized the importance of teachers' social and emotional competence in fostering a positive classroom climate, which supports effective classroom management, enhances teacher-student relationships, and improves students' social, emotional, and academic outcomes. Dorman (2001) emphasized the positive effects of classroom environment on mathematical performance, with Student Cohesion, Teacher Support, and Task Orientation having the strongest effects. Chionh & Fraser (2009) found that better exam results in mathematics and geography were associated with higher levels of Student Cohesiveness, while positive attitudes and self-esteem correlated with greater Teacher Support, Task Orientation, and Equity. Cross-national studies also linked Teacher Support and Task Orientation to reduced self-handicapping behaviors (Dorman et al., 2002). Teacher Support, Investigation, and Equity were also positive predictors of student achievement in high school biology classes, while Student Cohesiveness showed a negative relationship (Rita & Martin-Dunlop, 2011). The physical, pedagogical, and psychosocial dimensions of the learning environment were closely related and influenced students' learning experiences (Closs et al., 2022). A study of parent and student perceptions of the classroom environment found that students wanted more Investigation, while parents favored greater Teacher Support, with Task Orientation strongly related to student outcomes and attitudes (Allen & Fraser, 2007). A positive learning environment has also been shown to improve student motivation and engagement (Cayubit, 2022). Both physical and psychosocial aspects play a role in technology-rich environments, with factors such as Student Autonomy and Task Orientation being critical for student satisfaction and outcomes (Liu et al., 2012; Zandvliet & Straker, 2001).

1.2. Objective of the Present Study

This study focuses on students enrolled in wood science and technology education programs in Slovenia. The choice of this area was primarily motivated by the authors' affiliation with wood science and technology education, as well as our particular interest in understanding competence development within these educational programs, especially in view of the ongoing curricular reforms that also affect this field of education.

While previous research has investigated various factors that influence students' digital and sustainability competencies, relatively little attention has been paid to the role of the learning environment. Therefore, the overarching aim of this study is to investigate how the perceived learning environment affects students' self-perceived digital and sustainability competencies, distinguishing between generic and profession-specific competencies. In line with previous research where self-assessment is the most commonly used approach to assess students' digital (Laanpere, 2019; Sillat et al., 2021) and sustainability competencies (Redman et al., 2021), we used self-assessment as a method to capture students' self-perceived level of competence and their views on the actual and preferred learning environment. This approach was also chosen to foreground the learners' perspective, as the aim was not to measure objective performance but rather to understand students' subjective experiences and insights regarding their own learning and conditions. The main research questions (RQ) were:

RQ1 – What is the effect of students' perceived learning environment on their self-perceived level of digital and sustainability competencies?

RQ2 – Are there discrepancies between students' perceptions of the actual learning environment and their preferred learning environment?

The rest of this article is structured as follows. First, we present the methodology, including the sample, the measurement instruments, and the process of data preparation and analysis. We then present and discuss the main findings, situating them within the context of current educational reforms, with a particular focus on competency-based education. Finally, we address the study's limitations and provide concluding remarks.

2. Methods

2.1. Sample

To answer the research question, the study focused exclusively on students enrolled in wood science and technology education programs in Slovenia. Accordingly, we used a purposive sampling method, a non-probability method, which is best suited for studying a specific group (Tongco, 2007). The study involved 433 final year students of Slovenian wood science and technology programs at various levels of education, representing approximately 82% of the population in Slovenia. The sample was predominantly male (97%), which also reflects the current demographics in the sector. We included all educational qualifications, except for short vocational education and doctoral studies: 3 years of vocational education (ISCED 353) for "Carpenters"; 4 years of technical vocational education (ISCED 354) for "Technicians"; 2 years of technical education (ISCED 354), that enable graduates of a three-year VET program to obtain an upper secondary technical level of education; 2 years of higher vocational education (ISCED 554) for "Engineers"; 3 years of vocational and academic bachelor's degree programs (ISCED 645 & 655) for "Bachelors of Wood Engineering" and 2 years of master's degree program (ISCED 767) for "Masters of Wood Science and Technology". To ensure the relevance and accuracy of our results, careful attention was paid to representativeness across academic levels and qualifications.

The data was collected through in-person surveys from March to May 2024. During this period, we visited all educational institutions in Slovenia that offer the educational programs examined in this research. This corresponded to 35 final-year classes of students within the wood science and technology education programs. The surveys were completed by the students on the school computers in Slovenian, with us present in person. This allowed us to give them precise instructions and ensure that all respondents received the same guidance throughout the survey.

Finally, ethical approval was not required, as it is not necessary according to Slovenian regulations for educational research using surveys. Nevertheless, the study was conducted in full compliance with ethical standards and the principles of informed participation. Verbal consent to participate in the study was obtained from the participants.

2.2. Measures

The questionnaire consisted of three content sections and a demographic section. In the first content section, students rated their own digital and sustainability competencies, as well as other aspects not covered in this study. In the second and third sections, we examined various aspects, including students' assessments of the actual and preferred learning environment at their school/university.

2.2.1. Assessment of digital and sustainability competencies

To assess competencies, we included 21 digital competencies from the DigComp framework (Vuorikari et al., 2022) and 12 sustainability competencies from the GreenComp framework (Bianchi et al., 2022). Since these competencies are mostly generic, we also included 24 profession-specific competencies related to digitalization and sustainability tailored to the wood and furniture industry (Goropečnik et al., 2024). Students self-assessed their competencies based on 8 proficiency levels defined in DigComp 2.1 (EC et al., 2017).

TABLE 1. Descriptive statistics for the assessment of competencies.

Area of competencies	N_{items}	M	DE	*n*	α
Generic Digital Competencies	21	4,68	1,18	421	0,94
Generic Sustainability Competencies	12	4,58	1,26	428	0,92
Profession-Specific Competencies	24	4,33	1,22	415	0,96

Note: M = mean, SD = standard deviation, *n* = sample size, α = Cronbach's alpha

Table 1 presents descriptive statistics and Cronbach's Alpha (α) for three areas of competencies. On average, students' self-perceived competence levels range from 4.325 to 4.680 on a scale of 1 to 8. This places their self-perceived level of competence roughly in the middle, suggesting they can handle well-defined, non-routine problems independently and according to their needs. The standard deviations (SD), between 1.183 and 1.257, indicate moderate variability across all competence areas. This is expected since the sample is large and includes participants at different educational levels. Cronbach's Alpha values are very high (0.917-0.957), indicating excellent internal consistency in all competence areas.

2.2.2. Assessment of actual and preferred learning environment

We used the "What Is Happening in This Class?" (WIHIC) scale (Aldridge et al., 1999) to determine the students' actual and preferred learning environment. The questionnaire consists of 7 subscales: Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, and Equity, which together comprise 56 items. Students were asked to reflect on the educational program they were enrolled in at the time and evaluate the overall learning environment. In other words, they had to form an overall picture, representing the average of all subjects, teachers, classmates, and so on. They rated how they perceive the actual learning environment based on their experiences, namely how often certain things happen, and what their preferred learning environment would look like, namely how often they would like certain things to happen. This was done using a 5-point Likert scale: "1 – almost never", "2 – seldom", "3 – sometimes", "4 – often", and "5 – almost always".

Using confirmatory factor analysis, we analyzed the underlying structure of our questionnaire to determine whether the 56 items are grouped into the 7 expected subscales. Essentially, we aimed to determinate whether these items measured different aspects of the learning environment as intended and to confirm the accuracy of our translation of the questionnaire. We chose Principal Axis Factoring as the extraction method because WIHIC measures latent constructs, and Oblimin with Kaiser Normalization as the rotation method because it allows the factors to be correlated. The results of the factor analysis indicate that the subscales of the WIHIC questionnaire correspond to the constructs they are intended to measure, both for the actual (Appendix 1) and preferred (Appendix 2) learning environments. However, the Stu Coh 6 item loaded on a different factor when assessing the actual learning environment, although the false loading was not significant. This item also had the lowest factor loading in the study by Skordi and Fraser (2019).

TABLE 2. Descriptive statistics for the learning environment scale.

WIHIC scale		N_{items}	M	DE	*n*	α
Actual Learning Environment	Student Cohesiveness	8	3,79	0,60	414	0,82
	Teacher Support	8	3,03	0,81	411	0,90
	Involvement	8	3,07	0,69	417	0,85
	Investigation	8	2,90	0,72	416	0,88
	Task Orientation	8	3,58	0,63	418	0,81
	Cooperation	8	3,46	0,70	414	0,87
	Equity	8	3,65	0,88	423	0,93
Preferred Learning Environment	Student Cohesiveness	8	4,07	0,67	412	0,87
	Teacher Support	8	3,73	0,83	411	0,91
	Involvement	8	3,35	0,75	417	0,88
	Investigation	8	3,34	0,79	415	0,90
	Task Orientation	8	4,12	0,78	418	0,91
	Cooperation	8	3,81	0,75	418	0,91
	Equity	8	4,08	0,85	423	0,95

Note: M = mean, SD = standard deviation, n = sample size, α = Cronbach's alpha

As shown in Table 2, the participants' average scores for the actual learning environment range from 2.90 to 3.79, and for the preferred environment, from 3.34 to 4.12, indicating a moderately positive perception with a desire for improvement. The Cronbach's Alpha values (0.81 to 0.93 for the actual environment and 0.87 to 0.95 for the preferred environment) indicate good to excellent internal consistency.

2.3. Data preparation and analysis

Data analysis was conducted in SPSS using linear regression to assess the impact of the actual learning environment on students' digital and sustainability competencies. Paired-samples t-tests were also conducted to compare the actual and preferred learning environments, with effect sizes calculated using Cohen's d.

The assumptions for the regression analysis were tested and confirmed as follows: Normality was verified with non-significant Kolmogorov-Smirnov and Shapiro-Wilk tests, homoscedasticity and linearity were supported by scatter plots, and independence of errors was confirmed with a Durbin-Watson value close to 2. Furthermore, no multicollinearity was detected (VIF < 10, tolerance > 0.1), and no influential points were identified based on Cook's Distance.

3. Results

Since all assumptions for the regression analysis were satisfactorily met, we proceeded with the analysis to test the relationship between the actual learning environment factors and competencies.

Table 3. Correlation matrix for competencies and actual learning environment factors.

	1	2	3	4	5	6	7	8	9	10
1. Generic Digital Competencies	--									
2. Generic Sustainability Competencies	0,74	--								
3. Profession-Specific Competencies	0,67	0,70**	--							
4. Student Cohesiveness	0,12*	0,13**	0,13**	--						
5. Teacher Support	0,06	0,11*	0,12*	0,32**	--					
6. Involvement	0,23**	0,25**	0,23**	0,42**	0,46**	--				
7. Investigation	0,26**	0,29**	0,33**	0,30**	0,45**	0,53**	--			
8. Task Orientation	0,19**	0,20**	0,23**	0,38**	0,41**	0,36**	0,46**	--		
9. Cooperation	0,15**	0,21**	0,18**	0,52**	0,50**	0,53**	0,41**	0,44**	--	
10. Equity	0,07	0,13**	0,10*	0,36**	0,58**	0,35**	0,30**	0,40**	0,49**	--

Note: *p < 0.05, **p < 0.01

The Spearman correlation matrix in Table 3 shows statistically significant relationships between many factors of the actual learning environment and the competencies. Generic Digital Competencies correlate mainly with Investigation (ρ = 0.26) and Involvement (ρ = 0.23). Generic Sustainability Competencies correlate mainly with Investigation (ρ = 0.29), Involvement (ρ = 0.25), Cooperation (ρ = 0.21), and Task Orientation (ρ = 0.20). The profession-specific competencies show the strongest correlation with Investigation (ρ = 0.33) and correlate with Involvement (ρ = 0.23) and Task Orientation (ρ = 0.23). Based on the statistically significant correlations found in the Spearman correlation matrix, we proceeded with linear regression modeling to assess the partial effects of students' perceived learning environment factors on their self-perceived competence levels.

3.1. Regression Analysis of Learning Environment Factors on Competencies

The multiple linear regression analysis for predicting self-perceived competencies based on the actual learning environment was statistically significant in all models. Model 1 (Generic Digital Competencies) was significant, $F(7, 402) = 6.206$, $p < 0.001$, and explained a substantial part of the variance (SS = 55.807). Model 2 (Generic Sustainability Competencies) showed even stronger significance, $F(7, 402) = 7.596$, $p < 0.001$, with a larger SS (75.546). And Model 3 (Profession-Specific Competencies) showed the highest significance, $F(7, 401) = 9.037$, $p < 0.001$, and a SS of 82.067.

Table 4. Model summaries for regression predicting competencies.

Models	R	R^2	Adj. R^2	Std. Error
1. Generic Digital Competencies	0,312	0,098***	0,082	1,133
2. Generic Sustainability Competencies	0,342	0,117***	0,101	1,192
3. Profession-Specific Competencies	0,369	0,136***	0,121	1,139

Note: ***p < 0.001

Predictors: Actual Learning Environment: Equity; Investigation; Student Cohesiveness; Task Orientation; Involvement; Teacher Support; Cooperation

As shown in Table 4, Model 1 (Generic Digital Competencies) explains 9.8% of the variance, indicating modest explanatory power. Model 2 (Generic Sustainability Competencies) explains 11.7%, indicating a slightly better fit, while Model 3 (Profession-Specific Competencies) has the strongest fit, explaining 13.6% of the variance, indicating the strongest correlation. The relatively low explained variance (R^2) in our models aligns with expectations in social science research, where students' outcomes are influenced by numerous factors, and the primary goal is often not to achieve high predictive power, but to determine whether certain predictors have a statistically significant effect. In this context, R^2 values around 10% are generally considered acceptable (Ozili, 2022).

Table 5. Coefficients for regression models predicting competencies.

	Generic Digital Competencies			Generic Sustainability Competencies			Profession-Specific Competencies		
	B	SEB	β	B	SEB	β	B	SEB	β
(Constant)	3,159	0,386		2,662	0,406		2,484	0,388	
Student Cohesiveness	-0,065	0,107	-0,035	-0,078	0,113	-0,040	-0,026	0,108	-0,014
Teacher Support	-0,248	0,094	-0,173**	-0,224	0,099	-0,147*	-0,146	0,095	-0,099
Involvement	0,214	0,109	0,130*	0,187	0,114	0,106	0,142	0,109	0,084
Investigation	0,321	0,103	0,200**	0,394	0,109	0,231***	0,507	0,104	0,307***
Task Orientation	0,179	0,109	0,101	0,173	0,114	0,092	0,183	0,109	0,101
Cooperation	0,074	0,105	0,046	0,132	0,110	0,078	0,0004	0,105	0,0002
Equity	0,011	0,079	0,008	0,031	0,083	0,023	-0,048	0,079	-0,036

Note: *p < 0.05, **p < 0.01, ***p < 0.001

The coefficients of three separate regression models predicting competencies are shown in Table 5. Although some predictors show small or non-significant effects, they were retained because they originate from the validated WIHIC scale, with each subscale representing a theoretically distinct dimension of the learning environment (Fraser, 1998). This structure was also confirmed on our sample by factor analysis (Appendix 1 and 2).

In the model predicting Generic Digital Competencies, Investigation (β = 0.200) and Involvement (β = 0.130) were significant positive predictors, while Teacher Support (β = -0.173) was a significant negative predictor. The other factors, including Student Cohesiveness, Task Orientation, Cooperation, and Equity, showed no significant effects, suggesting that their effect on Generic Digital Competencies was not significant in this model.

For the model predicting Generic Sustainability Competencies, Investigation (β = 0.109) was the only significant positive predictor. Teacher Support (β = 0.099) again showed a significant negative effect. Involvement and the other factors, namely Student Cohesiveness, Task Orientation, Cooperation, and Equity, were not significant predictors in this model.

In the model predicting Profession-Specific Competencies, the Investigation (β = 0.307) was again the only significant predictor, showing a strong positive effect on Profession-Specific Competencies.

3.2. Perception of Actual Learning Environment Compared to Preferred Learning Environment

To assess the differences between students' perceptions of their actual and preferred learning environments, a series of paired-samples t-tests was conducted. Significant positive correlations were found between the actual and preferred learning environments for all factors ($p < 0.001$), with correlation coefficients ranging from 0.531 (Teacher Support) to 0.744 (Student Cohesiveness). These correlations suggest that students who perceive their actual learning environment more positively also tend to have higher preferences for the same environmental factors.

TABLE 6. Paired samples T-test results comparing actual and preferred learning environment factors.

	Paired Differences						
			95% CI				
Learning environment factors	**ΔM**	**SD**	**Lower**	**Upper**	**t**	**p**	**Cohen's d**
Pair 1: Actual – Preferred Student Cohesiveness	-0,27	0,46	-0,31	-0,23	-11,91	<0,001	0,46
Pair 2: Actual – Preferred Teacher Support	-0,72	0,79	-0,79	-0,64	-18,36	<0,001	0,79
Pair 3: Actual – Preferred Involvement	-0,27	0,60	-0,32	-0,21	-8,92	<0,001	0,60
Pair 4: Actual – Preferred Investigation	-0,44	0,58	-0,50	-0,38	-15,22	<0,001	0,58
Pair 5: Actual – Preferred Task Orientation	-0,54	0,55	-0,60	-0,49	-20,10	<0,001	0,55
Pair 6: Actual – Preferred Cooperation	-0,34	0,57	-0,40	-0,29	-12,29	<0,001	0,57
Pair 7: Actual – Preferred Equity	-0,44	0,70	-0,51	-0,37	-12,91	<0,001	0,70

Paired-samples T-tests revealed significant differences between students' perceptions of the actual and preferred learning environments for all factors (Table 6). The difference was greatest for Teacher Support (ΔM = -0.72, Cohen's d = 0.79), indicating a strong unfulfilled preference among students. Task Orientation (ΔM = -0.54, d = 0.55), Investigation (ΔM = -0.44, d = 0.58), Equity (ΔM = -0.44, d = 0.70), and Cooperation (ΔM = -0.34, d = 0.57) also showed significant gaps with moderate to large effect sizes. Student Cohesiveness and student Involvement showed smaller but still significant gaps (ΔM = -0.27, d = 0.46 and 0.60).

4. Discussion

While the influence of the learning environment on learning outcomes is well known, and researchers have explored various aspects that affect the development of competencies, this study aims to investigate how factors within the learning environment impact students' self-perceived generic and profession-specific digital and sustainability competencies. Our results show that students' perceived learning environment has a significant effect on their self-perceived digital and sustainability competencies, both in terms of generic and profession-specific competencies. In particular, the factors of Investigation, Involvement, and Teacher Support proved to be the most impactful in our study.

Factor Investigation, which focuses on inquiry skills, processes, and their application in problem-solving, proved to be a significant positive predictor for all three groups of competencies in our study, namely Generic Digital, Generic Sustainability, and Profession-Specific Competencies related to digitalization and sustainability. This result underscores previous studies that emphasize the crucial role of problem-solving and inquiry-based learning in the development of digital (Scholkmann, 2017) and sustainability (Carrió Llach &

Llerena Bastida, 2023; Meyer, 1977) competencies. Kolb's (1984) experiential learning theory further supports this by assuming that learning through direct experience and reflection promotes greater competence and mastery. These approaches enable students to engage with real-world problems and enhance their ability to analyze, evaluate, and apply knowledge in diverse, complex scenarios, which is crucial for effectively addressing global challenges.

The Involvement factor, which reflects students' attentive interest, active participation in discussions, completion of additional assignments, and general enjoyment of the class, proved to be a significant predictor of students' self-assessed Generic Digital Competencies. These findings can be supported by theories of active learning, which emphasize that students learn more effectively when they are actively engaged in the learning process (Bonwell & Eison, 1991). Empirical studies support these findings. Hake (1998) found that students achieve a better conceptual understanding in active, discussion-based learning environments, a finding also confirmed by Freeman et al. (2014), who found that students performed significantly better in active classrooms. Additionally, Romero-García, Buzón-García, and de Paz-Lugo (2020) found that active participation in collaborative learning activities supported by digital tools improves students' digital competencies. However, Lucas (2019) emphasizes that the facilitation of activities by teachers, supported by digital tools, is crucial for developing these competencies.

Teacher Support, which indicates the extent to which the teacher helps, befriends, trusts, and takes an interest in students, showed a significant negative effect on self-perceived levels of both Generic Digital and Sustainability Competencies, which may seem counterintuitive. However, this could suggest that students who have more autonomy and less direct support engage more intensively with relevant tools and concepts themselves, leading to a higher perceived level of competency in these areas. This is consistent with self-determination theory, which states that autonomy is a critical factor in intrinsic motivation and skill development (Deci & Ryan, 2000). In addition, the negative impact of perceived Teacher Support on self-perceived competencies may also be related to the concept of self-efficacy—the student's belief in their own ability to successfully accomplish certain tasks (Bandura, 1997). Research suggests that an overly supportive environment can sometimes lead to lower self-efficacy as students become dependent on external reassurance and assistance rather than developing confidence in their own abilities (Schunk & Pajares, 2002). In such cases, students may perceive their competencies as lower, especially in areas such as digitalization and sustainability, where independent problem-solving is crucial. An alternative explanation could be social comparison theory (Festinger, 1954), where students who receive more support from the teacher compare themselves to peers who appear to need less support. This comparison could lead to feelings of inadequacy or lower self-esteem, which could also have a negative impact on their self-assessment of competencies.

As the study employs a cross-sectional design, it is not possible to determine causality, i.e., whether greater teacher support leads to lower self-perceived competence or whether students with lower self-perceptions receive more teacher support and vice versa. Therefore, the negative effect of perceived Teacher Support on self-perceived competencies may also reflect a positive and pedagogically meaningful outcome. In contrast, a plausible interpretation is that teachers provide more support and attention to students who face greater challenges and/or perceive themselves as less competent. This suggests that teachers are responsive to students' different learning needs in terms of their readiness, interests, and learning profiles, which reflects and supports the development of a more inclusive educational environment (Gheyssens et al., 2023) and is also an important element of competence-based education (Makovec Radovan, 2025). This interpretation is also supported by our T-test results, which indicate that students would prefer more support from teachers. While these findings reflect a positive focus at the classroom level, their effectiveness often depends on broader institutional frameworks that support and reinforce individualized approaches rather than leaving them solely to individual teachers (Skubic Ermenc et al., 2020). This is another challenge that can be addressed within the framework of competence-based education.

The non-significant results for factors such as Student Cohesiveness, Task Orientation, Cooperation, and Equity suggest that, despite their importance in creating a supportive and equitable learning environment, we did not find a direct impact on the development of Digital and Sustainability Competencies in this study. Nevertheless, our results show that students are also striving for improvement in these areas. The fact that the actual learning environment does not match students' preferences is consistent with the findings of previous studies (Fraser, 1998; Rita & Martin-Dunlop, 2011). This discrepancy underscores the importance of addressing students' needs to create a supportive and empowering learning environment, as Fraser & Fisher (1983) emphasize that students tend to perform better when their actual and preferred learning environments match.

Based on these findings, it is essential to consider how they align with the ongoing shift toward competence-based education, which serves as the foundation for current national educational reforms. These reforms also explicitly emphasize the development of key competencies in areas such as digitalization and sustainability (Mali et al., 2025; Skubic Ermenc et al., 2024; Vlada Republike Slovenije, 2022). In competence-based education, teachers focus on developing students' competencies, leading to a shift toward learner-centered planning and instruction, which also changes the pedagogical process itself (Makovec Radovan, 2025). In this context, the learning environment plays a crucial role. Our study, which identified Investigation, Involvement, and Teacher Support as key predictors of both generic and profession-specific digital and sustainability competencies, highlights the value of learning situations based on inquiry, collaboration, and problem-solving, while emphasizing the importance of student autonomy and individualization. There is no one-size-fits-all pedagogical approach, as certain methods and forms of work may be better suited to the development of certain competencies than others. Nevertheless, pedagogical approaches that promote the learning environment factors identified in our study as influential on students' self-perceived digital and sustainability competencies include problem-based, project-based, experiential, and collaborative learning (Makovec Radovan, 2025). These approaches should also incorporate authentic learning situations based on real-world work and life contexts, promoting connections between school and work-based learning, in line with the principles of modular, flexible, and professionally relevant program design (MZI, 2024).

4.1. Limitations and Future Research

This study is subject to certain limitations that should be taken into consideration. First, the use of self-assessments may lead to biases. Although self-assessment provides valuable insights into learners' perceptions and reflections, it represents only one perspective. Future research should therefore consider the use of triangulation methods, such as teacher evaluations, analyses of curriculum content, or performance-based assessments that include practical tasks or exams. Second, the cross-sectional design of the study limits the ability to draw causal inferences between the learning environment and competencies. Therefore, longitudinal or experimental studies are needed to determine the direction and causality of these relationships. The generalizability of the results is also limited. The study focused exclusively on Slovenian students in one field of education, which may limit the transferability of the conclusions to other national contexts or fields of education. In addition, while the gender imbalance in the student sample (97% male) reflects the current demographics of the field, it also limits the generalizability of the findings. Future research could replicate the study in other educational fields, in multiple countries, and with more balanced samples to test the robustness and relevance of the findings in different contexts.

5. Conclusions

This study highlights the crucial role of the learning environment in fostering students' digital and sustainability competencies, which are recognized as key competencies in current national educational reforms. In particular, the perceived learning environment factors of

Investigation, Involvement, and Teacher Support showed a significant effect on students' self-perceived digital and sustainability competencies, both generic and profession-specific.

The Investigation showed a positive effect on all types of competencies: generic digital, generic sustainability, and profession-specific digital and sustainability competencies, while Involvement only had a positive effect on generic digital competencies. Teacher support, on the other hand, had a negative effect on generic digital and sustainability competencies, which may seem counterintuitive. However, we discuss possible explanations that may even reflect a positive pedagogical response to students' individual learning needs.

Therefore, based on the influencing factors of the learning environment, it would be beneficial to focus on promoting learning situations that emphasize inquiry, collaboration, and problem-solving, while also emphasizing student autonomy, individualization, and consideration of student preferences for the learning environment. This requires a move away from subject-centered education and traditional frontal teaching, which still dominate. One promising avenue is competence-based education, which is not new, but its implementation depends on how each school incorporates it into its curriculum. It is a pedagogical and didactic approach that requires significant changes in both the design and implementation of the curriculum. At its core, it places the profession for which students are to be educated at the center of the learning process, focusing teaching on the development of students' competencies. It promotes diverse teaching methods to achieve specific learning objectives. In light of our findings, approaches such as problem-based, project-based, experiential, and collaborative learning would effectively support the factors of the learning environment to develop students' (self-perceived) digital and sustainability competencies. However, teachers cannot be solely responsible for implementing these changes; they need systematic support and opportunities for professional development.

Author contributions

Luka GOROPEČNIK: Conceptualization; Methodology; Formal analysis; Investigation; Resources; Data curation; Visualization; Writing (original draft); Writing (review and editing).

Danijela MAKOVEC-RADOVAN: Conceptualization; Methodology; Writing (review and editing); Validation; Supervision.

Jože KROPIVŠEK: Conceptualization; Methodology; Resources; Writing (review and editing); Validation; Supervision.

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Appendices

Appendix 1. Factor loadings for the Learning Environment Scale: Evaluation of the Actual Learning Environment.

Item	Factor Loadings						
	1	2	3	4	5	6	7
Stu Coh 1	0,61						
Stu Coh 2	0,56						
Stu Coh 3	0,39						
Stu Coh 4	0,71						
Stu Coh 5	0,69						
Stu Coh 6	(0,29)			-0,34			
Stu Coh 7	0,62						
Stu Coh 8	0,44						
Tea Sup 1		0,66					
Tea Sup 2		0,70					
Tea Sup 3		0,67					
Tea Sup 4		0,73					
Tea Sup 5		0,58					
Tea Sup 6		0,73					
Tea Sup 7		0,54					
Tea Sup 8		0,49					
Invol 1			0,49				
Invol 2			0,59				
Invol 3			0,39				
Invol 4			0,55				
Invol 5			0,41				
Invol 6			0,52				
Invol 7			0,41				
Invol 8			0,36				
Inves 1				-0,59			
Inves 2				-0,56			
Inves 3				-0,74			
Inves 4				-0,62			

Inves 5				-0,61			
Inves 6				-0,60			
Inves 7				-0,56			
Inves 8				-0,65			
Tas Orn 1					0,54		
Tas Orn 2					0,46		
Tas Orn 3					0,36		
Tas Orn 4					0,50		
Tas Orn 5					0,59		
Tas Orn 6					0,48		
Tas Orn 7					0,51		
Tas Orn 8					0,56		
Coop 1						-0,51	
Coop 2						-0,60	
Coop 3						-0,59	
Coop 4						-0,60	
Coop 5						-0,54	
Coop 6						-0,68	
Coop 7						-0,73	
Coop 8						-0,60	
Equity 1							-0,70
Equity 2							-0,64
Equity 3							-0,75
Equity 4							-0,84
Equity 5							-0,76
Equity 6							-0,82
Equity 7							-0,80
Equity 8							-0,74
Eigenvalue	3,17	2,12	15,82	1,47	2,47	1,85	3,97
% Variance	5,67	3,79	28,24	2,63	4,40	3,30	7,09

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
Factor loadings less than 0.35 have been omitted from the table

Appendix 2. Factor loadings for the Learning Environment Scale: Evaluation of Preferred Learning Environment.

Item	Factor Loadings						
	1	2	3	4	5	6	7
Stu Coh 1	0,71						
Stu Coh 2	0,61						
Stu Coh 3	0,61						
Stu Coh 4	0,75						
Stu Coh 5	0,73						
Stu Coh 6	0,39						
Stu Coh 7	0,59						
Stu Coh 8	0,44						
Tea Sup 1		0,70					
Tea Sup 2		0,68					
Tea Sup 3		0,69					
Tea Sup 4		0,69					
Tea Sup 5		0,61					
Tea Sup 6		0,73					
Tea Sup 7		0,65					
Tea Sup 8		0,57					
Invol 1			-0,58				
Invol 2			-0,55				
Invol 3			-0,48				
Invol 4			-0,51				
Invol 5			-0,61				
Invol 6			-0,60				
Invol 7			-0,53				
Invol 8			-0,54				
Inves 1				0,59			
Inves 2				0,63			
Inves 3				0,62			
Inves 4				0,65			
Inves 5				0,43			

Inves 6				0,64			
Inves 7				0,44			
Inves 8				0,54			
Tas Orn 1					0,51		
Tas Orn 2					0,62		
Tas Orn 3					0,61		
Tas Orn 4					0,54		
Tas Orn 5					0,67		
Tas Orn 6					0,54		
Tas Orn 7					0,69		
Tas Orn 8					0,70		
Coop 1						-0,61	
Coop 2						-0,65	
Coop 3						-0,58	
Coop 4						-0,66	
Coop 5						-0,50	
Coop 6						-0,70	
Coop 7						-0,63	
Coop 8						-0,59	
Equity 1							-0,76
Equity 2							-0,71
Equity 3							-0,84
Equity 4							-0,87
Equity 5							-0,75
Equity 6							-0,86
Equity 7							-0,74
Equity 8							-0,75
Eigenvalue	2,52	3,07	1,73	1,28	20,50	2,02	3,59
% Variance	4,51	5,48	3,10	2,29	36,61	3,60	6,41

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
Factor loadings less than 0.35 have been omitted from the table

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Emotional appraisal of climate change in young Andalusians: structural equation modelling and multigroup analysis

Evaluación emocional sobre el cambio climático en jóvenes andaluces: análisis de ecuaciones estructurales y multigrupo

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Abstract:

Climate change is one of the most urgent environmental and societal challenges of our time. Since the mid-20th century, psychoeducational research has shown correlations between emotional processes and action-oriented decision-making. The *appraisal theory of emotions* posits that emotions arise from processes of appraisal, both unconscious and conscious, shaped by numerous factors. A thorough examination of the influence of these factors, and of how they modulate emotional appraisal in the context of the climate emergency, is a crucial step towards guiding educational interventions towards more holistic pedagogies focused on climate action.

In this context, the present study aims to develop an exploratory structural model to examine how frequency of information consultation and perceptions of responsibility and risk influence emotional appraisals of climate change. To this end, the structural equation modelling was applied to a sample of young individuals from eight provinces in Andalusia, Spain (n = 1,050). A multigroup moderation analysis was conducted to explore whether differences in academic year between subjects influence these relationships.

The fit of the proposed model is favourable, explaining almost half of the variance in negative emotions and nearly a quarter of the variance in positive emotions. The results highlight significant causal patterns, with risk perceptions showing large and particularly relevant regression weights on negative emotions towards climate change. We also examined the significant and incremental influence of social networks (both online and offline) and the perceptions of externalised responsibility for the causes of climate change, especially as students advance through the education system. These are all crucial aspects for educators to consider.

Keywords: climate change, structural equation modelling, young people, emotions, emotional processing and appraisal, information sources, risk perceptions and responsibility

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Resumen:

El cambio climático es uno de los problemas ecosociales más urgentes a los que debe enfrentar la humanidad. La investigación psicoeducativa, desde mediados del siglo XX, ha identificado conexiones entre los procesos emocionales y la toma de decisiones orientadas a la acción. La *Teoría de la evaluación emocional* sostiene que las emociones son el resultado de un proceso de valoración (inconsciente y/o consciente) que es condicionado por numerosos factores. Explorar en profundidad la influencia de algunos de estos factores, así como la modulación que ejercen en la evaluación emocional ante la emergencia climática, se considera fundamental para orientar la intervención educativa hacia pedagogías más holísticas y enfocadas a la acción climática.

En este contexto, la presente investigación tiene como objetivo elaborar un modelo estructural exploratorio que permita entender cómo influyen la frecuencia de consulta de información y las percepciones de responsabilidad y riesgo en la evaluación emocional sobre el cambio climático. Para ello, se utiliza la técnica de análisis de ecuaciones estructurales en una muestra de jóvenes españoles de las 8 provincias de Andalucía (n=1.050). Se explora cómo la diferencia de curso educativo entre los sujetos puede influir en estas relaciones, mediante un análisis multigrupo de moderación.

El nivel de ajuste del modelo es favorable, logrando además explicar casi la mitad de la varianza de las emociones negativas, así como cerca de un cuarto de las positivas. Los resultados muestran la presencia de patrones causales significativos, siendo especialmente relevante el gran peso de regresión que tienen las percepciones de riesgo sobre las emociones negativas respecto al cambio climático. Asimismo, analizamos la influencia significativa e incremental que ejercen las redes sociales (tanto *online* como físicas) y las percepciones de externalización de la responsabilidad causal del cambio climático, especialmente a medida que los estudiantes avanzan en el sistema educativo; todos ellos son aspectos cruciales que deben tener en cuenta los educadores.

Palabras clave: Cambio climático, análisis de ecuaciones estructurales, jóvenes, emociones, procesamiento y evaluación emocional, fuentes de información, percepciones de riesgo y responsabilidad.

1. Introduction

The present article aims to explore causal influences in the emotional response to climate change expressed by young people. We used structural equation modelling (SEM) as an exploratory strategy to identify significant relationships between variables that scientific literature has linked to changes in patterns of emotional elicitation. Specifically, this study seeks to clarify how the following variables shape the process of emotional appraisal: 1) frequency of consulting different media sources for information on climate change; 2) perceived risk of its consequences, both at the individual level and for Andalusia; 3) perceived responsibility for the cause of climate change, attributed both to oneself and to Andalusia. In addition, the influence of the *year group* demographic variable is explored through moderation analysis.

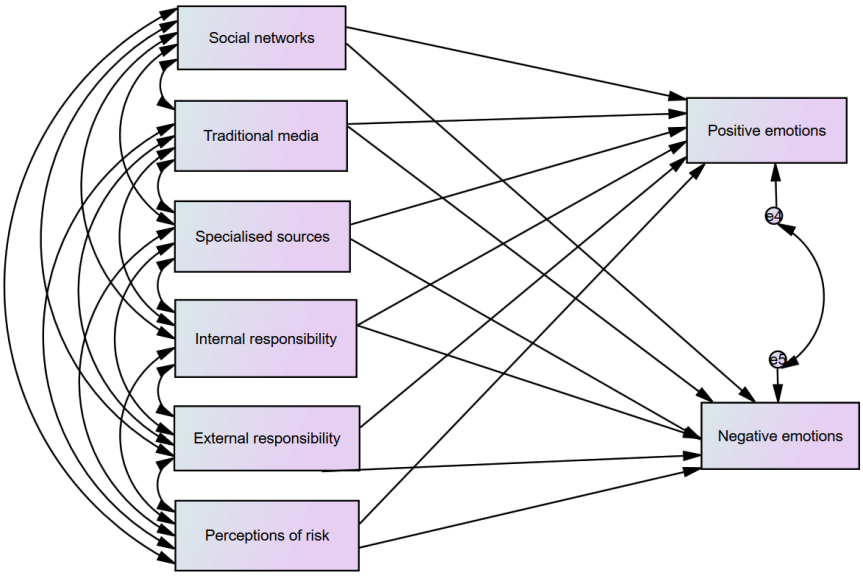
These variables are shown in the *theoretical model* proposed in Figure 1, which we will try to test using an exploratory SEM that permits in-depth consideration of how and to what extent the frequency of media source consultation, together with perceived responsibility and risk, influence the process of *emotional appraisal* regarding climate change. These study aims are articulated in the following research objectives:

Objective 1. To analyse the fit of the *structural model* to the overall sample and determine the proportion of emotional variance it explains.

Objective 2. To interpret the significance, strength and direction of the associations between the exogenous variables of the *structural model* and the endogenous variables of *positive* and *negative emotions* in the overall sample.

Objective 3. To examine potential differences in the structural relationships of the *structural model* arising from the moderating effect of the *year group* variable.

FIGURE 1. Theoretical Model



Source: Prepared by the authors

2. Theoretical framework and state of the art

Over the past decade, there has been growing interest in the study of emotions in the context of the climate emergency. Among the emerging lines of research in this field, particular attention has been paid to studies examining how these complex and multidimensional socio-psychological processes differ across groups, and how they correlate with factors such as interest, motivation to act and intention to change habits in response to the climate emergency.

In a survey of 10,000 young people (aged 16-25) across 10 countries, Hickman *et al.* (2021) concluded that: 1) respondents frequently report feeling negative emotions such as eco-anxiety, sadness, fear, anger and hopelessness, which affected their daily life; 2) these negative emotions were associated with critical perceptions of government actions to address the climate crisis; 3) the elicitation of negative emotions in relation to climate change is not exclusively limited to the countries most affected by this phenomenon; and 4) it is vital to validate young people's emotions and urge governments to take effective action in the face of the climate crisis to safeguard the emotional and mental well-being of these generations. In the opinion study by Ogunbode *et al.* (2022), the authors explored correlations between eco-anxiety, well-being and pro-environmental action in 32 countries based on a total sample of 12,246 subjects. The inverse relationship between psychological well-being and eco-anxiety in 31 countries, as well as the significant association with pro-environmental behaviours (24 countries) and climate activism (12 countries) stand out among the most significant findings.

With regard to the range of emotions elicited by climate change, it is important to highlight the work of Pihkala (2022). In this study, the author presents a semi-systematic narrative review (n = 14) of empirical studies, including observational or self-report surveys, that address at least five distinct climate emotions. Its main contribution is an emotional taxonomy of climate change, illustrating connections between climate emotions and resilience, climate action, psychological well-being and health. Pihkala also concludes that this field of research is still emerging, and notes a lack of research into the variety of emotions associated with climate change.

Ojala's (2022) review shifts the focus from negative emotions, which have traditionally received greater attention in the context of climate change, to positive emotions elicited when individuals perceive the precursor object or situation as favourable to their well-being, survival or goals (Borsch, 2021). Ojala note that recent research in this area, although limited, examines the relationship between hope, motivation, and participation in climate action. The following conclusions of the study are particularly noteworthy: 1) interventions should focus on spreading messages that promote and encourage individual and collective action in response to climate change, rather than simple optimistic messages; and 2) it is necessary to distinguish between optimism, understood as a belief that everything will turn out well without the need for action, and hope, understood as the perception that improvement is possible when facing a negative situation. In the latter case, it is important to identify the *emotional appraisal* process, as it will shape a form of hope that may hinder or drive climate action, which Ojala terms *critical hope*. According to the *appraisal theory of emotions*, *emotional appraisal* is an unconscious and/or conscious process based on prior experiences, values, perceptions and beliefs, among other factors, which influences the intensity and positive or negative valence of the resulting emotional response (Moors *et al.*, 2013).

In the study of pro-environmental and climate behaviours, the classic work by Kollmuss and Agyeman (2002) stands out as one of the most influential in bibliometric terms. These authors reviewed leading theories and models that aimed to explain the factors influencing decision making, as well as the possible barriers that hinder its implementation. Their principal contribution is a new multivariate model, supported by the previous models, which identified three major factors that shape pro-environmental behaviours: 1) demographic factors: gender, age, educational level, etc.; 2) external factors: institutional, economic, social and cultural influences; and 3) internal factors: motivation, knowledge, values, emotions, individual responsibility, among others. Within the internal factors block, particularly those linked to emotions and emotional reaction, they observed that negative emotions elicited by environmental problems (e.g., fear, sadness, anger) may not serve as causal predictors of pro-environmental behaviours. Rather, it is the subjects' perceived sense of control in the face of the situation that elicits these feelings. Accordingly, individuals who feel little control over the evolution of an eco-social problem such as climate change, combined with strong negative emotions, are more likely to develop behaviours of avoidance, apathy and delegation.

Building on previous literature and responding to the demand for research in this field, our study seeks to identify how young people appraise climate change emotionally, and to determine which predictors shape their emotional elicitation and decision making in the face of the climate crisis.

3. Methodology

3.1. Study instrument and sample

The present research employs a survey design using a third-generation *ad hoc* questionnaire that was reviewed by national and international experts and has been applied in previous research by the RESCLIMA Project (González-Muñoz *et al.*, 2024; García-Vinuesa *et al*., 2024; Meira *et al*., 2022).

The purpose of this quantitative questionnaire, which gathers respondents' opinions, is to characterise social profiles in relation to the climate emergency and provide an empirical basis to guide strategic educational and political interventions aimed at enhancing climate literacy and fostering young people's commitment to action. Through a multivariate orientation, the questionnaire enables integrated analysis of seven thematic blocks (González-Muñoz *et al*., 2024). The present study focuses on the *Information Sources* and *Emotions* blocks and, partially, the *Beliefs and Perceptions* and *Socio-educational Variables* blocks.

Information Sources were assessed through a general instruction inviting participants to indicate how often they used different media to obtain information about climate change, on a scale from 1 (rarely) to 3 (often). An exploratory factor analysis (EFA) identified three factors: 1) *traditional media*, including television, popular magazines, and newspapers; 2) *social networks*, comprising online networks (TikTok, Instagram, YouTube, etc.) as well as offline networks (friends, family, etc.); and 3) *specialised sources*, which include workshops, talks or activities with teachers, NGOs or environmental groups.

Perceptions of responsibility for the causes of climate change were explored through two items: *external responsibility* ('indicate from 1 [minimum] to 10 [maximum] the responsibility of Andalusia for the causes of climate change'), and its equivalent for personal responsibility, or *internal responsibility*. Risk perceptions were measured using a similar structure and scale, asking respondents to assess how they thought climate change could affect Andalusia and their own lives. The focus on individuals and their autonomous region was chosen to minimise possible divergences in responses, particularly those linked to emotional distancing, and to maintain a focus that was more local and context-specific than, for example, a nationwide scale.

First, the possibility of grouping the responsibility and risk items into two latent variables was examined. The perceived risk items showed a significant moderate-to-strong correlation (Pearson = 0.53, Spearman = 0.52, p = 0.00), as well as satisfactory R^2 coefficients in the confirmatory factor analysis (CFA), which justified grouping them into a single latent factor: *perceived risk*. By contrast, and despite having prioritised a local focus, the responsibility items displayed only a significant weak-to-moderate correlation (Pearson = 0.35, Spearman = 0.34, p = 0.00) along with R^2 values below the established threshold (≥ 0.50), indicating insufficient strength to justify grouping them into a single latent construct.

To assess *emotions*, respondents were given the following instruction: 'Assess from 1 (not at all) to 10 (a lot) how strongly you experience the following emotions and feelings when you think about climate change.' A self-report technique was used, without providing specific contexts or examples that might influence responses. An exploratory factor analysis (EFA; González-Muñoz *et al*., 2024), confirmed a polarisation of items into two factors, consistent with the dimensional model of emotions based on valence: 1) *positive emotions*, comprising optimism and hope; and 2) *negative emotions*, comprising worry, fear, anger, indignation, sadness and impotence. The eight climate emotions included in the questionnaire were selected on the basis of their frequency in responses to an open-ended item in the first pilot study.

The final study sample comprised 1,050 young people from the eight provinces of Andalusia, Spain. Voluntary stratified sampling was used, involving 26 secondary schools (68.4% public and 31.6% state-supported private). Half of the participants identified as female, and half as male. Regarding *year group* and *age*, 56.2% of the participants were in Year 1 of Compulsory Secondary Education (ESO, equivalent to Grade 7 in the K-12 education system, aged 12-13 years), while the remaining 42.8% were in Year 4 of ESO (Grade 10 K-12, aged 15-16 years).

The research was conducted in accordance with the principles of the Helsinki Declaration. Participants were provided with an information sheet and were asked to give fully informed consent, and the principles of voluntary participation and anonymity were complied with

at all times. The project was approved by the Ethics in Human Research Committee of the Universidad de Granada (reference 3252/CEIH/2023).

3.2. Data analysis

The *theoretical model* proposed in this study was developed on the basis of an extensive literature review, together with the results and conclusions from the authors' exploratory, descriptive and inferential factor analyses (González-Muñoz *et al.*, 2024). The IBM SPSS v.28 package and IBM SPSS AMOS v.24 statistics programs were used for the analyses.

As a necessary preliminary step for SEM, a CFA was performed with the data and variables included in the *measurement model*. This CFA assessed three criteria: 1) *reliability*, with all of the latent variables achieving the required coefficients for *internal reliability* (Cronbach's alpha and McDonald's omega ≥ 0.70), *composite reliability* (≥ 0.60), and *average variance extracted* (≥ 0.50), indicating satisfactory reliability (Cronbach, 1951; Dash & Paul, 2021; McDonald, 1970); 2) *construct validity*, with the necessary coefficients achieved for *convergent validity* (factor loadings ≥ 0.60, with $p < 0.05$; $R2 \geq 0.50$), and *discriminant validity*, assessed using the Fornell–Larcker test, confirming validity (Fornell & Larcker, 1981; Zainudin, 2015); and 3) *goodness of fit*, evaluated following Hu and Bentler (1999) and Schreiber *et al.* (2006), with both *absolute fit* and *comparative fit* tests exceeding the required thresholds, indicating a good model fit (Table 1).

Table 1. Goodness of Fit of the Measurement Model

	Index name	Value
Absolute fit	Chi-squared (CMIN)	X2=161.62; DF=64; p=0.00
	Chi-squared/degrees of freedom (CMIN/DF)	2.53
	Goodness of fit index (GFI)	0.98
	Adjusted goodness of fit index (AGFI)	0.97
	Root mean square error of approximation (RMSEA)	0.04
	Standardised root mean squared residuals (SRMR)	0.02
Comparative fit	Tucker–Lewis index (TLI)	0.97
	Incremental fit index (IFI)	0.98
	Normed fit index (NFI)	0.97
	Comparative fit index (CFI)	0.98

Source: Prepared by the authors

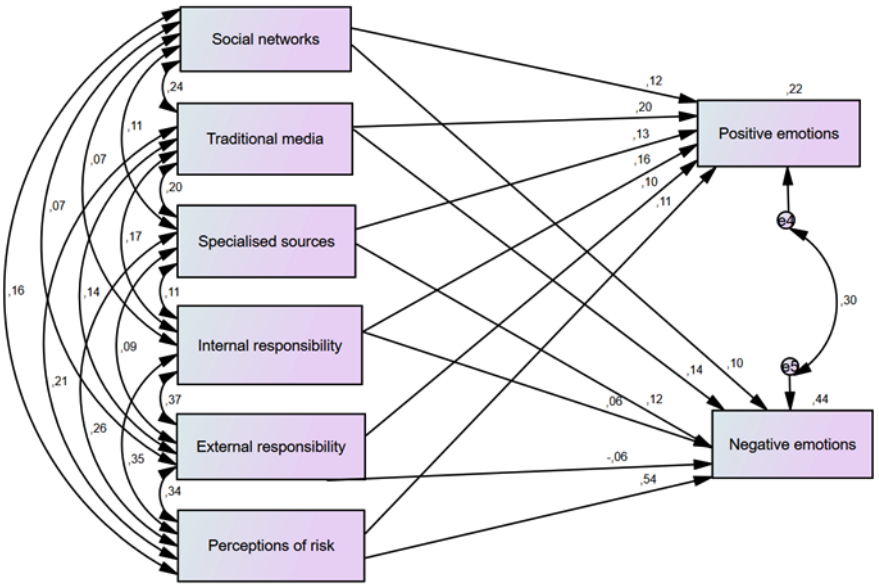
After testing the *reliability*, *construct validity* and *goodness of fit* of the *measurement model*, a *structural model* was developed with the overall sample (*General-StrMod)*. Using SEM, this model analyses both the proportion of emotional variance explained and the structural relationships among the variables. A multigroup analysis was also conducted to test the possible moderating effect of the *year group* variable. Exploring this variable was considered vital, rather than others such as ideology or prior experiences, for two main reasons: 1) homogeneity in the educational context, which allowed greater control of sample distribution between the two groups than more volatile or inconsistent variables; and 2) its interrelation with age, which enables simultaneous analysis of educational aspects and factors linked to cognitive, social, and emotional development. Nevertheless, the relevance of other variables is recognised for future lines of research within the framework the team is currently developing.

4. Results

4.1. Structural equation modelling

To represent the *General-StrMod* (Figure 2), an imputed version of the data was used. The model has six exogenous variables and two endogenous variables. The results of the *absolute* and *comparative fit* tests assessing the *goodness of fit* of the *General-StrMod* are identical to those obtained for the *measurement model* (Table 1).

Figure 2. General-StrMod: Standardised Regressions and Mean Explained Variance



Source: Prepared by the authors

Table 2 presents the results of the tests of association between the variables in the *General-StrMod*. In particular, it shows the regression weights and standardised regression weights, which reflect the direct effects of the exogenous variables on the endogenous ones in the model.

TABLE 2. Tests for Association Between Variables: General-StrMod.

Association of variables	Regression weight				Standardised regression weight
	Estimate(B)	SE	CR	*p*	Estimate(β)
PosEm←SocNet	0.12	0.03	4.44	***	0.12
PosEm←TradMed	0.24	0.03	7.33	***	0.20
PosEm←SpeSour	0.15	0.03	4.89	***	0.13
PosEm←InRe	0.04	0.01	5.34	***	0.16
PosEm←ExRe	0.03	0.01	3.31	***	0.10
PosEm←RiskPer	0.06	0.02	3.77	***	0.11
NegEm←SocNet	0.12	0.03	4.44	***	0.10
NegEm←TradMed	0.22	0.04	6.08	***	0.14
NegEm←SpeSour	0.17	0.03	4.98	***	0.12
NegEm←InRe	0.02	0.01	2.44	0.02*	0.06
NegEm←ExRe	–0.03	0.01	–2.46	0.01**	–0.06
NegEm←RiskPer	0.40	0.02	21.54	***	0.54

Note: PosEm= Positive Emotions; SocNet = Social Networks; TradMed = Traditional Media; SpeSour = Specialised Sources; ExRe = External Responsibility; InRe = Internal Responsibility; RiskPer = Risk Perceptions; NegEm = Negative Emotions; SE = Standard Error; CR = Critical Ratio; * = $p \leq 0.05$; ** = $p \leq 0.01$; *** = $p \leq 0.00$

Source: Prepared by the authors

4.2. Multigroup analysis of the year group variable

To determine whether the *General-StrMod* can be compared between the groups defined by the *year group* variable (Year 1 ESO vs Year 4 ESO), an analysis was conducted (Table 3) in which progressive restrictions were imposed on the factor loadings (model 1), structural relationships (model 2) and residual errors (model 3), with model fit assessed in each phase. The results indicate that the model is invariant across the groups defined by the *year group* variable, allowing valid comparisons of structural relationships that can be attributed to its possible moderating influence (Chen, 2007).

TABLE 3. Multigroup Invariance Matrix

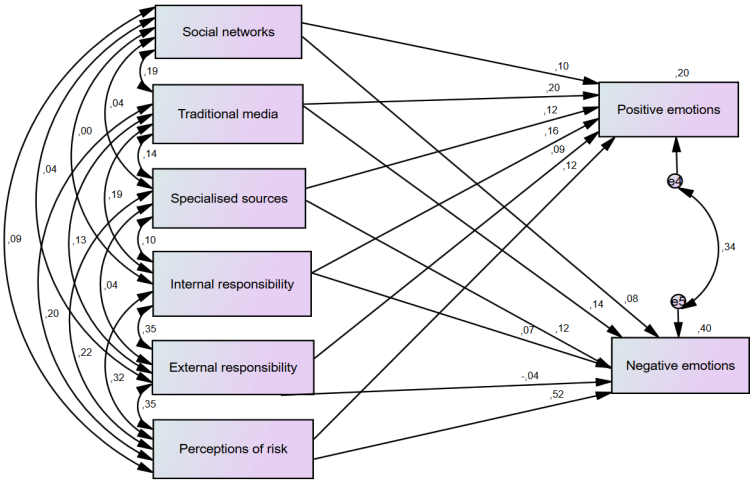
	CFI		ΔCFI
Model 0. Free from configural invariance	1		
Model 1. Metric invariance (M0 vs M1)	M0 1	M1 1	0.00
Model 2. Structural invariance (M0 vs M2)	M0 1	M2 0.99	0.01
Model 3. Residual invariance (M2 vs M3)	M2 0.99	M3 0.98	0.01

Source: Prepared by the authors

A chi-squared difference test was conducted to assess possible significant differences between the structural regressions of the *General-StrMod* owing to the moderating effect of the *year group* variable. This test compared the unrestricted model (base model) with a model that imposes invariance restrictions on the *year group* variable. The comparison (ΔCMIN = 25.34; ΔDF = 21; p = 0.04) indicated a significant moderating effect of *year group* on the model's structural relationships, warranting further exploration.

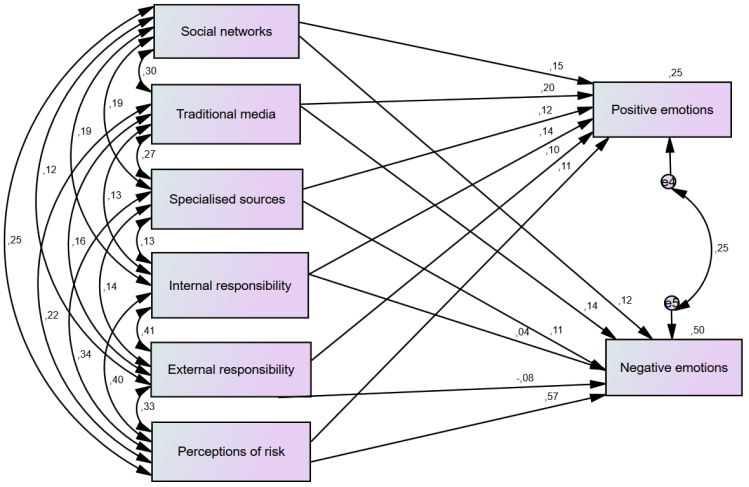
Twelve chi-squared difference tests were then carried out, each assessing one of the structural relationships proposed in the model. Statistically significant differences were identified for the following relationships: *positive emotions* ← *social networks* (ΔCMIN = 4.11; ΔDF = 3; p = < 0.05), *negative emotions* ← *social networks* (ΔCMIN = 4.58; ΔDF = 2; p = 0.03), and *negative emotions* ← *external responsibility* (ΔCMIN = 4.95; ΔDF = 2; p = 0.02). Following these analyses, the *structural model* for Year 1 ESO *(Year 1 ESO-StrMod)* and the *structural model* for Year 4 ESO *(Year 4 ESO-StrMod)* were represented in AMOS, with their imputed versions shown in Figure 3 and Figure 4 respectively.

FIGURE 3. Year 1 ESO-StrMod



Source: Prepared by the authors

FIGURE 4. Year 4 ESO-StrMod



Source: Prepared by the authors

Table 4 presents the descriptive statistics and inferential analyses for both groups on the variables included in the model.

Table 4. Descriptive and Inferential Results by Year Group

	Year 1 ESO		Year 4 ESO		Inferential test	
	$\overline{x}$	SD	$\overline{x}$	SD	ANOVA *(p)*	Kruskal-Wallis *(p)*
Social networks	2.22	0.74	2.19	0.72	0.49	0.43
Traditional media	1.81	0.63	1.79	0.64	0.51	0.48
Specialised sources	2.03	0.67	1.76	0.67	***	***
Internal responsibility	5.91	2.84	5.87	2.47	0.53	0.47
External responsibility	5.86	2.34	5.68	2.01	0.16	0.15
Risk perceptions	7.22	2.10	7.19	2.08	0.79	0.77
Positive emotions	6.40	1.76	5.92	1.81	***	***
Negative emotions	6.39	2.12	6.45	2.28	0.11	0.12

Note: *** = $p \leq 0.00$

Source: Prepared by the authors.

Finally, Tables 5 and 6 present the results of the association tests between variables for the *Year 1 ESO-StrMod* and *Year 4 ESO-StrMod* respectively.

Table 5. Tests for Association Between Variables: Year 1 ESO-StrMod

Association of variables	Regression weight				Standardised regression weight
	Estimate (B)	SE	CR	*p*	Estimate (β)
Positive emotions←Social networks	0.10	0.04	2.65	0.01**	0.10
Positive emotions←Traditional media	0.24	0.04	5.52	***	0.21
Positive emotions←Specialised sources	0.13	0.04	3.24	***	0.12
Positive emotions←Internal responsibility	0.04	0.01	4.15	***	0.16
Positive emotions←External responsibility	0.03	0.01	2.30	0.02*	0.09
Positive emotions←Risk perceptions	0.07	0.02	3.01	***	0.12

Negative emotions←Social networks	0.10	0.04	2.51	0.01**	0.08
Negative emotions←Traditional media	0.21	0.05	4.39	***	0.14
Negative emotions←Specialised sources	0.17	0.04	3.89	***	0.12
Negative emotions←Internal responsibility	0.02	0.01	2.03	0.04*	0.07
Negative emotions←External responsibility	–0.02	0.01	–1.09	0.28	–0.04
Negative emotions←Risk perceptions	0.37	0.02	15.08	***	0.52

Note: SE = Standard Error; CR = Critical Ratio; * = $p \leq 0.05$; ** = $p \leq 0.01$; *** = $p \leq 0.00$
Source: compiled by the author.

TABLE 6. Tests for Association Between Variables: Year 4 ESO-StrMod

Association of variables	**Regression weight**				**Standardised regression weight**
	Estimate (B)	**SE**	**CR**	***p***	**Estimate (β)**
Positive emotions←Social networks	0.16	0.04	3.71	***	0.15
Positive emotions←Traditional media	0.23	0.05	4.81	***	0.20
Positive emotions←Specialised sources	0.13	0.05	2.77	0.01**	0.12
Positive emotions←Internal responsibility	0.04	0.01	3.22	***	0.10
Positive emotions←External responsibility	0.04	0.02	2.27	0.02*	0.14
Positive emotions←Risk perceptions	0.06	0.03	2.40	0.02*	0.11
Negative emotions←Social networks	0.17	0.05	3.62	***	0.12
Negative emotions←Traditional media	0.23	0.06	4.14	***	0.14
Negative emotions←Specialised sources	0.17	0.05	3.29	***	0.11
Negative emotions←Internal responsibility	0.02	0.02	1.19	0.23	0.04
Negative emotions←External responsibility	–0.04	0.02	2.40	0.02*	–0.08
Negative emotions←Risk perceptions	0.43	0.03	15.21	***	0.57

Note: SE = Standard Error; CR = Critical Ratio; * = $p \leq 0.05$; ** = $p \leq 0.01$; *** = $p \leq 0.00$
Source: Prepared by the authors.

5. Discussion and conclusions

5.1. General structural model

The proposed *General-StrMod* explains 44% of the variance in the *negative emotions* construct through six endogenous variables (Figure 2), all of which have a statistically significant causal influence (Table 2). These results, together with the satisfactory model fit (Table 1), indicate that the proposed exploratory model is appropriate, particularly given the complexity and multidimensionality of emotions and the appraisal processes that underlie their elicitation (Moors *et al.*, 2013). They also support the robustness and relevance of the theoretical and empirical bases that underpin the proposed model.

The *General-StrMod* also explains 22% of the variance in the *positive emotions* construct through the six exogenous variables, all of which exert a significant causal influence (Table 2). In this case, the model accounts for almost a quarter of the variance in the intensity of *positive emotions*, which is an appropriate result given the complexity of emotional processes.

The theoretical-empirical bases of the *General-StrMod* are common to both emotional constructs, and the divergence in explained variance therefore requires analysis of the standardised regression weights (β coefficients). It is important to examine the possible moderating influence of categorical variables through multigroup analysis.

Because β coefficients allow the strength of causal influences between variables to be compared independently of measurement scale differences, the discussion is based on this coefficient.

In relation to the *Information Sources* block (Table 2), the frequency of consultation of *traditional media* shows the highest β value (0.20) for influence on *positive emotions* in the *General-StrMod*. By contrast, *specialised sources* and *social networks* display lower β values, which are similar to each other. The interpretation of the influence of *information sources* on the *emotional appraisal* of *positive emotions* largely depends on the accuracy and realism of the information conveyed through these media (Balleger *et al.*, 2024; Kollmuss & Agyeman, 2002; Ojala, 2022). In the absence of qualitative data on the type of information consulted, two hypotheses are proposed: 1) beneficial influence, where the increase results from access to realistic information about the capacity for climate action, progress in climate movements, environmental policies and so forth, creating a stronger sense of control and agency in relation to climate change (Hickman *et al.*, 2021; Ojala, 2022); and 2) harmful influence, where the increase is due to an unrealistic perception of control, shaped by discourses linked to *subtle forms of climate change denial* (Almirón & Moreno, 2022). In the case of *specialised sources*, which are typically managed by educators and climate activists, hypothesis 1 is considered more plausible, although this cannot be regarded as conclusive.

A similar pattern to that observed for *positive emotions* emerges in *negative emotions*, although with lower β scores. *Traditional media* has the second highest β value in the model, followed by *specialised sources* and *social networks* (Table 2). The hypotheses for their influence on *emotional appraisal* are as follows: 3) beneficial influence, where the increase is linked to realistic information about climate change that elicits negative feelings capable of motivating action without leading to immobilisation due to a perceived lack of control or capacity for action; 4) harmful influence, where the increase stems from overexposure to the consequences of climate change (present and future), including catastrophic narratives and/or a lack of clear connections to possible actions. As in the case of *positive emotions*, hypothesis 3 is considered more plausible for *specialised sources*.

The pattern of direct influence of *Information Sources* on both emotional constructs aligns with the hypothesis of González-Muñoz *et al.* (2024), who argued that more frequent consultation about climate change is associated with greater interest and heightened

emotional intensity, as proposed by the *appraisal theory* (Moors *et al.*, 2013). The SEM of the *General-StrMod* adds a further layer of discussion to this initial hypothesis, showing that: 1) the ordering of *traditional media*, *specialised sources* and *social networks* by β size is similar for both emotional categories, and 2) the β values for all *information sources* are somewhat higher in their influence on *positive emotions* than on *negative emotions*. These findings are consistent with those reported in other international studies (Ogunbode *et al.*, 2024).

The β values show a strong sense of *internal responsibility* for the causes of climate change on positive emotions, with the second highest coefficient in the model. *By contrast, external responsibility* attributed to Andalusia records the lowest value. Both exert a direct influence, yet the difference in β suggests that *internal responsibility* provides a greater sense of control over climate change and its evolution than *external responsibility*. These findings are consistent with the *appraisal theory of emotions* (Moors *et al.*, 2013) and with previous research on control (Domínguez, 2020; González-Muñoz *et al.*, 2024). As noted in relation to *information sources*, it is crucial that this sense of control be grounded in accurante information rather than in *subtle forms of climate change denial*.

For *negative emotions*, the β value of *internal responsibility* is relatively small (0.06). *External responsibility* shows the same value, but it is the only variable in the model with an inverse effect (-0.06). In this case, increases in *internal responsibility* are interpreted as producing a slight rise in the intensity of *negative emotions*, which the literature links to efforts to combat or prevent the underlying problem, provided individuals perceive a certain degree of control over the situation. By contrast, greater perceived *external responsibility*, which reduces the sense of personal responsibility, may encourage emotional disengagement from the problem, leading to a form of emotional 'short-sightedness' (Brosch, 2021; Moors *et al.*, 2013).

To conclude the analysis of *positive emotions*, *risk perceptions* show a direct influence. This finding contrasts with expectations, as the literature consulted in constructing the model points to an inverse relationship (Harth, 2021; Ojala, 2022; Schneider *et al.*, 2021; Smith & Leiserowitz, 2014). Further research is needed to explore this effect, which may attributable to variables not included in the *General-StrMod* or to the influence of moderating variables.

Risk perceptions exert a strong direct influence on *negative emotions*, with the highest βvalue of the *General-StrMod* (0.54) by a considerable margin, explaining much of the construct's variability. These results are consistent with the foundations of the model (Brosch, 2021; Meng *et al.*, 2023; Savadori & Lauriola, 2021). It is nonetheless essential that such perceptions be realistic and accompanied by knowledge and support for climate action, in order to reduce the risk of eco-anxiety, inaction or avoidant behaviours arising from viewing climate change as an overwhelming challenge.

5.2. Multigroup analysis of the *year group* variable: differences and similarities in emotional appraisal

The interpretation of the multigroup analysis of the *year group* variable drew on the descriptive-inferential analyses (Table 4), the β coefficients and their significance (Tables 5 and 6), and the significant results from the chi-squared difference tests of each structural relationship.

With regard to the significant difference by *year group* in the influence of *social networks* on both *positive* and *negative emotions*, participants from Year 4 ESO, (*Year 4 ESO-StrMod*) showed higher β values than those in Year 1 ESO (*Year 1 ESO-StrMod*), with differences of 0.05 for *positive emotions* and 0.04 for *negative emotions*. These divergences cannot be explained by significant differences in mean scores of the groups for frequency of consultation of *social networks* between the groups (Table 4). The results therefore suggest that students further advanced in their studies place greater importance on information obtained from *social networks*, both online (Twitter, Instagram, etc.) and

offline (friends and family) in their emotional appraisal of climate change. The difference in the influence of *social networks*, although not entirely clear, may be explained by various factors. In the online sphere, both the type of information consumed and the degree of credibility or authority attributed to it may play a role (Anguiano & Ilundain, 2021). In offline networks, while the effect also depends on the type of information and opinions shared, social acceptance and group identity become increasingly central during adolescence as individuals progress through this developmental stage, as highlighted in the conceptual framework of Ciranka and van den Bos (2019).

A significant difference was found on the influence of external responsibility on *negative emotions* by *year group*. Students from Year 4 ESO displayed a stronger inverse relationship (-0.08) than their younger counterparts (-0.04). Moreover, the significance of the *negative emotions* ß *external responsibility* relationship observed in the *General-StrMod* and in the *Year 4 ESO-StrMod* diminishes to the point of non-significance in the *Year 1 ESO-StrMod* (Table 5). By contrast, *internal responsibility*, although not showing a significant difference in its influence on the endogenous variables, does vary by *year group* in the significance of the β coefficient for *negative emotions* (Tables 5 and 6). Unlike *external responsibility*, the significance of the original direct relationship (*General-StrMod*) is maintained in the *Year 1 ESO-StrMod* but is lost in the *Year 4 ESO-StrMod*. Taken together, these results suggest that as students move through the Andalusian education system and, predictably, gain a greater understanding of the structural causes of climate change, they tend to externalise responsibility for its origins and escalation, thereby reducing their negative emotional load. In light of this, two hypotheses are proposed: 5) beneficial influence, where externalising causal responsibility allow students to reduce their *negative emotions*, helping them to avoid becoming overwhelmed or suffering eco-anxiety without diminishing their intention to act on climate change; and 6) harmful influence, where emotional detachment and denial of responsibility leads to disengagement from the phenomenon, encouraging avoidance and/or inaction.

6. Implications, limitations, and future lines of study

The *General-StrMod* shows a good level of fit, explaining almost half of the variance in *negative emotions* and almost a quarter in *positive emotions*. Both results are noteworthy, considering the inherent complexity and multidimensionality of emotions and the *emotional appraisal* processes that elicit them. The interpretation of the structural relationships in the *General-StrMod* provides a baseline for the field, underscoring the need for further multivariate studies at regional, national and international levels to test the generality of these findings. This study offers innovative and relevant contributions with implications for scientific research and for knowledge transfer across politics, society and communication.

In the field of education, these results have important implications for interventions and curriculum design in relation to climate change. Educators must address the climate crisis holistically, not only by covering conceptual aspects, but also recognising how information accessed by students outside the classroom influences their *emotional appraisal*. It is also essential to foster student perceptions of responsibility and risk that are realistic and oriented towards climate action. The findings show that students place more weight on information from *traditional media* than in *specialised sources*, even though the latter should in principle be more trustworthy and less likely to spread *subtle discourses of climate change denial*. This points to a need to reconsider which features of *traditional media* (e.g., audiovisual communication, the emotional tone of discourse, etc.) generate this imbalance, and to adopt more emotionally engaging and entertaining pedagogies such as game-based learning and other innovative or disruptive methodologies.

As students progress through ESO, they appear to place greater emotional weight on *social networks* (both online and offline) and to display an emotional pattern characterised

by a reduced sense of control over climate change, reflected in a significant decrease in *positive emotions* compared with Year 1 ESO and in the significant causal influence of *external responsibility* as an attenuator of *negative emotions.* It is therefore crucial at this educational stage to promote a critical and reflexive stance towards the information students consume and share, particularly on *social networks*, and to strengthen their emotional engagement with their own role in environmental action.

This study has several limitations. First, the absence of qualitative data restricts the interpretation of many of the results, making it necessary for the authors to propose hypotheses to address this gap. Second, although the sample size is adequate for SEM (n = 1.050), it is limited to the autonomous region of Andalusia, Spain. As the literature recognises emotional processes are influenced by numerous variables, including cultural and regional factors, any generalisation to national and international contexts should be made with caution. Third, the proportions of positive and negative emotions included in the questionnaire are uneven, which should be addressed in future instruments to capture the diversity of emotions more equitably. Fourth, the variance explained by the *General-StrMod* for *positive emotions* is half that explained for *negative emotions*, highlighting the need to incorporate additional variables into the model. Finally, the imbalance in ownership models among the schools surveyed may have introduced some bias.

Author contributions

Enrique González-Muñoz: Conceptualisation, data curation, formal analysis, methodology, resources, software, visualisation, writing (original draft), writing (reviewing and editing).

José Gutiérrez-Pérez: Conceptualisation, funding acquisition, investigation, methodology, project administration, resources, supervision, writing (original draft), writing (reviewing and editing).

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Reliability and validity of the upper secondary education teaching competencies scale

Fiabilidad y validez de la escala de competencias docentes de educación media superior

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Abstract:

The psychometric properties of content validity, construct validity, and reliability of an instrument to assess teaching competencies in upper secondary education were analysed. To analyse content validity, the instrument was evaluated by 21 experts and Aiken's content validity coefficient V was then calculated. Its reliability was evaluated with McDonald's Omega. For the analysis of construct validity, the instrument was administered to 3726 upper secondary education students. In the construct validity analysis, a cross-validation process was used that involved exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The instrument included the eight competencies established by the Government of Mexico in a simplified manner and in total consisted of 20 items. The items were validated for content (Aiken's V > 0.75, LV > 0.50). Its reliability was optimal (McDonald's Omega: 0.959, 95 % CI: 0.957 ± 0.961). The EFA also verified the instrument's correspondence with the theoretical model, as it only indicated one factor that explained 60 % of variance and in which 18 of the 20 items were represented. The evaluation of this model by confirmatory factor analysis revealed an optimal fit (χ^2/df ratio: 1.89; GFI: 0.995; RMSAE: 0.050; RMR: 0.028; CFI: 0.992; TLI: 0.994). The ECDEMS instrument has adequate psychometric properties.

Keywords: factor analysis, teaching, competence-based education, student, assessment, measurement instrument

Resumen:

Se analizaron las propiedades psicométricas de validez de contenido, constructo y confiabilidad de un instrumento para evaluar las competencias docentes en la educación media superior. Para la validez de dicho contenido, el instrumento se sometió al juicio de 21 jueces y se calculó el coeficiente de validez de contenido V de Aiken. La confiabilidad fue evaluada con

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el Omega de McDonald. Para el análisis de la validez de constructo, el instrumento se aplicó a 3726 estudiantes de la educación media superior. En el análisis de validez del constructo, se empleó un proceso de validación cruzada que involucró el análisis factorial exploratorio (AFE) y el análisis factorial confirmatorio (AFC). El instrumento integró de manera simplificada las ocho competencias establecidas por el Gobierno de México y en total se conformó de 20 ítems. Los ítems fueron validados en contenido (V de Aiken > 0.75, VI > 0.50). La confiabilidad fue óptima (Omega de McDonald: 0.959 IC al 95 %: 0.957 ± 0.961). Por su parte, en el AFE se verificó la correspondencia del instrumento con el modelo teórico, ya que únicamente denotó un factor que explicó 60 % de varianza, en el cual se encontraron representados 18 de los 20 ítems. La evaluación de este modelo mediante el análisis factorial confirmatorio reveló un ajuste óptimo (razón χ^2/gl: 1.89; GFI: 0.995; RMSAE: 0.050; RMR: 0.028; CFI: 0.992; TLI: 0.994). El instrumento «ECDEMS» posee adecuadas propiedades psicométricas.

Palabras clave: análisis factorial, docencia, educación basada en las competencias, estudiante, evaluación, instrumento de medida.

1. Introduction

The term competences, first used by McClelland (1973), is defined as a capacity that includes intelligence, aptitudes, motivation, personality traits, and behaviours that make for effective job performance by people and success in life. Boyatzis (1983) subsequently developed a systemic–empirical focus to evaluate and develop managerial talent in organisations, and later (2006) categorised competences into cognitive, emotional and behavioural ones when comparing high-performing employees' attributes with those of employees with average performance. While there have been terminological advances, the concept remains multifaceted, complex, open to debate, and lacking a consensus.

There are two main tendencies in the term depending on the context in which it is used. The first focusses on evaluation of work tasks and the second, on people's behaviours, attitudes, and performance (Wong, 2020). But in a broad sense, competences are regarded as capacities, attributes, knowledge, skills, self-concepts, values, personal traits, motivations, attitudes, or trainable, observable and measurable factors that make it possible to develop a complex and specific job and to do so outstandingly (Arribas et al., 2024; Zumstein-Shaha & Grace, 2023; WHO, 2022).

Something similar happens with the concept of teaching competences, as these have a wide range of definitions, which can be summarised as knowledge, skills, capacities, values, attitudes, and didactic–pedagogical experiences that enable teachers to create effective, efficient, excellent, and productive learning environments, under specific contexts and complex demands, seeking to develop the potential and formation of students, in accordance with the educational objectives established by the institution (Burbano et al., 2024; Otto, 2024; Singh, 2024; Uysal et al., 2021; Zhou et al., 2023).

Given the many meanings of teaching competences as a term, this article uses the definition established by the Mexican government for upper secondary education (USE): "those that formulate the individual qualities, of an ethical, academic, professional, and social character that the teacher must possess" (DOF, 2008c, p. 2). These are classified in eight personalised competences and are contextualised within Mexico's National Baccalaureate System: continuous professional training; command of knowledge to achieve meaningful learning; planning with a competence-based and contextualised focus; practising an effective, creative, and innovative teaching–learning process; providing formative assessment; building autonomous and collaborative learning; promoting healthy and integral development; and participating in the constant improvement of the school and in institutional management

(pp. 2–3). These are aligned with the generic competences (DOF, 2008b, pp. 2–4), disciplinary competences (DOF, 2008b, pp. 4–7), professional competences (DOF, 2008b, pp. 7–8), and extended competences (DOF, 2008b, pp. 6–7) of the students (DOF, 2008b; DOF, 2009), as well as competences required for the leaders of schools (DOF, 2008d, pp. 2–4).

Given their national and international relevance, teaching competences are important because they are part of the professionalisation of teachers (Agüero-Servín, 2022), who are the key stakeholders in education systems (Domínguez-González & Serna-Poot, 2021) and are responsible for the efficient implementation of the teaching–learning process (Granada et al., 2024). In the case of students, teachers' competences help them improve their educational achievement, as some studies attest (Di Lisio et al., 2025; Firda & Khairat, 2023; Putra & Yanto, 2025), they help students go on to higher education (Hollenstein & Brühwiler, 2024) and find better jobs (Gonzáles & Estrella, 2023) and they contribute to national and global development (DOF, 2008a, p. 2).

Moreover, it is essential to evaluate teaching competences given that they make it possible to diagnose the educator's capacity to transfer knowledge (Brown, 2024), identify their strengths and opportunities to improve the quality of teaching (Skedsmo & Huber, 2024), improve their professional development (Perrenoud, 2004; Wang & Sang, 2024), and inform society (Bleiberg et al., 2024), decision makers (Hunter & Kho, 2023), and educational policymakers (Castro-Castillo et al., 2024).

From the students' perspective, evaluating teachers' competences makes it possible to obtain, among others, indicators of the degree of development of the students' competences, which derive from the teachers' competences (Nessa et al., 2024), as well as of the level of learning acquired (Sánchez-Tarazaga & Ferrández-Berrueco, 2022). However, it is vital to have appropriate instruments for these aims.

Given the importance, complexity, and challenges of evaluating teaching competences in USE, there are several international instruments (Aydin et al., 2024; Baena-Extremera et al., 2015; Cabero-Almenara & Palacios-Rodríguez, 2020; Cinque Gómez-del-Pulgar & Rodríguez-Mantilla, 2020; Chee Yuet et al., 2016; Cortes et al., 2020; Fernández-Díaz et al., 2016; Gümüs & Kulkul, 2023; Kim & Kim, 2016; Salihu, 2019; Sánchez-Tarazaga & Fernández-Berrueco, 2022), as well as ones for Latin America (Hernández-Suárez et al., 2021; Pérez-Contreras et al., 2022), and for Mexico (Abarca-Cedeño et al., 2024; Luna-Serrano & Reyes-Piñuelos, 2015; Morán et al., 2015; Ramón-Santiago et al., 2017). Instruments self-administered by the teacher are most common, with few that are answered by the students, such as those of Baena-Extremera et al. (2015), Luna-Serrano and Reyes-Piñuelos (2015), and Ramón-Santiago et al. (2017).

When considering the theoretical foundations of these instruments, in most of them: a) there is a lack appropriate foundations for the teaching competences construct in USE; b) they are not confined to a specific focus; c) the dimensions established are broad and the items unrepresentative; d) the theoretical model that underpins the instrument is poorly identified; and finally e) they display dimensions and measurements of behaviours of little relevance, presenting under and over-representation of some domains.

Given these limitations, it should be noted that constructing an instrument demands the existence of an adequate justification, a precise definition of the study variable, a correct working, semantic, and syntactic definition of its relevant dimensions and pertinent behaviours; and an interrelation between these elements and items (Muñiz & Fonseca-Pedrero, 2019). Likewise, specific identification of the context of the study, the target population, the circumstances, the form of application, and the use of the instrument are vital, as are the appropriate content and construct analyses (AERA et al., 2014).

Consequently, the following objectives were chosen for the present study: 1) To design a scale to evaluate teaching competences in upper secondary education; 2) To determine the content validity of the instrument that evaluates individual competences of teachers from the students' perspective; 3) To define the general reliability of the instrument with McDonald's Omega; and 4) To establish the construct validity of the tool through exploratory and confirmatory factor analysis.

2. Methodology

2.1. Type of study

An instrumental study was performed, which, as Montero and León observe (2007), involves the development of tests and tools, including their design and adaptation, as well as study of their psychometric properties.

2.2. 2.2. Instrument

From the perspective of individual competences, the following working definition of the construct of teaching competences was used: "Those that comprise the individual qualities, of an ethical, academic, professional, and social character that a USE teacher must possess" (DOF, 2008c, p. 1). These include the areas of being (ethical character), knowledge (academic), action (professional), and coexistence (social), along with their respective competences and attributes that the Official Diary of the Federation establishes, superimposes, and interrelates (2008c, pp. 2–3). These qualities are also aligned with generic, disciplinary, and extended student competences (DOF, 2008b; DOF, 2009), as well as with competences required of school leadership (DOF, 2008d).

Nonetheless, to develop the Upper Secondary Education Teaching Competences Scale (Escala de Competencias Docentes de Educación Media Superior, ECDEMS), each competence specified in the Official Diary of the Federation (DOF, 2008c) was reflected on, namely: 1) Continuous professional training; 2) Command of knowledge to achieve meaningful learning; 3) Competence-focussed and contextualised planning; 4) Practising effective, creative and innovative teaching–learning processes; 5) Providing formative assessment, 6) Constructing autonomous and collaborative learning; 7) Promoting healthy and integral development; and 8) Participating in the continuous improvement of the school and in institutional management (pp. 2–3), and their respective attributes. These attributes were included in the items that make up the instrument. These comprised 20 positively worded items to be answered using a Likert-type scale with values ranging from 1 = Never to 5 = Always (Table 1).

Table 1. Structure of the ECDEMS.

Items
1) When my teacher makes a mistake in what he/she is teaching us, he/she makes an effort to improve in the following classes.
2) I note that my teacher always displays a willingness to continue learning and improve his/her classes.
3) I note that my teacher relates the content to the different subjects that I study.
4) My teacher asks us about what we have learnt in his/her classes.
5) My teacher sets project-based assignments.
6) When teaching us, my teacher emphasises practical learning.
7) I can see that my teacher plans and organises well the classes he/she teaches.
8) My teacher is creative when teaching.
9) My teacher likes to innovate when teaching us.
10) The way we are evaluated is made clear to us.

11) My teacher makes comments to us about how to improve a task or activity before giving us the definitive mark.

12) I can see that when my teacher assesses us, he/she is interested in my learning improving.

13) I think that my teacher is only interested in assessing me to give me a grade.

14) My teacher's way of teaching encourages me to continue learning for myself.

15) He/she looks for ways for us to learn by collaborating with our classmates.

16) The teacher respects our diversity of beliefs, values and ideas in the classroom.

17) His/her example inspires us to practice a healthy lifestyle.

18) He/she makes us participants in creating rules for coexistence in the classroom.

19) I can see that my teacher is committed to the continuous improvement of the school.

20) I can see that my teacher supports the administration of this school.

Source: Prepared by the authors.

2.3. Content validity analysis

The content validity analysis involved validation of the instrument by expert judgement involving 21 subject experts (Table 2). Criteria such as experience in the field of research, academic level, and experience in the design and validation of instruments (CIFE, 2018b; Juárez-Hernández et al., 2017; Juárez-Hernández & Tobón, 2018) were taken into account when selecting the experts.

TABLE 2. Characteristics of the Experts

Details	Characteristics
Gender (%)	23 % men and 77 % women
Highest level of studies	8 % post-doctoral 38 % doctoral, and 54 % master's
Roles	23 % postgraduate coordinators and administrators, 77 % research-active professors in higher education
Areas of professional experience	100 % university teaching and research

Mean years of professional experience (mean ± standard deviation)	19.84 (± 9.68)
Mean years of university teaching and research experience (mean ± standard deviation)	13.61 (± 7.82)
Mean number of articles published in the field (mean ± standard deviation)	21.69 (± 29.45)
Mean number of books published in the field (mean ± standard deviation)	4.23 (± 7.86)
Mean number of book chapters published in the field (mean ± standard deviation)	8.69 (± 13.74)
Experience in analysis, revision, design, and/or validation of research instruments	100%
Institution where they work at the moment of the evaluation of the instrument	23 % private universities, 77 % public universities

Source: Prepared by the authors.

The expert validation had a qualitative–quantitative focus (Juárez-Hernández & Tobón, 2018) and the expert validation scale was used (CIFE, 2018b), which consists of a qualitative evaluation where the experts can suggest precise improvements to items. For the quantitative evaluation, the instrument includes a Likert-type scale to evaluate the pertinence and wording of the items (Table 3), which were evaluated using Aiken's V content validity coefficient and its 95 % confidence interval (Penfield & Giacobbi, 2004). Specifically, a minimum value for acceptance of more than 0.75 for the coefficient was considered and of 0.50 for the lower value of the interval (Bulger & Housner, 2007).

Table 3. Expert Validation Scale

Category	Classification of level of pertinence	Exclusion
Pertinence The item evaluates a central aspect of the aim, dimensions, and/or theoretical construct of the instrument.	1. Not relevant	The item does not contribute to evaluating the aim, dimensions, and/or construct of the instrument. It can be eliminated completely.
	2. Low pertinence	The item evaluates a superficial aspect of the aim, dimensions, and/or construct of the instrument.
	3. Medium pertinence	The item acceptably evaluates the aim, dimensions and/or theoretical construct of the instrument.
	4. High pertinence	The item truly evaluates the aim, dimensions and/or construct of the instrument, and is in line with recent theoretical and methodological developments in the area.
Category	Classification of the level of comprehension	Exclusion
Wording The item is comprehensible by potential users and complies with the grammatical rules of the Spanish language.	1. It is not comprehensible	The item is not comprehensible by potential users of the instrument.
	2. Low comprehension	The item must be improved in at least half of its components, in aspects of wording and grammar.
	3. Medium comprehension	The item requires some superficial improvements to make its comprehension excellent.
	4. High comprehension	The item is highly comprehensible for potential users and follows the grammatical rules of the language.

Note: Taken from CIFE (2018b).

2.4. Pilot test

Having made the necessary improvements to the scale based on the experts' recommendations, the instrument was applied to 21 students from the sixth semester of USE. The chosen number of participants was based on the recommendations of Carpenter

(2018), who states that for this phase it can range from 5 to 100 people from the target group or population. The pilot group was 61.9 % female and 38.1 % male, with a mean age of 17.095 years (± 0.3008). 100 % (n = 21) were from the morning shift at a private school with a mixed socio-economic level. The pilot study analysed the feasibility of the instrument (Carvajal et al., 2011), specifically evaluating the level of understanding of the instructions and items using the instrument satisfaction questionnaire (CIFE, 2018a), and an initial reliability analysis was done using McDonald's Omega (McDonald, 1999) and its 95% confidence intervals. Regarding ethical questions, the aim of the instrument was explained to the participants, their informed consent was acquired, and their personal data was protected as required by the Mexican government (Cámara de Diputados del H. Congreso de la Unión, 2017).

2.5. 2.5. Construct validity analysis

To perform the analysis, the instrument was applied to a convenience sample of 3726 students from various USE subsystems belonging to various bodies from the south and south east of Mexico from publicly run and private schools. The mean age was 17.80 (± 0.650); 49 % female and 51 % male. As with the pilot group, the aim of the instrument was explained to them, they were asked to give informed consent, and their personal data was protected as required by the government (Cámara de Diputados del H. Congreso de la Unión, 2017).

A first analysis was done to establish whether the items fit the normal distribution using the Mardia index (Mardia, 1970). The item–test correlation was analysed and any items that displayed a value greater than 0.90 or less than 0.20 were eliminated (Tabachnick & Fidell, 2001). McDonald's Omega (McDonald, 1999) was calculated to evaluate the reliability of the instrument.

The sample was then divided into two equal parts (n1 = 1863; n2 = 1863), using random numbers through an electronic spreadsheet. The first subsample was analysed using exploratory factor analysis (EFA), and the second with confirmatory factor analysis (CFA). These analyses were done using the R software program (R Core Team, 2020). In this order, EFA was done with the first subsample to explore the structure, and CFA was done with the second subsample to confirm this structure (Brown, 2006). This process ensures that the factor structure identified is not a specific characteristic of the initial subsample, it reduces the possibility of biases, and it permits a better evaluation of the fit, stability, and quality of the model (Carpenter, 2018; Kline, 2013; Lloret-Segura et al., 2014; Worthington & Whittaker, 2006).

In the case of the EFA, the value of the determinant, the KMO test and the Bartlett test were analysed to determine their pertinence of analysis (Howard, 2016). Having established these, the type of correlation matrix and the extraction method were chosen, with the Pearson product–moment correlation matrix and the maximum likelihood estimation method being used if the items displayed a normal distribution (Howard, 2016; Lloret-Segura et al., 2014), and the polychoric matrix of correlation and the unweighted least squares (ULS) method being used if the assumption was not fulfilled (Xia & Yang, 2019). The number of factors to retain was based on the maximum consensus technique among the 23 methods used with the support of the nFactors library (Lüdecke et al., 2020). For the analysis of the factor matrix, the significance of the factor loadings per item had to be greater than 0.55 (Hair et al., 2010). In the event of problems with factorial complexity, the matrix was rotated using the most appropriate method (Juárez-Hernández, 2018; Lloret-Segura et al., 2014).

The factor structure obtained from the EFA was analysed in the second subsample using CFA. The maximum likelihood estimation method was used if the assumption of normality was fulfilled; if it was not, the unweighted least squares (ULS) estimation method was used (Yuan, 2005). The model's goodness of fit was evaluated using various indicators and indices (χ^2/df, GFI, CFI, TLI, RMSEA, RMR), considering the threshold values indicated by Ráczová et al. (2021). This analysis was done using the R software program and the laavan (Rosseel, 2012) and psych (Revelle, 2017) packages.

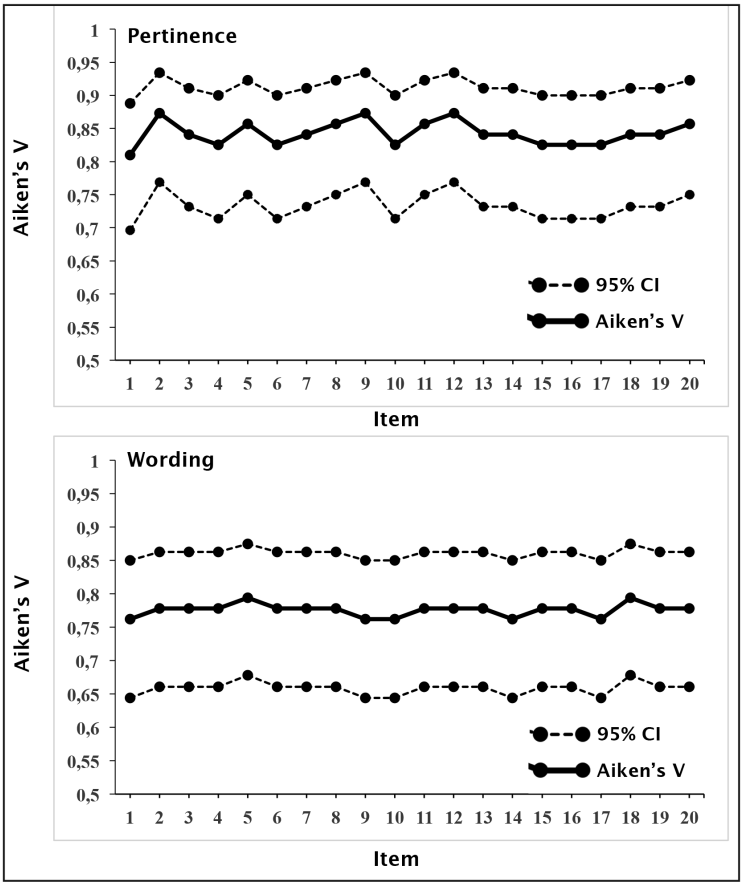
Through the standardised factor loadings, the average variance extracted (AVE) and the composite reliability were calculated, with the threshold value for the former being greater than 0.50 (Fornell & Larcker, 1981) and for the latter 0.70 (Hair et al., 2014). The convergent validity was analysed, considering that the AVE must be greater than or equal to 0.5, the standardised factor loadings greater than 0.50, and the composite reliability greater than 0.70 (Fornell & Larcker, 1981; Hair et al., 2014). Finally, the reliability was evaluated using McDonald's Omega (McDonald, 1999) and its 95% confidence intervals.

3. Results

3.1. Content validity analysis

All of the items were validated in the pertinence and wording criteria (Aiken's V > 0.75, LV > 0.50) (Figure 1).

FIGURE 1. Representation of the Results of the Quantitative Analysis of the Validation by Experts.



Source: Prepared by the authors.

The qualitative evaluation provided some observations relating to questions of wording that required attention (Table 4).

Table 4. Observations by the Experts

Items	Observations
13. I think that my teacher is only interested in assessing me to give me a grade.	Expert 1: The question should be in the same direction as the others as this complicates the scoring.
19. I can see that my teacher is committed to the continuous improvement of the school.	Expert 2: The question should be in the same direction as the others as this complicates the scoring.

Source: Prepared by the authors.

3.2. Pilot group

In general terms, the participants reported a high level of comprehension of the items (66.7 %) and a high level of comprehension of the instructions (76 %). Regarding the level of relevance and pertinence of the items, they described most of them as very important (47.6 %). The average time to respond to the instrument was 5.71 minutes. The reliability of this phase was optimal (McDonald's Omega: 0.920, 95 % CI: 0.853 ± 0.960).

3.3. Analysis of items and reliability

The absence of multivariate normality (kurtosis $p < 0.05$; skew < 0.05) was verified. Regarding the item–test correlation (ITC), it was found that item 13 had to be eliminated (Table 5). In this regard, this item makes a negative affirmation and states: I think that my teacher is only interested in assessing me to give me a grade. After this, the reliability was optimal (McDonald's Omega: 0.959, 95 % CI: 0.957 ± 0.961).

Table 5. Initial Analysis of the Items

Item	Item–test correlation
1	0.741
2	0.793
3	0.535
4	0.67
5	0.382

6	0.746
7	0.792
8	0.784
9	0.789
10	0.734
11	0.722
12	0.759
13	0.044
14	0.773
15	0.743
16	0.612
17	0.752
18	0.709
19	0.777
20	0.684

Source: Prepared by the authors.

3.4. Construct validity analysis

The analysis of the assumptions for application of EFA was satisfactory, as the variables were found to be significantly related ($p < 0.05$) and a determinant close to zero was found (0.0000001735). Similarly, the Kaiser–Meyer–Olkin test (KMO: 0.98) and Bartlett's test of sphericity ($p < 0.001$) demonstrated the pertinence of the use of EFA.

With regards to the extraction of factors, it was necessary to retain one factor, which contained 18 of the 19 items (with factor loadings greater than 0.50) and explained more than 60 % of the variance (Table 6). The resulting factor model corresponded with the theoretical model, which indicates that the items refer to the personal characteristics of teachers specified in Agreement 447, expressed as competences and attributes, because they are directly related to the teachers' being, knowledge, action, and coexistence.

Table 6. Result of the Exploratory Factor Analysis

Item	Factor loading
9	0.87
2	0.86
7	0.85
8	0.84
14	0.83
19	0.83
12	0.82
17	0.81
1	0.8
6	0.79
15	0.79
10	0.79
11	0.77
18	0.76
20	0.73
4	0.72
16	0.69
3	0.56

Source: Prepared by the authors.

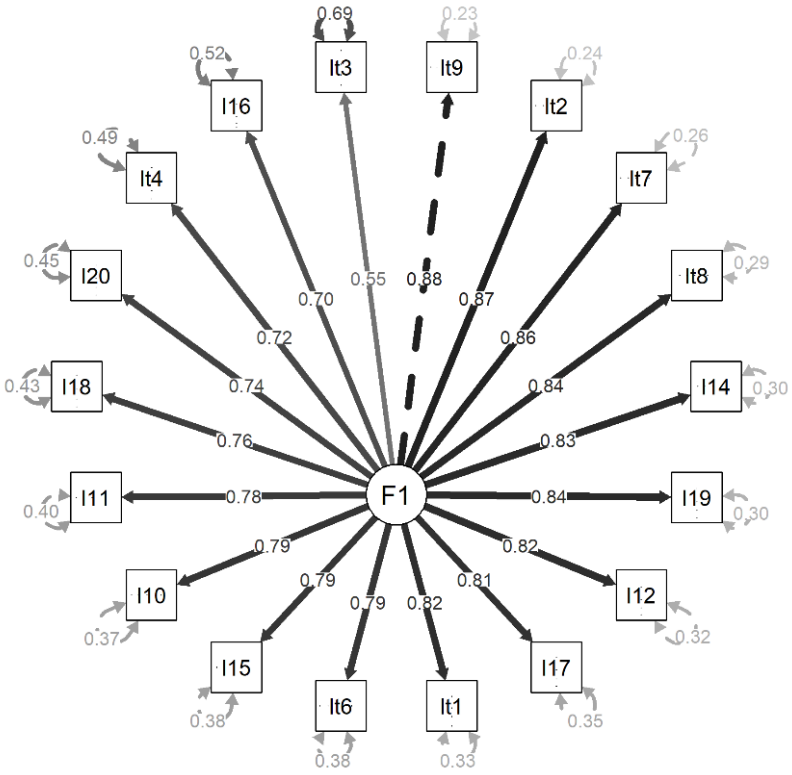
The CFA displayed a good fit for the model obtained (Table 6), as the different indices displayed optimal values (Table 7). The value of the average variance extracted (AVE: 0.7905) and of the composite reliability (CR: 0.966) were optimal. Each item displayed standardised factor loadings greater than 0.50 (Figure 2).

TABLE 7. Fit of the Factor Model

Index	Value expected (Ráczová et al., 2021)	Value obtained
Chi-squared/degrees of freedom ratio (χ^2/df)	Menor a 3	1.89
Goodness of fit index (GFI)	Mayor a 0.90	0.995
Root mean square error of approximation (RMSEA)	0.050 a 0.080	0.050 (0.048 a 0.079)
Root mean square residual (RMSR)	Menor a .050	0.028
Comparative fit index (CFI)	Mayor a 0.95	0.992
Tucker–Lewis Index (TLI)	Mayor a 0.90	0.994

Source: Prepared by the authors.

FIGURE 2. Representation of the Confirmatory Factor Model



Source: Prepared by the authors.

4. Discussion

Studying the construct of teaching competences is, among other reasons, part of the process of professionalisation of teachers to provide quality education, as they are key figures in education systems given the effectiveness and efficiency that they must demonstrate in the teaching–learning process in order to elevate students' educational achievements so that they can access a better quality of life in a globalised world.

It has also been established that evaluating teaching competences is important in USE, as this provides valuable data for public policymakers and decision makers within institutions. Specifically, it makes it possible to diagnose teachers' ability to transfer knowledge and to identify their strengths and weaknesses as points of reference to improve their educational and professional quality, as all educational processes and the stakeholders in them are ultimately closely connected to one another, in order to shape a student body that is competitive and ready to join the world of work or to go on to higher education.

Against this background, although it has been demonstrated that there are tools for evaluating teaching competence, these have been found to have limitations with regards to solid theoretical bases, and they have not been tested in a variety of contexts to confirm that they are appropriate for measuring the construct of teaching competences in USE. Consequently, there is a need to design and comprehensively validate the ECDEMS, based on the theoretical formulations of the Common Curriculum Framework of the National Upper Secondary Education System (Marco Curricular Común del Sistema Nacional de Educación Media Superior) and aligned with competences of the students and management of educational institutions at this level.

In line with these considerations, relevance is given to the individual qualities of the teachers' being, knowledge, action, and coexistence as a professional, which were transformed into items elaborated in the form of a scale as use of this type of instrument is recommended when measuring single-variable attributes (teaching competences), with graded answer options from which the respondent – in this case the student – must pick one.

After creating the instrument, it is vital to evaluate the quality of its measurement, which is done by analysis of its psychometric properties (Carvajal et al., 2011). In this regard, validation by experts found that all of the items displayed content validity. This means that the instrument reflects a specific content domain that it measures (Hernández-Sampieri et al., 2010). It is important to note that the validation by experts was based on quality guidelines, such as the selection of experts, the number of experts, qualitative–quantitative evaluation, and analysis by means of a relevance index (Juárez-Hernández & Tobón, 2018; Maldonado-Suárez & Santoyo-Telles, 2024), which gave the validation robustness and precision.

As for pilot testing, this is a fundamental phase, as its objective is to provide an initial approach to the instrument's adequacy for the target population, verify logistical aspects of application and administration of the instrument, and perform an initial analysis of reliability (Carpenter, 2017; Maldonado-Suárez & Santoyo-Telles, 2024; Muñiz & Fonseca-Pedrero, 2019). Accordingly, the adequacy of the instrument in this phase was satisfactory, as the degree of comprehension of items was acceptable and the degree of comprehension of the instructions was good. For its part, the reliability in this application was optimal.

A cross-validation process was performed for construct validity analysis, which is considered to be optimal (Lloret-Segura et al., 2014). EFA was used to test the structure that underlines the set of items, and CFA to validate this structure (Lloret-Segura et al., 2014). In this order, the preliminary analysis of the items found that item 13 – "I think that my teacher is only interested in assessing me to give me a grade" – displayed a low correlation with the instrument. Logic suggests that the correlation being like this is correct because, on the one hand, it addresses the absence of a competence, something that is not part of the study

performed, and on the other hand it could be due to lack of understanding by the respondent, or unclear wording.

According to the results of the EFA, the correspondence with the proposed theoretical model is established, in other words, one single factor explained more than 60 % of the variance, which is considered optimal (Velicer & Fava, 1998). In this sense, this factor included 95 % of the items, meaning that these represent the construct addressed (Lagunes, 2017), which emphasises the significance of the content validation process performed (Hayness et al., 2009). Regarding item 5, which was not represented in the factor model ("My teacher sets project-based assignments"), this could be because it addresses aspects relating to activities outside the classroom and non-specific assignments with a large scope, or, as noted above, it could be because of unclear wording or a failure to understand the item by the respondent.

The evaluation of the factor model through CFA verified the model's fit with the data, as all of the indicators displayed near optimal values. One aspect to note was the value of the standardised factor loadings, the average variance extracted, and the composite reliability, which indicate the existence of convergent validity (Fornell & Larcker, 1981; Hair et al., 2010), meaning that the proposed indicators adequately measure this factor (Cheung & Wang, 2017).

Observation through content validity that the instrument measures a specific domain (for example, personal competences), that the EFA identifies correspondence with the proposed theoretical model, and that the CFA corroborates the empirical sustainability of the model demonstrates that the instrument addresses the needs and distinctive characteristics of human nature through teaching competences. In other words, they emphasise analytical competences, action-oriented competences and the social competences of Baartman (2007) while seeking to develop personal well-being and the competence of the students (Braun & Hooper, 2024; Cachutt-Alvarado et al., 2024).

With regards to reliability, according to the results this was optimal; the precision and the degree of correlation between the final 18 items of the instrument is noted, indicating that the measurement is free from error (Carvajal et al., 2011; Jabrayilov et al., 2016). Therefore, we can conclude that the ECDEMS has adequate psychometric properties that reflect the quality of its measurement.

One strength of the study is that it followed the ideal model presented in the literature with content analysis performed first followed by analysis of construct validity through the process of cross validation (EFA and CFA). Also, a reasonably large sample population was used from a major geographical sector of the south and south east area of Mexico.

One significant limitation of the present study is methodological as probability sampling was used, which prevents the findings from being generalised. Another could be how each participant interpreted each item, as well as their socio-emotional conditions when they responded. A further limitation is the form or the circumstances under which the researchers collected the information.

5. Conclusion

Using evaluation scales such as the present instrument has important theoretical and practical implications because it allows measurements of teaching performance in USE to be contrasted with what theory states. For future teachers, it enables personalised identification of areas for improvement, as well as possibilities for professional feedback and the development of key and specific competences to increase students' educational achievement, as well as improving the efficacy of the local teacher training programmes.

This tool can also be used by educational policy makers and by the leaders of upper-secondary education institutes to diagnose teaching competences at the macro level and establish the corresponding medium- and long-term strategies.

Consequently, future research should replicate this study in other contexts both in Mexico and abroad, using probability sampling so that the results obtained can be generalised, and carry out comparative studies by gender to evaluate students' perception of their teachers, according to the regions they are from.

Author contributions

Dr. Emerson López-López: Conceptualisation, data curation, investigation, methodology, data collection, project administration, writing – original draft, writing – review & editing.

Dr Luis Gibran Juárez-Hernández: Data curation, methodology, formal analysis, supervision, validation, visualisation, writing – original draft, writing – review & editing.

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In Memoriam: Memories of My Friendship With Alejandro Llano

Although I'm no extrovert, a life that has already spanned many years has brought me some memorable friendships, cut short by the fragility of existence sooner than I've wanted or needed. That of Alejandro has been among those with the greatest impact, so much so that moments I had with him keep coming to mind, sayings of his that ingrained in me, teachings I owe to him and that help me in moments like this, in the trance of feeling his departure as an emptiness that cannot be filled. He would also recall phrases he'd heard from his friend and teacher Florentino Pérez Embid, one of which comes to mind now: 'Face it, dear Alejandro: at this point all we have left is the *desecho de tienta*...' For those who aren't into bullfighting, this is what they call rejected bulls that breeders deem unfit for bullfighting after having been enticed and tested. We also feel quite like the *'desecho de tienta'* in comparison to the great personalities we meet, with their 'great feats' and likewise all their 'small gestures', like that cordiality, that joy, those witticisms, those conversations which, at the time, may have seemed trivial, but which later become precious experiences that are lost... forever? Our memory clings to them, but our recollection is also fallible, and is gradually torn to shreds, as Alejandro himself had to suffer in his own spirit—a pain that he was able to bear with admirable fortitude.

There are some experiences that can't be swept away by even the strongest winds. Such was that morning in Madrid, more than ten years ago, outside the door to where we were about to have one of our seminars, when out of nowhere he said to me: 'Juan, I've been diagnosed with Alzheimer's.' I was so stunned that I didn't know what to say or do, except give him a fierce hug, probably the first and last we ever shared in all our years of companionship. That was actually a very strange thing about this relationship: we always kept our distance, we weren't the type to divulge our deepest secrets, and we never completely opened our hearts to one another. That was surely somewhat down to our nature, but mostly it was because we never really needed to. All our lives we'd been close, but without actually touching: I went from the University of Navarra to the University of Seville right when he moved to Navarra from Valencia. We both wrote our thesis on Kant; but he gave special (and original) attention to *Opus Postumum*, while I stuck to his pre-critical period. We were both interested in the problem of knowledge, but he took the metaphysics approach; I, however, took the natural philosophy route. We converged in many areas, but we never overlapped. While he was my superior in 'age, dignity and authority', I was his complement as opposed to his disciple: he knew a lot of things and possessed skills I'd like to have known and had. Meanwhile, he wouldn't have minded being a little more familiar with mathematics and natural science, as he rather liberally saw as my forte. I was undoubtedly luckier than he was in certain academic endeavours, and above all much more willing to devote myself to what I liked rather than to what I 'had to' do. His generosity was such that instead of feeling wounded, he was delighted to see that a friend had achieved noble ambitions that he himself had been denied, both in my case and in that of others. In short, his personality sometimes reminds me of James Stewart in the film *It's A Wonderful Life*.

Alejandro Llano viewed existence first and foremost as a commitment, and set his priorities on this basis. In this sense he had a fundamentally ethical personality, although he still had a hedonic side to him, which was in any case focused on the intellectual: he enjoyed studying and devoted himself to it with the passion of someone who could conceive of no greater pleasure than discovering the truth. In other words, he was a philosopher from head to toe. An entire day reading challenging texts, taking notes, getting ahead of research—for him, that was the limit of earthly happiness, a foretaste of another more complete happiness towards which his serene religiosity pointed. I remember around 1983 we spent the summer working together in the old humanities library in Pamplona. Our desks were close to each other: I was toiling away with a translation of Kant's *Living Forces* while he was engrossed in writing *Metaphysics and Language*. It was scorching hot and there was no air conditioning. My enthusiasm began to wane and I often thought of packing up all my things and escaping to the nearest swimming pool. But there he was, unyielding, undeterred by discomfort, diving into a sea of ideas, cooling off in the breeze blown by the great thinkers and seasoning the lulls with hints of the finest humour. Other considerations were unnecessary: I dismissed the idea of throwing in the towel, and at the end of August I returned home having completed my translation.

What's more, beyond his scholarly side, his pure intellect, Alejandro possessed immense leadership skills. He was a man who didn't drag people along by giving them orders or instructions, but by example; a sort of infectious enthusiasm. His leadership style made me think of those infantry officers who're the first to jump out of the trench, without needing to look back to make sure their soldiers are following as one man. I suppose—although I didn't know him at the time—that the years he spent as the head of a residential college in Valencia were the ones most in keeping with his charisma, because he knew, without being verbose, how to convey passion for a job well done, for effort taken on as a joyful challenge. He managed to make you forget the obligation behind a task you needed to do; rather, he framed it as an exciting opportunity, through a change of perspective that gave you the key to a successful life.

Youthful leadership and a passion for work: with these footholds, Alejandro made it his life's work to confront Christian truth with the thinking of late modernity and confused contemporaneity. The latest derivations of Kantianism, attempts to reconstruct a realist metaphysics, a linguistic shift, analytic philosophy, the philosophy of action, new developments in the philosophy of religion, and post-metaphysical thought were just some of the most important milestones in this journey, each of which left a wealth of publications, doctoral theses and research projects carried out by his own hand or by his disciples and friends. This is how one of the most important chapters of recent Spanish and Latin American philosophy has been written. I was involved in some of these ventures along with Lourdes Flamarique, José María Torralba, Marcela García, Amalia Quevedo, Rafael Llano and so many other collaborators of the undisputed leader of the group. My role was subordinate, since I'd never been good at being part of a team, not even one as *sui generis* and decentralised as the one inspired by our friend. The main nuanced difference, however, is that in Alejandro's case, a Christian worldview was somehow the starting point and a sure reference, whereas in my case it was more a target of pursuit, a port I hoped to reach. Neither of us were very explicit on this cardinal issue, until one day—as if in passing—I told him that, after a 'short lapse' of 40 years, I had returned to the sacramental practice of the faith my parents had passed on to me. With similar discretion, he'd told me that, although he was older, he felt the drive to try and get a doctorate in theology, without excluding that this might end up altering his devotion from the outside, because inside it would no entail any serious alteration.

As I've already suggested in passing, the personal and the institutional formed a very solid unity in Alejandro's person and life. Professionally, the dual vocation of teaching and research was more than enough to fulfil a devotion that met the highest standards and pursued the most ambitious goals. This didn't stop him from joining the faculty of the University of Navarra, a new battleground with increasing demands: the duties of head of department, division manager, dean and, finally, *honourable president!* Without a doubt he had more than enough

management capacity to take on all those tasks. In fact, his execution brought the bodies he governed to the zenith of their careers. And those were not easy times for him, due to the growing hostility of the external environment and the internal turmoil of those he managed. Universities are highly sensitive indicators of the changing signs of the times, and Spanish society suffered a general crisis of beliefs, values and loyalties while Llano was in charge at Navarra.

The fact is, just as Cincinnatus was frequently torn from his rural estates to assume the highest magistracies, Llano had to take on the leadership of the institution he served, while also resolving the serious questions that time and again were submitted to him as a consultant. The difference between the Roman patrician and Alejandro is that while the former took a break from his farming tools while he was busy saving the homeland, the latter continued with his work, his books, his doctoral students, even his classes as much as possible... This time I had a front row seat to the show of this philosopher called to govern the *polis*—as Plato recommended. He got down to work with the fierceness and ease with which we were already familiar. I remember visiting him during the first few days in his brand new office. I began nosing around like a child who gets caught up in grown-ups' things. On one of the shelves I found a thick, luxuriously bound volume, on the cover of which was written: 'The secret behind the University of Navarra' or something like that. Amused by my indiscretion, he said: 'I don't know what that is. Open it...' I opened it. It turned out to be a box, and inside we found... *a big crucifix!* Alejandro exclaimed: 'What a relief! I thought we were about to find a bottle of cognac or something similar... This must've been Alfonso Nieto's bright idea...' Nieto had been the former university president.

The new captain at the helm immediately went into overdrive. Some say he ended up being more like the president of bricks rather than the president of ideas, given the quantity (and quality) of buildings he constructed. But he didn't neglect the other side at all; the thing is, the wind easily carries away not so much the words we utter as the words we should hear, since they enter through one ear and go out the other. That's the tragic fate of philosophers, but we're just about used to it... and resigned to it. At the end of the day, we're not here to change the world, but to study it and explain it as best we possibly can. Around that time there were even videos of speeches by President Llano shown in the waiting rooms in the University Clinic. I remember once when José Antonio Millán and I attended a lecture he gave on educational ideals or whatever. The idea he was circling around was that there are universities that *inform* students, but his, at least, was also committed to *forming* students. At the end, after the ensuing applause, José Antonio, whose fine scepticism is as frightening as it is healthy, went up to him and asked, in a pseudo-innocent tone: 'Alejandro, do you really think this university "forms" people?' To this challenge he responded without losing his nerve or allowing himself to be intimidated: 'Of course I do, #&%@! Don't be a Little Johnny!' I don't have a great deal of expertise when it comes to how university presidents ought to behave, but naturally, in Llano's case, there was 100% commitment and 0% vanity or conceit. In fact, he put so much of his heart and soul into it that he gambled his health away.

His enthusiasm and work ethic rested on delicate physical foundations. The pace of the work was clearly too much, but what really made him suffer was his concern for the people who were distancing themselves from him and everything he stood for, without him being able to really do anything about it. This is pure speculation on my part, as he was always very discreet in the conversations we had. When I visited Pamplona, he'd often invite me to lunch to discuss projects rather than problems, and also—I believe—to have a bit of a break from the strict diet he was put on due to his heart problems. He hated the vegetables in his diet and almost always ordered *cabrito* (goat; also used as an insult meaning 'scoundrel'), a choice he would endorse with the following footnote: 'That way, there'll be one less...'

His management was bounteous in terms of results, but also in terms of intimate suffering. Finally came his long-awaited freedom. Years later, he showed me a photo of him at the main door of the central building, greeting the Chancellor, who was leaning towards him to say something. He said: 'In that very moment he confirmed that I was to be relieved of my duties. It

was one of the happiest moments of my life.' Thus, without any regrets he left his post, official car, chauffer and security guard (those were harsh times of terrorism). The first day he took the Villavesa again (the city bus service in Pamplona) he bumped into his predecessor, who instantly recited those well-known verses by the poet Zorrilla: 'I went up to the palaces... / I came down to the huts...'

Despite the scars that all the years and work had left on him, producing after-effects whose severity would gradually be revealed, Alejandro did not let us down and immediately resumed his life as a scholar, writer and university teacher. Beyond his numerous works of philosophical substance, he gifted us those fascinating memoirs in two volumes and a gripping book of conversations with his selected disciples. These are precious jewels that, in a way, represent the swan song of a great philosopher, and an even better person. All the talents God has given us, we must be ready to return them with the consequent yields, and for an intellectual like Alexander, no surrender could be more painful or meritorious than that of seeing his memory and capacity for reasoning decay without remedy. He saw this loss coming from afar, with full awareness and acceptance, manifesting once again the spirit of his Christianity. Gradually, he returned to his early innocence. I visited him from time to time, thanks to the great services of Lourdes Flamarique. Many colleagues and friends asked me afterwards: 'Did he recognise you?' My answer would be: 'I didn't have the poor taste to ask him, but he undoubtedly still has all the kindness and warmth he's always had. Lourdes and I carried the conversation, and he took part as naturally as ever. We reflected on old times and looked to the future with optimism.'

One of the greatest benefits of being a Christian is being sure that, effectively, the best is yet to come. Anything the past gave us that was truly worthwhile shall survive as living history. Not that I myself have much hope of still being read when I am gone. I even believe that, in the little time I have left, I will outlive my own work. It would weigh more heavily on my mind that so many good times, so many happy moments, so many examples of dignity and kindness could irretrievably vanish into oblivion, such as those enjoyed between Alejandro and the people who, at one time or another, were close to him. Moments like when he re-enacted the story that Elizabeth Anscombe told him about Wittgenstein's ultimate conversion; or when he wore a beret down to his eyebrows and—using a guitar as a tam-tam—chanted a telluric Asturian song about cheeses that went to and from his *hórreo* (storehouse); or when he got into an argument with Rafa Alvira on some point of political philosophy; or when, in the middle of an academic lecture, he took the plunge and said once and for all what he thought about the subject... Was that really all just a dream? Christian hope, which I have partly regained thanks to him, gives me the confidence that I will see God. Will this whole life story then dissolve into nothingness? I conjecture that whoever has the good fortune to stand before Him will also have access, in one way or another, to His Memory. And, as attested by those inspired verses from a supposed agnostic, Jorge Luis Borges:

'There is only one thing that there is not. That is oblivion.
God, who saves the metal, saves the dross
And encapsulates in His prophetic memory
The moons that shall be and those that have been'

There are life stories which, like the one we're celebrating, constitute true works of art, with all their lights and shadows. The prospect that not even the tiniest detail of them will be lost forever is a blissful one. Much too blissful *not* to be true.

Juan Arana Cañedo-Argüelles

Book reviews

Pérez García, A., Feijoo Fernández, B. y López Martínez, A. (eds.) (2023).
Los menores ante las redes sociales. Pensamiento crítico y reflexión ética.
(Universidad Internacional de La Rioja (UNIR)

Martín-Ezpeleta, A., y Echegoyen-Sanz, Y. (eds.) (2022).
El Giro Transdisciplinar. Integración de contenidos en torno a fenómenos y ámbitos.
(Universitat de València)

Herrán Gascón, A., Xu, R. (2023).
El Tao en la enseñanza: un enfoque radical e inclusivo. España
(UAM)

Carrasco Pons, S. (ed.) (2024).
Migración, movilidad y educación. Estrategias familiares y respuestas escolares.
Síntesis. 237 pp

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Book reviews

Pérez García, A., Feijoo Fernández, B. & López Martínez, A. (eds.). (2023).

Los menores ante las redes sociales. Pensamiento crítico y reflexión ética [Children and Social Networks: Critical Thinking and Ethical Reflection].

Tirant Humanidades. 216 pp.

The book "Los menores ante las redes sociales, pensamiento crítico y reflexión ética" addresses the study of digital, media, and computer literacy and the ability of minors to evaluate critically the content they consume on social networks. This joint work, edited by Álvaro Pérez García, Beatriz Feijoo Fernández, and Adela López Martínez, is the direct result of a research project funded by the Universidad Internacional de la Rioja called "El pensamiento crítico como competencia digital del S.XXI: Análisis de la capacidad de los menores para identificar y reconocer la procedencia e intencionalidad de contenidos informativos, divulgativos y persuasivos en redes sociales" (Critical Thinking as a Digital Competence in the 21st Century: Analysis of the Ability of Minors to Identify and Recognise the Intentionality of Informative, Promotional, and Persuasive Content on Social Networks).

This work comprises 10 chapters in three thematic sections, the first relating to ethical reflections on the use of social networks, a second addressing pedagogical considerations, and a third on practical questions in the fields of education and advertising. The development of young people's critical thinking is the main focus of this work. The different chapters demonstrate the importance of media and informational literacy to foster in young people's critical thinking and their ability to produce meanings creatively meanings after analysing and evaluating information to avoid ethical hazards such as fake news and media biases.

The first chapter analyses the ethical challenges of social networks from an anthropological perspective. A variety of changes that have been brought about by the emergence of social networks are analysed: the configuration of the self in a connected society; questions young people's identity in virtual spaces; modifications to the structure of attention; and the solitude that isolation from the social milieu can provoke. It also includes reflection on how these changes can inhibit reasoning, in-depth reflection, and ethics.

The second chapter reflects on the limitations of the development of critical thinking in adolescents, as while it can prepare them to use social networks appropriately, it is not sufficient in itself as in addition to critical thinking it is necessary develop intellectual habits that are acquired through practice and are based on the intellect and synderesis. It also highlights the importance of prudence, a practical question of reason that helps define what it is or is not

appropriate to do. This chapter illustrates the importance of education in prudence, its relation to critical thinking, and the development of basic intellectual skills.

Chapter three introduces the pedagogical considerations, starting with education for social networks, showing how young people relate to them, and proposing working formulas from the field of education to control and improve how they relate to them. An analysis of how young people use social networks is performed, considering the time they spend using them and how they construct their identity. The dangers and risks associated with their use are also underlined, such as the risk of infringements of data protection, honour, privacy, and personal image. Likewise, the potential benefits of social networks in education are shown, as these can facilitate communication and collaboration, access to information, promotion of digital literacy, and personalised learning. Finally, an overview of research and studies on adolescents and social networks is provided, analysing the most recent ones.

Emotional intelligence is the backbone of chapter four, which presents research into how this relates to social networks and young people. A descriptive analysis is made of the relationship between emotional intelligence and young people's communicative processes, as well as the trends in interactions. The relationship between emotional, intrapersonal, and interpersonal intelligence in communication is also explored, with the way these last two types of intelligence form the first being of special interest, underlining their importance and the risks of using social networks at an early age.

Chapter five addresses the question of parental digital mediation in adolescents, identifying the different styles and strategies used by families as well as young people's own perceptions of parental mediation. The types of mediation identified, such as enabling, restrictive, and technical mediation, are considered in depth as are the factors that influence their use. Moreover, the analysis of mediation centred on young people is of interest, which holds that mediation is not a unidirectional question but rather is one where context matters and that it fosters creativity and cognitive development and encourages interpersonal relationships among young people.

Chapter six reflects on the implementation of digital technologies in schools, the types of digital gap, and how these aspects can affect young people's digital literacy. This work is based on a qualitative study with primary school teachers, which examines their discourse to analyse how they use devices in class as well as how this shapes young people's digital literacy as well as the impact of teachers' and families' digital competence on the teaching–learning process.

Chapter seven presents a methodological proposal for the development of critical thinking in social networks aimed at secondary school students. A critical thinking work approach is based on the Paul-Elder model is proposed as well as an instrument for evaluating this method based on the bidimensional taxonomy table of Krathwohl and Bloom's taxonomy. This procedure centres on analysis of the elements of thinking –point of view, purpose, question at issue, information, interpretation and inference, concepts, assumptions, implications, and consequences– and the standards of quality of the thinking. This work shows that it is possible to develop critical competences in the field of education thanks to the proposed methodology for analysing information on social networks.

Chapter eight analyses the possibilities of the streaming platform Twitch as an educational tool for improving young people's critical thinking. This platform is explored as a virtual learning community, analysing how young people use it and the options it provides for developing basic and higher cognitive processes. The options Twitch offers for discussing and analysing information, as well as for interacting with content creators enables the development of critical and creative thinking. Chapter nine presents a comparative study of young people's advertising literacy in Spain and Slovakia when faced with influencer marketing. Young people's behaviour based on advertising literacy and the critical behaviour towards the marketing strategies of the influencers are analysed. This study identifies the differences among the participating minors and the need for action regarding advertising literacy from the field of education to develop critical thinking towards commercial media content.

Finally, chapter ten addresses the minors' ethical considerations about the consumption of content created by influencers. This study highlights how minors are influenced for

commercial ends and want to become influencers. Consequently, there is an urgent need to strengthen advertising literacy in digital environments.

In conclusion, this monograph provides an overview of the use of social networks from the philosophical and pedagogical sphere, identifying the need for media, informational, digital, and advertising literacy, as well as the vital importance of developing critical thinking in minors to foster their teaching–learning process and development for life.

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Martín-Ezpeleta, A. & Echegoyen-Sanz, Y. (eds.). (2022).

El Giro Transdisciplinar. Integración de contenidos en torno a fenómenos y ámbitos [The Transdisciplinary Turn: Integrating Content about Phenomena and Fields].

Tirant Humanidades. 200 pp.

Antonio Martín and Yolanda Echegoyen from the Universitat de València present *El Giro Transdisciplinar. Integración de contenidos en torno a fenómenos y ámbitos*, a multi-author book that, as is explained in some "Palabras liminares" (Liminal words), starts from the propositions of competence-based learning and their expression in concepts such as transdisciplinarity, problem-based learning, phenomena, or contexts to illustrate all of this by presenting didactic proposals designed or implemented in the context of teacher training. Many of the book's collaborators are from the "Science and Letters" interdisciplinary innovation group at the Universitat de València.

The pithy "Liminal words" contain a reflection on the abuse of the compartmentalisation of content into disciplines or areas, and advocate for a reflection that puts the basic competences that all subjects share at the heart of the debate. The next section of the book, "Del currículo académico-científico a la educación holística y transdisciplinar" (From the Academic-Scientific Curriculum to Holistic and Transdisciplinary Education), contributes to this reflection, with Professor Pilar Martínez-Agut laying the theoretical foundations of the concept of transdisciplinarity, relating it to contextualised methodologies, and using education for sustainability as a practical case.

The next chapter, "El proyecto Ciencias y Letras. Aprendizaje basado en fenómenos" (The Science and Letters Project: Phenomenon-Based Learning), starts from the selection of anthropological, cultural, or social phenomena or problems to construct a competence-based learning that is not incompatible with mixing disciplines and knowledges that are traditionally separated into one world of sciences and another of humanities that here are reconciled in a single one. It is a matter of showing the design of didactic sequences cut through by this theoretical-methodological focus, some of them designed and implemented by the "Science and Letters" innovation project that has been working on these tasks since 2017.

This provides a stimulating reflection on competence-based and transdisciplinary learning that invites us to imagine a flexible curriculum based on phenomena, rather than the traditional introduction to the scientific-academic disciplines with content that is often decontextualised from the reality or interests of the students.

This way of proceeding, which has clear overlaps with problem-based learning, is a way of teaching–learning that is in no way infrequent in early childhood and primary schools, but the authors throw down the gauntlet and call for experimentation in secondary education, given that they have done so with notable results in higher education. The fact that they have implemented this in the context of teacher training means that they also understand that it fulfils other objectives, as students are no longer only being trained in competences and content, but rather a didactic transposition of everything that incorporates self-evaluation of the process of how they have learnt is also being promoted.

The second section contains various transdisciplinary didactic sequences based on the phenomena of scientific travellers, the essay as a genre, science fiction, dystopia, and ecocriticism. In the chapter "Aprender y enseñar a partir del fenómeno de los viajeros científicos. (Learning and Teaching Based on the Phenomenon of Scientific Travellers: Darwin's Diaries in an Educational Experience with Pre-Service Primary and Early Childhood Teachers), Yolanda Echegoyen and Antonio Martín start from Darwin's voyage of the Beagle and his diaries to design an itinerary that entwines the sciences and humanities, information about Darwin's scientific discoveries and Darwin himself with the more humanistic analysis of the genre of travel diaries and literary analysis of fragments from Darwin's *Diaries*. All of this is accompanied by tasks done by pre-service teachers that display the aforementioned didactic transposition and which also derive from their reflections, from the design of didactic materials for students that they have elaborated following the structuring key of the phenomenon of scientific travellers.

In "El ensayo divulgativo transdisciplinar. El caso de *Sapiens. De animales a dioses* y sus oportunidades didácticas con docentes en formación" (The Transdisciplinary Informative Essay: The case of *Sapiens: from Animals to Gods* and its Didactic Opportunities with Pre-Service Teachers), Juan Carlos Colomer and Carlos Fuster set out the design of a didactic sequence based around reading the book *Sapiens* by Yuval Noah Harari, demonstrating that a work as ambitious as this one highlights the unity of academically separate content (from archaeology, sociology, anthropology, history...) and how easy and necessary it is to connect it all to teach–learn better.

Carlos Gómez, José Javier Verdugo, and Enric Ortega, for their part, tackle the phenomenon of science fiction in "*La guerra de las galaxias* contra las ideas alternativas de la ciencia" (*Star Wars* against the Alternative Ideas of Science), and with their didactic proposal astutely attempt to hook students of the experimental sciences through analysis of science fiction films. While watching these films, students are challenged to detect the many scientific errors in them, as well as to banish the alternative ideas that impede the comprehension of scientific knowledge.

In contrast, Álvaro Francisco Morote tackles the phenomenon of dystopia in "La transdisciplinariedad de los problemas ambientales. La sequía como tema de estudio" (The Transdisciplinarity of Environmental Problems: Drought as a Topic of Study), which starts from a reading of *The Drought* by J. G. Ballard to consider droughts, one of the main natural hazards in the current world. Through this proposal, he seeks to raise students' awareness of and sensitivity towards the use of water, as well as how the negative effects of climate change, that many authors such as Ballard, have anticipated in apocalyptic terms. The result, of course, involves becoming aware of the imbalances to which the planet is being subjected.

Next, it is the turn of the phenomenon of ecocriticism, which is develop based on two different didactic sequences. Matilde Portalés, in "*A pleno Sol*. Narrativas multimodales en el aula de Plástica: Arte, Literatura y Naturaleza" (*Plein Soleil*: Multimode Narratives in the Art Class: Art, Literature, and Nature), analyses the album *Plein Soleil* by Antoine Guilloppé, to develop the concept of multiliteracy, underlining the importance of the text-illustration symbiosis as well as the difficulty of the symbolic apprehension of the image. In contrast, in "Pedagogía del decrecimiento: estrategias para incorporar cuestiones ecosociales en el aula de español como lengua extranjera" (Pedagogy of Degrowth: Strategies for Incorporating Ecosocial Questions in the Spanish as a Foreign Language Classroom), Luis Prádanos sets out the pedagogy of degrowth as a framework for questioning the current dynamic and constructing different social imaginaries, something that involves changing how we think and relate to each other. The first of his didactic proposals revolves around unlearning, encouraging people to question the existing educational materials and incorporate ecological works and ecocriticism essays. The second seeks to move away from economic growth and achieve social cohesion, environmental regeneration, and a decent life for all people and living beings, for which he proposes appropriate readings to convey all in the context of the teaching of Spanish as a foreign language.

Finally, the book includes a third section, "Mestizajes disciplinares y educación por ámbitos" (Disciplinary Mixing and Education by Fields), which includes four chapters with proposals similar to what was previously explained. The first of them, by María Alcantud and Elia

Saneleuterio, revolves around the "Objetivos de desarrollo sostenible (ODS) en la clase de ILE/EFL" (Sustainable Development Goals (SDG) in the EFL Classroom) and consists of a magnificent proposal based on reflective learning that has as its connecting thread the international days of the United Nations, that act to introduce the SDGs. All of this is related to the design of specific didactic materials without forgetting the inclusion of monitoring and evaluation instruments.

In "El paisaje sonoro como contexto educativo interdisciplinar y transversal en la formación de docentes" (The Sonic Landscape as Interdisciplinary and Transversal Educational Context in the Training of Teachers) Amparo Hurtado and Ana Botella explain an educational innovation project that starts with the concept of the sonic landscape to examine in greater depth the relationship established between music, nature, and health, from a sequence that promotes awareness of cognitive skills that facilitate learning.

Meanwhile, in "Patrimonio y creación audiovisual para la integración curricular en la formación del profesorado de Primaria" (Patrimony and Audiovisual Creation for Curricular Integration in the Training of Primary Teachers) Paula Jardón makes an interesting and motivating didactic proposal to cover geography and history in the primary classroom. These are two types of content that, this time, are traditionally more related, but the innovation here is that they are connected to other content that is not usually as present in primary education, such as archaeology and its projection in the cultural heritage. This starts with selecting a social or environmental problem and formulating it as a question, which involves the activation of content and competences, notably creativity. Finally, making a short film that integrates elements of Valencian heritage and that can be interpreted as didactic material is proposed.

The last chapter is "El trabajo en el ámbito lingüístico y social en 1.º de ESO" (Work in the Linguistic and Social Field in Year One of Compulsory Secondary Education) by Alícia Martí and Pilar García, who present in their didactic proposal active methodologies and multimodal resources that are fully aligned with the integrated treatment of language and content. This contribution is of interest for observing the potential of context based learning, the promotion of which has been hindered by the lack of appropriate didactic materials.

The book closes with an "Epilogue" that is valuable both for its critical reflections and for the great emotion caused by the news that its author, Professor Ana Díaz-Plaja, always linked to the Universitat de Barcelona, has passed away and that these are the last pages she has written. She leaves us yet more adrift, in the image that structures her reflection in the epigraph "Aviso a navegantes" (A Warning to Seafarers), which warns of the dangers of "being shipwrecked in a bibliography" and the stormy waters of educational innovation that sometimes sells us "modernly dated" things, not to speak of the fear caused by the fact that "educating is not teaching to think, but teaching that we have to think". However, the author values these new educational focuses, which she skilfully links to projects as seemingly unconnected as the instructions of the Institución Libre de Enseñanza (Free Teaching Institution), underlining in detail the ideas and materials from the book glossed here that she judges are best. All of this is again accompanied by her argument for of a teaching profession with "technical reflection, like the one I recognise in the chapters of this book, [which] will be the best lifeline for the brave sailors of the educational oceans, but above all for the castaways". May these lines serve as a heartfelt homage to one of the few truly wise people there have been in this world.

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Herrán Gascón, A. Xu, R. (2023).

El Tao en la enseñanza: un enfoque radical e inclusivo [Tao in Teaching: A Radical and Inclusive Focus].

Spain, Hiares, 104 pp.

The book "El Tao en la enseñanza: un enfoque radical e inclusivo", by Agustín de la Herrán Gascón and Ruitian Xu, published in 2023 by Hiares, provides a vehement and very

necessary criticism of current educational paradigms. This work denounces the superficiality, egocentrism, and lack of depth that characterise contemporary Western education, and it proposes an educational methodology inspired by Taoism that seeks a genuine and meaningful transformation.

From the start, the authors do not hold back in their criticism of the Socratic method. They describe this method, which has been the backbone of Western education for centuries, as superficial and limiting. According to the authors, Socrates' influence has established a philosophical foundation that is insufficient for an effective and transformational education. This analysis underlines the urgent need to reconsider and abandon traditional educational practices that have been accepted without sufficient questioning.

Beyond the specific criticism of the Socratic method, this work more broadly addresses the lack of depth in Western education. The authors argue that the current education system is too focussed on the accumulation of superficial knowledge, and does not foster true inner transformation in the students. Instead of promoting an integral development of the being, Western education focusses on metrics and competences that often lack deeper meaning. De la Herrán Gascón and Xu argue for the inclusion of meditative practices and a holistic focus on the being, arguing that only through these methods can we achieve truly full and conscious education.

As well as criticising the Western educational focus, the authors also underline the predominance of Eurocentrism in the current education system. This bias has led to the omission and underestimation of valuable Asian perspectives, such as the teachings of Laozi and Gautama Buddha. According to the authors, this exclusion has resulted in an education and a society that lack complexity and depth, and are limited by an egocentric and biased vision. Excluding these perspectives not only impoverishes education, but it also perpetuates a limited and partial comprehension of the world.

In terms of solutions, "El Tao en la enseñanza" does not only criticise but also proposes concrete alternatives. The authors argue for implementing didactic methodologies based on Taoism that promote lucidity and the awakening to a conscious life. They emphasise practices such as wushu, taijiquan, and qigong as powerful tools for a teaching based on consciousness and integral well-being. They also argue for teaching without words that is based on the example, following the teachings of Laozi and his disciples. They argue that true knowledge transcends human language and that observation of the natural development of each student and respect for his or her individuality are fundamental for an effective education.

One key aspect of the authors' proposal is the need for a radical and authentic change in the attitude of educators. They insist that educators should embrace humility as the cornerstone of the practice. They note that excess abundance and arrogance are significant obstacles for developing a true conscience and comprehension. Just as a full glass cannot hold any more water, arrogant people's minds reject what is new. In contrast, people who follow the Tao value modesty and humility, recognising that true power lies in being below, like the water that fertilises the ground. This humility, symbolised by the vastness of a valley, is essential in education, as it enables educators to recognise their limitations and errors, so that they can guide their students towards an integral and meaningful development.

The authors also underline the importance of emptiness and uselessness, Taoist concepts that challenge the predominant utilitarian assumptions of contemporary education. They argue that emptiness should not be seen as idleness, but rather as a process of comprehensive renovation that eliminates useless and egocentric knowledge. Similarly, the "usefulness of the useless" is presented as a critique of extreme pragmatism and an invitation to value aspects of education that are often ignored as they have no immediate practical benefit.

In conclusion, "El Tao en la enseñanza: un enfoque radical e inclusivo" is a provocative and radical call to attention for all educators. It invites in-depth reflection on and questioning of established focuses, proposing an education that not only informs, but that also significantly transforms individuals and societies. This book is essential for those who seek to challenge the limits of conventional pedagogy and open themselves to new ways of understanding and

practising education. By combining the principles of Taoism with pedagogy, the authors offer an integral perspective that invites educators to reconsider their focus and to adopt a more conscious, inclusive, and transformational education.

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Carrasco Pons, S. (ed.) (2024).

Migración, movilidad y educación. Estrategias familiares y respuestas escolares [Migration, Mobility and Education: Family Strategies and School Responses].

Editorial Síntesis. 237 pp

Stereotyped images of the exotic, of others, of foreigners, permeate our outlook when we address the phenomenon of immigration. The bias against what is strange, different, or foreign means we view the migrant population as temporary visitors, protagonists of an unusual situation that will pass, while the history of humankind teaches us that migration has always been a permanent and unceasing activity. For decades, the mobility of migrant families with school-age children has been a normal situation in European societies. However, our education system has generally continued to function as though immigration were a trivial or fortuitous event: no special attention is paid to immigrant students, the solutions that are applied, if any are applied, are stopgap and provisional. There is no organised response to the characteristics of the structural phenomenon that currently –in a context of widespread economic precarity– shape migratory movements.

Migración, movilidad y educación. Estrategias familiares y respuestas escolares is a collection of thirteen studies done as part of an R&D project that has lasted ten years and has addressed different aspects relating to how the growing mobility of students, forced by economic, employment, or family circumstances, affects their schooling, both directly – provoking school disengagement, early school leaving, and the risk of social exclusion– and indirectly in the pedagogical and school organisation strategies implemented, which are too often based on the prejudice of immigration as an anomaly and staying in school as the norm.

The director of the project, Silvia Carrasco Pons, who is an Associate Professor in the Department of Social Anthropology at the Universitat Autònoma de Barcelona and an expert in migration and education, identifies in the prologue a pressing need for research initiatives in this area to fill the gaps in knowledge around the connections between the mobility forced by neoliberal capitalism and its consequences for the educational reality of our schools and the lives of thousands of minors. She also identifies the paradox that the project had to face when it encountered an inverse situation of forced immobility caused by the Covid-19 pandemic.

The studies in this publication were done in six primary and secondary schools from the metropolitan area of the city of Barcelona, using mixed methodological methods, including both qualitative and quantitative ones. The experts responsible for them are mainly professionals from the field of social anthropology who do research in connection to education, pedagogy, and young people. The book also includes three doctoral theses.

Some of the main objectives of the project that are reflected in this work are: to understand more precisely the effects of mobility on the academic trajectory of migrant students; to evaluate the school mechanisms applied to reception and participation; to identify and evaluate school accompaniment policies for students and their families; to explore the consequences of a context of high mobility for students' affective and relational development; and to evaluate the role of association movements and the local community in these impacts.

The research works –even though they are all linked by the interest in increasing our knowledge of the relations between migration, mobility, and education, as the book's title reflects– were done from a wide variety of perspectives: organisational strategies, taken-for-granted discourses, personal experiences of mobile students, the role and experiences

of families, connections with school coexistence, social imaginaries that are shared and are transmitted through the media etcetera. The range and depth of the studies included in this compilation facilitates a highly informative profile of the educational panorama in relation to its approach to the needs and challenges posed by the ever larger and more mobile presence of migrant students in our education system.

Several chapters include selections of testimonies from students, teaching staff, and families that formed a crucial part of the evidence used for the studies. Being able to read transcripts of some of these testimonies is in line with the work's attempt to familiarise us with the reality of migration and its impact on the school world. The words and voices of the people involved – students, teachers, mothers, etcetera– are especially illuminating for understanding the phenomenon addressed.

The analyses presented and the conclusions reached in these works provide important keys with which to understand the different responses that are set in motion from an education system that tends to function as though school immobility were the sole definitive situation. These key points signal a profound need for educational policies that take into account the social reality they face and for information and training for teaching staff in this subject, to replace the distorted image of immobility as the norm with a consideration of migrations and school mobility as not only a present and growing fact but, also, as an opportunity for human enrichment for schools and education. Seeing school mobility as a threat for the students involved produces an effect of surrender that helps the prophecy become fulfilled: if we work with a negative, erroneous, and stereotyped idea of these students and their families, we contribute to inaction and scepticism continuing and so will perpetuate the situation, and even help worsen it.

An interest in adapting pedagogical strategies to new social realities has always been viewed as essential for achieving equitable educational action. From this work, coordinated by Silvia Carrasco, there derives a pressing need to explore and develop this adaptive capacity, understanding and evaluating the situations that result from the phenomenon of migration and especially school mobility. From the studies presented, it can also be deduced that this knowledge will provide educational institutions and the teaching profession with positive resources and strategies both for teaching-learning processes and for school coexistence.

To continue inquiring in such an urgent matter, this project's work could be synthesised in a series of questions: How should the education system respond to the needs of a society where mobility is one of the fundamental conditioning factors of the life of a large part of its population? How will the school have to contribute to guaranteeing social rights in the current socioeconomic context?

Migración, movilidad y educación offers many more questions that follow from the previous ones and an important compilation of possible useful responses for schools to be, in real educational practice, setting that foster social justice.

Julia Rípodas

DoFemCo (Docentes Feministas por la Coeducación
[Feminist Teachers for Coeducation])

Revista Española de Pedagogía

Revista Española de Pedagogía (REP)
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Instructions for authors

A. Purpose of the journal

Revista Española de Pedagogía was created in 1943 and its search for excellence has always distinguished itself. It has been the first journal of pedagogical research in Spanish that has been indexed in the most relevant international databases. It accepts only original, high quality submissions from anywhere in the world that help advance pedagogical knowledge, avoid mere opinion polls, and are of general interest. Articles must follow commonly accepted ethical criteria; in particular, in cases of plagiarism and falsification of data, the author will be penalized by the rejection of their submissions. Articles with more than three authors will only be accepted if a reasoned explanation is provided, and in any case, the intellectual collaboration of all the signatories must be certified, not just data collection. Three issues a year are published.

B. Languages used in the journal

REP publishes all scientific articles and bibliographic reviews in Spanish and English.

When an article is accepted for publication and in order to guarantee the use of correct academic language in both languages, an agreement will be reached with the authors for the translation of their article into English or Spanish. If necessary, the translation will be made by professional experts who are native speakers of each language according to the conditions described in **H. Article Processing Charges (APCs)**. All contents of the original article, including tables and graphs, must be translated.

Texts cited in the article that were originally published in Spanish, even if they were later published in an English translation, must also be included in their original language. In this way, translators will not have to translate these texts again. In particular, it is preferable for a classic text to be cited with both versions: that of its original and that of the printed translation.

C. Requirements of originals

C.1. The publication of research articles must be in accordance with the *Publication Manual of the American Psychological Association* 7th Edition, 2020, (www.apastyle.org). Here are some basic points which must be strictly followed by the authors.

1) The length of the contributions, including all sections, will be between 6000 and 7500 words, using the Times New Roman font.
2) Articles should be submitted following the structure and formats indicated in the template that can be found on the journal's website (https://www.revistadepedagogia.org/rep/plantilla_articulo_eng.docx).
3) In cases where authors have compound names or use more than one last name, such as Hispanic authors, they should be connected with a hyphen. Example: María-Teresa Calle-Molina.

4) The authors must indicate the role of each one using **CREDIT taxonomy** (example available in the template).
5) 6 to 8 keywords should be included.
6) Following the APA model, the References list will be at the end of the article, in alphabetical order by surname, naming all the authors up to a maximum of twenty, with the second line indented.

The translation into English or Spanish should be included in square brackets next to the original title of the publications, since in the Spanish version of the article, the Spanish translations of the titles of the works published in English will be provided. **DOI of publications should be always included whenever possible.**

Some examples are given below:

• **Books:**

Genise, N., Crocamo, L., & Genise, G. (2019). *Manual de psicoterapia y psicopatología de niños y adolescentes [Manual of Psychotherapy and Psychopathology of Children and Adolescents]*. Editorial Akadia.

• **Journal articles:**

Siegel, H. (2002). Philosophy of education and the Deweyan legacy. *Educational Theory, 52* (3), 273-280. https://doi.org/10.1111/j.1741-5446.2002.00273.x

• **Chapters in multiauthor books:**

Mendley, D. M. (2005). The research context and the goals of teacher education. In M. Mohan & R. E. Hull (Eds.)*, Teaching Effectiveness* (pp. 42-76). Educational Technology Publications.

• **References to web page:**

Guarino, B. (2019, January 3). How will humanity react to alien life? Psychologists have some predictions. *The Washington Post*. https://www.washingtonpost.com/news/speaking-of-science/wp/2017/12/04/how-will-humanity-react-to-alien-lifepsychologists-have-some-predictions

U.S. Census Bureau. (n.d.). *U.S. and world populatíon dock. U.S*. Department of Commerce. Retrieved July 3, 2019, from https://www.census.gov/popclock/

7) References in the body of the article are written in an abbreviated way that differs from what is used in the Reference list. Specifically, if the reference is a direct quotation, the text must be enclosed in quotation marks and, usually at the end, the author's last name, year and page number are placed in parentheses: "(Taylor, 1994, p. 93)". If it is not a direct quotation, and so is not enclosed in quotation marks, the page number will be omitted: (Taylor, 1994). When the author's name is given in the text he/she will not be included in the parenthesis: "According to Taylor (1994, p. 93), culture ..." When an idea is supported by several authors, they will be separated by semicolons: "(Taylor, 1994; Nussbaum, 2012)".

To quote several works by one author, only the years will be added after the author, with letters added if it is necessary to distinguish between publications from the same year: "(Taylor, 1994, 1996a, 1996b)".

When citing works by 3 or more authors, only the first one is cited followed by "et al".

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Other authors' texts will be quoted following the criterion of consulting the originals that are written in those languages and using their official translation when such text has also been

edited in the other language. If this official translation is not available, the quoted text will be offered to the readers translated by the author of the article (noting that the translation belongs to the author of the article), or by the sworn translator hired by the journal.

The use of endnotes will be limited. They must have correlative numbering, using the automatic system in Word and they will be placed after the body of the article and before the References that list everything cited in the text.

8) To highlight a word, italics will be used. Underlining or bold should not be used.
9) The number of lists, diagrams, tables and figures in the text should be limited. These will be called Tables or Figures. In any case, they must be where they should be in the article. In tables, columns should be aligned using tabs (only one tab per column). When quoted in the text (e.g., "as we see in Figure 1 on core subjects"), only the first letter will be capitalized, while at the top of the Table or Figure the whole word will be in small caps, in 12 point capital with Arabic numerals, followed by a point, writing the title in normal text.

The text within the table will be written in the same typeface as the normal text and in 9 point. The source of the table or figure will be placed below it, without a space of separation, stating the Source, colon, surnames, comma and year.

Graphs and tables, in addition to appearing where they should in the article, have to be sent in their original editable format whenever possible. Images should always be sent in high resolution (300 dpi).

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12) Finally, a brief biography of the authors should be included, of a maximum of ten to fifteen lines, which should mention their ORCID and the main aspects of their academic career, current academic situation and the university where they obtained their higher academic degree.
13) Authors of published works that have been carried out with research data including the sex variable are encouraged to report whether the conclusions have taken into account possible differences between sexes.

C.2. In addition to research articles, the **Revista Española de Pedagogía** wishes to keep up to date by publishing, in various formats, other works and relevant information in pedagogical science. For this reason, it publishes reviews of books, current news, brief commentaries on educational problems, readers' comments on articles published in the last year, etc. The reviews, always on recent books from relevant publishers, will be between 1200 and 1700 words. They will be headed by the book's details as follows:

Villardón-Gallego, L. (Coord.) (2015). *Competencias genéricas en educación superior [Generic competences in higher education]*. Narcea. 190 pp.

Commentaries will be of moderate length. The analysis of published articles will be sent, from the journal, to the author of the analysed article, so that he/she can prepare a response.

D. Policy on the use of artificial intelligence (AI) in articles

Authors must follow the AI use policy established by Revista Española de Pedagogía and declare compliance with the following sections before submitting their articles.

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The system accepts Word or RTF files. The system will automatically generate a PDF for you. Images or graphics should be placed in the article in their proper place in the highest possible quality. If the images are not of sufficient quality (300 dpi), they will be requested again from the authors once their article has been accepted for publication. Tables should be placed in the article in the appropriate place and be editable.

The corresponding author will receive an automatic notification confirming receipt of the article. This notification will indicate the link through which you will be able to access your article on the journal's web platform and make any modifications or send new files that may be necessary during all the evaluation and editing process of the article.

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The editors will make an initial assessment of the article based on the suitability of the proposals to the editorial criteria of the **REP**. Authors can consult more information on the type of articles accepted by the journal at the following link: Scope. The result of this assessment will be notified within a maximum period of one month. If a positive first evaluation is received, the paper will be peer-reviewed. Authors will receive the result of the second evaluation within approximately three months.

Each article submitted will be subject to the journal's editorial decision process. The journal is under no obligation to publish the article.

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Accepted articles will begin the editing process (translation, style correction, layout, etc.), to be subsequently included in the corresponding issue, according to the decision of the editorial direction. Once the editorial process has been completed, the preliminary layout of the text will be sent to the authors for final revision and approval. The editing process usually takes a maximum of two months.

The average time between the receipt of an article and its publication is six months.

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https://twitter.com/REPedagogia

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- A video of approximately 1 minute in length, in horizontal format, summarizing the main ideas developed in the article for use on our social networks would also be appreciated.
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- Google Scholar, ORCID, Dimensions, PlumX, etc.
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- Social networks (Facebook, Twitter, LinkedIn, etc.).
- Personal or institutional website, blog, etc.

It is required that all the bibliographic data of the published work be detailed in these publications.

Each author should consider using the most effective means of disseminating their article, obtaining citations and contributing to the advancement of pedagogical knowledge.

Databases and bibliographic directories

Social Sciences Citation Index, Scopus, Cabell's International, Catálogo Latindex, Contents Pages in Education, Dialnet, Dulcinea, EBSCO Academic Search Complete, EBSCO Academic Search Elite, EBSCO Academic Search Premier, EBSCO Academic Search Ultimate, EBSCO Education Full Text, EBSCO Education Research Complete, EBSCO Education Source, EBSCO Education Source Ultimate, EBSCO Serials Directory, Educational Research Abstracts Online (ERA), Fuente Académica, Fuente Académica Plus, Fuente Académica Premier, Google Scholar, IBR Online Internationale Bibliographie der Rezensionen geistes- und sozialwissenschaftlicher Literatur, IBZ Online Internationale Bibliographie der geistes- und sozialwissenschaftlichen Zeitschriftenliteratur, IRESIE. Base de datos sobre Educación, JSTOR, Matriz de Información para el Análisis de Revistas (MIAR), MLA International Bibliography, Periodicals Index Online (PIO), Psicodoc, Redined – Red de información educativa, Social SCIsearch,
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Classifications and rankings

Journal Citation Reports (JCR), Scimago Journal & Country Rank (SJR), Scopus Sources, Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca (ANVUR), Clasificación Integrada de Revistas Científicas (CIRC), Dialnet Métricas, European Reference Index for the Humanities (ERIH).

Library catalogs

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The **Revista Española de Pedagogía** publishes three issues a year. The authors express the ideas contained in their respective articles under their sole responsibility. A full English version of the articles published from 2017 onwards is available on the journal's website.

Correspondence should be addressed to the Directors of the Revista Española de Pedagogía: Avenida de la Paz 137, 26006 Logroño, La Rioja, Spain.
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