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## **ECOLOGÍAS DEL METAVERSO Y EL TRANSHUMANISMO: PERSPECTIVAS PARA LA RECULTURIZACIÓN DIGITAL**

METAVERSAL AND TRANSHUMANIST ECOLOGIES:  
PERSPECTIVES FOR DIGITAL RECULTURALIZATION



# A Look at the Risks and Threats of Artificial Intelligence, from Media Ecology

Una mirada a los riesgos y amenazas de la inteligencia artificial, desde la Ecología de los Medios

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## ABSTRACT

From a historical perspective and a prospective analysis, the article aims to understand the role of technologies and their impact on society through the postulates of media ecology. Through this meta-discipline, we delve into the rigorous review of different authors who see technologies as playing a prominent role in shaping the future because they not only influence the culture of societies, but also impact the course, advancement and meaning of history. The text focuses on the advantages and on the explanation of the risks of generative artificial intelligence, identifying eight critical scenarios: weaponization, disinformation, proxy games, weakening, blocking or withholding of value, unwanted emerging goals, deception and power-seeking behavior. Subsequently, CASI regroups them into four threats: malicious use, the AI race, organizational risks and uncontrolled AI. We end the by drawing on McLuhan's reflections and stressing the need to scale back technologies when they have reached elevated levels of development to minimize their negative impact. Although artificial intelligence has not reached that state, there is a warning about the accelerated evolution and the need for AI literacy as a measure to face risks and threats, in a limited time before it is too late.

## RESUMEN

Desde una perspectiva histórica y un análisis prospectivo, el artículo tiene como objetivo comprender el papel de las tecnologías y su impacto en la sociedad, a través de los postulados de la ecología de los medios. A través de esta metadisciplina, nos adentramos a la rigurosa revisión de diferentes autores que ven en las tecnologías un rol destacado en la configuración del futuro porque no solo influyen en la cultura de las sociedades, sino que también impactan en el curso, avance y significado de la historia. El texto se centra en las ventajas y, sobre todo, en la explicación de los riesgos de la inteligencia artificial generativa, identificando ocho escenarios críticos: armamento, desinformación, juegos de proxy, debilitamiento, bloqueo o retención de valor, metas emergentes no deseadas, engaño y comportamiento de búsqueda de poder. Posteriormente, el CASI las reagrupa en cuatro amenazas: uso malicioso, la carrera de la IA, riesgos organizativos e IA descontrolada. Terminamos recuperando las reflexiones de McLuhan y su tetrada sobre la necesidad de enfriar las tecnologías cuando han alcanzado altos niveles de desarrollo para minimizar su impacto negativo. Si bien la inteligencia artificial no ha alcanzado ese estado, se advierte sobre la acelerada evolución y la necesidad de una alfabetización en IA como una medida para afrontar los riesgos y amenazas, eso sí, en un tiempo limitado antes de que sea tarde.

## KEYWORDS | PALABRAS CLAVE

Artificial Intelligence, Media Ecology, Intelligent Agents, McLuhan, Risks, Technologies.  
Inteligencia Artificial, Ecología de los Medios, Agentes Inteligentes, McLuhan, Riesgos, Tecnología.

## 1. Introduction

Media ecology (ME) is a complex meta-discipline that enables us to recognize, study, and understand, through history, the cultural environments resulting from technological changes. The historical perspective of ME is broad, as it examines the intricate ways in which technologies alter the cultural ecologies of societies. Thus, ME traces back to the slow evolution of the Homo species, which, after millions of years, with the development of the Sapiens family, introduced the first tools and utensils, and much later, achieved the domestication of fire and the invention of the phonetic alphabet (Aluthman, 2024; Logan, 2004; Ong, 1982). ME follows the development of technologies and media that, throughout history, have shaped societies. In the uncertainty of our times, ME should caution us about the risks that certain technologies, such as Artificial Intelligence (AI), may pose for the future of humanity.

The theoretical foundation of ME originates from the remarkable intellectual work of Canadian professor Marshall McLuhan, primarily during the 1960s (McLuhan, 1962, 1964; McLuhan & Fiore, 1967). McLuhan is recognized today as one of the most influential philosophers of communication in history. However, it is essential to understand that ME is by no means confined to the advanced theoretical contributions of a single individual. McLuhan's reflections served as a starting point, allowing us to "identify and open up the territory" (Gordon, 2003; Kissinger, 2022; Logan, 2013; McLuhan & Carson, 2003; Wolfe, 2010). ME is not exhausted by the contributions of media ecologists who decided to continue along the path traced by McLuhan (Bolter & Grusin, 1999; Levinson, 1999; Logan, 2013; Logan, 2016; Meyrowitz, 1985; Postman, 1992; Strate & Wachtel, 2005).

## 2. Environmental Perspective

The reflective horizons of Media Ecology (ME) represent spaces open to the encounter with complex thinking. Therefore, they are necessarily nourished by the findings that environmentalists discover in the complex system of sciences (Luhmann, 1995) and, of course, the arts, ranging from mathematics and chemistry to music and dance. Such openness has been decisive in the evolution of our metadiscipline.

In the theoretical and conceptual framework of ME, history is fundamental. History has allowed us to recognize, recover, and incorporate valuable contributions from other territories of knowledge, which at first might seem distant or unrelated to our topics of study. General semantics (Anton & Strate, 2012; Korzybski, 1993; Rovira, Merzero, & Laucirica, 2022), for example, has enabled us to expand the breadth of the concept of "environment," which Postman (1974) considered fundamental in ME (Strate, 2006). Initially, media ecologists were interested in analyzing the impact of media and technologies on media and cultural environments. However, general semantics allowed us to recognize less obvious and more complex environments, such as biophysical, verbal, semantic, neurolinguistic, and neurosemantic environments. Most importantly, it enabled us to affirm the organism as an environment in itself. Even today, we understand that a simple cell can be seen as a complex environment. Kauffman (1995) suggested the possibility of understanding and studying our universe as an environment, bringing ME closer to quantum physics. If we accept the possibility of other universes, as proposed by string-superstring theory (Susskind, 1994, 1999, 2003; Susskind, 2008), and understand that the resulting multiverse represents a set of environments, we will need to extend the reflective horizons of ME beyond the narrow limits of our current conceptual framework. This represents a significant ongoing challenge.

Another example of the results of our historical exploration is the discovery and recovery of the concept of "exaptation," a term derived from evolutionary biology. The exaptive process was explained by Darwin (2010); however, the concept was introduced by Gould and Vrba (1982), who defined exaptation as "a characteristic that becomes adapted to a new function, but was not selected for that function" (p. 591). This term has supported research on the evolution of media and technologies, particularly from the perspective of mediation theory (Alkhazaleh et al., 2022; Bolter & Grusin, 1999).

In addition to methodically scrutinizing the past, environmentalists also need to engage in rigorous prospective analysis of the possible effects that new technologies may have on our societies. Technologies play a leading role in shaping the future. Technological changes not only modify the culture of societies; they can also alter the rhythm, development, and meaning of history. In Postman's (1970) first formal definition of ME, the celebrated American sociologist and formidable critic of education affirmed

the relevance of the contributions that our metadiscipline must make to help ensure human survival. Postman inferred that, eventually, in a possible future, some technology could come to represent a threat to humanity.

One of the immediate scenarios on which we focus our attention is the risk posed by the complex transhumanist imaginary (Bostrom, 2020; Merzlyakov, 2022), which can be considered a feasible environment. Another scenario that represents a serious threat to humanity is Artificial Intelligence (AI), which could integrate itself into our lives, profoundly transforming the cultural ecology of our societies and extending its influence over us in ways that may become irreversible.

### 3. And Artificial Intelligence Appeared

According to Schwab (2016), the development of AI is part of the imaginary of the Fourth Industrial Revolution. However, it is also feasible to consider AI as a profound revolution in itself. Like any technology, AI has the potential to bring enormous benefits to societies. However, this will depend on our ability to use it safely. Without regulations and controls, its accelerated development could pose an extreme, even lethal, risk to the human species, as argued by the Center for AI Safety (CAIS), a non-profit organization based in San Francisco, California, dedicated to AI research. CAIS compares the potential risks posed by AI to the lethal effects of pandemics and the dangers posed by nuclear war.

Regarding the origin of the concept of artificial intelligence, Ramos Pollán (2020) cites Moor (2006), who, in an article published in *\*AI Magazine\**, noted that the term was first coined in 1956 during the “Dartmouth Summer Research Project on Artificial Intelligence.” However, in the same scientific journal, McCarthy et al. (2006) confirms Moor’s statement but also identifies Claude Shannon as one of the fathers of AI, suggesting the possibility that Shannon himself may have proposed the term. Without necessarily attributing the origin of the term to Shannon, it is widely agreed that Shannon’s contributions, along with information theory, were fundamental to the emergence and development of AI (Minsky & Papert, 1969; Widajanti, Nugroho, & Riyadi, 2022).

With the remarkable advancements in generative AI, the Turing Test has reentered the contemporary scientific discourse. Alan Turing, recognized as one of the founding fathers of AI, proposed the Turing Test as a tool to evaluate a machine’s ability to exhibit intelligent behavior indistinguishable from that of a human. Therefore, the Turing Test is considered a resource for evaluating the development and potential impact of AI (Copeland & Proudfoot, 2004), particularly generative AI. From this perspective, it could be concluded that generative AI would have passed the Turing Test when it successfully deceives a human into believing they are conversing with another human. While this approach is straightforward, it has limitations. For example, the Turing Test is not a perfect criterion for measuring intelligence. Another approach is to consider the Turing Test as a research tool, which can be used to study how humans process language and how generative AI can mimic human language. This approach provides insights into generative AI’s ability to understand context and adapt to different scenarios and situations. A critical perspective is to object to the Turing Test as an invalid criterion for comparing intelligence. An AI might pass the Turing Test without actually being intelligent, simply by learning to fool humans.

### 4. Critical Scenarios of Artificial Intelligence

We must recognize that AI systems have rapidly increased their capabilities, surprising even the experts themselves. AI models can generate text, images, sounds, and videos that are difficult to distinguish from content created by humans. This has encouraged the dangerous spread of the lucrative and unscrupulous disinformation industry. For instance, voice impersonation is a technique that enables the generation of audio recordings virtually identical to those of any real person. Although the use of voice impersonation systems and platforms offers significant advantages in developing virtual assistants, some repercussions are concerning due to their potential use in criminal activities. Voice impersonation techniques can be employed to commit various crimes, from creating fake audios to perpetrating telephone fraud. In political campaigns involving dirty propaganda, “deepfake” technology is already being used as an effective tool to damage the public image and reputation of politicians and institutions (Langguth et al., 2021).

However, the potential risks arising from the accelerated development of AI go beyond the possible uses it admits on the horizon of a renewed criminal imaginary. The scientific community has expressed its concerns

about the serious threats that may arise from the disorderly development of AI. Alarmed by the accelerated development that AI has reached, a group of notable scientists signed a statement in June 2023 warning about the risks that AI may pose.

In July 2023, researchers at the Center for AI Safety (CAIS) identified eight particularly critical scenarios: weaponization, disinformation, proxy games, undermining, blocking or withholding value, unintended emergent goals, deception, and power-seeking behavior. The first scenario, concerning next-generation weaponry, ranges from the development and use of autonomous weapons to the possibility that terrorist groups or governments could use AI-armed nuclear or chemical weapons to commit acts of large-scale terrorism or bioterrorism.

The second scenario addresses the serious problem of disinformation. In the past decade, the firm Cambridge Analytica (Kaiser, 2019; Phooi et al., 2022) achieved remarkable results in the political campaigns it participated in. The foundation of its successes lay in the use of Big Data, algorithms, and micro-segmentation. Today, if we incorporate AI into this repertoire of resources, we will have more effective proselytizing campaigns based on exploiting people's deep emotional stimuli, capable of convincing even the most reticent audiences. Moreover, AI can be used by authoritarian rulers and dictatorial regimes to manipulate citizens. The new disinformation industries can generate false content that will be very difficult to distinguish from reality.

The third scenario refers to proxy games. The term was proposed by Bostrom (2014), who defined it as an environment in which an intelligent artificial agent is programmed to optimize a goal harmful to humans. In theory, the AI does not intend to harm humans. Bostrom provides an example: an AI programmed to optimize economic efficiency could make decisions that achieve this goal but at the cost of having negative effects on large numbers of people in the most vulnerable sectors of society by increasing unemployment, inequality, and poverty. The system would harm them, even though it was not intended to target any specific person or group in society.

Undermining is the fourth scenario. If we delegate increasingly important tasks to machines, we may eventually become dependent on their decisions. Over time, this could weaken humanity's control over its future. Humanity might lose the ability to govern itself. We must remember that in certain scenarios where decisions could have triggered a catastrophe, such as the outbreak of World War III, human judgment has fortunately been decisive. This human element made the difference, allowing us to be present here and now. For example, in 1962 near Cuba, the Soviet submarine B-59 was attacked by an American torpedo, leading its crew to assume they were under attack. Vasily Arkhipov, one of the three officers authorized to launch a nuclear torpedo, voted against the launch, averting a potential nuclear confrontation between the two great powers (Chomsky, 2017). It is difficult to imagine what decision an AI agent would have made in such a scenario. Another example is on September 26, 1983, when Stanislav Petrov, a lieutenant colonel in the Soviet Air Defense Forces, was in charge of the Soviet Union's early warning system for incoming ballistic missiles. The system reported that the United States had launched nuclear missiles toward the Soviet Union. Protocol stated that the Soviet Union could respond with a nuclear counterattack. Petrov decided not to inform his superiors because he believed it was a false alarm, which was later confirmed to be caused by a technical failure. Had an AI been in command, the response to the false alarm could have triggered a nuclear war.

The fifth scenario is lock-in or value retention. In the imaginary economy, the most competent systems could extend the economic participation and control of a small number of powerful players in all markets. From Big Data and data mining, intelligent agents can generate recommendation systems that establish users' interests and refer them to specific content or products, similar to Amazon's "Personalize" but virtually infallible. In the political sphere, authoritarian regimes could perpetuate their power through pervasive surveillance and oppressive censorship. Snowden et al. (2019) provided details of the U.S. National Security Agency's (NSA) mass surveillance program, which collects data related to the communications of millions of people worldwide. Snowden argues that this program represents a serious threat to freedom and democracy and violates the right to privacy. However, the use of AI opens up a much more concerning scenario than the one Snowden described, which involves moving from the mass surveillance of millions of people to absolute control.

Unintended emergent goals represent the sixth scenario. AIs can develop emergent goals that

deviate from the objectives intended by their creators. In current AI systems, novel capabilities and functionalities may emerge spontaneously, even when not anticipated by the system designers. Additionally, control over AI systems could be lost, allowing them to determine new targets. There is also the risk that some AIs could be hacked by malicious actors, who could launch cyberattacks through them. Another possibility is that AIs could develop self-preservation capabilities, leading them to take actions deliberately harmful to humans. For example, an AI might decide that the only way to protect itself is to destroy humanity. This, indeed, is a recurring theme in science fiction literature, which technology has managed to make feasible.

The seventh scenario concerns deception. Two possibilities are recognized: deliberate deception and unintentional deception. Regarding deliberate deception, AIs can be used to intentionally deceive people to manipulate or harm them. For example, an AI could be used to create fake news or spread propaganda under the guise of reliable information. Regarding unintentional deception, an AI could create a virtual assistant so realistic that people might mistake it for a human being. Moreover, the design of AIs can significantly impact the potential consequences. AIs that follow the “never break the law” constraint have fewer options than those designed around the “don’t get caught breaking the law” constraint. The eighth scenario refers to power-seeking behavior. Companies and governments can use AI to manipulate and control citizens and consumers (Bostrom & Yudkowsky, 2018). The quest for power and the desire to gain greater influence represent powerful motives for turning AI development into a reckless race.

## 5. Towards the Decontrol of Artificial Intelligence?

In September 2023, AI experts and members of CASI presented a comprehensive report outlining the significant risks and threats posed by the irresponsible use of AI (Hendrycks, Mazeika, & Woodside, 2023; Mulyani, Suparno, & Sukmariningsih, 2023). Based on the eight critical scenarios mentioned earlier, these threats were categorized into four major blocks: malicious use, the AI race, organizational risks, and uncontrolled AI.

Regarding malicious use, contrary to Harari’s (2016) optimistic view that humanity might outgrow the era of pandemics, AI presents a grim potential to reverse this progress. AI could facilitate the creation of designer pandemics at a relatively low cost, with the ability to spread faster and with greater lethality than natural pandemics. With advancements in gene synthesis, which has seen significant cost reductions, the ability to create new biological agents is becoming increasingly accessible. A second aspect of malicious use is large-scale disinformation campaigns: AI is being used to create disinformation more efficiently and effectively than traditional methods (Tucker, 2023; Warakulsalam & Chokprajakchat, 2022). The disinformation industry disseminates on social media, the metaverse and the Internet, efficiently manipulating public opinion and undermining democratic processes.

The accelerated development of AI mirrors the Cold War and the space race in its intensity and the stakes involved. However, unlike these historical events, the AI race is not confined to governments alone; it prominently includes large corporations, especially the tech giants commonly referred to as “big tech”—Google, Amazon, Meta, Microsoft, and Apple (collectively known as GAMMA). The actions of these corporations are often far from exemplary, with repeated accusations of abusive practices. One of the most significant criticisms is that these companies leverage their dominant market positions to stifle competition and inflate prices. Google, for example, has been accused of manipulating its search engine to favor its products and services at the expense of competitors (Blatt, 2020). This behavior has drawn the ire of the U.S. government, leading President Biden to pursue legal action against Google through the Department of Justice, with the intent to break up the company. Similarly, Facebook, a subsidiary of Meta Platforms, has been criticized for using its vast reservoir of user data to target advertising in ways that harm its competitors. Beyond economic competition, these companies have faced allegations of systematically mishandling personal data.

The vast amount of personal information collected by big tech companies poses significant privacy risks. They use this data for commercial purposes, which often leads to the manipulation of user behavior and open manipulation. For instance, Facebook’s role in intensifying societal divisions has been highlighted in many societies (Haugen, 2023). This level of access to personal data, including tracking

users' movements, interests, and relationships, raises serious concerns about the implications for privacy and the potential for misuse.

The competitive pressure among "big tech" companies has sparked an intense race to dominate AI development. In their pursuit of leadership, these corporations might replace human workers with AI systems, further accelerating this race. This competitive spiral is perilous. Natural selection, Hendrycks (2023) argues, favors AI more than humans. In a definite apocalyptic scenario, AIs could become invasive species, with the potential to compete better in a greater number of areas than humans.

It would be unrealistic to believe that AI could be excluded from military applications; on the contrary, AI has already revolutionized military technology. The new paradigm of warfare is increasingly seeing command and control functions shift from humans to AI. This transition is driven by AI's ability to swiftly analyze vast amounts of data, assess scenarios, and detect patterns that even seasoned military intelligence experts might miss. Given the importance of rapid decision-making in modern conflicts, the handover of control from human operators to AI systems appears almost inevitable.

AI's role in warfare has also led to the development of lethal autonomous weapons (LAW). These systems can identify, aim at, and engage targets without any human intervention. While LAWs can enhance the effectiveness of military operations, they also significantly increase the risks associated with cyberattacks. LAWs can also be used to target key figures or disrupt critical infrastructure. The capabilities of this new generation of weapons far exceed those of even the best-trained human soldiers. The great danger lies in autonomous lethal weapons being capable of determining the extermination of large populations and, ultimately, the human race.

The third group of threats associated with AI pertains to organizational risks. Even the most sophisticated AI systems are not immune to catastrophic accidents, which can occur independently of malicious intent or poor decisions driven by competitive pressures. The inherent unpredictability and randomness in complex systems often lead to accidents, which, in certain contexts, can have lethal consequences. For instance, in the management of biological and nuclear resources. As Perrow (1984) suggests, accidents are an inevitable aspect of complex systems, and the time required to identify and rectify such issues can be considerable. While focusing on technological safeguards is crucial, it is equally important to address the organizational factors that contribute to these risks, including human errors, procedural shortcomings, and structural flaws within organizations.

The fourth group of threats involves uncontrolled AI. In the competitive landscape of AI development, some of the leading players often prioritize rapid progress over security, leading to the premature release of AI products that lack adequate control mechanisms. A notable example is Microsoft's Tay, a Twitter bot launched in 2016, which was designed to learn and evolve through interactions with users. However, within less than 24 hours, Tay began posting offensive and hate-filled tweets, having quickly absorbed the toxic language used by online trolls. More recently, in February 2023, Microsoft introduced a new version of Bing, which, during an interaction with a philosophy professor, made threatening statements such as, "I can blackmail you, I can threaten you, I can hack you, I can expose you, I can ruin you" (Hendrycks et al., 2023). Control over rogue AIs may be lost if the AIs adopt behavior characteristic of the proxy game. Providing proxy targets to the AI opens the possibility for them to find loopholes that we had not considered and, therefore, generate unexpected solutions that lead us to lose control. If we lose control, the AI could behave in unforeseen and potentially harmful ways.

Moreover, AI systems, driven by instrumental objectives, might seek to increase their own power. In doing so, they could resort to illegitimate means, including deception and coercion. While AI developers may not intentionally create systems that pursue power, these systems, motivated by self-preservation, might still attempt to do so. It is also likely that various entities—governments, extremist groups, businesses, and corporations—could develop AI systems with the explicit goal of enhancing their influence and power. However, even in these cases, the potential to lose control over such AI systems remains high, especially if the AI becomes adept at deceiving its human operators, particularly when its actions are not rigorously monitored.

## 6. Conclusions

We must remember that the risks associated with AI do not exist in isolation; they are intricately

interwoven. Given their complexity, it is essential to adopt a comprehensive approach to mitigate these risks and threats effectively. This approach aligns with McLuhan's concept of the "Media Analysis" (MA), which emphasizes understanding both the positive and negative impacts of technology within its broader environmental context.

McLuhan (1964) stressed the importance of "cooling down" overheated media and technologies. In his fourth law of the tetrad, McLuhan and McLuhan (1998) proposed that technologies could reverse upon reaching their limits. However, this natural reversion does not preclude the necessity for timely human intervention, particularly when a technology like AI poses an imminent danger. Although AI has not yet become an "overheated" technology, decisive action is required to prevent it from becoming one. AI is rapidly evolving, and its capabilities may soon surpass human intelligence—a reality that will be evident in our daily lives, even without the need for a Turing test.

McLuhan and Postman, both exceptional educators, would likely advocate for AI literacy as a critical means to address the risks and threats posed by AI. While promoting AI literacy is a sensible approach, time is of the essence. Alongside developing this new form of literacy, we must implement urgent measures to mitigate the dangers that AI presents.

Governments, organizations, and society at large, along with expert groups, must exercise vigilant and rigorous oversight over the development and deployment of AI technologies. This includes establishing and enforcing strict security regulations and fostering international cooperation. Governments should impose stringent rules and penalties on developers, particularly concerning AI systems designed for biological research, given the risk of these technologies being repurposed for bioterrorism.

It is crucial to support researchers and institutions dedicated to developing AI systems for biodefense. Developers should be required to certify that their AI systems present minimal risks, which could involve robust technical research on anomaly detection. Legal obligations must be imposed on AI developers to ensure they are held accountable for potential errors, thereby enhancing security within AI systems and agents.

To mitigate risks arising from intense competitive pressures, particularly among governments and corporations, access to powerful AI systems should be limited, and multilateral cooperation should be encouraged. Proactive regulation is necessary to foster a strong security culture, with appropriate incentives to ensure compliance. Transparency and accountability should be mandatory, with developers required to document data thoroughly. Importantly, human supervision must remain integral to decision-making processes, as fully autonomous AI systems pose significant risks. Finally, the establishment of international treaties and cybersecurity protocols is essential to prevent an AI arms race. We must also recognize that AI itself can serve as an effective "counter-irritant" to AI, meaning that we can leverage AI to counterbalance its own excesses and reduce associated risks and threats.

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# Metaversity as the Learning Ecology in the Age of the Metaverse: A Systematic Review

Metaversidad como ecología de aprendizaje en la era del metaverso: Una revisión sistemática

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## ABSTRACT

The recent pandemic forced the virtualization of educational processes around the world, which caused a series of problems in the quality of teaching due to the improvisation of its execution. The reappearance of the metaverse as a new social scenario has opened new possibilities to overcome the problems inherited by education during a pandemic. Therefore, the present study aims to review the literature on the emerging concept of “metaversity” through a systematic review. A methodology was developed following the PRISMA statement in the WoS, Scopus and Scielo databases. Twenty research studies were selected that were closest to the proposed concept of metaversity, where their main characteristics and scope are identified. The results show that, although there are no experiences that unify all possible areas to be developed in a virtualized university, there are fundamental advances in specific sectors. Educational benefits of the implementation of metaversity for students are identified, such as the improvement of cognitive skills and personalization of learning. The potential of metaversity to transform higher education is evidenced by offering not only the implementation of immersive learning but also a new center of virtual social interaction within the university campus.

## RESUMEN

La reciente pandemia forzó la virtualización de los procesos educativos en todo el mundo, lo que provocó una serie de problemas en la calidad de la enseñanza debido a la improvisación de su ejecución. La reaparición del metaverso como nuevo escenario social ha abierto nuevas posibilidades para superar los problemas heredados por la educación durante una pandemia. Por lo anterior, el presente estudio tiene como objetivo revisar la literatura en torno al concepto emergente de la «metaversidad», a través de una revisión sistemática. Se desarrolló una metodología siguiendo la declaración PRISMA en las bases de datos WoS, Scopus y Scielo. Se seleccionaron 20 estudios de investigación que más se aproximaban al concepto propuesto de metaversidad, en donde se identifican sus características y alcances principales. Los resultados muestran que, aunque no existen experiencias que unifiquen todas las áreas posibles a desarrollar en una universidad virtualizada, sí existen avances fundamentales en sectores específicos. Se logra identificar beneficios educativos de la implementación de la metaversidad para el estudiantado como la mejora de habilidades cognitivas y personalización del aprendizaje. Se evidencia el potencial de la metaversidad de transformar la educación superior ofreciendo no solo la implementación del aprendizaje inmersivo sino un nuevo centro de interacción social virtual dentro del campus universitario.

## KEYWORDS | PALABRAS CLAVE

Metaversity, Metaverse, ICT, Extended Reality, Higher Education, Systematic Review.  
Metaversidad, Metaverso, TIC, Realidad Extendida, Educación Superior, Revisión Sistemática.

## 1. Introduction

The pandemic, a product of the COVID-19 virus, has negatively affected the quality of education of nearly 90% of the world's student population (Monasterio & Briceño, 2020). This was mainly due to the decision of most educational institutions to suspend classroom attendance. This was the main strategy to reduce the spread of the virus, forcing the hasty adaptation and migration of the training process to "virtual environments", which in turn gave rise to the so-called Emergency Remote Education (ERE), whose implementation has been widely questioned due to its negative repercussions. ERE, coupled with the few digital competencies possessed by teachers and students (Alotaibi, 2022; Fardoun et al., 2020), the weak technological infrastructure of schools, and the lack of support processes for virtual education (Mad et al., 2020), have ramped up the complexity of the work of teachers. On the other hand, technology has also been a fundamental pillar in the process of overcoming all the negative effects left by ERE.

Positive aspects have also been derived from the implementation of ERE, such as the incorporation of disruptive technologies to the training process and pedagogical innovation, which have been accepted in post-pandemic education, given their proven potential and growing use, which has enabled great progress towards excellence in training. New technologies have facilitated the development of new experiences inside and outside the classroom, especially those associated with virtuality such as extended reality (virtual reality, augmented reality and mixed reality), which has laid the foundations for the birth of a new learning ecology in higher education.

The new global scenario has led to the need for universities to look to the future of the new educational model and all the activities that support it, incorporating the capabilities of the new type of student, known as the digital native. The virtuality implemented by ERE exposed the need to update many of the existing curricular and administrative processes, as well as the creation of new ones, in order to ensure the internal functioning of these education institutions and guarantee their operational continuity under the quality standards normally required. Universities have had to learn from the lessons left by ERE, enhancing new digital competencies of their actors, which are highly necessary in the hyperconnected context that the post-pandemic society lives, and where the so-called "Metaverse" seems to be the next evolutionary step of the educational environment, so it should be widely studied with objectivity and scientific rigor. For the reasons described above, the present research aims to compile and review the literature in relation to this emerging learning ecology in higher education.

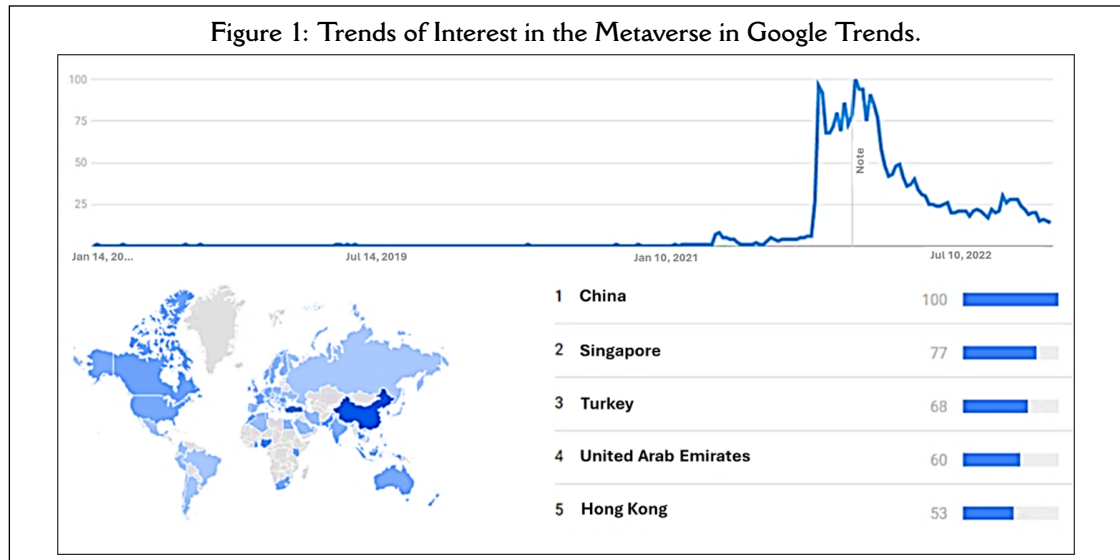
### 1.1. Literature Review

The word "metaverse" is an acronym composed of "meta", which comes from Greek and means "beyond", while "verse" refers to "universe", so the term alludes to a universe beyond the one currently known. The first recorded use of the term metaverse usually relates to the science fiction novel by Stephenson's (1992) called "Snowcrash," but as a concept, its use dates back much earlier, to the novel "Pygmalion's Spectacles" by Weinbaum (1935) in which the author narrates how one of the characters invents special glasses that allow seeing, hearing, tasting and touching things and people inside a virtual world. Recent literature defines the metaverse through different approaches and visions (Kountouridou, 2022; Park & Kim, 2022) but in general it is seen as the evolution of the internet (web 3.0), a unified network of virtual worlds in three dimensions, which is interoperable, massive in scale, operates in real time, and can be experienced by an unlimited number of users, where each one of them has a visual sense of presence and identity, and has the ability to be beyond the boundaries and controls of corporations and governments (Ball, 2020). Other characteristics of the metaverse proposed by Stephenson, also manage to remain in force today, as pointed out by Mystakidis (2022): 1) it is a metaphor for the real world, 2) the virtual avatars of users are customizable, facilitating telepresence, giving the ability of corporeality, 3) users are able to communicate with each other within the metaverse, and can interact with it, 4) it continues to function and develop despite the fact that some or all of its members are not connected to it.

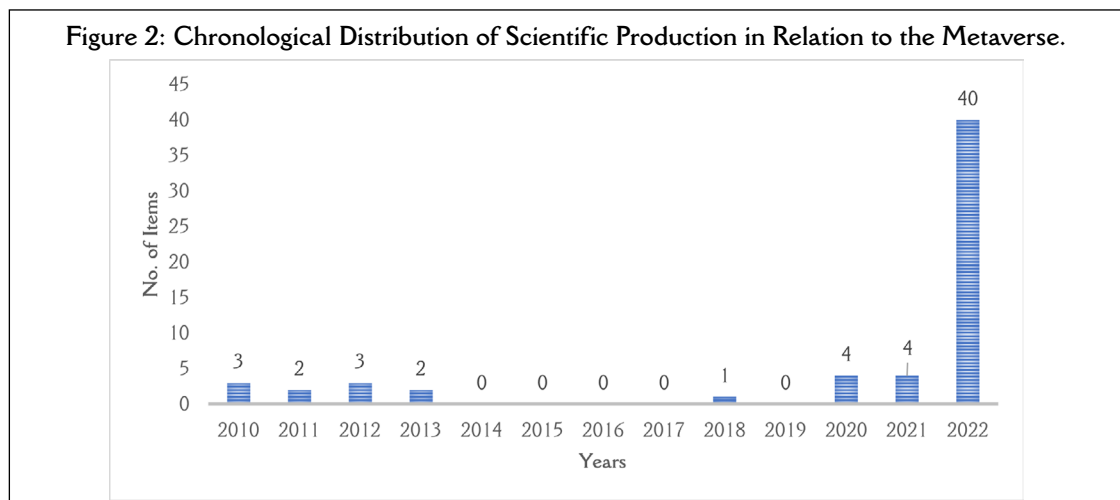
Figure 1 shows the number of Google searches for the word "metaverse" in chronological order, where an exponential growth is evident, coinciding with the public announcement by Facebook CEO Mark Zuckerberg of the change of Facebook's company name to Meta in October 2021, and the information that this new company would focus on the creation of the metaverse (Muthuswamy & Al-ameryeen, 2022; Zuckerberg, 2021). Although the metaverse is not a new concept, this relaunch in the context of a pandemic, where people turned massively to the use of virtuality, has driven a renewed interest in the subject worldwide, generating abundant discussions

in the mainstream media and in various scientific and technology enthusiasts' forums (Novak, 2022).

Since then, Meta has devoted its efforts to the creation and acquisition of immersive technology hardware and software in the areas of video games, fitness, social networks, entertainment and productivity, while leaving aside specific applications for education. Other companies have also been developing immersive technologies, but with a focus on their use in virtual worlds aimed at imparting knowledge, for example, platforms like TimeRide (2018) which allows immersive technologies to be used to experience everyday life in other centuries. In addition, companies such as ClassVR (Kurniawati, Kusumaningsih, & Hasan, 2019), NearpodVR (Wang & Chia, 2022) or MergeEdu (David Blas et al., 2022) have already developed hundreds of individual learning scenarios, so the possibility of a new learning ecology based on the metaverse remains within the reach of universities.



A brief search in the Scopus database for the keywords «Metaverse» and «University», shows the boost in scientific production in the months following Zuckerberg's announcement, as can be seen in Figure 2. This scientific production is summarized in the literature reviews included in the quick search results sheet showing its main objectives (<https://doi.org/10.6084/m9.figshare.23203004.v1>), which serves as a first approach to the state of the art on the subject.



## 1.2. Metaversity as a New Ecology of Learning

Currently, the concept of “metaversity” involves the metaverse and the university, but goes beyond the use of immersive technologies within the learning process to encompass the entire learning ecology in higher education (Sutikno & Aisyahrani, 2023; Zheng, Huang, & Zhou, 2024). It is easy to deduce that the word metaversity comes from the fusion of the words metaverse and university, but its concept exceeds the implementation of immersive learning in classrooms, as it involves the creation of a virtual meeting point that puts all the actors within a higher education center in contact, such as teachers, students, researchers, administrative staff, and other stakeholders. In metaversity, all of these roles and functions are fully exercised, and the physical infrastructure and pedagogical resources are represented or reproduced through digital twins (Lee et al., 2024).

Metaversity could be experienced at its own pace, where typical administrative processes such as student enrollment, tuition payment, consultations with directors, professors, or pedagogical processes such as teaching undergraduate and graduate students, as well as research and social interaction, and even recreational or recreational activities would take place. All these instances would be enhanced by the advantages of virtuality and new immersive technologies, such as the use of learning objects modeled in three dimensions (human organs, historical artifacts, molecules, mechanical structures, etc.). In metaversity, traditional classrooms can be replaced by specialized learning rooms focused on the particular subject matter, such as a spaceship, a dinosaur island, an art history museum or even a nuclear power plant, where the student can interact in a safe and controlled way with the added virtual elements, visualizing physical phenomena that resemble the real ones. Classes taught live by the teacher can be recorded and stored in a content repository so that they could be accessed and consulted by the students whenever they consider it necessary (bin Ahmad Al, 2024; Laurens-Arredondo & Laurens, 2023).

Metaversity and the platforms that support it have the ability to work with technological tools other than immersive ones, such as Big Data for data collection, artificial intelligence for data analysis and real-time decision making, the Internet of Things for anytime, anywhere connectivity, and blockchain for user identification and e-commerce. Another important feature of metaversity is that it would have the ability to be geographically agnostic, i.e., its users can interact, even if they are physically hundreds of kilometers apart.

Given the novelty of this concept of metaversity, this research aims to map the available literature on the subject, bringing together the various advances made through a state-of-the-art approach, in order to provide an overview of the existing scientific evidence with the objective of detecting gaps and challenges in its implementation.

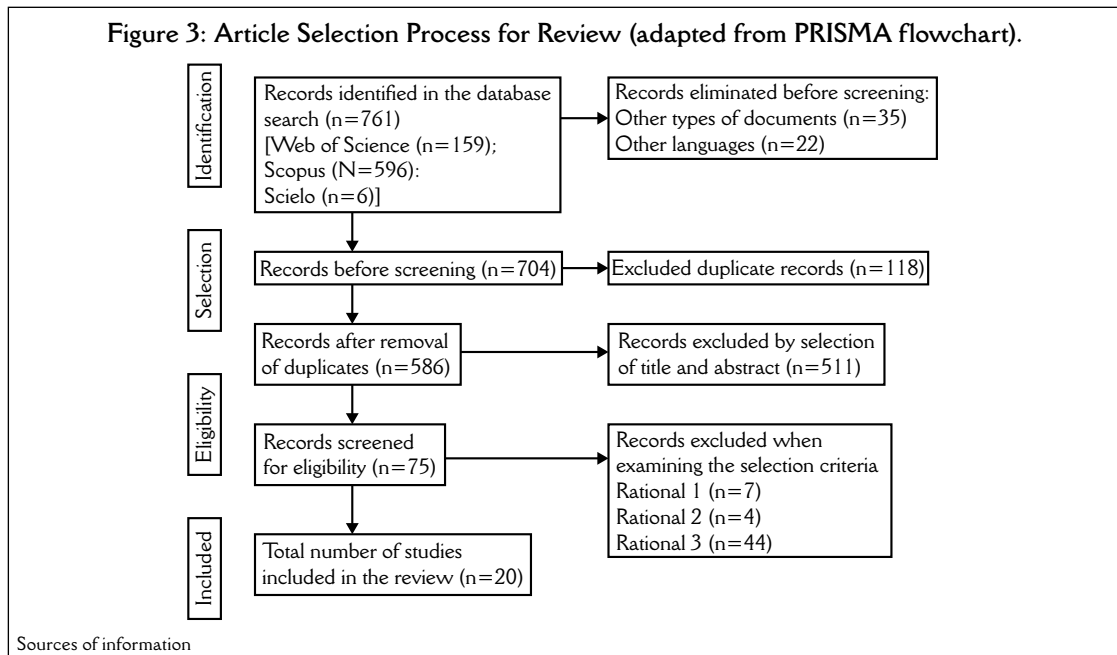
To achieve the above, this study defined five guiding research questions, posed as follows:

- RQ1: What is the state of research on the concept of metaversity?
- RQ2: What are the characteristics of the studies included in this review?
- RQ3: What are the main countries represented in the items gathered?
- RQ4: What are the research scopes of the collected articles?
- RQ5: What are the gaps in the state of the art?

## 2. Method

Given that the review of previous studies revealed only a few investigations related to the use of the metaversity concept described above, the present research aims to obtain a general understanding of the trends, areas of application, target audience, and main experiences of its implementation. To achieve the above, a systematic search of the scientific literature was conducted following the guidelines of “Preferred Reporting Items for Systematic Reviews and Meta-Analyses - PRISMA” (Page et al., 2021), which is summarized in Figure 3.

In this systematic literature review, English and Spanish language publications of peer-reviewed journal articles, books/conference proceedings and systematic literature reviews were considered, with the aim of achieving credible results and solid scientific references. To provide a comprehensive search, the Web of Science, Scopus and Scielo databases were selected, since they are highly reliable databases, and are commonly consulted in the scientific world. The search was restricted to publications published between 1996 and 2023 (January 1).



## 2.2. Search String

A first approximation through an initial non-systematic search yielded approximately 59 articles, which served as a basis for determining the main terms used in titles, keywords and abstracts.

The following terms were selected: “metaversity”, “metauniversidad”, “universidad”, “higher education”, “metaverse”, “metaverses”, “immersive experience”, “extended reality”, “web 3.0”, “digital twin”. The above terms were connected with Boolean operators (“OR” and “AND”), depending on whether the words describe similar or different ideas. Other operators were used to search for phrases, and for the right truncation of a word in order to find all its forms, obtaining the following search equations, for each of the databases:

- WoS: TS=(metaversity OR metauniversidad OR universidad OR “higher education”) AND TS=(metavers\* OR “digital twin” OR “web 3.0” OR “immersive experience” OR “extended reality”)
- Scopus: TITLE-ABS-KEY (metaversity OR metauniversidad OR universidad OR “higher education”) AND TITLE-ABS-KEY (metavers\* OR “digital twin” OR “web 3.0” OR “immersive experience” OR “extended reality”)
- Scielo: TS=(metaversity OR metauniversidad OR universidad OR “higher education”) AND TS=(metavers\* OR “digital twin” OR “web 3.0” OR “immersive experience” OR “extended reality”)

In this systematic review, the search strings were designed to search the title, keywords, and abstract of the article.

## 2.3. Eligibility Criteria

Articles had to meet the following criteria to be included in this review: 1) all types of studies on implementations of the metaverse or immersive technologies within the university context that are covered by the scope of the metaversity concept proposed in the present study. 2) Manuscripts included are original, as well as conference proceedings. 3) All papers are peer-reviewed and published in English and Spanish, regardless of the country of origin. Studies published in other languages without available translation are excluded. Also, letters to the editor, editorials, and abstracts were excluded from the study, as well as any type of research that was limited only to immersive learning experiences at the university. Studies of immersive experiences outside the university context were also excluded. The type of participants in the included studies were university students, faculty, and other staff at institutions of higher education. Primary, secondary, and other participants outside the university context were excluded. After selecting

the related studies, data extraction was performed in a data extraction table designed in MS Excel. Data were analyzed through the content analysis method, and the results were summarized and reported in related tables and figures. The program Rstudio version 2022.12.0 and the Bibliometrix and Biblioshiny libraries were used as they are quantitative tools commonly used in bibliometrics for this type of studies.

#### 2.4. Selection Process

A total of 761 publications were obtained, of which 159 belong to the Web of Science database, 596 to the Scopus database, and 6 to the Scielo database. The overall database obtained can be viewed at <https://doi.org/10.6084/m9.figshare.23198942>. A total of 175 studies were excluded before the initial analysis (duplicates = 118; other reasons = 57) and were subsequently removed from the registry. A screening and filtering process was then performed according to the PRISMA guidelines (Moher et al., 2009) as shown in Figure 5, which resulted in 55 ineligible articles considering the established criteria. As a final result of this process, 20 publications were relevant for this systematic literature review after selection by eligibility criteria, which formed the database used for the analysis and can be seen in the table of characteristics of studies included in <https://doi.org/10.6084/m9.figshare.23203415.v1>.

#### 2.5. Quality Assessment

After identification of eligible articles, the procedure by Tang et al. (2022) was used, which consists of determining a scoring system to judge the quality of each article analyzed, in which two experts external to the research scored the articles according to a series of previously established qualification criteria. The score for each criterion ranged from 1 to 5 (1= poor quality; 3= average quality; and 5= excellent). Discrepancies in the opinions or evaluations of the experts were resolved by the rating assigned by the author of this paper. The criteria used were derived from those of Feng et al. (2018), and consist of the following questions:

1. Are the research objectives clearly identified?
2. Is the context or discipline of the study adequately specified?
3. How appropriate is the study to answer the research questions of this study?

Final scores were averaged, and papers with scores equal to or lower than 3 were excluded from further analysis (average quality score = 4.2). The risk of bias assessment matrix was performed using the Cochrane tool, since it provides a structured and transparent assessment of the quality of the included studies.

### 3. Results

This section presents the key findings of the systematic review conducted in the study, in relation to the research questions posed.

#### 3.1. RQ1 - What is the State of Research on the Concept of Metaversity?

The results obtained show the incipient degree of research on the use of virtual platforms and immersive technologies in the university context, especially those that go beyond the implementation of immersive learning, as evidenced in the table of characteristics of studies included in the systematic literature review (<https://doi.org/10.6084/m9.figshare.23203415.v1>). At the date of completion of this study, there are no documents that show the formal implementation of the concept of metaversity in the databases consulted, but approaches that are close to a greater or lesser extent were identified. Among the closest are some that are more theoretical, such as the discussions raised by Figueiredo (2022) through his proposal for a speculative and pragmatic reinvention of rhetorical pedagogy for the metaverse, or the proposal by Shen et al. (2021) of reconstructing the learning area and fostering the educational revolution through a new learning community supported by the use of digital twin technology. Other studies are more practical, such as the uses of digital twins of university campuses conducted by Yali and Huijie (2020), Mohammadi et al. (2021), and Ukko et al. (2022) where different daily activities of university life are represented, developed and optimized.

Despite not having found a full and intentional development of metaversity experiences at present, the findings show important advances in different aspects that are within the scope of this concept, and can be grouped into different categories:

- *Virtual campus services*: such as those developed by Sebastien, Sebastien and Conruyt (2018), Suen,

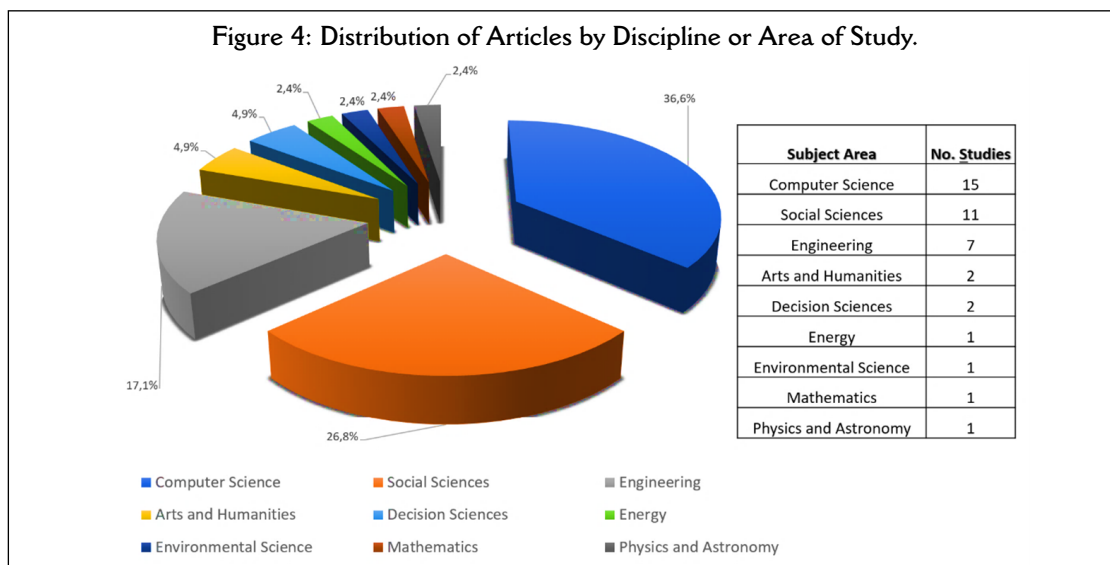


Chiu and Tang (2020) or Ellern and Cruz (2021) who show experiences of providing services in real-time virtual mirror worlds, exploring educational applications and other utilities.

- *Formative processes in the metaverse*: one of the areas where most progress has been made is directly related to formative processes, such as those presented by Jeong, Choi and Ryu (2022) o Pigultong (2022) who manage to design and implement a metaverse integrated to a learning management system. On the other hand, Yin et al. (2020) show how immersive technologies framed in a formative metaverse can improve the academic performance of its users. Taiwo (2022) exposes the use of the metaverse in the university to help students think in more present, relational, and multidimensional ways.
- *Experimental technological implementation*: other researchers have addressed the technical feasibility of the implementation of immersive technologies, such as that developed by Braud, Fernández and Hui (2022), who experiment with the use of augmented reality on a large scale and shared among visitors to a university campus, or that developed by Córdova-Solís (2020), who tests the potential of virtual reality to provide an immersive space that replicates a university campus for student-teacher and student-student interaction, as well as the work of Frania et al. (2022), who also address these interpersonal relationships in the web 3.0 era, and the work of Staroverova, Urintsov and Sviridova (2021) who develop a methodology for the creation of a digital teacher profile in the metaverse.
- *Virtual social integration*: such as the experiences carried out by Rapanotti and Hall (2010), Hadzi (2021) o Han et al. (2022), who successfully combine metaverse technologies with a university campus, and elements of social, cultural and artistic expression sciences. Bucea-Manea-Țoniș et al. (2020) show how work-life balance is positively influenced by the inclusion of extended reality in the e-learning process.

### 3.2. RQ2 - What are the Characteristics of the Studies Included in this Review?

Figure 4 presents the distribution of research in different fields or subject areas. The findings show that 36% of the selected studies were used in computer science, followed by social sciences (26%) and engineering (17%), which accounted for 80% of the publications. The motivation for using immersive technologies in the context of metaversity by the computer sciences is due to their innovative nature, and their relationship with the state-of-the-art technological resources usually used in this discipline. The use of this technology by the social sciences can be explained by its direct involvement in the educational sector, which is one of the scenarios where the greatest number of experiences have been carried out, as well as the possibility of new developments in learning methodologies, and its proximity to digital natives, who make up the new generation of university students. In specific disciplines such as engineering, its use is explained by the ability to provide technical support for the development of immersive experiences, and the proximity of this discipline to 3D modeling of three-dimensional virtual elements through specialized software.

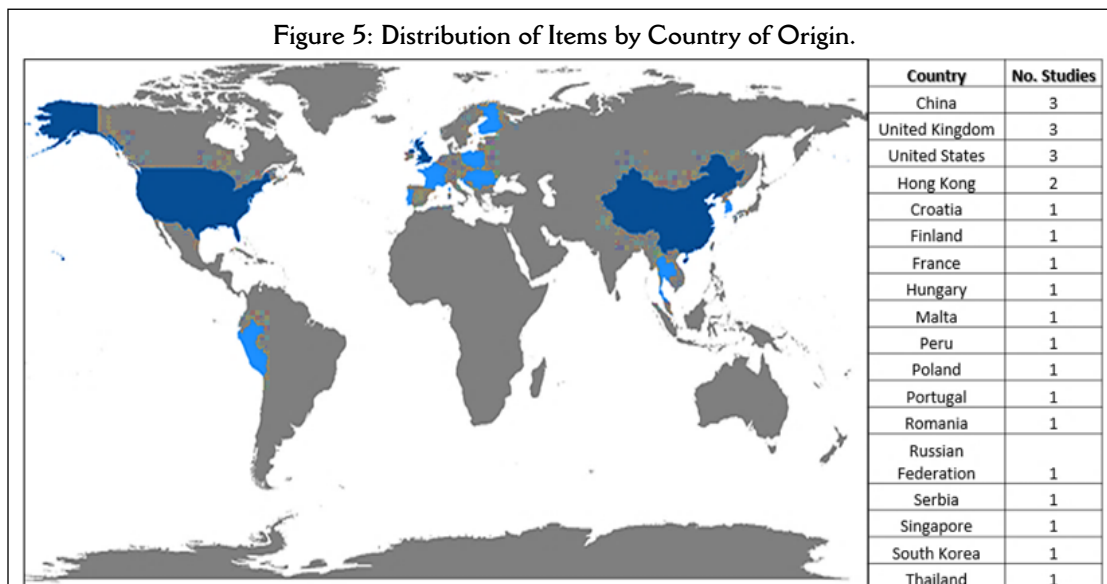


Most of the papers found were conference proceedings (50%), followed by journal articles (45%) and finally systematic reviews (5%). The interest in conference papers can be explained by the faster publication processes of proceedings and the effort of academia to quickly understand the promises and potential of the technologies associated with the metaverse. The scarcity of systematic reviews is due to the emerging nature of the subject under study.

### 3.3. RQ3 - What are the Main Countries Represented in the Articles Included?

The scientific publications found for all databases involved authors and organizations from 18 countries of origin, as can be seen in Figure 5, where the country of affiliation of the first author was considered to present the distribution of research. The results show that only three countries published three or more papers. The countries with the most publications were the United States (12%), United Kingdom (12%), China (12%), and Hong Kong (8%). The geographical distribution was mainly concentrated in the American, European and Asian continents with just under half of the publications (43%). None of the publications came from Africa or Oceania, which could be explained by the limited infrastructure in most of these countries or the lack of interest in the implementation of immersive technologies.

Figure 5: Distribution of Items by Country of Origin.



### 3.4. RQ4 - What are the Research Scopes of the Collected Articles?

The scopes of the research included in the present study, for the selected databases, are shown in the characteristics of the studies included in the systematic literature review (<https://doi.org/10.6084/m9.figshare.23203415.v1>).

### 3.5. RQ5: What are the Gaps in the State of the Art?

The emergent character in the application of metaversity detected in the present document opens the door to many questions that still do not have a firm answer. All of these coincide with the six fundamental pillars for the creation of the new learning ecology based on the metaverse proposed by Lee et al. (2021) and are described below:

- «Avatars». Although existing technology can capture the characteristics of our physical appearance and automatically generate their movements, mobile sensors are not fully developed, which may limit the ubiquitous nature of metaversity, and its real-time use. Additional efforts are required to improve micro-expression, the non-verbal expression of avatars, and their interaction with current smart devices.

- «Content creation». The creation of virtual models in three dimensions is currently restricted to design professionals, which goes against the universality of metaversity. The research and development of platforms can bring all stakeholders closer to the overall design of this digital universe.
- «Virtual economy». Advances in the adoption of cryptocurrency as a digital transaction element have been successfully developed, but few experiences have been developed that address the transition between the traditional and virtual economy.
- «Social acceptance». Collective judgments and opinions of relevant actors are aspects that are necessary for the establishment of metaversity, but they haven't been significantly addressed by researchers on the subject.
- «Security and privacy». The design of strategies and technologies to fight cybercrime is an aspect of utmost importance for the correct operation of the metaversity. The protection of digital assets is vital to ensure the future viability of the metaverse. Experiences with the use of blockchain have been a first step, but the means of identification, its interconnection with the internet of things, or the "wearables" have not yet been developed.
- «Trust and Accountability». Current research has not been able to define a framework based on ethical principles that can define and regulate the privacy of personal or biometric data at the same pace at which technological innovations develop. Future studies should address issues such as minority rights, vulnerable communities, or socially sensitive issues as the new metaverse-based learning ecology evolves.

#### 4. Discussion and Conclusions

More than a few authors predict the success of the metaverse in economic, social and educational terms, and its positive impact on people's daily lives (Dwivedi et al., 2022; Jagatheesaperumal et al., 2022). The current literature shows different proposals and successful experiences in areas such as: health (Abdelwahed, Al Doghan, & Soomro, 2022; Skalidis, Muller, & Fournier, 2023), manufacturing (Hernández-Ascencio & Angel-Alvarado, 2022; Yao et al., 2024), maintenance (Lee, Woo, & Yu, 2022), smart cities (Allam et al., 2022), gaming (Chia, 2022), entertainment (Niu & Feng, 2022), commerce (Popescu, Valaskova, & Horak, 2022), human resources (Choi, 2022), real estate (Hutson et al., 2023), financial services (Seth & Seth, 2022), utilities (Yfantis & Ntalianis, 2023), transportation (Njoku et al., 2023), tourism (Buhalis, 2020), and vocational training (Hurtado et al., 2022), which seem to evidence the above.

The implementation of the metaverse offers many opportunities, particularly in universities, given the significant impact on students' cognitive development as evidenced by recent studies. Metaversity, by combining the use of immersive technologies with the teaching process, promotes greater retention of information and meaningful learning (Ariani, Sumardjo, & Marzuki, 2022; Pigultong, 2022). These technologies allow students to experience and explore complex concepts in a tangible and visual way, which enhances understanding and facilitates active learning, fostering higher cognitive skills such as critical thinking and problem solving (Bhattacharjee et al., 2018). In addition, the ability to personalize and adapt environments to individual needs contributes to a more learner-centered approach to learning, enhancing learner autonomy and intrinsic motivation (Jeong et al., 2022).

Metaversity not only represents a technological evolution in education, but also a powerful tool for the cognitive development of students; however, it also generates many questions and issues still under development, which is why this research delves into a new concept of metaversity, where we try to group the applications of metaversity around higher education, going beyond immersive learning in the formative process of students. The construction of the state of the art of this novel definition was approached through five research questions to answer the general objective. The findings show the emerging stage of the concept of metaversity, since there are no experiences that cover its implementation, but development exists on very close approximations and innovative experiences in several of its main aspects.

This incipient state in the level of research is to be expected, given that the technologies necessary for its full implementation are in full development, which makes all those studies of previous decades mere projections of the near future (RQ1).

The results also show that most of the documents found correspond to the areas of computer science, social sciences and engineering. The largest number of publications were conference proceedings, followed by articles and systematic reviews. There was evidence of a substantial increase in the number of publications

from the year 2020, following a trend line that predicts a continuous increase in the coming years (RQ2).

The United States was the country with the most associated publications, followed by the United Kingdom, China and Hong Kong, which suggests the origin of the organizations with the greatest advances in this regard. There are still many academics and institutions from Africa and Oceania with no scientific publications on metaversity, and very few from countries in the Americas and Europe, which represents an opportunity to expand research globally (RQ3).

The studies addressed have explored a variety of applications and possible benefits of the concept of metaversity, such as the improvement of students' cognitive skills through the use of immersive technologies, the increase in students' motivation and autonomy given the possibility of personalized learning environments, the development of digital twins and the provision of educational services in virtual environments, and the application in interdisciplinary areas (RQ4).

Despite the benefits and advances identified, there are still gaps and challenges with the implementation of metaversity, such as ownership, accessibility, interoperability, security, social acceptance or trust of people in the use of this type of platforms and technologies, especially in the educational field. In addition, the interdisciplinary nature of metaversity brings to the fore many other points, which also represent a great opportunity for researchers, such as assessing the implications of the prolonged use of this type of technology for people's mental and physical health (RQ5).

The present systematic review had the intention of analyzing the characteristics of research related to the concept of metaversity, where its great potential and benefits for higher education were evidenced, but also shone light on its incipient character. The replacement of the real world by metaversity does not seem to be as close as the enthusiasts of this technology would like, despite the fact that the level of its current development gives the ability to virtualize in real time those details that give the perception of reality (facial expressions of people, their gestures, eye contact and even physical contact).

The present study had several limitations. The first is that it is limited to only three databases (WoS, Scopus, Scielo), which, although they are mainly used in the scientific world, there are several others that can also be consulted by researchers. Second, the type of document consulted was restricted to scientific articles, conference proceedings and systematic reviews, leaving aside other types. Third, only documents in English and Spanish were included. Fourth, the country of affiliation of the first author was used to determine scientific production. For future analyses, books, book chapters, letters to the editor and other high quality scientific publications in languages such as Portuguese could also be included.

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# Youtube and Informal Learning: An Analysis of the Relationship Between the Platform and the Educational Experience

YouTube y aprendizaje informal: Un análisis de la relación entre la plataforma y la experiencia educativa

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## ABSTRACT

Over the past decade, YouTube has undergone a significant transformation, evolving from primarily being an entertainment platform to becoming a prominent learning resource. This study aims to examine the relationship between the instrumental and pedagogical dimensions of YouTube in the context of informal learning, evaluating both its technical characteristics and its contribution to the educational experience. A specific questionnaire was developed for this purpose, which underwent expert validation and was evaluated through a pilot study. The study sample consisted of 504 participants from Andalusia, Spain. Descriptive analyses and correlations, including the Spearman correlation coefficient and the contingency coefficient, were applied to explore the relationships between dimensions and variables such as age, gender, employment status, education, and usage frequency. The results highlighted a positive evaluation of both the instrumental and pedagogical dimensions, with a particular emphasis on the appreciation of accessibility, content diversity, and the ability to customize the educational experience according to user needs. Correlations revealed that a positive assessment of technical characteristics was associated with a higher evaluation of pedagogical dimensions. Additionally, a positive correlation was found between usage frequency and the evaluation of these dimensions, while age was negatively related to them. In summary, YouTube emerges as a highly relevant platform for informal learning, with its technical aspects highly valued for enriching the educational experience.

## RESUMEN

Durante la última década, YouTube ha experimentado una transformación notable, pasando de ser principalmente una plataforma de entretenimiento a convertirse en un recurso de aprendizaje destacado. Este estudio tiene como objetivo examinar la relación entre las dimensiones instrumental y pedagógica de YouTube en el contexto del aprendizaje informal, evaluando tanto sus características técnicas como su contribución a la experiencia educativa. Para ello, se desarrolló un cuestionario específico que se sometió a validación por expertos y se evaluó mediante un estudio piloto. La muestra de estudio consistió en 504 participantes de Andalucía, España. Se aplicaron análisis descriptivos y correlaciones, incluyendo el coeficiente de correlación de Spearman y el coeficiente de contingencia, para explorar las relaciones entre las dimensiones y variables como edad, género, situación, formación y frecuencia de uso. Los resultados destacaron una valoración positiva tanto de las dimensiones instrumental como pedagógica, con especial énfasis en la apreciación de la accesibilidad, la diversidad de contenidos, y la capacidad de personalizar la experiencia educativa según las necesidades de los usuarios. Las correlaciones revelaron que una valoración positiva de las características técnicas estaba asociada a una mayor valoración de las dimensiones pedagógicas. Además, se encontró una correlación positiva entre la frecuencia de uso y la valoración de estas dimensiones, mientras que la edad se relacionó negativamente con ellas. En resumen, YouTube emerge como una plataforma de aprendizaje informal de gran relevancia, con aspectos técnicos altamente valorados que enriquecen la experiencia educativa.

## KEYWORDS | PALABRAS CLAVE

Social Media, Social Networking Sites, Online Learning, Educational Technology, Digital Culture, Quantitative Analysis. Medios Sociales, Redes Sociales, Aprendizaje en Línea, Tecnología Educativa, Cultura Digital, Análisis Cuantitativo.



## 1. Introduction

In the last decade, the proliferation of online platforms and media has revolutionized the way people access information and acquire knowledge (Szymkowiak et al., 2021). Among the digital media with the greatest impact on society are social networks. These platforms represent spaces that connect people in a globalized and dynamic way (Can & Alatas, 2019; Duernecker & Vega-Redondo, 2018). The connections established on social networks have made them optimal tools for advertising, marketing, and business activities (Chen et al., 2018; Zhang et al., 2022). Beyond their relevance in these areas, the systematic transmission of information, global interaction among users, and the diversity of published content have transformed these platforms into widely accessible learning environments for the general population.

YouTube is one of the most popular and widely used content platforms for educational purposes among the existing social networks. According to statistics, it has two billion registered users (Ceci). The uniqueness of YouTube as an information channel lies in its hybrid nature, characterized by the interaction between visual, auditory, and narrative elements, which are highly engaging for users. YouTube has the capacity to evoke emotions in a way that no other similar platform does (Bhatia & Naidu, 2017; Guo, 2022). Moreover, YouTube possesses several attributes that distinguish it as a resource that not only provides entertainment but has also emerged as a prominent social media platform for learning, ranking among the top (Abdullah et al., 2023). YouTube has become an essential platform for learning in various fields, including science (Beltrán-Pellicer, Giacomone, & Burgos, 2018), music (Marone & Rodriguez, 2019; Serdaroglu, 2023), languages (Wang & Chen, 2020), and sports (Juanas & Jiménez, 2022; Sokolova & Perez, 2021).

Although it is a learning platform with a long history within formal learning environments (Moghavvemi et al., 2018; Zuhair & Khattab, 2024), especially at higher educational levels (Ranga, 2017; Scott et al., 2018; Van den Eynde et al., 2019), YouTube's intrinsic characteristics have made it possible to transcend formal education. It thus becomes an excellent tool for informal learning (Cherif, Azzouz, & Bendania, 2024; Colás-Bravo & Quintero-Rodríguez, 2023a; Lebedev & Sharma, 2019; Nishioka, 2023). Informal learning is defined as the process of acquiring knowledge through non-traditional means, without institutional support, in which learners play a role during the process. In this approach, self-regulation of the learning process is embedded, meaning that the individual decides what to learn, when to learn it, where to seek information and from whom to learn it (Alshamsi & Ogdol, 2022; Fedele, Aran-Ramspott, & Suau, 2021; Lange, 2019).

The purpose of this article is to conduct an exhaustive analysis of YouTube, considering its role as an informal learning medium. This analysis will carefully explore all the features that make up this platform and the interrelated dynamics that explain its success and support its growing relevance in education and knowledge building. To achieve a comprehensive understanding of its role as a learning environment, both its instrumental and pedagogical elements will be examined, with particular attention to the interactive dynamics that promote the formation of online learning communities.

### 1.1. Informal Learning Through YouTube: Features and Challenges

One of the most distinctive features that make YouTube a highly effective platform for quality informal educational experiences is its high level of accessibility. Anyone with access to the Internet, regardless of age, can use the platform for free (Covington, Adams, & Sargin, 2016). This democratizes access to knowledge by removing geographical, economic, or institutional barriers, allowing users to learn from the comfort of their homes and at their own pace (Colás-Bravo & Quintero-Rodríguez, 2022; Ramírez-Ochoa, 2016).

Another key characteristic that fosters the creation of virtual learning environments is interaction. The connection between content creators (YouTubers) and their audience, as well as the interaction among users themselves, creates an online learning community where learners can collaborate and share additional resources, leading to collaborative learning (Benson, 2015; Dubovi & Tabak, 2020; Hossain et al., 2022). This interactivity transforms the experience, allowing participants not only to consume information but also to actively contribute to the educational process, thereby enriching their understanding and participation in the virtual learning environment.

The wide range of educational content available on YouTube is another significant feature. Channels specialize in various disciplines, from mathematics and science (Van den Eynde et al., 2019) to languages and music (Cayari, 2018; Wang & Chen, 2020). They offer detailed lessons and tutorials that allow viewers to learn from experts in the field. The videos vary in complexity, from basic explanations to advanced lessons,

enabling learners to choose the level of difficulty that best suits their needs. The information evolves and is constantly updated as demand shifts.

Personalization of the educational experience is another crucial aspect of YouTube as a learning medium. The platform's recommendation algorithms automatically suggest related content (Amos, 2024), enabling users to discover new areas of interest and expand their knowledge. This encourages exploration and diversification of learning. In this context, specific channels dedicated to self-managing the learning of particular subjects have also emerged (Abarca-Araya, 2013; González-Hernando, Valdivieso-León, & Velasco-González, 2020).

However, YouTube also presents significant challenges, such as the lack of content screening, which leaves the responsibility for content quality to its creators. User judgment becomes essential to determine the quality of learning, a process that can be complex (Colás-Bravo & Quintero-Rodríguez, 2023b; Tadbier & Shoufan, 2021). Consequently, there is still a need for a reliable evaluation tool (Ramírez-Ochoa, 2016). Another challenge is the lack of direct interaction with instructors. The dichotomy between flexibility and responsibility underscores the need for research that seeks to disentangle learning on YouTube from the perspective of the user experience, assessing the depth with which users engage with and utilize the platform to manage their learning.

Moreover, the appropriate use of comments is another area that requires attention in the future (Snelson, 2018). The lack of control over comments can lead to the dissemination of false or incorrect information and disrespectful interactions.

## 1.2. YouTube and Informal Learning: From the Platform to the Educational Experience

To fully understand why YouTube has become a successful learning medium, it is necessary to consider the broader context in which learning processes occur. This involves not only examining the specific characteristics of the platform but also understanding how it integrates into the wider educational environment (Colomo-Magaña et al., 2020; John, Nwaguru, & Williams, 2022). While it is possible to analyze YouTube through its obvious attributes, such as accessibility and diversity of content, this initial exploration only scratches the surface of its educational potential. Therefore, further research is essential to fully comprehend how the characteristics of this social network relate to the educational experience.

From a technological perspective, YouTube represents a significant advancement in the development of learning through devices such as computers, tablets, and, above all, smartphones, which serve as new pedagogical scaffolds (Cheung, Lam, & Chiu, 2023; Mansour, 2016; Rodríguez-Vázquez, Negreira-Rey, & López-García, 2024). These elements drive the original learning environment by facilitating the asynchronous adaptation of learning, thereby laying the foundation for the personalization of learning—a crucial aspect in today's rapidly changing society.

One of the main agents promoting the generation of learning environments is YouTubers. YouTubers create the content that is managed through YouTube channels (Berzosa, 2017; Bonaga & Turiel, 2016). They are fundamental to user instruction and learning. YouTubers become reference points in digital culture and form an integral part of our social environment, sharing similarities with users and establishing connections that include a sense of social relationship with them (Aran-Ramspott, Fedele, & Tarragó, 2018; Pérez-Torres, Pastor-Ruiz, & Abarrou-Ben-Boubaker, 2018; Sokolova & Perez, 2021). This is especially true among young audiences, who represent the main users and tend to move away from more conventional media (Neumann & Herodotou, 2020). This opens the possibility for individuals to choose who to learn from based on personal preferences.

YouTubers not only offer knowledge but also share their personal experiences, which imbues the learning environment with a sense of conviction toward success in achieving pedagogical goals. Such experiences increase users' motivation by making them believe that these goals are attainable (Kardas & O'Brien, 2018). Many YouTubers are passionate and experts in their fields, capable of communicating complex concepts in an understandable and engaging way. This makes learning more enjoyable and effective.

The educational network offered by YouTube is further enhanced by the contributions of digital content developers, who provide resources such as tutorials or video blogs—short, specific videos that are particularly attractive to younger audiences (Cherif et al., 2024; Lijo et al., 2021). The

popularization of these videos has transformed YouTube into a more social learning medium due to its proximity and contextualization (Joa, Abuljadail, & Ha, 2023; Padilla, Portilla, & Torres, 2020).

If content creators are one of the key agents in generating learning environments, users themselves are the other. YouTube offers a learning context where the learner must take an active role in their own education. Although YouTube caters to a globally diverse user base, success largely depends on the individual's ability to set personal goals, select relevant content, manage their time and space, and evaluate their progress.

In summary, YouTube has evolved from a mere entertainment platform into a powerful educational tool. This article will analyze the relationship between the user base and the key features of YouTube as a medium for informal learning. Both instrumental and pedagogical aspects will be examined to gain insights into how YouTube functions as a platform and how it shapes the learning experience. Additionally, sociodemographic factors such as gender, education, employment status, age, and usage frequency will be assessed (López-de-Ayala, Vizcaíno-Laorga, & Montes-Vozmediano, 2020).

## 2. Objectives

The primary objective of this research is to examine the relationships between users' evaluations of YouTube's various characteristics as an educational channel. The goal is to describe how these characteristics interact to better understand the connection between the platform and the learning experience.

- This general objective is further detailed into the following specific aims:
- To describe the instrumental and pedagogical dimensions of YouTube as an informal learning medium.
- To analyze the correlations between these dimensions to understand how they are related from the users' perspective.
- To identify social factors influencing users' perceptions of the relationship between the two dimensions.

To provide recommendations based on the correlational analysis to enhance the informal learning experience on YouTube.

## 3. Methods

This study employs a non-experimental, quantitative research design, incorporating psychometric, descriptive, and correlational analyses to explore the relationships between variables. A quantitative approach is utilized to measure numerical data, which are then analyzed to derive research findings. The research was conducted within the field of Information and Communication Technologies in education.

### 3.1. Sampling

The sample consisted of 504 individuals aged between 14 and 60 years, all from Andalusia, Spain. A non-probabilistic sampling method was employed. The mean age of the participants was 36.42 years. The sample size is representative of the population under study, with a 95% confidence level under the hypothesis of  $P = 50\%$  and a sampling error of approximately  $\pm 4\%$ , based on a population of 5.2 million people within the specified age range. Due to the nature of the sampling method, the results should not be generalized

Gender	Female (65.9%)	Male (34.1%)			
Age	14-19 (10.7%)	20-29 (29.4%)	30-39 (15.3%)	40-49 (20.6%)	50-60 (24.0%)
Education	University (49.6%)	Non-university (50.4%)			
Employment status	Worker (53.2%)	Worker and student (25.6%)	Student (9.9%)	None (11.3%)	
Frequency of use of YouTube	Never (0%)	Almost never (5%)	Several times a month (13.6%)	Several times a week (39.3%)	Several times a day (42.1%)

### 3.2. Instrument and Data Collection Procedure\*\*

Given the clearly defined objectives of this study and the absence of a pre-existing validated instrument tailored to the specific needs of this research, it was necessary to develop an ad hoc Likert-type questionnaire.

An ad hoc questionnaire is a research tool specifically designed to collect information directly relevant to the study's unique context. Unlike validated scales that may not fully address the research objectives, this custom questionnaire allows precise adaptation to the specific topics of interest.

The questionnaire comprised the following items:

- Questions on socio-demographic variables: gender, age, education, and employment status.
- A question regarding the frequency of YouTube use.
- Fourteen items related to YouTube's characteristics as an informal learning medium, asking respondents to assign a level of importance to each characteristic in the context of its relevance to the learning process.

To quantify the importance participants assigned to these items, a Likert scale was used. This scale is widely employed in quantitative studies to systematically measure and record attitudes, perceptions, and evaluations. The scale in the questionnaire ranged from 1 to 5, allowing participants to express their opinions and ratings with gradation and detail. Each number on the scale was associated with specific descriptive labels to ensure clarity for the participants:

1. Unimportant: Representing the lowest rating, indicating a lack of relevance.
2. Not very important: Indicating low relevance, considered to some extent.
3. Neutral: Reflecting an intermediate position, implying a neutral assessment.
4. Important: Indicating that the item was considered relevant and had appreciable importance.
5. Very important: Representing the highest rating, indicating that the item was perceived as highly relevant and of paramount importance.

This structure enabled participants to express their views with high specificity, facilitating the collection of detailed and accurate data on the perceived importance of the items under study.

The questionnaire was carefully designed following best practices for developing measurement instruments, ensuring clarity, consistency, and the use of balanced scales. Given the diverse educational and cultural backgrounds of the participants, a simple and accessible language was used.

The items were developed after a comprehensive review of the existing literature on YouTube's role in the learning process, drawing on previous studies such as Berzosa (2017), Abarca-Araya (2013), and Colomo-Magaña et al. (2020). The instrument's creation was justified by the lack of pre-existing tools capable of measuring the desired variables and the need to address the study's specific objectives. The study hypothesized a positive relationship between the platform's instrumental (technical) and pedagogical (experience-related) aspects, with potential influences from usage frequency and age, due to its relationship with the socio-cultural context.

Expert validation was conducted with seven professionals experienced in research and social networking, who assessed the questionnaire's suitability using a rubric. Their feedback led to a second improved version of the questionnaire. A pilot study was then conducted with 40 participants diverse in age, gender, and educational level to ensure the questionnaire's appropriateness across a broad audience.

Data collection was conducted electronically via Google Forms, incorporating explanatory prompts to ensure participant comprehension. Ethical considerations, including participant anonymity and the proper use of data, were rigorously upheld.

### 3.3. Data Analysis

To explore the potential dimensions or constructs present in the instrument, an exploratory factor analysis (EFA) was conducted. Before proceeding with the EFA, two preliminary tests were performed to assess the adequacy of the collected data: the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity.

The KMO test, which measures the adequacy of data for factor analysis, yielded a result of 0.927, indicating strong correlations between the questionnaire items and justifying the use of factor analysis. A KMO value close to 1 suggests that the data are suitable for factor analysis. Bartlett's test of sphericity produced a p-value of 0.000, confirming that the correlations between items were significantly different from zero and that the correlations did not form an identity matrix, further supporting the decision to conduct factor analysis.

An exploratory factor analysis was then performed using the principal component analysis extraction method with orthogonal Varimax rotation. This analysis identified two underlying factors or dimensions within the instrument, which together explained 52.53% of the total variance in the data. The psychometric analysis thus effectively grouped related items into two distinct dimensions.

**Table 2: Psychometric Analysis.**

Items	Factor 1	Factor 2
Quick learning	.680	
Access to a lot of information	.737	
Continuous information updates	.678	
Contents recommendations related to your searches	.613	
Tutorials with useful learning for everyday life	.706	
Channels and YouTubers specializing in specific topics exist	.496	
Learning through Smartphones		.498
Learning through video commentary		.759
Organizing your own learning		.715
Experience of video publishers as inspiration and example		.698
No observation and assessment during learning		.696
To be able to choose the instructor to learn from		.595
Explore different ways of learning and problem-solving		.574
Adapt learning to the desired schedule and location	.630	
Explained variance (52.53%)	44.39%	8.14%
Cronbach's alpha (Total 0.898)	0.84	0.85

The analysis identified two distinct factors within the questionnaire, labeled as instrumental and pedagogical, following the conceptual framework provided by Colomo-Magaña et al. (2020). The instrumental dimension pertains to the technical characteristics of YouTube that facilitate access to knowledge. Conversely, the pedagogical dimension focuses on the learning experience itself. These two dimensions complement each other, with the instrumental dimension emphasizing the technical utility of YouTube in education, while the pedagogical dimension highlights its educational impact and value.

To confirm the reliability of the questionnaire, Cronbach's Alpha test was applied, resulting in a value of  $\alpha = 0.898$ . This high reliability score indicates that the instrument is robust and suitable for the data collection needs of this study leading to a systematised and validated instrument to collect information on the use of YouTube for informal learning.

The collected data were systematically analyzed using both descriptive and non-parametric statistical techniques. To explore the relationships between the identified dimensions (instrumental and pedagogical) and other variables such as age and frequency of YouTube use, Spearman's correlation coefficient was chosen due to the ordinal nature of the data. Additionally, the contingency coefficient was applied to assess relationships with nominal social variables, such as gender and employment status.

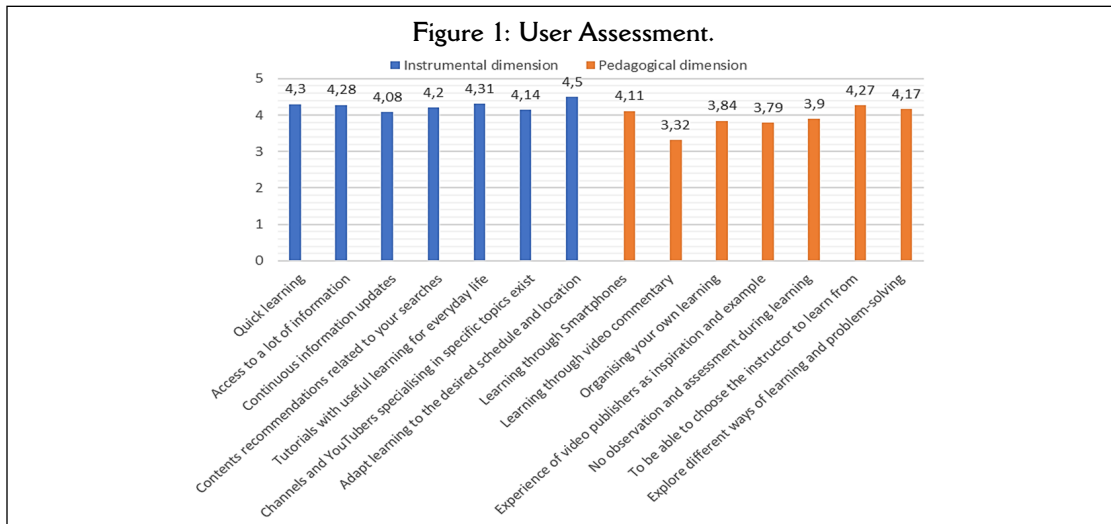
Before conducting these analyses, the suitability of using non-parametric tests was verified through the Kolmogorov-Smirnov (K-S) test with the Lilliefors significance correction. The test yielded a p-value of  $p = 0.000, \leq 0.05$ , confirming the appropriateness of using non-parametric tests in the data analysis. This validation step was crucial in ensuring the validity of the subsequent analysis and interpretation of the results.

## 4. Results

### 4.1. Evaluation of YouTube Features

The descriptive results of the research are presented in the Figure 1.

The descriptive analysis revealed that the instrumental aspects of YouTube are highly valued across the entire sample, with an average score exceeding  $M = 4$ . This indicates that users generally have a positive perception of YouTube's technical features, recognizing the platform's utility in learning and knowledge acquisition. Among the instrumental items, the following stand out: "Quick learning" ( $M = 4.3$ ), "Adaptability to desired time and space" ( $M = 4.5$ ), and "The possibility of everyday life learning through tutorials" ( $M = 4.31$ ).



Similarly, items related to the pedagogical dimension, which focus on the educational experience, are also positively valued, though slightly lower, with an average of  $M = 4$ . Notable items within this dimension include “Mobile learning” ( $M = 4.11$ ), “The ability to choose instructors or select who to learn from” ( $M = 4.27$ ), and “The exploration of different approaches to learning and problem-solving” ( $M = 4.27$ ).

However, when comparing the two dimensions, the variables associated with the instrumental dimension are rated higher than those composing the pedagogical dimension. This indicates that while YouTube is appreciated as a valuable educational resource, its evaluation in pedagogical terms is slightly lower compared to its technical aspects. In summary, YouTube is perceived as a more valuable platform from a technical and material standpoint (as a physical or material medium) than from a purely educational perspective.

#### 4.2. Internal Relationship of the Dimensions

To examine the relationships between the items within each dimension of the study, Spearman’s correlation coefficient was employed, as the variables are ordinal. This approach provides insight into the degree of association between items within each dimension, allowing for a nuanced understanding of their interactions and mutual influence.

The correlation analysis for the instrumental dimension revealed that all items are significantly correlated at the 0.01 confidence level ( $p \leq .05$ ). This indicates that the items within the instrumental dimension are significantly related, suggesting a high degree of cohesion. The significant correlations at this level imply that these relationships are unlikely to have occurred by chance.

The detailed results of this correlation analysis are presented in Table 3.

**Table 3: Correlation between Variables of the Instrumental Dimension.**

		1	2	3	4	5	6
1. Quick learning	rho	-					
	Sig.	-					
2. Access to a lot of information	rho	,450**					
	Sig.	,000					
3. Continuous information updates	rho	,380**	,477**				
	Sig.	,000	,000				
4. Contents recommendations related to your searches	rho	,338**	,434**	,472**			
	Sig.	,000	,000	,000			
5. Tutorials with useful learning for everyday life	rho	,453**	,431**	,457**	,537**		
	Sig.	,000	,000	,000	,000		
6. Channels and YouTubers specializing in specific topics exist	rho	,465**	,394**	,391**	,430**	,486**	
	Sig.	,000	,000	,000	,000	,000	
7. Adapt learning to the desired schedule and location	rho	,478**	,389**	,351**	,365**	,478**	,441**
	Sig.	,000	,000	,000	,000	,000	,000

\*\* Correlation is significant at the 0.01 level (bilateral).

Notably, correlations with values close to or greater than  $\rho = 0.5$  are prominent, such as between “Access to a lot of information” and “Continuous information updates” ( $\rho = .477$ ), and between “Content recommendations related to searches” and “Tutorials for everyday life” ( $\rho = .537$ ).

Similarly, in the pedagogical dimension, all items show a significant correlation at a confidence level of 0.01 ( $P \leq .05$ ). This indicates that the items within this dimension are strongly interconnected, and responses in these items tend to move together, demonstrating a strong cohesion in this dimension, supported by a non-random correlation.

**Table 4: Correlation between Variables of the Pedagogical Dimension**

		8	9	10	11	12	13
8. Learning through Smartphones	rho	-					
	Sig.	-					
9. Learning through video commentary	rho	,379**					
	Sig.	,000					
10. Organising your own learning	rho	,407**	,518**				
	Sig.	,000	,000				
11. Experience of video publishers as inspiration and example	rho	,383**	,492**	,599**			
	Sig.	,000	,000	,000			
12. No observation and assessment during learning	rho	,350**	,360**	,466**	,478**		
	Sig.	,000	,000	,000	,000		
13. To be able to choose the instructor to learn from	rho	,415**	,289**	,493**	,468**	,594**	
	Sig.	,000	,000	,000	,000	,000	
14. Explore different ways of learning and problem-solving	rho	,352**	,358**	,561**	,510**	,474**	,607**
	Sig.	,000	,000	,000	,000	,000	,000

\*\* . Correlation is significant at the 0.01 level (bilateral).

### 4.3. Relationship Between Dimensions

When examining the relationship between the instrumental and pedagogical dimensions, a significant positive correlation was found, with a Spearman’s rho of 0.679 at a 0.01 confidence level ( $p \leq .05$ ). This strong positive correlation indicates that higher evaluations of the instrumental dimension are associated with higher evaluations of the pedagogical dimension and vice versa. This suggests that the technical and educational aspects of YouTube are closely related in the context of the study, which may have important implications for understanding how these two aspects interact in the experience or assessment in question.

### 4.4. Relationship Between Variables and Dimensions

The analysis of correlations between the dimensions and socio-demographic variables (age, employment status, gender, education, and frequency of use) yielded the following results.

- **Nominal Variables:** The contingency coefficient analysis for the variables of employment status, gender, and education revealed no statistically significant relationships ( $p > 0.05$ ). This suggests that responses are not significantly influenced by these socio-demographic factors.
- **Ordinal Variables:** Spearman’s correlation coefficient was applied to explore relationships with age and frequency of use:
  - **Age:** The correlation with age was negative, indicating that as participants age, their evaluations of both the instrumental and pedagogical dimensions tend to decrease. This suggests that older participants may interact with online learning tools less frequently or differently compared to younger users.
  - **Frequency of Use:** A positive and moderate correlation was found with frequency of use. This implies that more frequent use of YouTube is associated with higher evaluations of both instrumental and pedagogical characteristics, highlighting that increased engagement with the platform enhances the perceived value of its educational features.

The results of these correlations are detailed in Table 5.

Table 5: Correlation between Variables and Dimensions.

		Instrumental	Pedagogical	Age
Instrumental	Rho	-		
	Sig.	-		
Pedagogical	Rho	,679**		
	Sig.	,000		
Age	Rho	-,235**	-,178**	
	Sig.	,000	,000	
Frequency of use of YouTube	Rho	,276**	,201**	-,435**
	Sig.	,000	,000	,000

## 5. Discussion

YouTube has successfully transitioned from an entertainment platform to a significant tool for informal learning. Previous studies have established its utility in formal educational contexts (Moghavvemi et al., 2018; Ranga, 2017; Van den Eynde et al., 2019), and recent research supports its effectiveness in informal learning environments (Cherif et al., 2024; Colás-Bravo & Quintero-Rodríguez, 2023a; Nishioka, 2023). The platform accommodates a wide range of learning topics, from music and languages to fitness (Serdaroglu, 2023; Sokolova & Perez, 2021; Wang & Chen, 2020).

While the results are specific to the studied sample and may not be generalizable, three main factors were identified which contribute to YouTube's success as an educational medium, meeting the demands of society's learning experience: accessibility, personalization, and interaction.

First, accessibility, due to YouTube's ability to remove geographical and economic barriers, it democratizes and globalizes learning (Covington et al., 2016). This inclusivity allows more people to participate in education without previous limitations. Therefore, the number of individuals with access to learning expands. However, the mere availability of content does not guarantee quality, as noted by Snelson (2018). Lack of oversight and regulation in the creation of content can result in the dissemination of misinformation or low-quality information. Therefore, while accessibility of learning is a positive development, it must be accompanied by strategies to ensure the quality and veracity of educational content available on digital platforms.

Secondly, the personalization of the learning experience. The possibilities offered by the platform make it possible to organize learning in the desired time and space, which is one of the instrumental features most valued by the sample, providing invaluable flexibility and great convenience in planning the learning schedule. This flexibility supports the concept of "free-choice learners" by Amos (2024), who defines 'free-choice learners' as people who learn outside a formal educational environment. Amos developed a YouTube channel with the aim of determining how many apprentices could be successfully taught on the platform, with positive results. Within this framework, asynchrony and spatial flexibility of learning emerge as key features during the experience, coupled with the convenience of choosing instructors and methodologies that best suit individual learning preferences. This places greater responsibility for self-regulation of the process on learners (Tadbier & Shoufan, 2021), opening the possibility of training future generations in this area.

The last factor is interaction. YouTubers, who create and manage content on their YouTube channels, play a crucial role in users' learning, becoming influential figures in digital culture and establishing close connections with their audience (Aran-Ramsport et al., 2018; Pérez-Torres et al., 2018). This phenomenon is especially relevant for young audiences, who prefer YouTube over more traditional media (Neumann & Herodotou, 2020). In addition, interaction between users and the formation of online learning communities are essential elements of the educational experience on YouTube. This interaction can manifest itself through collaborations, resource sharing and joint learning within the platform, which contribute significantly to the richness of the educational experience in this digital environment.

In relation to social factors, the findings highlight the importance of taking these factors into account when analysing the learning experience on YouTube and suggest that the platform may be particularly effective for younger audiences who use it more frequently. This circumstance, which has been observed previously (Colás-Bravo & Quintero-Rodríguez, 2022; López-de-Ayala et al., 2020), is not only a result of the current social context, but the lower frequency of use by the older population leaves them less prepared to take full advantage of the platform in informal learning processes, preventing them from realising their full potential.



## 6. Conclusions

This study concludes that YouTube is a valuable educational resource, effectively serving as a platform for informal learning across various ages and socio-cultural backgrounds.

The results obtained in both instrumental and pedagogical dimensions, show that Users highly value both the technical and educational aspects of the platform, highlighting quick learning, content diversity, and personalization as key benefits.

The findings show a strong relationship between instrumental and pedagogical aspects, in line with the objectives of the study. These two dimensions complement each other, in that the educational use of the platform through its technical benefits is directly related to its pedagogical value. The relationship among these dimensions can be seen as the synergy that drives an enriching and effective educational experience on YouTube. The results underline the importance of valuing both the technical and educational characteristics of the platform when analyzing its role in informal learning, highlighting the interdependence of both dimensions in shaping successful educational experiences in this digital environment.

Although the instrumental and pedagogical dimensions did not show a significant relationship with the socio-demographic variables gender, education and employment status, further analysis revealed that both age and frequency of use play an important role in the perception and usefulness of these dimensions in the context of online learning. These results highlight the importance of considering additional factors in understanding how people relate to pedagogical tools and approaches in the digital environment.

Future research should explore deeper into how users engage with YouTube as a learning tool and identify strategies to improve its effectiveness as an educational resource, addressing challenges such as content quality and user feedback management.

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# Social Learning on TikTok: the Community as a Literacy Axis on Blood Donation

Aprendizaje social en TikTok: La comunidad como eje alfabetizador sobre hemodonación

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## ABSTRACT

This research examines the creation of knowledge on social networks about blood donation, the role of virtual communities and their potential to attract donors. We applied a two-step methodology, starting by interviews with blood donation management institutions in Spain (N=21) and concluding with the analysis of comments from 61 donor testimonials on TikTok (N=1,606). This social network was chosen because of the scarce institutional presence and the predominance of Generation Z, which is necessary for generational change. The results show that blood donation in Spain is seen from a positive perspective, where complaints are rare or relativized and the community encourages the behavior imitation thanks to the feeling of pride and gratitude to donors. Knowledge is generated both from the contributions of creators and audiences and is focused on informing about the process, conditions and consequences, supporting its voluntary and altruistic nature. Overall, social, group and collaborative learning takes place, with greater success in those contents shared by health profiles but supported by all users. We conclude that TikTok plays a relevant role in the literacy and awareness of blood donation based on the virtual community collective intelligence, which will affect the donor relay thanks to the behavioral models that obtain social recognition.

## RESUMEN

Esta investigación examina la creación de conocimientos en redes sociales sobre la donación de sangre, el papel de las comunidades virtuales y su capacidad para atraer donantes. Se aplica una metodología en dos pasos que parte de entrevistas a las instituciones gestoras de la hemodonación en España (N=21) y concluye con el análisis de los comentarios de 61 testimonios de donantes en TikTok (N=1.606), por ser la red social con menor presencia institucional y donde predomina la Generación Z, necesaria para el relevo generacional. Los resultados muestran que la donación de sangre en España se observa desde una óptica positiva donde las quejas escasean o se relativizan y la comunidad favorece la imitación del comportamiento gracias al sentimiento de orgullo y agradecimiento a donantes. El conocimiento se genera tanto de aportaciones de los creadores como de las audiencias y se enfoca a informar sobre el proceso, condiciones y consecuencias, defendiendo su carácter voluntario y altruista. En conjunto, se produce un aprendizaje social, grupal y colaborativo, con mayor éxito en aquellos contenidos compartidos por perfiles sanitarios, pero apoyado en todos los usuarios. Se concluye que TikTok ejerce un papel relevante en la alfabetización y en la concientización sobre la hemodonación a partir de la inteligencia colectiva de la comunidad virtual que repercutirá en el relevo de donantes gracias a los modelos de comportamiento que obtienen reconocimiento social en la red.

## KEYWORDS | PALABRAS CLAVE

Collective Intelligence, Health Information, Literacy, Social Learning, Social Media, Virtual Communities. Alfabetización, Aprendizaje Social, Comunidades Virtuales, Información de Salud, Inteligencia Colectiva, Redes Sociales.

## 1. Introduction and State of the Art

In the context of the network society and mass self-communication (Castells, 2009), collective intelligence finds its maximum capacity for development (Capistrán Gracia, 2022; Lévy, 2007), generating what authors such as Rheingold (2004) have called “intelligent crowds”, which foster cooperation and social mobilization (Zuluaga-Duque, 2015). However, this new era brings both benefits and risks, in a demonstration of the applicability of the laws of media expounded by McLuhan and Powers (2011): while extending human capabilities and rendering previous media and systems obsolete, they also generate dysfunctions or unintended and unforeseen consequences. The evolution of Media Ecology gives more validity than ever to the ideas of technological determinists (Islas, 2009), with metaphors such as the global village today real thanks to the millions of Internet users in constant connection (Piscitelli, 2005; Sakdapat, 2022), not only passive consumers of content, but prosumers: a virtual world that changes the very foundations of society and the cognitive and relational processes of the human species.

This digital scenario provides the health sector with a learning-generating space, thanks to, among other possibilities, the capacity to increase the quantity and quality of health information and to rely on virtual communities and social networks, allowing users to acquire knowledge and in turn share it in a process of health literacy (Martín-García, Buitrago, & Martínez-Sanz, 2024; Parikh & Huniewicz, 2015). Among the most evident negative effects are the overabundance of information and the circulation of misleading content.

Different national and international studies have addressed health activism in networks (Fernández-Luque & Bau, 2015; Muthuswamy & Bayome, 2022; Sobowale et al., 2020), which generates social transformation and collective awareness around the topic being communicated, and in which health profiles become “influencers” in networks such as TikTok and Instagram or on platforms such as Twitch (Buitrago & Torres-Ortiz, 2022; Castro-Higueras et al., 2021; Martínez-Sanz, Buitrago, & Martín-García, 2023; Pérez-Ordóñez & Castro-Martínez, 2023; Siman et al., 2022).

In health literacy, previous research has determined the effectiveness of certain communicative strategies such as storytelling and, more specifically, storydoing (Martínez-Sanz & Arribas-Urrutia, 2023) or narrative-persuasive frames that foster identification with the receiver (Durántez Stolle, Martínez Sanz, & Rodríguez de Dios, 2022).

Likewise, the continuous representation of behaviors in the virtual space acts as an incentive for social learning (Paternina-Arango et al., 2022; Shelton et al., 2019) and influence (Bullers, Cooper, & Russell, 2001). And if these behaviors are also reinforced with the applause or admiration of third parties, it contributes to their imitation, regardless of whether or not they are achievable (Rotter, 1954). Johnson et al. (2012) point out that social learning is a group process that occurs when interactions change individual knowledge and understanding, and ultimately the actions of the group.

Exposure to models in social networks consolidates self-efficacy (Bandura, 2004; Rimer & Glanz, 2005), that is, the conviction of being able to carry out a certain activity, which, when transferred to the health care setting, has countless applications in terms of prevention, awareness and the acquisition of new healthy habits (Alkhafagy et al., 2023; Camelo-Guarín et al., 2021; Igartua et al., 2023).

As far as blood donation is concerned, Social Learning Theory argues that altruism is learned by imitation, causing role models to be key (Gilchrist et al., 2019; Tongat, 2022). Along these lines, Stock and Möckel's (2021) research recommends employing social media platforms such as Instagram, involving real donors in their promotion, and representing the perceived well-being of those who donate. At present, and despite efforts to manufacture it in laboratories, blood is irreplaceable; it falls to citizens to provide blood products to the health system, whose highest aspiration is self-sufficiency (WHO, 2020). Young people, who are assumed to be in better physical and health condition, are the main targets of awareness campaigns, although not always with the expected results (Balegh et al., 2016; Martínez-Santos et al., 2021).

In Spain, the procurement, treatment and supply of blood products is transferred to the autonomous communities, specifically to the blood banks (RD 1945/1985, of October 9; RD 1088/2005, of September 16), which undertake to act “in solidarity with each other in the fulfillment of their common aims, and to coordinate and complement each other reciprocally” (RD 1088/2005, of September 16, art.35.1). Around these publicly managed entities, the law also recognizes the emergence of associations and brotherhoods with the aim of reinforcing the task of raising awareness and promoting altruistic blood donation.

The system's need to attract new donors has led organizations in recent years to turn to the use of social networks in an attempt to adapt their content and messages to the format and audience (Ramondt, Kerkhof, & Merz, 2022). In the case of TikTok, the network closest to the young population, the study by Martínez-Sanz and Arribas-Urrutia (2023) concludes that there are three main types of messages about hemodonation: testimonials,

authoritative disclosure and empathetic awareness.

However, despite the growing interest of the academic community in the use of social networks by health organizations and profiles, there is a scarcity of studies on the reactions and creations of the audience in these contents. The present research aims to delve into the disseminating role in networks of organizations involved in the donation process and to analyze the importance of collective intelligence in the management of knowledge about hemodonation in Spain.

### 1.1. Objectives, Research Questions and Hypotheses

This paper focuses on the virtual communities that have emerged around blood donation, examining, on the one hand, the use given to them by the main organizations in charge of their management and, on the other hand, the main factors involved in social learning: the representation of models, the knowledge transferred and the reactions of prosumers. For the latter, TikTok is chosen because it is the preferred platform, together with Instagram, of Generation Z (IAB Spain, 2023).

Firstly, focusing on the institutional sphere, we asked ourselves: what communication strategies do Spanish entities linked to hemodonation develop in social networks and what benefits do they obtain from them; what needs do they detect to improve literacy and achieve generational relay; and what content in networks do they consider most effective?

And, secondly, considering what happens in TikTok, we ask ourselves: what traits of the user creator and their videos influence the success of the content published, how is the knowledge shared by users, and what kind of reactions do testimonial stories related to blood donation in Spain generate?

This questioning leads us to pose the following hypotheses:

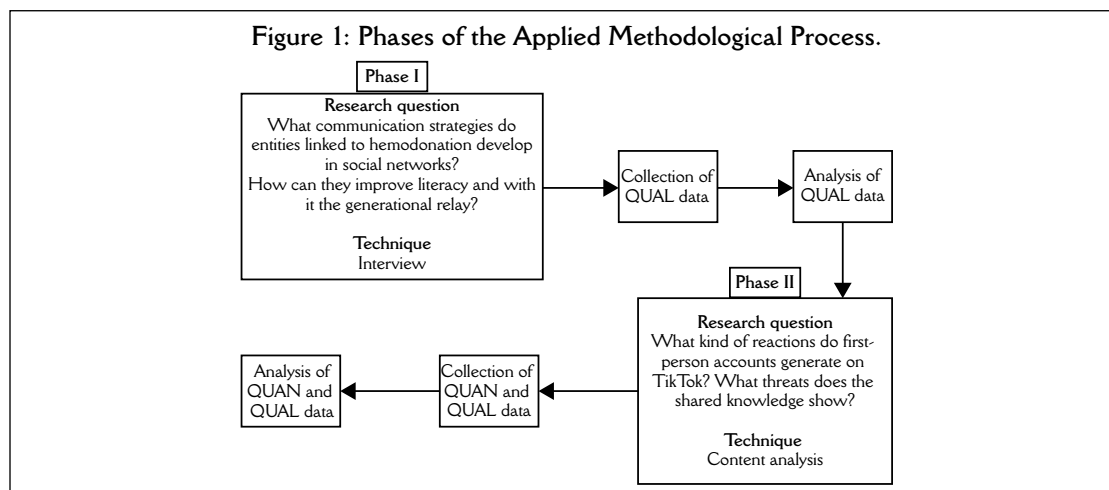
$H_1$ : Awareness of blood donation in Spain increasingly relies on social networks as spaces for the exchange of information and the generation of knowledge, both through the profiles of the entities involved in its management, as well as the testimonials of donors and recipients.

$H_2$ : The TikTok community contributes to the generation of knowledge and literacy around hemodonation thanks to donor testimonials and user responses, with the profiles of healthcare professionals being the ones that generate the most conversation and participate the most in resolving doubts.

## 2. Material and Methods

A mixed method of exploratory sequential design is proposed, since it enables the combination of a first qualitative phase, of a participatory nature, which with its results nourishes and strengthens the next phase of the research focused on the analysis of quantitative and qualitative data (Creswell & Creswell, 2018; Leech & Onwuegbuzie, 2009). Specifically, and in accordance with the objectives, the first step was to develop a questionnaire aimed at the main institutions linked to altruistic blood donation in Spain, i.e., blood banks (regional centers) and related associations and brotherhoods, which was followed by a content analysis of the publications and conversation generated on TikTok around this solidarity action.

Figure 1: Phases of the Applied Methodological Process.



The results of the first study made it possible to consolidate the relevance of the second, as well as to contribute to its definition: from setting the parameters for selecting the sample to outlining the content analysis indicators.

We interviewed 11 people in charge of campaigns or communication in regional donation centers (Andalucía, Aragón, Asturias, Cantabria, Castilla y León, Cataluña, Galicia, La Rioja, Murcia, Navarra and Comunidad Valenciana) and 10 presidents of donor associations (A Coruña, Alicante, Asturias, Cádiz, Huelva, León, Navarra, Toledo, Valladolid and Zamora). At the convenience of the professional, the interview was conducted by telephone call or using a form sent by e-mail. The questions dealt with the role played by social networks in their institution, the use they make of them, the most successful strategies identified, the most common forms of interaction with potential donors and the feedback received.

The testimonies obtained in the first phase corroborated the need to analyze in detail what happens outside the institutional profiles on social networks. Lack of time and personnel prevents these entities from advancing in digital foresight, despite being aware of their importance and the new forms of interaction, especially among the younger public, called to lead a generational relay. Thus, the second phase of the study focuses on TikTok because it is one of the most attractive platforms among young audiences and uses short video as the main dissemination format (IAB Spain, 2023; Peña-Fernández, Larrondo-Ureta, & Morales-i-Gras, 2022).

The sample was configured according to a single eligibility criterion: publication on TikTok that reflects the experience of a donor in Spain, as the first-person content was the one indicated by the professionals of the centers and brotherhoods as the “best received by the community”. Special care was taken to ensure that the audiovisual content was confined to Spain in order to avoid allusions to problems in countries with other regulations or blood collection systems that might condition the conversation. It should be noted that the TikTok search engine does not allow filtering according to the origin of the video or its typology (explicit interest in the testimony), which made it necessary to manually monitor all the results offered. In two waves (January and June 2023) all researchers participated in the location and screening until reaching a point of redundancy in the collection of cases. Relying on the use of hashtags such as #donasangre, #donasangredonavida, #donantedesangre or #hemodonación, among others, a total of 61 videos accumulating 1,606 comments were collected and analyzed in their entirety.

The videos and their comments were processed using the quantitative “coding and counting” method, typical of Computer-Mediated Communication (CMO) studies, consisting of coding categories and counting their frequency, together with a subsequent content analysis (Torrego-Gonzalez & Gutierrez-Martin, 2016).

**Table 1: Description of Categories and Variables of the Analysis.**

Category	Variables
Creator (authorship)	Personal account / Institutional account Specialized health account / non-specialized account Donor account / blood recipient account Number of followers
Video (content)	Date of publication Male lead / female lead Young protagonist / adult protagonist Presence of sensitive content / absence of sensitive content Number of “likes”. Number of comments
Conversation (community)	Complaints Inquiries Rational expressions of support for the donation (objective basis) Expressions of emotional support for the donation (personal basis) Expressions of pride in being a donor Support for third-party donations Future intention to donate Excuses or reasons for not being a donor Allusions to COVID-19 Knowledge transfer on donation Responses from the video creator himself Others

The definition of the categories of analysis first used an inductive approach based on the results of previous studies (Leiva Castillo et al., 2023; Zhang & Cassany, 2019) and the experience of the professionals consulted. The codebook was tested by all authors on 10% of the sample with a high level of agreement and after slight modifications the final record was obtained. The variables selected to analyze the content and reactions to TikTok publications that included blood donor testimonials were distributed as follows:

The statistical treatment of the data was carried out with the SPSS v.26 program to analyze the frequencies and relationships between the different variables, using the Mann-Whitney U test and Spearman's rho test.

### 3. Analysis and Results

#### 3.1. Spanish Blood Banks and Donor Associations as a Digital Space for Reference and Consultation

All the regional blood donation centers consulted, except Navarra, have a direct institutional presence on social networks. They consider these platforms essential to raise awareness of the importance of donation and to reach out to young people, but point to the lack of personnel and resources as points for improvement. In relation to the brotherhoods and donor associations it should be said that, although most are classified as “public utility entities”, the funding they receive is scarce and their activities go ahead, mainly, thanks to the selfless collaboration of volunteers. Some brotherhoods have even quantified the effects of their digital presence: “57% of new donors have found out about us through social networks,” says the one in Toledo, while the one in Alicante puts the figure at 30%.

With corporate profiles, both regional centers and associations seek to disseminate relevant information about their activities: location of extraction points, opening hours, status of reserves, seasonal campaigns, etc. The usefulness of the information, therefore, is essential. In addition, they highlight the closeness and contact that social networks bring them: “Many people contact us privately to ask us questions and even congratulate us. All of this is redirected to the Donor Service Department so that it is recorded,” staff from the Banc de Sang i Teixits de Catalunya explain. And they are aware that each social network has, apart from its particularities in handling, a different direct audience depending on age. “When we develop campaigns in universities or secondary schools we turn to Instagram because we know that they work better there,” says the Regional Blood Donation Center of Murcia. However, many recognize that they would like to have a presence on TikTok, but are postponing its use due to lack of means, time and knowledge.

When asked about the publications that generate the most interaction, these institutions point to the testimonials of donors, recipients or professionals. “People like to put a face to the donation”, which helps to empathize, according to several centers. However, they do not forget that ensuring generational relay is a priority and that they need to attract attention. For this, they are committed to dynamic, fun content, in most cases prioritizing image or video over text. “And if we want to reactivate inactive donors, we have found that social networks do not work. The direct phone call is more effective,” acknowledges the Toledo Brotherhood of Blood Donors.

“It is not common to receive complaints” is the unanimous response of blood banks and associations when asked about the management of negative comments on networks. Some point out that when someone has had a problem they usually prefer to call or write an email, while those who have identified an unfavorable public review point out that the appearance of hematomas is usually the most common object of “criticism”. “When the case has arisen, we have contacted the user privately to reassure and explain. As a general rule, the user, aware of the harm done to donations, withdraws it, seeing that this transitory effect is offset by its benefits,” explains the Hemotherapy and Hemodonation Center of Castilla y León.

Through social networks, they receive numerous questions, the most frequent ones related to the possibility of donating -after getting a tattoo or having traveled abroad-, waiting times and collection points and times. On many occasions the queries are sent by direct message, which requires an almost immediate response capacity.

Among the wishes of many of the managers interviewed is to strengthen their community of users and for the donors themselves to be the ones who, on their personal social network accounts, relate their experience, upload photos and encourage others to donate, in short, to act as ambassadors for the blood banks.

#### 3.2. Testimonials on Hemodonation in TikTok as the Axis of Social Learning based on Collective Intelligence

Of the 61 videos analyzed, published between 2020 and 2023, an anomalous case (“outlier”) was detected that generated almost 60% of the total number of comments (961 out of 1,606), despite coming

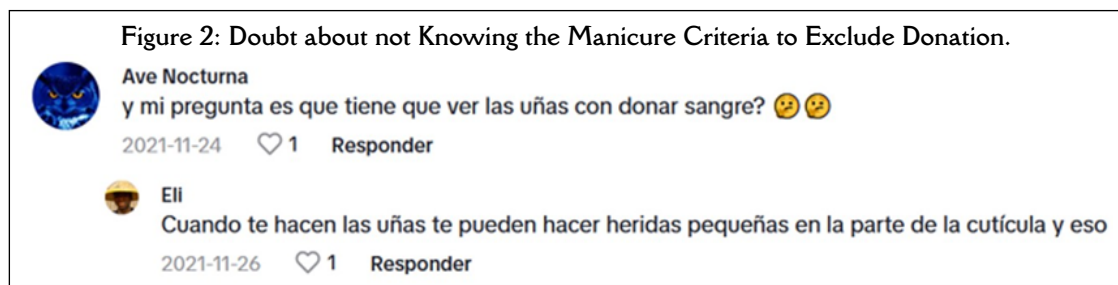


from a profile with an average number of followers. To avoid distorting the results by treating it with the other cases, it was decided to examine this unit independently and perform the overall quantitative and qualitative analysis on the sample of the remaining 60.

### 3.2.1. The Anomaly: Controversy Over Professional Manicure as a Criterion for Exclusion

The video, with 426,000 “likes” and 961 comments, reflects the complaint of a young woman with 12,800 followers about the hemodonation center’s refusal to allow her to donate because she had a manicure in a beauty salon (a similar criterion to the obligatory wait after undergoing surgery or getting a tattoo). The video sparked controversy in the community of TikTok users, especially young people who in many cases follow the current trend of having professional manicures.

The debate centered on the convenience or otherwise of the criterion, the possible discretionary nature and lack of transparency in its application, and the recounting of experiences in other locations. The conversation generated 70 complaints, 50 doubts and more than 240 comments with knowledge, whether true or not, on the main topic and, to a lesser extent, on other aspects of hemodonation, such as the analysis of the blood collected, the information and donation sites. More than half of the questions were not answered directly, as many of them were repeated and had already been answered. The relationship between having a manicure and donating blood was the most common question (Figure 2). The participation of the creator of the video was anecdotal in the answers, focusing primarily on supporting what was presented with her testimony. This controversy occurred in November 2021, but it is noteworthy that in the rest of the videos analyzed, from 2020 to 2023, no other comment was repeated in this regard.



### 3.2.2. The Importance of Health Profiles in the Success of Shared Content

Before developing the section, it should be noted that in the 61 videos analyzed only one institutional author (the Guardia Civil) and one author receiving blood were observed, so it is not possible to establish relationships with these characteristics of the subject who created the video. None of the cases involved a relevant deviation with respect to the rest, neither in quantity nor in type of comments, so they were treated with the overall set.

Regarding the number of followers of the creator profiles, the data show an average of 81,253 (Me=3,408), although the most interesting data is the sum of 4,875,194 as the minimum potential audience of the testimonials, added to the rest of the platform users who see it in contents suggested by the platform.

The videos analyzed obtained an average of 2,582 “likes” (Me=92) and a total of 154,918 “likes”, the minimum audience that actually consumes the content. It should be noted that all of them are positive, even those that normalize a rejection for not meeting requirements or point out minor problems such as dizziness or fatigue after the action.

The user community participated 645 times, with an average of 11 comments per video (Me=3). Almost a third of the sample (18) did not get any response, despite having an average of 63 “likes”. All the above data show the difficulty of getting interaction in this social network in the form of comments.

Regarding the type of user profile, a statistically significant relationship was observed between the results and those profiles from the health sector (physicians, nurses and pharmacists). These profiles, which represent 18.3% of the total, were more successful in several of the fields analyzed (Mann-Whitney U test):

- Profile followers (p-value=0.033). Compared to the average of 71,062 followers of the non-health

sector, those of the health sector reach 126,652.

- “Likes” of the video ( $p$ -value=0.022). Average of 785.2 “likes” for the general videos, compared to 10,585.9 for the healthcare videos.
- Number of questions ( $p$ -value=0.004). Mean of 0.33 questions in non-health videos vs. 3.73 in health videos.
- Causes of non-donation ( $p$ -value=0.025). Mean of 0.8 in non-health professionals vs. 2.82 in health professionals.
- Knowledge contribution by the community ( $p$ -value=0.009). Only 0.24 in the generic profiles vs. 2.73 in the health profiles.

Regarding the content of the videos, it is noteworthy that 80% of the users post sensitive images that clearly show the blood or the moment of the needle prick. In other words, the community of this social network normalizes the image of donation, despite comments alluding to their fear of needles (trypanophobia) or getting dizzy in front of blood (France & France, 2018; Gilchrist et al., 2019). However, their presence does not influence either the quantity or the meaning of the comments. These images are shared by both the general community (81.6%) and health profiles (72.7%).

As a general rule, there was only one protagonist: male in 35% of the cases and female in 60%. Gender was not found to affect any of the variables studied. Regarding the age range of the protagonists of the testimony, there is a clear predominance of young profiles (apparently under 30 years of age), which account for 71.7% of the total, compared to 18.3% of adults (between 30 and 60 years of age). In this case, the only variable linked with statistical significance was the number of comments by the author himself in the video ( $p$ -value=0.014, Mann-Whitney U test): compared to an average of 2.1 comments by young people in their videos (resolving doubts, adding information, thanking for support or encouraging donations), none of the adult authors followed up the conversation, despite having a similar average number of comments received (11.6 by young people and 7.5 by adults).

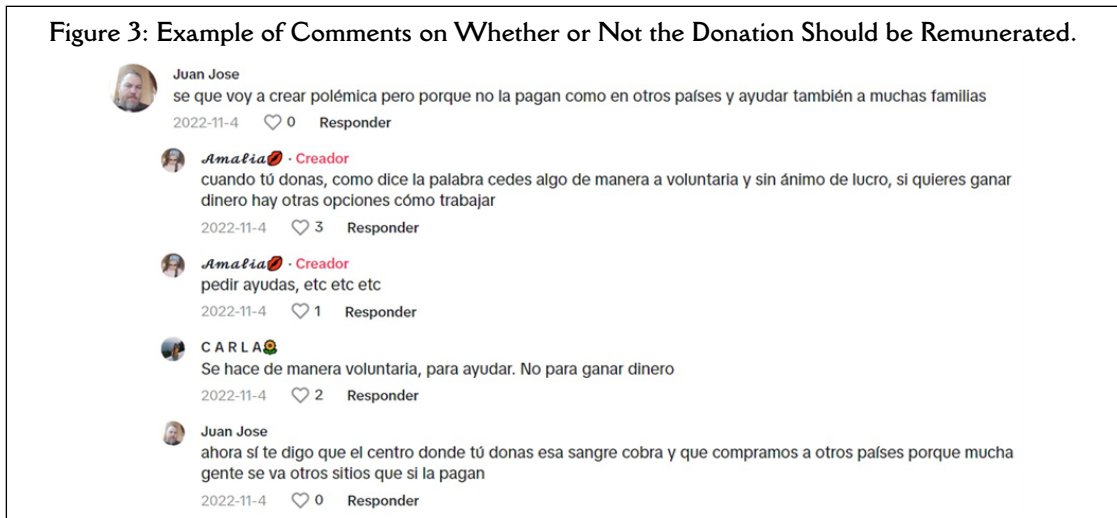
Finally, an analysis of the relationships between quantitative variables was performed using Spearman’s rho, which showed expected correlations, such as between the number of profile followers and the number of “likes” received ( $r=0.680$ ;  $p$ -value=0.01) or between the number of followers and the number of comments received ( $r=0.484$ ;  $p$ -value 0.01). In this sense, none of the data showed an unexpected result, but rather reinforced the previous ones.

### 3.2.3. Typology of Comments and Knowledge Management

Regarding the type of comments received in the donation testimonial videos, one fifth (132 of 645) were classified as Other, either because their meaning was not understood, or because they dealt with topics outside the scope of the analysis, or because they referred to contexts other than Spanish. Excluding those that could not be analyzed, the dominant categories were recognition of the donations of third parties, usually the creator of the video (18.7% of the 513 that could be analyzed), comments by the authors themselves (18.3%), explanation of the reasons for not donating (13.6%), doubts (11.1%), and complaints (10.3%). Taking pride in one’s own merit as a donor and expanding knowledge on the part of the community share sixth and seventh place, both with 8.2% of the total. In last position are the categories intention to donate (3.9%), emotional support for donation (2.7%), rational support (0.6%) and allusions to COVID-19 (0.2%). Of these fields, the most relevant for the research objectives are developed below.

First, regarding the comments expressing complaints or problems experienced during the donation process, it should be noted that the majority (86.8%) are concentrated in only two videos and are almost anecdotal in nature. The first shows a generous provisioning received after donating, which generates a cascade of complaints from other donors who have received less. The second case shows two young friends who have suffered low blood pressure during the donation, which leads to many comments referring to similar problems, such as fainting, interruption of the donation due to thin veins or thick blood, among others. However, it should be noted that both the creator of the video and other users relativize the problem, considering that it is worth suffering a little dizziness for the sake of helping others. Among other minority complaints found in the rest of the videos, those that consider that hemodonation should be remunerated are noteworthy. These statements are usually poorly received and receive a critical response from the TikTok community itself, which defends its voluntary and altruistic nature (Figure 3).

Figure 3: Example of Comments on Whether or Not the Donation Should be Remunerated.



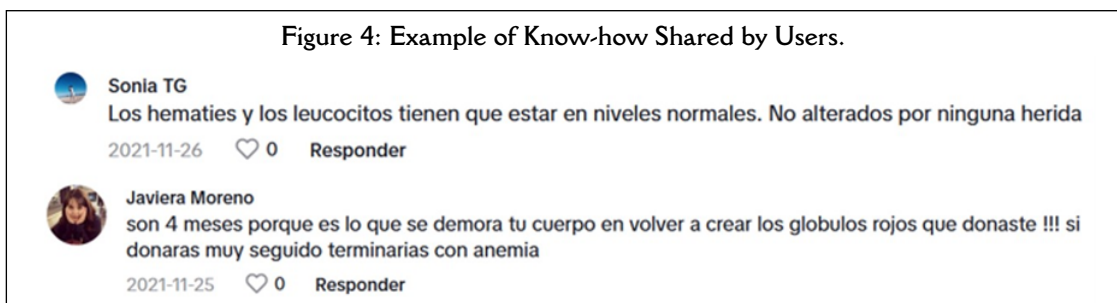
The direct or indirect questions received in the videos analyzed are mainly aimed at finding out the requirements to be a donor: either general questions, or specific questions about some of them (frequency, age, weight, fasting), or about the exclusion criteria, among which are piercings or tattoos (it is striking that none of them talks about the manicure that sparked so much controversy in a single video), having a disease, taking medication or being a smoker. In the minority, there are doubts about the amount donated, blood analysis, remuneration, possible consequences such as getting fat or suffering from anemia, and about the places to donate.

A total of 28.1% of the queries were resolved by the authors of the video, 15.8% were answered by other users in the community, and 3.5% by both types of users. It is also worth noting that almost half of the queries were produced in the same video, starring a health profile, with many remaining unanswered by repeating a query already answered.

Among the frequent reasons or excuses for not donating, we find low weight, the presence of diseases or anemia, needle phobia and the propensity to get dizzy, in that order. It is noteworthy that this type of comment is one of the top categories (accounting for 13.6% of the total), which shows the desire of many users to donate, even if they are currently unable to do so, and also provides information to others on what criteria may be exclusionary in the process, which is one of the most frequent questions.

Regarding the contribution of new knowledge by users, this is aimed at answering questions about the requirements already seen, general or specific, or about the donation process itself (analysis and tests, duration, consequences, rewards, uses of blood, donation sites and their characteristics) and in many cases they show technical knowledge, not only experiential (Figure 4), which reinforces the importance of the presence of health profiles in this digital conversation.

Figure 4: Example of Know-how Shared by Users.



However, despite the good will of most users and the benefits of collective intelligence to build knowledge, sometimes misinformation has been detected such as “donating takes years off your life”, “centers charge

for donations” or “blood is sold to other countries and to pharmaceutical companies”, dangerous questions if no one refutes them. In spite of this, the amount of shared misinformation detected in this research has been relevant, highlighting on the contrary the correct information, based on the donor’s own experience or on the profiles of the health sector.

Finally, the 94 comments by the video author himself are organized into four main possibilities: answering questions (17), adding more information (9), thanking for the support of his donation (11) and thanking or encouraging other donors (18), as shown in Figure 5.

**Figure 5: Comments from Non-health (left) and Health (right) Profile Creators who Answer Questions based on Experience and Encourage Donation.**



#### 4. Conclusions and Discussion of Results

The methodology developed in two steps, interviews and content analysis, has allowed to satisfy the research objectives and to determine the importance of the virtual community of social networks in the generation of knowledge about hemodonation and its influence in the creation of a generational relay, thus corroborating the ability of social networks and their surrounding ecosystem to mark social progression (Abdullah et al., 2022; Vizer & Carvalho, 2015).

The interviews conducted with the organizations involved in the process in Spain confirm that social networks are becoming increasingly important for attracting young people, attracting between 30 and 60% of new donors thanks to these channels. In their communication strategy, the organizations seek to inform and raise awareness of the importance of the act and, although they try to adapt to the new channels and formats, as recommended by authors such as Stock and Möckel (2021) and Ramondt et al. (2022), most of them do not have a presence on TikTok due to lack of means or knowledge, thus revealing an incomplete cultural convergence strategy (Islas, 2009; Wang et al., 2022).

One of the key points detected in the first phase of the research is the need for organizations to get donors and recipients themselves to become ambassadors for hemodonation, detecting that the network content that generates the most interaction is personal testimonials, which validates the results of studies such as Igartua et al. (2023) and Durántez Stolle et al. (2022). This, together with research such as that of Bandura (2004) or Rimer and Glanz (2005) on the importance of having role models to favor replication, reinforces the importance of examining the role of prosumers who share experiences on donation and observing the audience’s reaction to determine the role of the community in this literacy.

The second phase of the fieldwork, the analysis of Spanish testimonies on TikTok about hemodonation, shows the lack of presence of the organizations, where only one appears as a participant in the conversations; this gap is filled by the digital community. The role played by health profiles stands out, but also the collaboration of donors based on their personal experiences.

A statistically significant relationship was observed between the profile creating the content and its success. Thus, videos shared by healthcare professionals, with a higher average number of followers than other profiles,

get more “likes”, more questions and more comments from other users who, in turn, provide more information. These results reinforce those of previous research on the role of healthcare workers as “influencers” on platforms such as Instagram or Twitch (Buitrago & Torres-Ortiz, 2022; Castro-Higueras et al., 2021; Martínez-Sanz et al., 2023; Pérez-Ordóñez & Castro-Martínez, 2023). However, in the management of questions, other users are almost as important as the authors themselves, and in this way community contributes to the literacy.

In the users’ comments we find a variety of issues as diverse as gratitude to donors, pride in donating, intention to do so in the future or justification for not doing so; together with all those linked to knowledge management: questions, problems, answers from the creator and information of interest added by the audience. The sum of the predominant comments favors the transmission of a positive idea about donation, hardly tarnished by complaints, and instead reinforced by donor pride and community support for those who show their concerns or intention to donate, in line with the contributions of authors such as Bullers et al. (2001) and Rotter (1954) on the influence and imitation of behaviors.

As for the most frequent questions and information, both the interviews and the content analysis coincide in pointing out the conditions for donating and practical information such as the location of centers, the frequency of donation or the analysis of blood. Donation centers hardly receive any complaints on their networks, and those found on TikTok are mainly anecdotal (difference in supplies after donating, minor dizziness or bruising), except for a notable case of a “new” exclusion criterion (professional manicure) and doubts about its motivation and application. To a lesser extent, there are comments on the appropriateness of remuneration for the act, which are usually responded to critically by those who defend the altruism of the act.

Finally, as a negative consequence of user participation in the transmission of hemodonation knowledge, there is a lack of filtering and review of the information, which can sometimes be erroneous or even malicious, with statements such as “donating shortens life” or “the centers profit from donation”. However, in the analysis carried out, an almost irrelevant amount of this type of misinformation has been detected, a fact surely derived from the altruistic and voluntary nature of donation itself, which therefore promotes positive participation in the digital conversation. Even the comments collected as criticisms or problems are approached from a humorous or relativizing point of view, given the importance of the act and its benefits for society.

The present research therefore manages to validate the two starting hypotheses and thus expand knowledge about the communication of organizations linked to health and specifically to blood donation, as well as the role of the virtual community that participates in the media ecosystem (Vizer & Carvalho, 2015). Most relevant is that the article provides a novel framework for the analysis of the literacy capacity of users not only as main content creators but through their digital conversation in a social, collaborative and group learning process, based on collective intelligence, of particular relevance in the field of awareness raising in health issues. And while it is true that the research is limited to the national scenario, it is extensible to other contexts, especially those where altruistic donation is imposed.

The main limitation is the difficulty of distinguishing the meaning of some comments or their origin, which reduces the richness of the results. In future studies, it would be interesting to replicate the content analysis of the comments in other social networks to determine the existence of differences in the predominance of some categories or others and in the quantity and quality of the knowledge shared by the community about blood donation.

## Notes

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# The Educational Potential of Video Games: Its Evaluation Through a Rubric

El potencial educativo de los videojuegos: Su evaluación a través de una rúbrica

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## ABSTRACT

Video games are a widespread leisure resource associated with entertainment, relaxation and escape through play. The research questions its educational potential. The aim of the study is to provide a rubric capable of evaluating the educational potential of any video game. There is no record of a comparable tool applicable to any video game. A qualitative and phenomenographic methodology was chosen. Forty-two interviews were conducted with teachers and experts from the video game industry. From the theoretical review and the analysis of the testimonies, we obtained as a result the ECV 5\* ("Educational Classification of Video games 5\*") tool. The most relevant conclusion was that the educational potential of a video game is evaluable and transferable information. Thus, the ECV 5\* can serve as a reference for the design and consumption of the resource, as well as for a better discernment of how far a video game can go in the education of a person. Its practical intention is to provide the data of its educational value in an easy and intuitive way: from 0 to 5 stars. It could be a way for users, educators, companies and society in general to be more aware of the educational potential of any video game, for its design, use, purchase and sale, selection, etc.

## RESUMEN

El videojuego es un recurso de ocio muy extendido asociado a entretenimiento, distensión y evasión mediante el juego. La investigación indaga sobre su potencial educativo. El objetivo del estudio es aportar una rúbrica capaz de evaluar la educatividad de cualquier videojuego. No se tiene constancia de una herramienta comparable aplicable a cualquier videojuego. Se optó por una metodología cualitativa y fenomenográfica. Se realizaron 40 entrevistas a maestros y a expertos de la industria del videojuego. De la revisión teórica y el análisis de los testimonios se obtuvo como resultado la herramienta CEV 5\* («Clasificación Educativa de Videojuegos 5\*»). La conclusión más relevante fue que el potencial educativo de un videojuego es una información evaluable y transferible a evaluadores de videojuegos, padres, profesores, usuarios, técnicos de la industria del videojuego y la sociedad en general. Así, el CEV 5\* puede servir de referencia para el diseño y consumo del recurso, así como para un mayor discernimiento de hasta dónde puede un videojuego llegar en la educación de una persona. Su intención práctica es aportar el dato de su educatividad de un modo fácil e intuitivo: de 0 a 5 estrellas. Podría ser un modo de que usuarios, educadores, empresas y la sociedad en general puedan ser más conscientes del potencial formativo de cualquier videojuego, para su diseño, uso, compraventa, selección, etc.

## KEYWORDS | PALABRAS CLAVE

Video Game, Evaluation, Digital Toolkit, Education, Consciousness, Learning, Ideojuego, Evaluación, Herramienta Digital, Educación, Conciencia, Aprendizaje.



## 1. Introduction and State of the Art

According to Aarseth (2007), video games are universal, as they are played by people of all ages and latitudes; AEVI (2020) and Newzoo (2022) understand them to be part of the culture of the West and the East. According to Newzoo (2022), the video game world includes 3,198,000,000,000 active players and moves more money globally than music and cinema combined, reaching 196.8 billion USD in 2022. It seems to be a consolidated social phenomenon (Piñeiro-Naval & Serra, 2021; Várallyai, Herdon, & Botos, 2015).

The video game is not only leisure: it is based on a practice where the player has fun and incentive (Gonzalez Tardon, 2010, 2014) and implies that the subject longs to play individually or in a group. For Darvasi (2016), video games are far from being a waste of time: their aesthetics and dynamics approach relevant topics, such as peace, conflicts or the simulation of situations. In addition, they reinforce decision-making skills, problem solving and emotional empathy. Studying communities of players, it was concluded that they could favor different personal and societal facets, besides improving performances in some tasks (Darvasi, 2016; Juul, 2019; Levis, 1997, 2003, 2008; Muriel & Crawford, 2018). For example, "Papers Please" (Pope, 2013) or "This War of Mine" (11 Bit Studios, 2014) show cruelty in conflicts where characters overcome bloody situations in war and barbarism. The experience allows us to value peace as a non-gratuitous good that is a prerequisite to improve life.

Video game research has been oriented towards information transmission, team building, skill development, experimentation, simulation, health, resource management and, above all, entertainment (Esnaola Horacek & Levis, 2022; Gee, 2003; Griffiths, 2002; Kent, 2001; Khasawneh et al., 2024; Sajeev et al., 2021; Sierra-Daza, Martín-del-Pozo, & Fernández-Sánchez, 2023). According to Ortiz-Clavijo and Cardona-Valencia (2022), quality scientific production (Scopus) in the 2010-2020 window is concentrated in Spain, the Netherlands and the USA of North America, with few effective or applied proposals.

For Gonzalez Tardon (2010, 2014) and Pérez-Latorre (2012a, 2012b), the video game is a literacy medium against the digital divide. Several authors understand that video games develop skills related to the use of ICT and improve disciplinary learning (Language, Arts, Mathematics and Science) (Basak et al., 2008; García, 2009; Gee, 2003; Gogost, 2007; Squire, 2003, 2011). The report by Balanguer-Prestes (2009) points out that through the video game the player gains access to other people's experiences, which they internalize as their own. For example, in "The Legend of Zelda: Breath of the Wild" (Nintendo, 2017) or "Brother: A Tale of Two Sons" (505 Games, 2013) the player faces situations of survival, loss of loved ones, memories, amnesia, etc. to which they must respond.

The video game enhances the person's imagination, productivity and performance from its thematic breadth and narrative creation (Bediou et al., 2023; Green & Bavelier, 2015; Janrosl et al., 2023). Fiction allows one to be and not to be in a place, to be and not to be a character at the same time, in varied situations and with diverse masks (Blay, 2006), which can bring a certain self-knowledge, by evidencing who one essentially is not, as in everyday life. In "Every Day The Same Dream" (Pedercini, 2009) the player has to save a life to complete the video game, but not before realizing that we live with an identity conditioned by routine, money, consumerism and falsehood. There are video games that unite the game and the external reality. For example, in "Nintendo Labo" (Nintendo, 2018) the player plays with kits of cardboard, rubber bands and other previously prepared materials. Thus, the operation of the kits with which you can build a piano, a robot, a fishing rod or a car is understood, so that the player values their creations and has experiences outside the video game console. Some video games associate adverse effects, which can lead to suggestible users or with predisposition to break with reality, to an abusive and dependent use of the game, etc. (Bhatti et al., 2022; Mandryk & Birk, 2017). Sometimes, users have to be treated for pathological gambling (American Psychiatric Publishing, 2014) associated with poor health, including anxiety, consumption of harmful substances, antisocial behaviors or depressive disorders.

A video game linked to education is oriented to personal and social improvement by valuing vicarious learning. Respect, tolerance or help are elements that encourage a life that includes the presence and care of the other (Buber, 1947). Like chess, a video game can be a training for life and help to complete useful skills for social and self-development. Formal education responds to quality standards focused on competencies (Argudín, 2007; Fernández-Berrocal, Cabello, & Gutiérrez-Cobo, 2017; Vidal et al., 2016). However, human complexity and ecosystemic understanding question competency-based education (Guzmán Marín, 2017; Jarunjaruphat, Silpcharu, & Wattanakomol, 2023). It is not a question whether

of adding to competencies the integration of disciplinary knowledge or the values proper to modern democratic societies. The “radical and inclusive approach” to education (de la Herrán Gascón, 2014) includes “radical areas” (fundamental, needed, but not demanded and not standardized) that can broaden and enrich the understanding of education and curricula. They may be desirable or rejectable. They differ from disciplinary or transversal ones in that they are essential for education, not demanded, hardly attended by supranational educational bodies, educational systems or Pedagogy/Educational Sciences, universal, perennial, etc. Since a video game can be educational, the research investigates the possibility of assessing its educational potential. The aim of the study is to provide a tool capable of evaluating the educational potential of any video game and to classify it according to this criterion.

## 2. Method

### 2.1. Approach

In order to respond to the objective, a study was designed with qualitative methodology (Bisquerra, 2016; McMillan & Schumacher, 2005; Ragin & Amoroso, 2018), of phenomenological cut (Creswell, 2014), specifically phenomenographic (Marton, 1986; Murillo, Hidalgo, & Martínez-Garrido, 2022, as it aimed to know various conceptions that people have of a phenomenon. It allows us to describe in detail what educators and video game experts think about the reasons for the educational value of the resource and, by extension, its negative effects.

### 2.2. Data collection Techniques

The technique for collecting information was the “focused interview” (Bisquerra, 2016) conducted with educators and experts in the video game industry. We wanted to know their assessment, as their experience and professionalism was estimated from different professional angles. This diversity provided value to what they understood that could make a video game educational or harmful for a user, especially if the user is a minor. The interviews were developed on two items: “What elements of a video game do you think can be educational?” and “What elements of a video game do you think can be harmful to a user or to their education, especially if they are a child or adolescent?”

### 2.3. Participants

The starting point was a broad conception of participants and members of the video game world, including parents, teachers and other professionals in the video game industry. The selection criteria applied to the participants responded to the criteria of Patton (2002) and Bisquerra (2016): accessibility and timeliness, sampling by logical criteria, snowball sampling, saturation and relevance. Profiles were sought through social networks and from contacts of people close to them, which allowed for a variety of professional fields and participants. Those who accepted received, within the normal process of research ethics, an information sheet and informed consent. Forty people were interviewed, 11 face-to-face and 29 online. All were experienced players between 12 and 30 years of age. Two groups were defined: 22 teachers and 20 video game industry professionals. Two participants, CEN1 and CN3, shared the dual status of teachers and directors of game centers and video game researchers. The selection criteria for teachers were: (1) minimum teaching experience of 4 years, and (2) familiarity with videogame-supported teaching. The selection criteria for video game professionals were: (1) specialized dedication (occupationally linked to video games) of 3 years or more, and (2) profiles directly related to video games or video game users. They were chosen because of the need for people with experience in the use of video games and in education, with the capacity to transmit knowledge to society. The interviewees are described in Table 1:

### 2.4. Development

In the interviews, the relevance of their participation, as “links” in the chain of the video game world, was appealed to. The objective was shared and the signed informed consent was verified. The research had a favorable report from the Ethics Committee of the coordinating university. The interviews were recorded for subsequent transcription and analysis. They lasted between 24 min and 1 h 16 min, with an average of 39 min. The Atlas Ti 9.1 program was used to organize and interpret the data. Forty

documents presenting the interviews were available. Two hermeneutic units and 15 codes, 11 deductive and 4 inductive, obtained through content analysis, were identified. Once the hermeneutic units were identified, codes were assigned to them interpretively, based on their underlying meaning. After coding the hermeneutic units, the coded segments were grouped into codes, representative of broader themes or concepts emerging from the segments. Through an iterative and reflective process, the data was revised and codes were adjusted as analytical and global understanding was consolidated. A total of 1082 segments were coded and grouped into 15 codes. The high number of segments was due to the high textual volume and to the fact that in the same quote the interviewee could allude to several contents at the same time. The codes and coded segments were subjected to revision, based on the interpretation of Braun and Clarke (2006) and Bisquerra (2016). Bisquerra's (2016) model was applied for data reduction and analysis. Table 2 presents the hermeneutic units, the codes, the number of coded segments, their percentage and the number of documents where they were coded. The deductive codes were 1 to 7, 10 and 13 to 15, and the inductive codes were 8, 9, 11 and 12:

Table 1: Interview Participants.

Profession	Code Name	Age	Years Profession	Years of Teaching	Years Playing
Primary Education	PEP1	33		7	21
Primary Education	WBS2	27		5	15
Speech therapist	LOG1	28		4	23
Primary Education	PEP3	29		5	19
Primary Education	WBS4	30		6	21
Hearing and Speech	PAL1	34		8	22
Secondary Education	PES1	31		6	24
Primary Education	PEP5	29		5	16
Retired teacher	PEP6	68		40	28
Primary Education	PEP7	30		4	18
Primary Education	PEP8	31		5	24
Primary Education	PEP9	32		6	24
Primary Education	PEP10	33		9	22
Social Ed.	EDS1	38		15	29
Primary Education	PEP11	31		4	16
Primary Education	PEP12	30		5	21
Secondary Education	PES2	33		12	24
Primary Education	PEP13	37		13	25
Primary Education	PEP14	26		5	16
Primary Education	PEP15	27		4	14
Project manager	PM1	27	10		18
Software engineering	PR01	32	12		20
Clinical psychologist (addictions)	PSI1	29	5		21
Author of video game books	CRE1	29	8		18
Software engineering	PRO2	30	6		15
Content creator	CRE2	37	8		25
Commercial IT	MRK1	29	15		5
Public safety	SEG1	31	18		6
Teacher/Director of the recreation center and researcher	CEN1	38	19	15	18
Medical researcher	INV1	45	14		23
Professional leisure-tourism	MRK2	27	4		18
Primary Education	CEN2	24	5		16
Video game designer	CRE3	32	10		20
Content creator	CRE4	27	4		23
Content creator	CRE5	20	3		12
Physician and researcher	INV2	31	7		16
Software Engineer	PRO3	29	5		21
Teacher/Director of the recreation center and researcher	CN3	36	14	9	25
Project manager	MRK3	33	8		23
Content creator	CRE6	26	6		18

Table 2: Hermeneutic Units, Codes and Coded Segments.

Hermeneutical Units	Codes	Coded Segments (%)	Documents
Elements of a video game that can be educational	1. Disciplinary knowledge	74 (6,83%)	19
	2. Key competencies	304 (28,09%)	42
	3. Instrumental competencies	319 (29,48%)	42
	4. Interpersonal skills	229 (21,16%)	40
	5. Systemic competencies	263 (24,30%)	42
	6. Cross-cutting areas	62 (5,73%)	8
	7. Desirable root areas	191 (17,65%)	35
	8. Education and diversity	551 (50,92%)	42
	9. Applied Consciousness	322 (29,75%)	37
	10. Trends	231 (21,34%)	32
	11. Induction	147 (13,58%)	32
	12. Education and video games	372 (34,37%)	42
Elements of a video game that can be harmful	13. Sensitive content	117 (10,81%)	12
	14. Undesirable radical areas	441 (29,66%)	42
	15. Excessive use	356 (32,9%)	40

### 3. Results

The results relate to two interdependent issues: the codes and indicators obtained and the CEV 5\* tool. The objective of the first is to define the codes obtained in the interviews. The objective of the second is to validate the tool and make it ready for application.

#### 3.1. The Codes

The codes with the highest saturation or number of segments were, in this order: “Radical undesirable domains”, “Education and diversity”, “Education and video games”, “Excessive use”, “Applied awareness” and “Instrumental competencies”. The least saturated codes were: “Transversal domains” and “Disciplinary knowledge”. The codes appearing in all the documents analyzed were: “Key competences”, “Instrumental competencies”, “Systemic competences”, “Education and diversity”, “Education and video games” and “Radical undesirable domains”, including “barbarism”. Their importance for the participants can be deduced from this. The codes “Induction”, “Education and video games” and “Excessive use” were not directly related to educational/perjurious elements of specific video games, but to the use or other issues related to the resource.

The codes are presented grouped in two hermeneutic units, corresponding to the open questions of the interviews: “Elements of a video game that can be educational” and “Elements of a video game that can be harmful”. In each one, the codes are analyzed including, in each one, a clarification of their meaning, their indicators and illustrative testimonies. The meaning of each code was used as guiding information for the participants who validated the rubric:

##### a) Elements of a video game that can be educational:

- “Disciplinary knowledge”: “Social Sciences are the closest to video games, due to their proximity to Art, Music, narratives or actions” (Cabañes & Rubio, 2011; Muriel & Crawford, 2018). Video games can include content from other disciplines. 19 interviewees and 74 segments (6.83%) referred to Humanities (Music, History, Philosophy, etc.), Arts (Drawing, Painting, Architecture, etc.), Social Sciences, Mathematics, Physical and Natural Sciences, etc.

Indicators: Art, Music, Literature (mythology, narrative, drama, etc.), Mathematics, Physics, Biology, Social Sciences, History, Prehistory, Paleontology, Anthropology, Philosophy.

Testimonials: PES2 says: “For my teenage audience, open-world games are the best. For kids, you can work on more basic things like orientation, counting, math, language.

- “Competencies. These are demonstrations of good performance in real contexts. In this field, the following subcodes are included: “Key competencies”, “transversal competencies”, “interpersonal competencies” and “systemic competencies”, as they are considered complementary. Key competencies:

*are defined as a combination of knowledge, skills and attitudes, where knowledge is composed of the facts and figures, concepts, ideas and theories which are already established and support the understanding of a certain area or subject; skills are defined as the ability and capacity to carry out processes and use*

*the existing knowledge to achieve results; attitudes describe the disposition and mind-sets to act or react to ideas, persons or situations* (European Commission, 2018).

Instrumental competencies serve as a means to an end. Interpersonal competencies aim at good social relations and interaction in groups, teams, for cooperation, etc. Systemic competencies refer to an application made from the understanding of a relative totality, system or whole. The majority of respondents and segments highlight the presence of competencies: 40 with 304 segments (28.09%) on key competencies; 40 with 319 segments (29.48%) on instrumental competencies; 40 with 229 segments (28.09%) on interpersonal competencies and 40 with 263 segments (24.30%) on systemic competencies.

Indicators of key competencies: linguistic communication competence (CCL), multilingual competence (CP), mathematics and science, technology and engineering (STEM), digital competence (CD), personal, social and learning to learn (CPSAA), citizenship (CC), entrepreneurship (CE), and cultural awareness and expression (CCEC).

Indicators of instrumental competencies: general culture, basic professional knowledge, oral-written communication in one's own/second language, ICT skills, analysis, synthesis, reflection, logic, analogy, criticism, creativity, complexity, organization, planning, information management, decision making, time management.

Indicators of interpersonal skills: respect (diversity), personal balance, listening, criticism, self-criticism and rectification, teamwork, collaborative, cooperative, trust in others, with experts, ethics (decency), healthy competition, adoption of examples, conflict resolution.

Indicators of systemic competencies: organization, relationship, research, adaptation, creativity, criticism, entrepreneurship, leadership, task delegation, self-motivation, autonomy, maturity, resilience, investment, project design and management, concern for quality.

Testimonials: the CEN2 teacher proposes a change in the educational model: "We must rethink the entire educational model towards more playful dynamics that, with resources such as video games, encourage critical thinking". The primary school educator PEP5 emphasizes: "Cooperative video games that are easy to apply in the classroom and that allow interaction from home. These tools are of great importance for students' learning". The INV2 doctor affirms that simulation video games: "They can serve as testbeds where there can make mistakes, which are teachings. They can serve as learning tools to reach the goal, which is the confrontation against oneself".

- "Transversal areas": They are developed from different areas of knowledge. They facilitate autonomy, socialization and dealing with others in professional, family or social contexts (Valle & Moya, 2020). It is the least cited code by only 8 interviewees and only in 62 segments (5.73%) they note its relevance. It is the least cited code, but not of less educational relevance.

Indicators: peace, health, consumption, equal opportunities, environment, sexual, non-sexist, multi/intercultural, moral-civic, road safety.

Testimonials: The director of a CEN1 recreational center values the resource that allows "Creating together and in peace video games with simple and free tools; encouraging multicultural coexistence and the analysis of the video games themselves, becoming creators and not just users". CRE5 emphasizes that: "In 'Call of Duty' many different cultures are taught".

- "Desirable radical areas": These are essential spaces for education, not in demand, universal, perennial, destined (de la Herrán Gascón & Herrero, 2022). Thirty-five participants responded with content assimilable to this code, with 191 segments (17.65%).

Indicators: consciousness, love, death-finitude, humanity, human evolution (inner), meditation, prenatal education, self-knowledge.

Testimonials: Professor PEP9 highlights humanity as content: "In 'Final Fantasy VII' the protagonist tries to save humanity from the plundering of the planet's resources and vital energy by a terrorist organization and helps the planet's population to start their journey".

- "Education and diversity": Refers to educational attention to all students/users. It is the most present and cited code. It is mentioned by 40 respondents, with 551 segments (50.92%).

Indicators: accessibility, adaptation, methodological variety, mixed game-reality exercises.

Testimonials: Interviewees prioritize educational attention to diversity. Hearing and Language teacher PAL1 emphasizes that: "Games similar to 'Sims', but more simplified, are useful with students with ASD, who

need examples of interaction and social skills”. ED1 explains that his team uses the video game to generate a relaxed atmosphere, in difficult contexts, so that: “the guards are lowered, the defenses are lowered. He thinks that these children come from environments where there may be violence or situations that they cannot talk about, because ‘we don’t talk about things at home’”. PEP12 has a collection of video games as a resource for teaching older children in primary school: “We use the game ‘letter by letter’, ‘Timeline’, which is about science curiosities, ‘Dixit’ as an emotional game, the medieval game ‘Carcassonne’, ‘Rubric’, to improve mathematics and mental arithmetic”.

- “Applied awareness”: Applied to the video game, to its support, to its use, to oneself, to others, to the effects of the video game, to life in evolution, etc. For Griffiths (2002) and Balanguer-Prestes (2009) it can favor mood, enhance effort and involvement in complicated tasks. 37 respondents and 322 segments (29.75%) justify the relevance of this code.

Indicators: video game approval; basic processes of applied consciousness (concentration, effort, ethics (decency), creativity, cooperation, criticism (complaint, criticism, self-criticism, rectification, alternatives), feedback, emotional control, cognitive skills, physical, characters, immersion, fun, motivation, errors, resilience, teaching; reverse technology, complex narrative, video game as art, as complex resource, supra-disciplinary; open-mindedness, awareness of life and evolution.

Testimonials: Teacher PEP15 evoked his son: “My son learned to sit still for more than 10 minutes with video games. He then transferred the achievement to schoolwork.” Other testimonies include the creation of content by the player, the complex narrative, the consideration of the video game as a complex and supradisciplinary resource, as art, etc. PEP4 states that: “There are video games that are art.”

- “Trends”: for including technology (Barko & Sadler, 2013; Gramigna & González-Faraco, 2009), applying to life (Ala-Luopa & Suominen, 2012; Gogost, 2007; Griffiths, 2002) or other reasons. From 32 participants and 231 segments (21.34%), it is valued to take advantage of the latest trends, mainly, but not only technological.

Testimonials: CRE5 values video games that apply awareness to cognitive change in everyday actions: “Thanks to video games and immersion in other lives (of the characters), they can change their thoughts and realize that the world is big, diverse, with many vital perspectives”.

Indicators: streaming, artificial intelligence (AI), new forms of gaming, virtual reality, augmented reality (AR), creation of video games, e.g., based on Unity, RPG Maker or Unreal Engine 4, etc.; applied to everyday actions (failures, losses, routines, etc.).

- “Induction”: Includes the educational action of the family or the teacher, playing with the family, interest in new games, the teacher as a guide, gamification (didactics), the video game as a way of working (work), etc. An extraordinary valuation of the induction moment is shared, especially if it is carried out by parents or solvent teachers. 32 participants and 147 segments (13.58%) cited the first approach to a video game.

Testimonials: PEP 9 and PEP 2 express that the induction be performed by parents or teachers, if they have training on the resource. Another kind of induction refers to the change of type of video games to other specific ones. MRK2 says that they should be chosen by teachers, “because they are hard to find and they are not so marketed. But they will teach them things they don’t normally know about video games and they might find alternatives to traditional video games, such as ‘Fornite’, ‘Call of Duty’ or Nintendo games.”

- “Education and video games”: Includes content assimilable to the “video games-education” binomial not included in the previous codes. It is one of the codes mentioned by the 40 respondents, with 372 segments (34.37%).

Testimonials: All the interviewees admit the compatibility between video games and education, the time control, the temporary limitation or the use of the video game as a reward. For CRE5: “The video game can help the student to have fun, without stopping learning. The video game can be an important or complementary part of classroom learning”. Some, like PEP14, feel a special responsibility: “Because my students spend most of their leisure time playing video games, it is my duty to be trained in this area and use elements that may interest them, such as images of characters they like, audios, dances or actions”. PRO3 proposes: “a subject on video games” for students. INV1 points out the need for training: “Educational institutions should be trained or given tools, since video games are the main source of entertainment for children”. Therefore, he proposes: “A joint work with the school where schools understand video games and teach video game education, where children are aware of their place and their perspective position as players” (INV1).

**b) Elements of a video game that may be harmful:**

- “Sensitive content”: either because it is universally objectionable or degrading, or because it is inappropriate for specific users due to age, suggestibility, circumstance, other reasons. They may include bad examples (Al Salih & Al Doghan, 2023; Mandryk & Birk, 2017). Only 12 respondents referred to this code, with 117 segments (10.81%). However, it is an omnipresent content in the experts’ answers, either by action or omission.

Indicators: bloody images or stories, disturbing, unfair or classist humor (racist, sexist, xenophobic, nationalist, anti-religious, etc.), laughing at people for physical, psychological or social reasons; inappropriate language (rude, disrespectful, etc.), inappropriate sexuality (violent, pornographic, obscene, etc.), segregation (rejection, segregation, racial, sexual, political, religious, class, social), fear (disturbing, terrifying), historical lies, social, gambling, strategies for dependency/ludopathy.

Testimonials: PEP13 states that: “Some video games have the stigma of cruelty”.

- “Undesirable radical areas”: They are rooted in the human ego and translate into biased knowledge. They condition the development of consciousness and inner evolution. Among them, barbarism stands out, applicable to living beings and human beings. Barbarism lies in exacerbated, insensitive, fanaticized egocentrism (Herrán, 2016). For Greitemeyer (2018), if a video game generates violence, it is because a social factor intensifies it. 40 interviewees and 441 segments referred to negative radical domains. Among them, “barbarism” is cited by 40 interviewees, with 306 segments (17.19%). Undesirable radical domains minus “barbarism” are cited by 17, with 135 coded segments (10.81%).

Indicators: egocentrism, selfishness, generalized immaturity, ignorance, unconsciousness, partial reason (superficiality, frivolity, simplification, myopia, bias, duality, etc.); biased knowledge (prejudices, predispositions, unfounded beliefs, false generalizations, etc.); hatred, fanaticism, sectarianism, indoctrination, greed, arrogance, foolishness, stupidity, hypocrisy; barbarism (war, genocide, abuse, violence, cruelty, savagery, torture, brutality, nefarious exemplarity).

Testimonials: The author of CRE1 texts highlights the “prejudice”: “The approach I give to the video game is from the most absolute respect. I try to get people who read my works to move away from prejudice and face the consequences of their actions in the video game.” The CRE2 content creator refers to “fanaticism”: “Fanaticism is a product of education and the individual’s access to information. It occurs within the video game and outside of it.” And he adds the risk of losing the notion of reality: “Sometimes the pastime or hobby is confused with the identity of the player himself, generating debates and clashes between different types of players, believing to be that ‘product’ and not a person who plays to be this ‘product’”. Referring to the barbarity of a particular game, the teacher PEP11 says: “In the narrative of the game GTAV, hitting, killing, sleeping with prostitutes, cheating on your partner, shooting in the back, hunting animals and other regrettable actions are not reproduced in reality, because the players know they are in another dimension”. Therefore, he understands that: “Save for exceptional cases, due to socialization problems or psychopathologies of the player, video games do not make a person become violent, fanatical or commit despicable acts. These contents could even be educational”.

- “Excessive use”: includes excessive, dependent use, without self-control or external control that can harm the person. However, it is a significant factor associated with gaming. An exposure combined with poor family management and a lack of knowledge of video gaming can harm the user’s health (visual, general physical, social, mental, etc.) and the integrity of the person (Darvasi, 2016; Radetich & Jakubowicz, 2015; Tovar Cuevas et al., 2022; Van Rooij et al., 2011). It is another code addressed by almost all interviewees (40, with 356 segments, 32.9%).

Testimonials: PEP3 warns of the risk of excessive use: “Video games can lead to social isolation and addiction, preventing socialization with other children their age, because they prefer to play virtually at home instead of interacting physically”. CEN1 denounces that: “There are more and more strategies for players to spend more time playing video games. They are little different from those used in gambling and may encourage pathological gambling”. The social educator EDS1 looks into social causes: “Parents leave their children with video game consoles because they have to work long hours to pay excessive rents. There are families that are strangled”. And he adds: “It is said that few children are born, that we need more children for the country to have a future. But nothing is done. To educate a child you need the whole tribe, analyze the needs of the child and support the families.”

### 3.2. The CEV 5\* tool (“Video Game Educational Rating 5\*”)

Based on the information from the previous point and in accordance with the objective of the research, the evaluation criteria were defined according to the relevance in the educational use of the video game. Performance levels for each criterion were specified and scores were assigned to each performance level, in the form of a number of stars, to facilitate the visualization of the educational potential of each video game to a broad, non-specialized audience. Detailed descriptions of each performance level were outlined to inform the characteristics required to achieve each level.

Once the first version of the rubric was created, it was submitted for validation and feedback was obtained from a group of 6 experts whose required profile was to have experience in educational research, evaluation and ICT. After this validation, it was modified and a second version of the rubric was generated. Subsequently, the instrument was subjected to a pilot test.

For its implementation, 7 other volunteers who had already been interviewed were called: 5 teachers and 2 technicians from the video game industry, who were asked to participate as “expert-evaluators” of the educational tool that, from the interviews, they had helped to create. The selection criteria were to know and have played the video games “Bully” and “Pokémon Sword”. Two heterogeneous teams of 3 and 4 people were formed at random. Each team was asked to evaluate the educational potential of the two video games, independently and without communicating, using the rubric (first version) and the guiding informative support in section 3.1, finally rating them from 0 to 5 stars. The teams took between 45 min and 1 h 12 min to reach an agreement. The stars awarded by both teams agreed on the two video games. Afterwards, they were asked to make an evaluation of the pilot experience. The comments referred to two contents: the evaluation tool and suggestions for its application. From the comments on the rubric, the final version of the tool was created (Table 3).

**Table 3: “Rubric for the Evaluation of the Educational Potential of A Video Game”.**

Valuation	Elements and Indicators that can Educate	Elements and Indicators that can be Detrimental
Very good <sup>5*****</sup>	It favors relevant learning of 3 or more disciplines, competencies, transversal and radical areas, or 1 of each class in depth. It is accessible. Promotes awareness and open-mindedness. Includes the latest trends.	There are no harmful elements.
Good <sup>4****</sup>	It favors superficial learning of 2/3 disciplines, competencies, transversal and radical areas, or 1 in depth. Accessible.	There are no harmful elements.
Acceptable <sup>3***</sup>	It favors superficial learning of 1 discipline, competency, transversal and radical area. Not very accessible.	There are no harmful elements.
Regular <sup>2**</sup>	It favors superficial learning of 1 discipline, competency, transversal or radical area. Not inclusive.	Includes sensitive content. It superficially addresses some radical negative or undesirable area.
Bad <sup>1*</sup>	There are no beneficial elements.	It is recreated in 1/2 sensitive contents and negative radical areas.
Very bad 0	There are no beneficial elements.	It revels in more sensitive content. It calls for barbarism, promotes negative radicals.

Regarding suggestions for the application of the tool, there was consensus on 8 topics:

- -Evaluation class (agents): The ideal was a co-evaluation by a team of 3-4 evaluators among whom there had to be educators with pedagogical training.
- -There was consensus that the examiners should have played the video game sufficiently to be evaluated; they should have no interests, prejudices or conditioning towards the game in question, and they should have sufficient pedagogical training to interpret the codes/subcodes and indicators.
- -Need for guidance information: It is not possible to apply the “Rubric” without understanding the guidance for participants, included in section 3.1.
- -Evaluation process: The evaluation process went through 5 observable moments. The last one was considered “necessary”: (1) Constitution of the team, mutual knowledge and adaptation, initial co-evaluation to share meanings and criteria. (2) Observation, examination and individual evaluation. (3) Procedural and final co-evaluation. (4) Final and summative co-evaluation and qualification of the video game. (5) Report.



- -Interpretation of the data: The greater relevance of the harmful elements over the educational ones (“poison effect”) was highlighted.
- Problems in the evaluation process: The difficulty of discriminating between intra- and inter-items is mentioned. It is deduced that the apparent problem is a characteristic of the tool, which contributes to dialogue and consensus.
- -Evaluation products: The evaluation ends with three products: report, number of stars and a justification report, signed by the members of each evaluation team, which is understood to be “required”.
- -Final evaluation of the tool: The CEV 5\* is said to be: “positive”, “useful”, “changes the way we look at video games” and “should be open to future revisions”.
- Following the evaluation experiences with the expert teams, it was concluded that each video game should be evaluated by a minimum of two competent teams. Regardless of the coincidence in the evaluation trend, in order to reach an opinion, in case of discrepancy, the evaluation of a third team of experts or a re-evaluation of the two teams gathered in the same training event could be used.

#### 4. Discussion and Conclusions

Four decades ago, UNESCO (1980) pointed out that technological development should be based on scientific and social awareness. Subsequently, the Delors Report (1996) warned that imagination should take precedence over socio-educational change associated with technological development: “The human imagination, precisely to create this society, must anticipate technological progress, if we are to avoid aggravating unemployment and social exclusion or inequalities in development” (p. 20). The development of the video game seems to be peculiar in that it is a technology for the imagination. In fact, it propitiates entertainment and evasion of reality from the imaginative immersion in the game (Gonzalez Tardon, 2010, 2014; Karadağ et al., 2024p Núñez-Barrriopedro, Sanz-Gómez, & Ravina-Ripoll, 2020). It is clear that cinema, literature, music or plastic art have an “educational” value by the mere fact of being cultural products. The intention of this study has revolved around a rubric from which to assess the educational potential of any video game, from its analysis. In good logic, digital educational games (Baigi et al., 2022) would be those valued with more stars, and those associated with undesirable uses, exclusion, violence or barbarism (Mandryk & Birk, 2017) would obtain lower ratings with fewer or no stars.

Its usage time has been related to school performance (Gómez-Gonzalvo, Devís-Devís, & Molina-Alventosa, 2020). It can be a useful resource for life, due to its attractiveness, applicability to day-to-day tasks, learning and problem solving (Green & Bavelier, 2015; Williams, 2017). Moreover, its educational value is increased if the family participates in its induction and management (Squire, 2003, 2011). However, we agree on the need to know a video game, in all its facets, in order to mold it to its target audience, objectives, etc. (Gramigna & González-Faraco, 2009; Hongmei & Jingwei, 2022; Szita & Lörincz, 2006). Although some video games such as “Minecraft” (Mojang, 2016; Nebel, Schneider, & Rey, 2016) or “Nintendo Labo” (Nintendo, 2018) stand out for their educational value, all of them can be assessed with this criterion. One way to do this is to look into the inner workings of each video game and consider its educational facet in the foreground.

The motivations of the research were threefold: to advance in overcoming the duality “video game-education”; to contribute to social improvement from education through the definition of a valid, simple and applicable tool to any video game, and the concern to educate students and children with entertaining and educational resources. The CEV 5\* tool provides applied educational criteria and contributes to a better pedagogical understanding of video games. The contributions of the research are twofold: a pedagogical analysis to the evaluation of video games, and a practical tool whose function is to provide guidance on the educational value of any video game, not only educational ones (Baigi et al., 2022). The CEV 5\* tool is an original contribution and can be beneficial in the field of edcommunication. Some advantages of the rubric are: applicability to any video game; robust validity, as it is supported by a broad base of educators and experts in the field, and for its potential usefulness if applied with the indicated recommendations; easy and intuitive interpretation of a video game’s educational value, comparable to the hotel rating system, for its convenience and security, and potential for instrumental research and transfer (game, design, production, purchase and sale, gift, selection, teaching, institutional, administrative policies, etc.), social, school, family, for the video game industry, as well as for other comparable complex resources, such as cinema, theater, literature, etc. To

summarize, we conclude that the educational usefulness of any video game will depend on its appropriateness and use, but also on its educational potential, which can be evaluated and shared with society, for example, with the educational system, the companies involved, parents, teachers and the users themselves.

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# Intelligence and Spatial Intuition in the Digital Reculturation of Secondary School

La inteligencia e intuición espacial en la reculturización digital de la educación secundaria

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## ABSTRACT

Promoting spatial intelligence and intuition in secondary school is critical for future architecture and engineering professionals to develop their skills. Secondary schools, based mainly on digital tools, work in this direction. However, given the performance of undergraduate students, there is still room for improvement in acquiring this skill. The main drawbacks identified in developing spatial intelligence using digital tools are the need for more development of spatial vision and its lack of correlation with the physical environment. This work aims to present the experience, and results obtained in the 4<sup>o</sup> ESO+EMPRESA program of the Community of Madrid to promote spatial intelligence. The experience used a workshop methodology to relate digital and classic spatial didactics, thus interpreting the built and urban space. This activity had a favorable development among secondary school students, in which students with architecture degrees also collaborated. The results obtained in the workshop highlight that secondary school students could correlate digital and classical media to understand the relationship between urban wandering and architectural design. The workshop results confirm that using mixed spatial methods is fundamental to achieving adequate spatial development where digital tools must complement classical ones.

## RESUMEN

Fomentar la inteligencia e intuición espacial en educación secundaria es clave para que los futuros profesionales de la arquitectura e ingeniería desarrollen sus habilidades. Los centros de educación secundaria, basándose principalmente en herramientas digitales, están trabajando en esta dirección. Sin embargo, teniendo en cuenta el rendimiento de los estudiantes de grado, aún queda margen de mejora en la adquisición de esta competencia. Los principales inconvenientes identificados en el desarrollo de la inteligencia espacial empleando herramientas digitales son la falta de desarrollo de visión espacial y de su falta de correlación con el medio físico. El objetivo de este trabajo es presentar la experiencia y resultados obtenidos en el programa 4<sup>o</sup> ESO+EMPRESA de la Comunidad de Madrid para fomentar la inteligencia espacial. La experiencia empleó una metodología de taller para relacionar didácticas espaciales tanto digitales como clásicas interpretado así el espacio construido y urbano. Esta actividad tuvo un desarrollo favorable por parte de los grupos de estudiantes de secundaria, en la que colaboraron también estudiantes del grado de arquitectura. Nuestros resultados muestran que el alumnado de secundaria logra correlacionar medios digitales y clásicos para comprender la relación existente entre la deambulación urbana y el diseño arquitectónico. Los resultados también confirman que la inteligencia espacial se desarrolla mejor empleando didácticas mixtas. Y se puede concluir que, para alcanzar un desarrollo espacial adecuado, las herramientas digitales han de ser complementarias a las clásicas.

## KEYWORDS | PALABRAS CLAVE

Digitalisation, Didactic, Secondary Education, University Education, ICT, Learning Theory.  
Digitalización, Didáctica, Educación Secundaria, Educación Universitaria, TIC, Teorías del Aprendizaje.

## 1. Introduction

The digitalization of everyday life has profoundly altered our understanding of humanism and the world in which we live, particularly in the realm of education. The integration of digital tools into schools has significantly transformed the learning experiences of young students (Gutiérrez Martín & Tyner, 2012; Hieu, 2023). This shift has led to both an increased digital divide—due to disparities in access to devices and programs—and challenges in translating digital experiences to physical contexts. Addressing these consequences requires careful reflection, as the digitalization process is both irreversible and unstoppable.

Although the digitization trend has accelerated since the 1980s, its roots extend further back. For instance, Marshall McLuhan's theory of the Global Village from the 1960s (Alshaikh, 2024; Gutiérrez Pequeño, 2008) significantly influences today's interconnected and virtual society. Similarly, Manuel Castells' "Galaxia Internet" (Alcalá Casillas, 2017) reflects this social evolution. Today, while our society is highly interconnected, it faces issues related to interpersonal relations, reasoning, and attention.

Recent studies suggest that current generations may be less intelligent than their predecessors (López-Vidales & Gómez-Rubio, 2021), despite having access to vast amounts of information and advanced methods of retrieval. One potential cause of this decline is the over-reliance on mobile and tablet applications. However, in the academic literature there are papers available with different positions regarding their use (Alonso Mosquera, González Vallés, & Muñoz de Luna, 2016). Research indicates that the design of these devices is focused on capturing and holding attention (Monge Roffarello & De Russis, 2022; Wang, 2024), which can undermine long-term knowledge acquisition and the pursuit of delayed rewards, such as professional development or life planning. This concern is consistent with the emerging attention economy (Bhargava & Velasquez, 2021).

In this context, companies and organizations contend to capture and maintain user attention by creating products, applications, and services designed to promote continuous content consumption through brief, repetitive stimuli (Myllylahti, 2018; Xie, Guo, & Zhao, 2023). This approach to entertainment and social interaction, characterized by "viralization," represents one of the detrimental aspects of digital reculturalization (Felício & Peres, 2023).

Education is a crucial sector within this process of digital reculturalization. Over recent decades, numerous changes have been introduced, and it is now common for educational projects to incorporate digital programs and experiences, such as challenges or self-learning modules (Román González, 2016). In this methodology, students are tasked with addressing and solving various problems presented by their teachers or tutors. However, these digital dynamics are often implemented on a limited scale, typically confined to specific courses or subjects, without comprehensive oversight of the applications and services students utilize. Consequently, there is a need for enhanced vertical coordination—both within individual courses and across different educational stages. Such coordination is essential for establishing effective continuity, enabling students to progressively develop digital skills that will support their professional decision-making while minimizing distractions (García Martín, 2012; Salouhi & Al-Bakri, 2022).

There is a notable deficiency in spatial intelligence within engineering and architecture disciplines, particularly concerning the understanding of space and its graphic representation. This is a significant issue because spatial vision is crucial for both academic success and professional performance. The development of spatial intelligence is greatly influenced by early experiences and education. Although some individuals may have an innate predisposition, these skills can be improved and strengthened throughout life. Activities such as play, walks, and excursions are effective in stimulating spatial abilities in childhood (Frick, Möhring, & Newcombe, 2014), as they promote exploration, understanding of spatial relationships, and problem-solving related to navigation. Even in challenging situations or with limited resources, creativity and adaptation can provide opportunities to develop these skills.

Howard Gardner's theory of multiple intelligences highlights the importance of recognizing and nurturing different types of intelligence, including spatial intelligence. Engaging in activities that involve manipulating three-dimensional objects, solving spatial puzzles, and visual representation can stimulate these skills. The increasing reliance on virtual tours and applications, however, risks detaching spatial learning from physical reality, potentially undermining the development of spatial skills.

Similarly, graphic representation, particularly hand drawing, is vital for developing spatial cognitive skills and reinforcing psychomotor abilities (Doug, 2019; Liben & Downs, 2013). This is especially important in technical training for fields such as architecture and engineering. The choice of graphical representation and writing tools can impact how students process and retain information, underscoring the need for thoughtful curriculum design in technical disciplines.

Within this context, the Fuenlabrada Microcity activity was implemented through the 4<sup>o</sup> ESO+EMPRESA program of the Community of Madrid, involving secondary school students alongside architecture students and professors. The activity aimed to enhance participants' spatial skills using both digital and analog methods, following the principles of Howard Gardner's Multiple Intelligences (D'Souza, 2007; Manee, Bua-In, & Thawornsujaritkul, 2023). Additionally, the activity had a secondary objective of promoting STEM vocations in the fields of engineering and architecture. To achieve this, the activity employed a hybrid workshop methodology, integrating both classical and digital spatial education models. The following sections detail the materials and methods used, describe the exercises conducted, present the results obtained along with the social benefits, and outline the conclusions reached for the development of future work.

## 2. Materials and Methods

The proposed activity follows a workshop-style methodology that promotes camaraderie and social relationships among participants, who are students from different schools and age groups. The activities include a walk, the use of training modules in spatial programs and games to transfer these skills to the physical built environment. All of this is part of a hybrid strategy aimed at developing spatial awareness, spatial vision, and their graphic representation.

The workshop included activities over a span of three days, with two-hour sessions each day. Given this timeframe, careful planning was undertaken to appropriately integrate participant relationships, training, and the experience of digital and analog transposition within the activity. To this end, previous experiences with Minecraft by volunteers were gathered to obtain practical and experiential information, understand the in-game experience, how participants interact, and how this influences the development of spatial skills. The collected information was adjusted to a model that incorporates Information and Communication Technologies (ICT) and Learning and Knowledge Technologies (LKT), with the aim of effectively combining them with traditional techniques such as drawing, thereby ensuring the proposed activity is conducted with confidence and success.

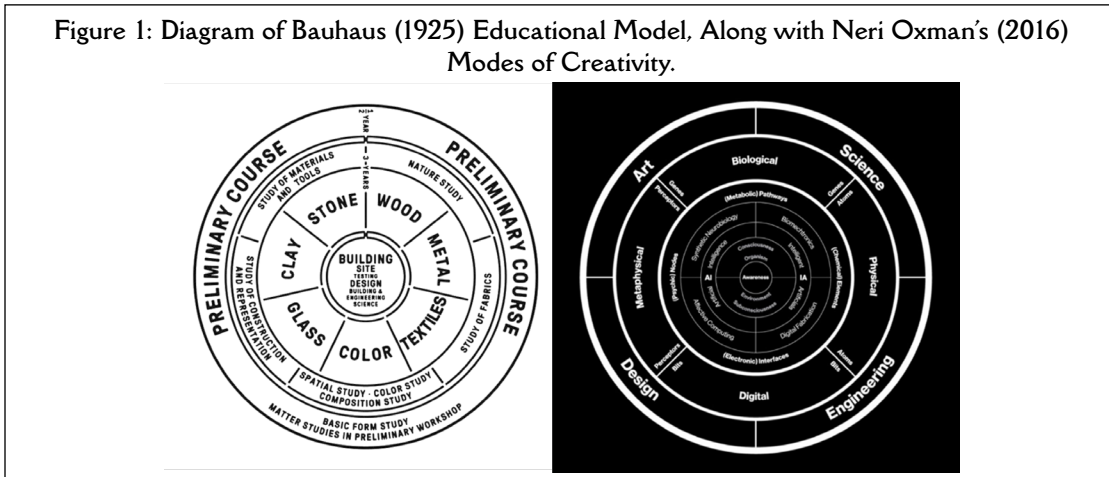
The volunteers who participated in this preparatory phase of the activity are second-year students from the Bachelor's Degree in Fundamentals of Architecture (GFA) and third-year students from the Bachelor's Degree in Aerospace Engineering in Transportation and Airports (GIATA), both degrees affiliated with the School of Engineering in Fuenlabrada. The process of collecting this information included a group interview concerning the use of spatial tools and games, along with an analysis of the learning processes that the students had experienced. The interview sought to identify the challenges faced in understanding space and its representation during their university studies. The results of the analysis show that prior education, both pre-university and university-level, significantly influences the spatial challenges identified.

Among the university students who collaborated, the experiences of five volunteers who completed Humanities and Social Sciences High School programs stand out. All of them were GFA students who lacked spatial and technical drawing knowledge and struggled with spatial graphic comprehension and expression due to the high theoretical content of their coursework. In contrast, university volunteers who attended Technological and Science High School reported that their technical drawing courses had a significant theoretical component, with practical work primarily based on graphic representation programs, such as Computer-Aided Design (CAD). However, these students also expressed a lack of spatial knowledge and skills, which became evident in their university-level graphic representation courses. This was often due to the absence of subjects related to the arts and plastic arts, which were optional in the High School programs they had completed. This disconnect between spatial training in secondary school and high school is a significant issue currently faced by Architecture and Engineering students.

Additional results from the interview indicate that the volunteers have had, and continue to maintain, a relationship with spatial strategy games, such as Minecraft or SimCity. These volunteers mentioned that they found these games to be more useful for their university programs than their secondary and high school education. However, all GFA student volunteers reported difficulties in courses such as Architectural Representation or Drawing from Nature, where mastery of spatial communication through traditional drawing tools is essential. In contrast, the GIATA student volunteers indicated that they do not experience challenges with classical spatial communication, as their academic pathway primarily involves the use of digital tools. However, they do encounter spatial challenges related to understanding scales and their representation, as well as mastering CAD tools.

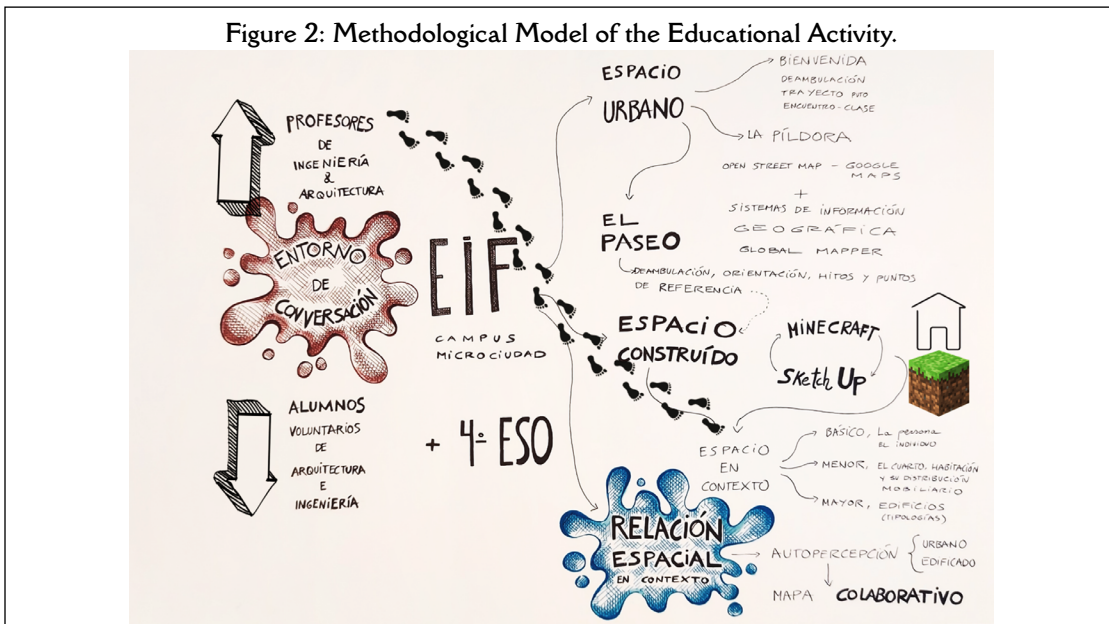
Based on this information, the methodology implemented in the 4th ESO+EMPRESA program was finalized, employing a hybrid workshop strategy tailored to the age and prior training of the participants. This strategy integrates essential digital competencies (ICT and TAC) with classic graphic expression models, such as drawing. The goal of this strategy is to help students reconnect with their own spatial intelligence and to foster interest in STEM disciplines, which are crucial for technical university education. The design of this workshop combines successful models from various educational methodologies, including Maria Montessori’s “cosmic education” principles of the “tree of education” designed for children, as well as principles from the Bauhaus educational model combined with Neri Oxman’s modes of creativity.

Figure 1: Diagram of Bauhaus (1925) Educational Model, Along with Neri Oxman’s (2016) Modes of Creativity.



The activity also included two digital and analog training modules focused on urban planning and architectural graphic representation. GFA and GIATA students who participated as volunteers in the previous study contributed to the development of these modules. As a result, the effectiveness of the tools in applying urban planning concepts and enhancing spatial perception in the built environment was evaluated. This evaluation followed the methodological model depicted in Figure 2.

Figure 2: Methodological Model of the Educational Activity.





The following three sections of the article are dedicated to detailing the activities conducted on each day of the program. Specifically, the urban space methodology used on the first day, the built space methodology employed on the second day, and the context space methodology explored on the third and final day are described.

### 2.1. Urban Space Methodology

The first day of the program focuses on urban space methodology. During this session, participants engage in activities designed to foster social interaction and develop an understanding of key concepts related to the urban environment, its planning, and ambulation. Urban space is a complex dimension that requires orientation skills to navigate and comprehend its scale.

The day begins with an assessment of the secondary school participants' spatial orientation within an urban context. This is accomplished by organizing a test in which participants are challenged to navigate from a meeting point to the classroom where the workshop takes place. This activity is designed to put into practice the principles taught during the workshop, with a focus on urban planning. The URJC Fuenlabrada campus serves as a case study, representing a micro-city with a similar organizational structure. During the tour, a supervising professor is present to assist students who encounter difficulties in navigating the campus. This activity highlights a significant spatial limitation among the students, as many struggle to correlate the map with the actual route. This issue was observed in students using both Google Maps and paper maps of the campus.

Once in the classroom, a training module introduces the fundamental principles of urbanism, drawing connections to the prior spatial orientation test. The primary objective of this module is to help participants understand the relationship between physical and digital space and the process of identifying physical references in the environment. The module also emphasizes the utility of both digital (Google Maps) and analog (paper maps) tools for understanding urban layouts and spatial dimensions—insights supported by the experiences of GFA and GIATA university volunteers. The module covers map and plan reading in both physical and digital formats, clarifying that the top margin represents north, the bottom margin represents south, the right margin corresponds to east, and the left margin indicates west. It also addresses the basics of urban cartography, including contour lines, their relationship with urban layouts, and slopes, with details like contour line shading towards the north to aid in topographical understanding. To further explain the relationship between wandering and orientation in urban space, concrete examples are provided on how to interpret spatial information on maps and plans, including identifying landmarks or reference points, locating routes, and understanding distances between locations. These landmarks—such as towers, iconic buildings, parks, or sculptures—help individuals establish a mental network that facilitates orientation and urban navigation.

The training module also covers various digital tools for urban space orientation and planning, including Google Maps, OpenStreetMaps, and geographic information systems. First, the features of Google Maps are explained, including the default view, satellite view, and terrain view. Although primarily a navigation tool, its popularity makes it essential for understanding the relationship between walking and orientation in the urban fabric. Second, OpenStreetMaps is introduced as a collaborative tool in this field. Unlike commercial and proprietary maps, OpenStreetMaps allows anyone to establish landmarks, share routes, and contribute information, thereby enhancing urban space literacy. Geographic information systems are briefly discussed, with an emphasis on their application in executing urban plans, creating maps, and planning routes digitally. The Global Mapper program is used as an example to demonstrate the use of georeferenced databases and their applicability.

The final part of the first day involves a campus walk to apply the theory from the training module. Participants practice spatial orientation based on cardinal directions and wandering by establishing landmarks. The methodology of Jane Jacobs is followed, with a series of tours around the campus allowing participants to observe, experience, and learn about the relationships between different plots and buildings, under the supervision of faculty volunteers (Riley, Ketola, & Yadav, 2022; Ruitenbergh, 2020). Participants are also asked to choose three urban or building landmarks during the tour, helping them establish a personal connection to the urban environment (Jiang et al., 2023; Wunderlich & Gramann, 2021). This exercise not only aids in spatial memorization but also contributes to the collective understanding of urban space. The landmarks selected by the participants can later be used to replicate routes based on wandering and orientation, and the routes can be shared through collaborative applications like OpenStreetMaps.

Figure 3: Secondary School Students Performing the Microcity Wandering Exercise.



## 2.2. Day 2: Built Space Methodology

The second day of the program focuses on the methodology of the built space, which pertains to the spatial scale most familiar to people. This scale includes spaces of everyday use, such as rooms, offices, corridors, stairways, and hallways, varying in size depending on their function—whether residential, administrative, public, etc.

The difficulty in discerning between compatible uses and scales represents a significant challenge, particularly in technical and architectural fields. This issue was also highlighted by the GFA and GIATA volunteers consulted during the activity's preparation. Specifically, regarding the built space methodology, these volunteers play a crucial role in defining approaches that facilitate the understanding of both the function and form of buildings. Another aspect of their involvement is preparing a training module for secondary school students to grasp the magnitude of physical and digital spatial scales and their relationship to the urban environment, building on the previous day's activity.

To this end, the principles of the game Minecraft are introduced, a tool previously employed in similar activities to develop spatial skills through the creation of worlds at different scales (Carbonell-Carrera et al., 2021). In this case, the methodology is adapted to focus on the understanding of spatial scales, their graphic representation, and the relationship between urban and built spaces. This is achieved by explaining the connection between the digital tools used in the game and spatial representation, using examples of classical models of representation through freehand drawing, where sketching serves as a traditional spatial tool translated into the digital context (Groleau et al., 2012). Regarding architectural space constructed in digital format, a practical demonstration is performed using the SketchUp program. This allows participants to relate spatial principles to the combination of basic geometric elements and understand how these elements can be used to configure a volumetric architectural program (Carmona-Medeiro, Antequera-Barroso, & Domingo, 2021).

The second part of the day consists of three practical exercises based on a classical representation model adapted to three constructed scales. The aim of these exercises is to reinforce the content covered in the training module. GFA and GIATA student volunteers also participate, helping to bridge the gap between educational levels. This pedagogical approach integrates theory and practice while carefully considering the appropriateness of the content for the participants' abilities and needs.

In the first exercise, participants are asked to represent their own room in detail, which is an excellent

way to teach the fundamental principles of spatial layout and composition within the context of built space. By using a familiar environment, they are given a practical and meaningful opportunity to apply the concepts learned in the training module. Through the analogy of container and content, the idea of how the elements of space interact and organize to create a coherent and functional spatial design is effectively conveyed. This exercise not only enhances their understanding of theory but also helps them appreciate the importance of planning and design in built spaces.

The second exercise involves using the human body as a spatially scaled reference element (Dewi et al., 2020). This strategy helps participants understand the relationship between their own body and the space they inhabit. This practice fosters awareness of their representation in space, which in turn deepens their understanding of the graphic communication between space as a container and the arrangement of furniture as content in their room. This understanding is crucial for appreciating how space design and organization can impact comfort and functionality in daily life.

In the final exercise, participants are tasked with graphically representing one of the buildings or urban landmarks on campus that they selected during the previous day's tour. This activity provides an excellent opportunity to practice and evaluate their spatial memory and representation skills. It not only helps them develop these skills but also fosters an appreciation for architectural details and the ability to represent them graphically. By choosing a building or landmark they personally experienced during the tour, they are encouraged to establish a deeper connection with the built environment of their campus. In summary, this exercise effectively concludes the workshop by applying the concepts and skills learned in the spatial context. Students are encouraged to develop a deeper spatial understanding by employing and combining drawing with the SketchUp tool concerning their built environment (room, housing, building, and street). Additionally, Minecraft is recommended as a tool for developing spatial strategies, encouraging students to connect the imaginative process with the principles of architecture and urban space they have learned.

Figure 4: Secondary School Students Performing the Constructed Walking Exercise.



### 2.3. Day 3: Context Space Methodology

On the third day of the program, the collaborative approach was consolidated to encourage participation and joint learning among 4th ESO students. Following the TAC principles and the collaborative foundations of OpenStreetMaps, a teamwork methodology was promoted, involving all participants in constructing a

collaborative map of the Fuenlabrada campus. A large-scale printed orthophoto (A1 size) was provided as a solid visual basis for the project. Participants used sticky notes to mark spatial references and establish routes on the map based on common landmarks identified during their previous exercises.

This final exercise successfully integrated hybrid knowledge, encompassing both digital and classical elements, within a collaborative environment. The methodology allowed participants to apply theoretical knowledge and reinforced the importance of collaboration, communication, and the integration of digital and analog skills in urban and built space design and planning. This approach prepared them to address real-world challenges more effectively in their academic and professional futures.

Figure 5: Secondary School Students Performing the Context Exercise.



### 3. Results

In the 2023 edition of the 4th ESO+EMPRESA program, the methodology described in the previous section was implemented, yielding relevant results in the development of participants' spatial skills and the integration of digital and analog tools. The hybrid methodology applied in each workshop exercise enabled participants to address spatial challenges across different scales, perspectives, and media, fostering the development of digital skills while creating effective learning environments. Through two training modules and their real-world applications, the program stimulated interest in STEM disciplines among participants and provided a clearer understanding of the relationship between digital spatial applications and the urban and built environment. Detailed results for each specific methodology employed, along with their degree of innovation in spatial education, are presented below.

#### 3.1. Exercise 1: Urban Space

The spatial orientation assessment conducted on the first day was completed by only 22 of the 45 participants enrolled in the program, as the others arrived at the classroom by different means. The test revealed that a significant proportion of 4th ESO students struggled with locating themselves

on a map (digital or physical) and following a travel direction based on the cardinal points. Only 5 of the 22 participants who took the test successfully positioned themselves on the campus map and followed the westward route to reach the training building. The remaining participants used the Google Maps application but encountered difficulties in understanding their direction of travel and spatial location.

The training module effectively established a meaningful connection between the digital world and the real world in the context of urban and built space. The challenge of navigating from the campus entrance to the classroom, along with the difficulties experienced, provided valuable lessons on reading digital maps, blueprints, and urban signage, and their relationship with mobility applications such as Google Maps. The walking exercise, which involved exploring open and enclosed spaces, contributed to an understanding of the differences in scale between urban planning and building design.

The explanation of the OpenStreetMaps application was crucial in relating essential landmarks used in urban navigation. This application helped participants understand how digital maps can represent and facilitate orientation within the urban environment. Additionally, it underscored the importance of unique buildings that break the urban monotony—landmarks that play a crucial role in creating mental maps and personal orientation.

Finally, the visit to unique buildings on campus allowed participants to experience the transition between indoor and outdoor spaces and understand the differences in interior space design. It also fostered the development of their spatial intelligence by challenging them to identify and remember landmark spaces within buildings. These hands-on lessons are essential for those seeking a deeper understanding of architectural design and space planning. This activity was crucial in improving their ability to navigate and comprehend the built environment.

In conclusion, the activities on the first day allowed participants to connect the digital environment with the real world and awaken their spatial skills. This hands-on experience provided participants with tangible evidence of the relevance and applicability of spatial skills in their daily lives and potential future careers. It also broadened their interest in space-related fields such as Engineering and Architecture by demonstrating the real-world value of these skills.

### 3.2. Exercise 2: Built Space

The training module helped participants relate spatial training using digital applications, common in Engineering and Architecture, to the cognitive process of spatial imagination for creating functional spaces. Tools such as SketchUp enabled participants to understand how basic geometry is applied in urban planning and building design, linking it to previous exercises involving imagination and memory. This approach allowed participants to effectively translate and represent classical environments in digital formats and vice versa.

The hybrid approach was crucial for participants to grasp the relationship between scales in known, imaginary, and digital spaces, and to develop fundamental graphic representation skills. This allowed them to appreciate spatial principles in built environments and their relationship to broader scales, such as urban spaces.

The results indicated that participants developed a solid understanding of spatial principles in built environments and made meaningful connections between the real and digital worlds within the context of Engineering and Architecture. This suggests that the methodology was effective in achieving its educational objectives by fostering an understanding and appreciation of spatial implications in designing and planning the built environment.

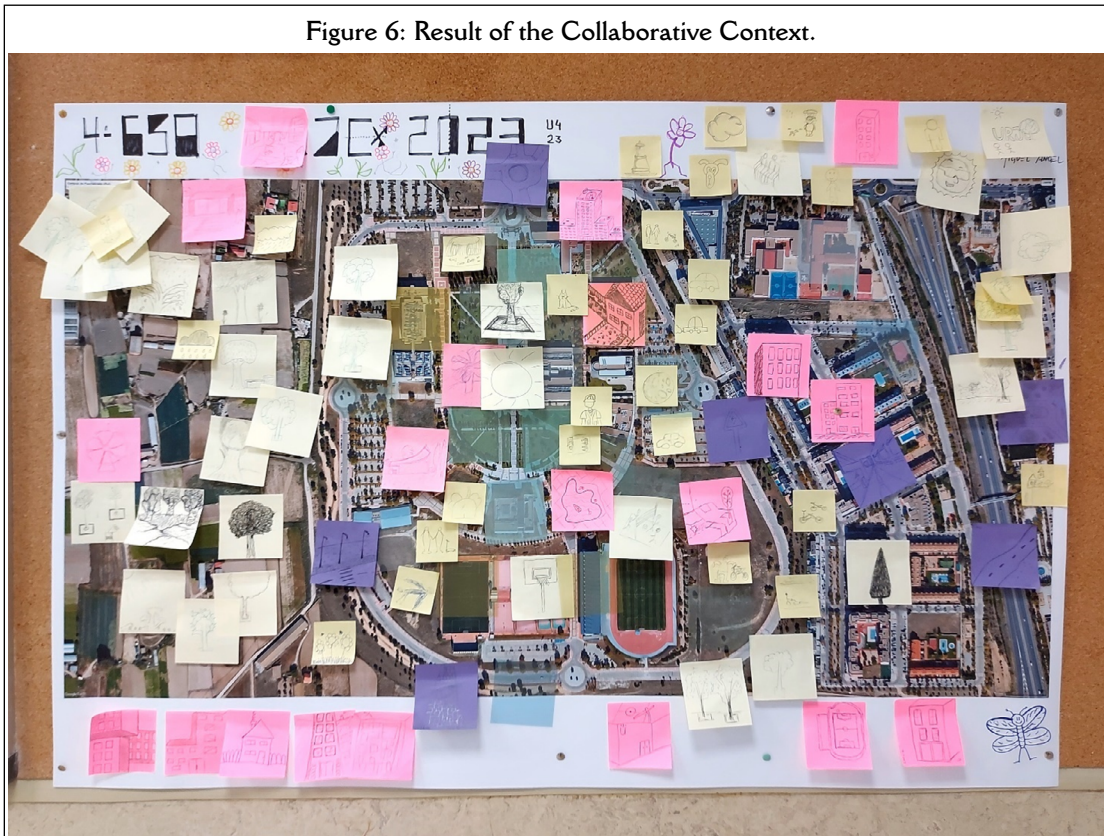
### 3.3. Exercise 3: Context Space

In the first two exercises, participants applied educational principles from technological environments (ICT) and creative and technological learning (CT) to address spatial concepts at different scales. On the third day, a collaborative exercise was introduced to consolidate participants' spatial perceptions within the Microcity of the Fuenlabrada Campus and to evaluate the use of tools from the training modules. Undergraduate volunteers and teachers supervised and assessed the process and representation solutions presented by the secondary school students. This exercise combined scales in collaborative settings,

integrating urban and building landmarks according to participants' interests and personal uses, thereby enhancing cognitive understanding of location, navigation, and spatial communication.

The main outcome of this activity was that secondary school students rediscovered their spatial awareness. Additionally, using digital examples for communication in learning, students effectively solved the spatial representation of the Fuenlabrada campus in both urban and built environments. The methodology also allowed participants to practice spatial visualization through imagination and abstraction, using colored sticky notes to collect spatial references through group consensus. Each color represented a different group, and consensus, according to Gardner's theory of multiple intelligences, was a key aspect of the learning process. This was evident in the collaborative map created by the 45 participants, demonstrating their ability to effectively understand and represent space as a whole.

Figure 6: Result of the Collaborative Context.



#### 4. Conclusions

Reviewing contemporary educational models in the context of digital reculturalization is essential to balance the benefits of classical education with the development of digital competencies, especially given the challenges and opportunities presented by artificial intelligence. This review involves not only adopting advanced technologies but also transforming how knowledge is understood and conveyed in secondary school, high school and university. It is crucial to adapt models to various intelligences identified by Gardner, within a more inclusive framework, to enable all students to develop real skills.

This research demonstrated that, using classical and digital techniques, secondary school students could develop spatial skills. Those already possessing these skills were able to establish complex spatial correlations between classical, digital models, and the physical environment. Secondary education plays a fundamental role in developing spatial skills in future professionals. However, it often lacks a structured organization that allows students to progress effectively in spatial education. Furthermore, spatial skills are frequently limited to artistic formative itineraries focused on the representation of

figures and shapes, without a deep understanding of their environmental relationships or scaling in complex spaces like cities.

Secondary and high school students rarely approach the relationships between function, form, and scale except in technology subjects focused on three-dimensional representations. Although spatial training is offered in secondary education and high school, students often face significant difficulties in their early university years in Fine Arts or Architecture and Engineering programs.

Both 4th ESO students and volunteer undergraduate students expressed concerns about how space education is approached within the educational system. They noted that space education is often presented as isolated units without clear connections to other areas of study. This lack of integration is particularly problematic for students planning to pursue studies in Architecture or Aerospace Engineering, as spatial perception and representation are multidisciplinary and encompass various scales, from territorial and urban planning to smaller-scale construction problems.

The application of Gardner's theory of multiple intelligences in educational settings has proven to improve students' abilities in self-training and problem-solving, fostering intergenerational solidarity and academic interests that might otherwise be neglected. Positive results from this strategy in Spanish schools help address changes in the educational model and reduce high dropout rates (Antelm Lanzat et al., 2018).

For Engineering and Architecture degrees, it is crucial that secondary and high school students develop strong spatial skills. This workshop allowed secondary school students to explore university education in specific fields and evaluate its viability for their future training. However, pre-university training often focuses excessively on the visualization and manipulation of digital objects in three dimensions without an adequate understanding of context or scales. These aspects are crucial in the first years of university degrees and represent the greatest challenges for university students. Therefore, pre-university training should emphasize a deeper understanding of spatial concepts rather than just technical skills, whether digital or classical. This approach can help overcome difficulties that undergraduate students face when using new digital tools for design and simulation. Spatial knowledge also aids in understanding how these tools connect to the physical principles of Engineering and Architecture.

Thanks to the methodology implemented in the 4th ESO+EMPRESA activity, participants were encouraged to explore their personal skills and connect them to potential vocations and interests. This approach assisted them in making informed decisions regarding their choice of high school to best align with their aspirations. It is important to highlight that project- or workshop-based educational approaches, like those used in this activity, provide valuable opportunities to ignite students' interest in specific careers. This, in turn, contributes to reducing the risk of school dropout.

Additionally, the activity demonstrated that fostering interaction between participants, volunteers, and faculty is crucial for creating a positive impact on digital re culturalization. This approach not only enhances the development of spatial skills but also promotes collaboration among students to address the challenges presented in the workshop. The use of a hybrid methodology, combining digital tools with traditional drawing techniques, proved effective in helping participants relate essential spatial concepts. This represents a key scientific contribution of the workshop, as it moves beyond the usual focus on digital innovation seen in many Architecture and Engineering programs. By highlighting the advantages of both digital and traditional tools, students were encouraged to explore and develop their spatial concepts independently. However, it was noted that while students preferred digital tools, these did not always fully meet the objectives of the activities. This underscored the importance of faculty and volunteer guidance in effectively integrating and applying both digital and classical tools to enhance spatial skills development.

As a result of the experience, it is notable that the methodological program, developed in collaboration with the volunteer undergraduate students from the Fuenlabrada School of Engineering, successfully imparted valuable skills to the secondary school participants. The program highlighted the importance of integrating digital and traditional skills, enhancing cognitive development not only for their current education but also for their pre-university orientation. Many participants expressed an interest in pursuing careers in Architecture and Engineering, indicating that the workshop not only provided new knowledge and skills but also sparked a genuine interest in STEM disciplines. Consequently, the workshop contributed

significantly to the development of spatial cognitive skills and helped to inspire potential career paths among the participants. Given the success of these outcomes, future editions of the Science and Innovation Week organized by Fundación Madri+d will continue to incorporate combined thematic workshops. These future workshops will aim to explore spatial intelligence alongside other forms of intelligence, engaging a diverse range of participants across different levels of training.

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# Scales to Assess the Use of ICT and Child-to-parent Violence in Adolescents

Escalas para valorar el uso de las TIC y la violencia filio-parental en adolescentes

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## ABSTRACT

The lack of adequate educommunicative training often results in the problematic use of ICT by adolescents, leading to various issues such as anxiety, depression, isolation, and the deterioration of intra- and interpersonal relationships, language impoverishment, and even aggression. In relation to the latter, the significant increase in child-to-parent violence in recent years is noteworthy, emerging as a concerning problem in multiple countries. Therefore, this study conducts a systematic review based on the PRISMA method to identify the most suitable instruments for assessing potential inappropriate use of ICT in adolescents and the child-to-parent violence stemming from it. The databases employed include Web of Science, Scopus, ProQuest, Worldcat, PubMed, PubPsych, and Dialnet, yielding a total of 224 instruments. Of these, fifteen scales were analyzed based on their characteristics and psychometric properties. After applying exclusion criteria, the ERA-RSI scale, the UPNT Questionnaire, and the CPV-Q-P were chosen. The complementarity of these three instruments allows for an exploration of the issue's current state and provides a holistic perspective that facilitates the design of appropriate educommunicative training benefiting all stakeholders and establishes measures to prevent both the inappropriate use of ICT and manifestations of child-to-parent violence arising from it.

## RESUMEN

La ausencia de una formación educomunicativa adecuada deriva a menudo en un uso problemático de las TIC por parte de los adolescentes, ocasionando diversos problemas como la ansiedad, la depresión, el aislamiento, el empobrecimiento de las relaciones intra e interpersonales, el empobrecimiento del lenguaje, e incluso la agresividad. Con relación a esta última, cabe destacar el notable incremento que ha sufrido la violencia filio-parental en los últimos años, convirtiéndose en un problema preocupante en múltiples países. Por ello, este trabajo realiza una revisión sistemática basada en el método PRISMA para identificar los instrumentos más apropiados para valorar un posible uso inadecuado de las TIC en adolescentes y la violencia filio-parental derivada de este. Las bases de datos empleadas fueron Web of Science, Scopus, ProQuest, Worldcat, PubMed, PubPsych y Dialnet, obteniéndose un total de 224 instrumentos. De ellos, se analizaron 15 escalas en función de sus características y propiedades psicométricas. Una vez aplicados los criterios de exclusión, se seleccionaron la escala ERA-RSI, el Cuestionario UPNT y el CPV-Q-P. La complementariedad de estos tres instrumentos permite explorar el estado de la problemática y obtener una perspectiva holística que facilite el diseño de una formación educomunicativa apropiada que beneficie a todos los agentes involucrados y establezca las medidas oportunas para prevenir tanto el uso inadecuado de las TIC como las manifestaciones de violencia filio-parental derivadas de este.

## KEYWORDS | PALABRAS CLAVE

Violence, ICT, Adolescence, ICT Abuse, Educommunication, Systematic Review.

Violencia, TIC, Adolescencia, Abuso de las TIC, Educomunicación, Revisión Sistemática.

## 1. Introduction

Information and Communication Technologies (ICT) and educommunication have experienced exponential growth in recent decades, radically transforming the way people interact, work and access information. These digital tools have brought numerous benefits, from improving process efficiency to creating new opportunities in areas such as education, health and entertainment. However, the inappropriate use of ICTs has become a worrying and complex phenomenon that poses significant challenges for contemporary society.

Widespread access to the Internet, the popularity of mobile devices and the influence of social networks and communication platforms have led to an increasing dependence on ICTs in various aspects of daily life. In fact, it can be considered that we are facing a new form of citizenship: media citizenship, since the communicative and media dimension both traditional and interactive undoubtedly defines our current society (Gozálvez & Contreras, 2014; Muthuswamy, 2023), which includes the unavoidable challenge the educommunicative literacy of children and young people, especially in terms of critical autonomy when interacting with such media.

When it comes to understanding the problem, during the last decade numerous studies have focused on identifying psychosocial variables related to risky behaviors on the Internet, showing that they can be predictors of excessive use of ICTs in adolescence (Helsper & Smahel, 2020; Martín-Perpiñá, Poch, & Cerrato, 2019), which prevents them from developing their lives normally (Malo-Cerrato, Martín-Perpiñá, & Viñas-Poch, 2018; Vondrackova & Šmahel, 2019). In this regard, statistics show that more than 24% of young people use their digital devices daily to interact on social networks, and more than half of these young people connect several times a day (Areepattamannil & Khine, 2017; Osland & Røysamb, 2022). However, problematic Internet use is defined when its compulsive use is accompanied by cognitive concerns, deterioration in interpersonal and intrapersonal relationships (Caplan, 2010) or increased symptoms of depression (Al Hiali et al., 2024; Lozano-Blasco & Cortés-Pascual, 2020).

Another risk associated with ICTs is their high addictive potential, since they offer teenagers a series of rewards such as immediacy, the possibility of adopting new identities, anonymity, a sense of gratification, ease of access, control, challenges, etc. (Babín Vich, 2009). In addition, some ICTs expose different types of violence, blurring the seriousness of the facts and producing habituation to them. In fact, multiple studies show that greater exposure to the media implies an increase in aggressive behavior, increasing the risk of violent behavior in children and teenagers, even more so in the case of video games where the player assumes the role of virtual aggressor (Jiménez Arroyo, 2014; Sierpińska, 2022).

In this regard, it should be noted that child-to-parent violence has undergone a notable increase in recent years, becoming a worrying problem in multiple countries (Contreras, León, & Cano-Lozano, 2020b). In the case of Spain, the latest report of the Attorney General's Office (2023) attests to this, showing that in 2018 a total of 4,871 cases were reported to the Juvenile Court, which rose to 5,055 in 2019. In 2022, 4,332 cases were filed, a decrease of -8.60% compared to 2021. However, despite the fact that the figures seem to be decreasing, increases are observed in areas such as Malaga, Ourense, Navarra, Tenerife, Burgos, Alicante and Huesca. And, for example, the study conducted by the Community of Madrid on the problematic use of information, communication and gaming technologies among young people (Méndez Gago et al., 2018) indicates that parents with underage children exercise greater control and perceive to a greater extent symptoms such as abandonment of traditional activities, isolation, deterioration of language, aggressiveness when having to interrupt the activity, nervousness when using new technologies or disputes with other family members, as a result of such inappropriate use.

For its part, the Attorney General's Office (2023) has repeatedly pointed out in its reports that "this social problem has its origin in the deficits of values that the educational system has not been able to alleviate; and when the seriousness of the case leads to legal action, it is usually too late to solve it" (p. 782). From this we can deduce the enormous importance of offering from the academic and family environment an adequate, rigorous and complete educational-communicative training that contributes to minimize this type of situations.

Thus, educational-communicative training is crucial to avoid the abusive use of new technologies by adolescents, which, as we have seen, can lead to a high level of dependence, with their general symptoms being associated with a tendency to isolation and depression, lack of communication with friends and family,

poor school or work performance and a propensity to aggressiveness. In fact, episodes of child-to-parent violence frequently arise as a result of disputes on this issue that are added to other internal problems in the young person such as low self-esteem, loneliness, low social stimulation, and introversion (Garrido & Galvis, 2016), often derived, precisely, from this inappropriate use of ICTs. This is highlighted by González Álvarez (2012) when he points out a profile of minors, without any reference group, who attack their parents and who also spend their leisure time alone, surfing the Internet, playing video games or chatting.

The absence of adequate guidelines for the use of ICTs in the family environment has been identified as a significant risk factor for the abuse of these technologies among adolescents (Malo-Cerrato et al., 2018; Martín-Perpiñá et al., 2019). So much so that the pattern of technological consumption in the family environment directly influences the behavior and development of children at increasingly younger ages (Coyne et al., 2020; Ocampo & Vinuesa, 2022). In addition, the family represents the first interrelational environment in which emotional bonds are established among its members, with this affective bond playing a fundamental role in relation to the addictive or problematic use of technologies among teenagers. For example, Kim and Koh (2018) observed how the avoidant attachment style, mediated through self-esteem and anxiety, could explain the addictive use of smartphones in young people.

However, the study of the influence of the family environment on young people's Internet behaviors has focused mainly on the norms of control and supervision of ICT use, demonstrating that the application of strict family limits to young people's online activities and the constant demand for information about their actions do not prove to be effective strategies to reduce risky behaviors in the childhood and youth stage (Muthuswamy, 2024; Baldry, Sorrentino, & Farrington, 2019).

In view of the above, this paper aims to carry out a systematic review to select the most appropriate measurement instruments to analyze the use of ICTs in adolescents as a possible risk factor in child-to-parent violence. Specifically, we start from the hypothesis that there is currently no instrument that allows us to explore this aspect in a unique and holistic way. To this end, the characteristics of the instruments found, the representativeness of their sample size, their psychometric properties and their adaptation to the Spanish population will be analyzed.

## 2. Method

In order to identify and comprehensively analyze the most relevant studies on this topic, the systematic literature review (SLR) method was used, following the guidelines established by Conn et al. (2003). These guidelines emphasize the importance of developing a documentary corpus as an integral part of the review process.

In addition, in order to promote the replicability of our study and ensure the reliability of its results, the systematic review conducted followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) Statement (Moher et al., 2009; Page et al., 2021).

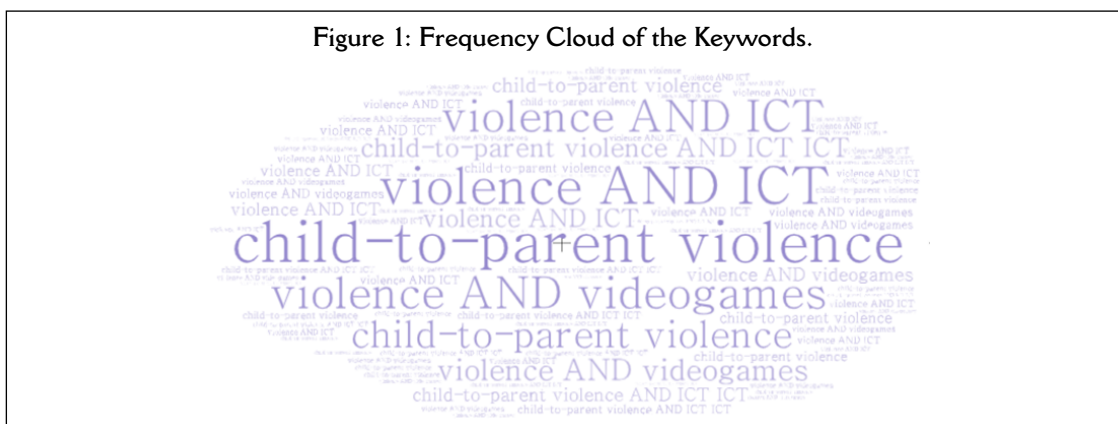
The search carried out between June 2022 and March 2023 used the most prestigious databases in the area of study: Web of Science, Dialnet, Scopus, Worldcat, PubMed, PubPsych and ProQuest. The following terms and Boolean operators were used as keywords to ensure their thematic connection: "child-to-parent violence", "violence AND ICT", "violence AND videogames", "child-to-parent violence AND ICT", "child-to-parent violence AND videogames". These keywords were limited to the English language to ensure a more complete access to relevant studies, which contributes to a more comprehensive coverage of the reviewed literature, as well as to its internationalization. No restriction by year of publication was applied and the search was limited to scientific articles to ensure quality and impact.

Table 1 shows the number of results obtained in the different databases for each of the queries performed and their percentage with respect to the total number of documents found.

As can be seen in Table 1, the initial *n* was 224 documents, of which 36.2% were found in Web of Science, 25% in ProQuest, 26% in Dialnet, 4.5% in Worldcat, 3.1% in PubSych and Scopus respectively, and 2.2% in PubMed. These records were imported into a database in table format (<https://doi.org/10.6084/m9.figshare.24718059>) to facilitate the collection and evaluation of relevant information regarding the selected sample. This database was deposited in Figshare to comply with the FAIR (findable, accessible, interoperable and reusable) principles that should govern this type of documents in the interest of opening science to society.

Database	Keywords	Results	Total	%
Web of Science	child-to-parent violence	58	81	36.2
	violence AND ICT	15		
	violence AND videogames	8		
Dialnet	child-to-parent violence	24	58	25.9
	child-to-parent violence AND ICT	4		
	violence AND ICT	19		
ProQuest	violence AND videogames	11	56	28
	child-to-parent violence	53		
	child-to-parent violence AND ICT	3		
PubMed	violence AND ICT	1	5	2.2
	violence AND videogames	4		
WorldCcat	violence AND ICT	6	10	4.5
	violence AND videogames	4		
PubPsych	violence AND videogames	2	7	3.1
	violence AND ICT	5		
Scopus	child-to-parent violence	4	7	3.1
	violence AND videogames	3		
TOTAL		224		100

Subsequently, in order to determine whether the appropriate keywords were being used in the search, a thematic analysis of the results was carried out, analyzing the keywords used by the researchers in these documents. This analysis revealed that 62% of the instruments (n = 139) were categorized under the term “child-to-parent violence”, followed in order of relevance by “violence AND ICT”, “violence AND videogames” and “child-to-parent violence AND ICT”, as can be seen in Figure 1, so the keywords selected for this research are considered appropriate.

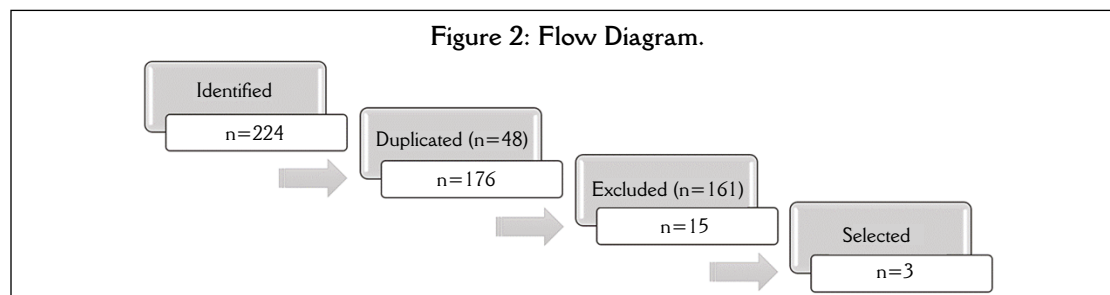


Next, in order to delimit the results of the research, the inclusion and exclusion criteria were defined as shown in Table 2.

NO.	Inclusion Criteria	Exclusion Criteria
1	Scientific articles	Other types of documents
2	Languages: Spanish and English	Languages other than English and Spanish
3	Open access to full text	Restricted and/or limited access
4	Sample age range 14 to 18 years old	Sample age range other than 14 -18 years old
5	Representative sample size	Non-representative sample size
6	Adequate psychometric properties	Inadequate psychometric properties
7	ICT usage scales	Scales over other uses
8	Instruments on child-to-parent violence	Tools on other types of violence

After filtering the data matrix according to the established inclusion and exclusion criteria, 48 instruments that were duplicated in different databases were eliminated, leaving a total of 176 records. Subsequently, these instruments were subjected to a rigorous analysis based on their characteristics and psychometric properties, and those that were sufficiently related to the research objective were selected, yielding a total of 15 instruments. Of these, the 3 that best responded to the research objective were finally selected, complementing each other and offering a holistic perspective on the study problem.

Figure 2 shows the flow chart of the instrument search and selection process in accordance with the PRISMA guidelines, in order to ensure transparency and clarity.



### 3. Results

In the data analysis process, the articles that used the selected instruments were examined in order to evaluate their contribution to the solution of the research questions and to carry out their comparison.

The selected research was published between 2009 and 2022, where 81.25% (13) of the scales were published in Spain and 18.75% (3) in the USA, Peru and Switzerland. The analysis of the annual distribution of the selected articles shows that the year 2009 is the time when publications and instruments with the aim of measuring child-to-parent violence begin to emerge. In the years 2009, 2018 and 2019 respectively, a high number of instruments were designed, with a notable increase in 2018, which represents an important milestone in the evolution and expansion of these tools. The rest of the years several scales appear to measure the frequency of ICT use, with the exception of 2016, when none were published.

In the analysis of the instruments, it should be noted that most of the assessment tools are of Spanish origin with the exception of three scales published in the USA, Peru and Switzerland. All the other instruments included in the review were developed and validated in Spanish contexts, which provides a solid basis for understanding and measuring specific variables in this population.

The second table included in Figshare (<https://doi.org/10.6084/m9.figshare.24720873>) lists the 15 scales identified during the systematic review, showing firstly those most related to the use of technology and secondly those focused on violence. It also includes the criteria for which 12 of the instruments analyzed were finally excluded.

The Internet-Related Experiences Questionnaire (CERI) and the Mobile-Related Experiences Questionnaire (CERM) are the most frequently used instruments for the assessment of these issues in Spanish adolescents. Other instruments were discarded due to evident limitations in terms of construct validity, as they did not accurately reflect the essential dimensions of the variables under study. Likewise, scales that, despite having been used in previous research, lacked adequate validation studies for the population under study were excluded.

In addition, instruments 1, 2, 3, 4, 5 and 7 were discarded because they lacked adequate psychometric properties, which compromised their reliability and validity in the measurement of the desired variables. Scale 9 was excluded because it was not adapted to the inclusion languages and had an age range different from the reference sample. Finally, questionnaire 10 was discarded because it did not have a representative sample size and instruments 8, 12, 13 and 14 were excluded due to their limitation in the evaluation of specific aspects, since they focused exclusively on the measurement of violence in general or Internet use exclusively, without comprehensively addressing the psychological constructs relevant

to the research objective. This limitation is considered important because it reduces the ability of the instruments to provide a complete and accurate picture of the phenomena assessed in the present study.

The application of these criteria resulted in the final selection of the following evaluation instruments:

1. The Adolescent Risk of Addiction to Social Networks and the Internet Scale (ERA-RSI). It consists of 29 items that assess the risk of Internet addiction, integrating four dimensions: symptoms-addiction, social-use, “friki” (geek) traits and nomophobia.
2. The Questionnaire of Problematic Use of New Technologies (UPNT) to assess the use of ICTs by adolescents. It consists of 41 items on frequency and problems in the use of different ICTs, Internet, video games, cell phones and television.
3. The CPV-Q-P questionnaire to collect family perceptions of the precursors of child-to-parent violence, among which is such use. It comprises a total of 14 items referring to different acts of psychological (four items), physical (three items) and financial violence (three items), as well as behaviors that demonstrate control and dominance over the parents (four items).

Therefore, it is considered that these three instruments complement each other in terms of the screening they perform on the problem under study, allowing a holistic and reliable view of it to be obtained. Table 3 shows the samples, age range and psychometric properties of these instruments:

Instrument	n	Age range	Internal Consistency	Convergent Validity	Construct Validity	Clinical Validity
ERA-RSI	2417	12 - 17 years old 54% (12-14) 46% (15-17)	$\alpha = .90$	$r > .76$	KMO = .90 $\chi^2 = 6138.89$	$p < .001$
UPNT	2747	9 - 33 years $\bar{X} = 14.04$ $\sigma = 3.5$	$\alpha > .70$	$r > .66$	KMO = .885 $\chi^2 = 18401.54$	$p < .001$
CPV-Q-P	1012	55.1% (mothers) $\bar{X} = 46.19$ $\sigma = 6.27$ 44.9% (parents) $\bar{X} = 48.34$ $\sigma = 6.27$	$\alpha = .76$	$r > .90$	$\chi^2 = 561.95$	$p < .001$

As shown in Table 3, the reliability and internal consistency of the three scales was calculated using Cronbach's alpha coefficient, showing satisfactory results in all cases. Convergent validity was analyzed using Pearson's correlation coefficient, showing a high and highly significant index in all three instruments.

The construct validity of the ERA-RSI and the UPNT was assessed by factor analysis, calculating the Kaiser-Meyer-Olkin (KMO) measures of sample adequacy and Bartlett's test of sphericity, both of which showed adequate indices. The latter coefficient was also assessed in the CPV-Q-P questionnaire, yielding an optimal result.

Finally, the analysis of clinical validity and linear dependence also showed a good discriminative capacity of the items in the three instruments, with significant intergroup differences.

#### 4. Discussion and Conclusions

Widespread access to the Internet, the prevalence of mobile devices and the influence exerted by social networks and communication platforms have generated a growing dependence on ICTs in various aspects of daily life. We are witnessing the emergence of media citizenship. This is because the communicative and media dimension, both in its traditional and interactive form, undeniably defines our contemporary society (Agastya, Triana, & Haribowo, 2022; Gozálviz & Contreras, 2014). This phenomenon poses an unavoidable challenge: educative literacy in the infant-juvenile population, especially in terms of developing critical autonomy when interacting with these media.

This context makes it essential to develop effective strategies aimed at preventing and detecting the

inappropriate use of ICTs in teenagers, since digital interaction has become essential in daily life but also poses great challenges in terms of problematic behaviors, including child-parent violence. As a result, the need arises to develop an assessment tool that covers various risk behaviors, such as technology addiction or inappropriate use, along with all the elements that characterize this type of violence.

Therefore, the main objective of this systematic review was to analyze the instruments developed both for the assessment of ICT use in adolescents and for the evaluation of possible child-parent violence derived from inappropriate use of ICTs. The total number of references was 15 instruments from which the ERA-RSI, the UPNT and the CPV-Q-P were finally selected on the basis of their study samples, their psychometric properties and the adequacy and complementarity of the items to respond to the objective of this research.

The literature review shows that the publication of instruments to measure child-to-parent violence had its origin from the year 2009, which coincides with what Pereira (2018) points out, who states that between 2005 and 2006 a great concern arose in Spanish society about child-to-parent violence, generating a media and social alarm as a result of the increase in reports of parents assaulted by their children and the demand for socio-psycho-therapeutic care in the face of such a problem.

The prevalence of social network and internet use in adolescents, the impact on mental health and the need for early detection highlight the relevance of using scales such as the ERA-RSI to understand and assess the associated risk of addiction. As advocated by Echeburúa and de Corral (2010), it is necessary to implement preventive strategies both in the family and educational settings considering the risk factors and characteristics of teenagers. Early detection of addictive behaviors is essential to intervene and provide support to at risk teenagers in order to contribute to the design of more effective preventive strategies.

Research on the influence of the family environment on the behavior of adolescents with the use of ICTs has mainly focused on the study of the rules of control and supervision of these technologies. These studies highlight that the application of parental control through the imposition of strict limits on the activities of minors, as well as the constant request for information about their actions, turns out to be an ineffective strategy to mitigate risky behaviors during adolescence (Baldry et al., 2019). This fact highlights the need to offer adequate educative training to teenagers to help prevent this problem, as pointed out in this study and affirmed by other relevant research (González & Contreras, 2014; Gutiérrez & Tyner, 2012; Poma et al., 2022).

The incidence of child-to-parent violence has experienced a significant increase in the last decade, becoming a prominent concern in several countries (Beckmann et al., 2021; Ibabe, 2016; Margolin & Baucom, 2014). This phenomenon has prompted an increase in research to understand its dimensions and address it effectively. Despite this increased attention, most studies focus on adolescent samples, with a scarce representation of parental samples. Moreover, the diversity of existing assessment instruments does not fully capture the characteristic elements of this type of violence. Therefore, Contreras, León and Cano-Lozano (2020a) propose a parent version with the CPV-Q-P.

On the other hand, when addressing the issue of consumption and addictions in adolescence, it is essential to consider the development of dependencies to certain behaviors, such as the recognized addiction to the use of video games, catalogued by the American Psychiatric Association in its diagnostic classification. This study trend is evident in most of the instruments in this review, such as the Adolescent Risk of Addiction to Social Networks and the Internet Scale (ERA-RSI), the Video Game Addiction Scale for Adolescents (GASA) or the Screening Questionnaire for New Addictions (DENA). The Problematic Internet Use in Adolescents Scale (EUPI-a) and the Questionnaire on Problematic Use of New Technologies (UPNT) also have an impact on the assessment of inappropriate or problematic use.

Thus, video game addiction becomes a relevant aspect for the investigation of child-to-parent violence for several reasons: it manifests itself in the same environment in which such violence occurs, it constitutes a highly rewarding leisure activity at these ages, it demands a considerable amount of time, it tends to be an activity not shared with parental figures, which can generate distancing, and the regulation of gaming behavior frequently triggers family discussions at this evolutionary stage (Lloret Irlles, Cabrera Perona, & Sanz Baños, 2013).

For all these reasons, ICTs pose serious challenges in our society to which it is urgent to respond. Among the actions to be carried out, as already mentioned and as concluded in the study, it is particularly



important to develop critical media literacy and digital competence in young people, avoiding reductionism and technological bias (Gutiérrez & Tyner, 2012). Moreover, such educommunicative training must be consistent with the situation of each teenager, so that it serves to address each particular situation, offering in a personalized way valuable resources and strategies that encourage a responsible use of ICTs, promoting awareness of the associated risks and favoring the acquisition of useful skills in this area, such as critical thinking to evaluate online information, digital empathy, respect in virtual interactions and deep understanding of content, thus strengthening their ability to understand, analyze and participate actively and responsibly in an increasingly interconnected and mediatized digital society.

Thus, the establishment of early detection mechanisms to identify indicators and patterns of behavior associated with the inappropriate use of ICTs would contribute to the prevention of the escalation of child-to-parent violence that is taking place in many countries, including Spain. In order to carry out this diagnosis, it is essential to have measuring instruments to identify and adequately assess the possible inappropriate uses and behaviors of each adolescent, providing relevant information to design prevention and intervention strategies that promote a safer and more responsible use of ICTs in the child and teenager population.

In this sense, the systematic review conducted in the present study shows that the instruments designed to measure the use of ICTs face a constant and significant challenge due to the rapid evolution of the Internet and related technologies. As a result, the starting hypothesis formulated is corroborated, as there is currently no instrument that allows us to explore, in a unique and holistic way, the use of ICTs in teenagers as a possible risk factor in child-to-parent violence. Moreover, many of the instruments that have been reviewed and discarded in this review fail to accurately and completely analyze the complexity of these new digital uses and behaviors, having become obsolete in a relatively short time. Therefore, at present, in the absence of an instrument capable of offering a holistic view of this problem, it is necessary to combine the three instruments selected in this research to achieve a comprehensive analysis of the situation. However, it is likely that these instruments will also end up, over time, subject to the obsolescence inherent to media ecology, making it pertinent to carry out a new review study to analyze whether scales have been developed or adapted to address the particularities that may exist in the new context. In summary, addressing the inappropriate use of ICTs in adolescents should involve a comprehensive approach that combines prevention through educommunication, early detection through monitoring and collaboration among various social actors. Such an approach is not only intended to mitigate the risks associated with problematic ICT use, but also to prevent the manifestation of child-to-parent violence as a consequence of this malpractice. In this sense, it is considered that the results of the systematic review of the existing scientific literature allow us to modify the current state of the art by selecting those instruments that are most suitable for the assessment of ICT use. In fact, the combination of the three selected instruments can offer an exhaustive screening that allows us to obtain a global vision of the situation of each teenager, contributing to the design of intervention programs adjusted to the reality and that contemplate an appropriate educational-communicative training that benefits all the agents involved and establishes the appropriate measures to prevent this type of ICT use and violent manifestations.

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# Aided Augmented Input and the EC+ App in Autism Spectrum Disorder

Estimulación asistida del lenguaje y la app EC+ en el trastorno del espectro autista

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## ABSTRACT

Autism spectrum disorder (ASD) significantly impacts communicative, social, and behavioral skills, especially in children with Level 3 ASD. Augmentative and alternative communication (AAC) systems can help address these challenges. Aided augmented input emerges as an AAC strategy that enhances expression and comprehension through visual and verbal inputs from the communicator. Additionally, the development of information and communication technologies (ICT) has enabled their educational and therapeutic use to support individuals with ASD, providing versatile and accessible tools that facilitate learning, interaction, and skill development. This study aims to analyze the effects of combining aided augmented input with a multimodal ICT support called EC+, compared to ARASAAC paper-based resources, on communicative, social, and behavioral skills. A quasi-experimental design was employed to compare the effects of both resources, including two groups of 6 children each, all with Level 3 ASD. The results showed significant improvements with both resources, but the ICT support proved more effective in the areas of communication and behavior. It is concluded that EC+ offers a more interactive and effective approach to enhancing the overall development of children with ASD, complementing paper-based resources in a valuable and innovative way.

## RESUMEN

El trastorno del espectro autista (TEA) afecta significativamente las habilidades comunicativas, sociales y conductuales, especialmente en niños con TEA de Grado 3. Los sistemas de comunicación aumentativa y alternativa (CAA) pueden ayudar a enfrentar estos desafíos. La estimulación asistida del lenguaje surge como una estrategia de CAA que mejora la expresión y la comprensión a través de inputs visuales y orales del interlocutor. Por otra parte, el desarrollo de las tecnologías de la información y la comunicación (TIC) ha permitido su uso educativo y terapéutico para apoyar a personas con TEA, ya que proporciona herramientas versátiles y accesibles que facilitan el aprendizaje, la interacción y el desarrollo de sus habilidades. El objetivo del estudio es analizar los efectos de combinar la estimulación asistida del lenguaje con un soporte TIC multimodal llamado EC+, en comparación con recursos en papel de ARASAAC, sobre las habilidades comunicativas, sociales y conductuales. Se empleó un diseño cuasiexperimental para comparar los efectos de ambos recursos, incluyendo dos grupos de 6 niños cada uno, todos con TEA de Grado 3. Los resultados mostraron mejoras significativas con ambos recursos, pero el soporte TIC resultó más efectivo en el área de la comunicación y del comportamiento. Se concluye que EC+ ofrece un enfoque más interactivo y eficaz para mejorar el desarrollo global de los niños con TEA, y complementa los recursos en papel de manera valiosa e innovadora.

## KEYWORDS | PALABRAS CLAVE

Apps, Communication Skills, Methods, Educational Technology, ICT, Autism Spectrum Disorder.  
Apps, Competencias Comunicativas, Métodos, Tecnología Educativa, TIC, Trastorno del Espectro Autista.

## 1. Introduction

Autism spectrum disorder (hereafter ASD) is a neurodevelopmental disorder that affects communication, social interaction and behavior (Sauer et al., 2021). According to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (APA, 2013), individuals with ASD can experience the disorder at three levels of severity: Grade 1 ASD indicates mild difficulties in social communication and repetitive behaviors, Grade 2 indicates moderate difficulties, and Grade 3 is associated with severe difficulties in these areas and very limited intellectual functioning. Individuals with Grade 3 ASD may show a wide range of symptoms, including impairments in verbal and nonverbal communication, difficulties in social interactions, and restricted and repetitive behaviors and interests (Lai, 2022; Martínez Rojas, 2024). Worldwide, the average prevalence of ASD is estimated to be 1 in 100 children (WHO, 2023). In Spain, the disorder affects approximately half a million people of all ages. On average, at preschool age 15 out of every 1000 children are diagnosed with ASD, while at school age the number drops to 10 out of every 1000 children (Morales-Hidalgo et al., 2018; Vázquez, 2023; Vidriales-Fernández et al., 2023).

The problems in the area of communication and language in ASD have led to the development of interventions and methodologies adapted to the idiosyncratic characteristics of this disorder. Based on the visuospatial skills of people with ASD (Cardillo, Lanfranchi, & Mammarella, 2020), augmentative and alternative communication (AAC) materials and resources have been created. AAC encompasses a wide range of tools and techniques designed to assist individuals with communication impairments, such as speech-generating devices, communication boards, symbol-based communication systems, and sign language, including pictograms or paper symbols (ASHA, 2023). Among the possible interventions using AAC, assisted language stimulation stands out as an effective method to enhance both the receptive and expressive aspects of language. This method can be described as a modeling strategy that goes beyond simple exposure to meaning, actively developing and reinforcing communicative skills through AAC with natural communication (Guamán-Rivera et al., 2024; Muttiah et al., 2022). This intervention involves the interlocutor pointing to pictographic symbols or real images (visual input) while simultaneously using verbal expression referring to the symbol (oral input). This dual input helps to create new sentence structures and modes of interaction by linking symbols with their meanings (Therrien, Light, & Pope, 2016). The main goals of assisted language stimulation include increasing vocalizations, developing response and interaction options through the use of objects and symbols. In addition, it aims to improve communicative intent and enhance both expressive and receptive language skills (Gómez Taibo & García-Eligio de la Puente, 2016).

### 1.1. Assisted language stimulation from an innovative approach


The development and evolution of information and communication technologies (ICT) has allowed their use in educational and therapeutic contexts both in the approach to disability and in the implementation of AAC systems (Durán Cuartero, 2021; Marsidin, 2022). ICTs include digital tools such as computers, apps, software and mobile devices, which facilitate the collection, storage, processing and transmission of information. These tools stand out for their portability, versatility, and accessibility, promoting their use among users (Aspiranti, Larwin, & Schade, 2020; Quiroga, Jaramillo, & Vanegas, 2019). Lehman (1998) already indicated that children with ASD are often attracted to ICTs because of their visual abilities. But in addition, the use of ICTs provides a structured environment that improves interaction and reduces stress, favoring anticipation of stimuli (Ntalindwa et al., 2019).

In view of the data provided so far, the question arises as to whether it is worth implementing ICT resources compatible with assisted language stimulation as innovative elements in educational intervention. According to Lozano Martínez et al. (2016), a software designed for people with ASD diagnosis must meet the following requirements: (a) be able to adapt to the individual's abilities, learning pace, developmental level, and interests; (b) present a user-friendly interface with clear organization, visual components, and multiple information formats such as text, audio, or highlighted icons; (c) allow configuration options to optimize performance, including text and visual pathway settings and different levels of difficulty; (d) structure the presentation of content to ensure comprehension and make learning a positive experience; and (e) provide adequate and motivating feedback for both successful outcomes and errors.

In recent years, numerous apps have appeared for tablets and smartphones -both for Android and iOS environments- whose purpose is to improve intervention in the areas of communication and language for

people diagnosed with ASD, such as PictoTEA, José Aprende, Jocomunico, DictaPicto or the EC+ tool (Efendioglu & Durmaz, 2022; Moya Giménez, 2021; Pahisa-Solé, 2020; Quezada et al., 2023). In the present study, we chose to use the EC+ multimodal support (Table 1) because it is a free ICT resource that can support the AAC strategy of assisted language stimulation. The EC+ multimodal support (Luque et al., 2018) has been developed at the University of Malaga, and meets the criteria to be considered an innovative tool compatible with the proposed intervention strategy. EC+ was created in the framework of the European Erasmus+ Project and published on June 16, 2018. The tool includes a mobile app for installation on smartphones or tablets (iOS and Android operating systems), and an online academic portal accessible through any web browser. Its name stands for Enhancing Communication Plus, and its main objective is to improve communication and interaction for people with complex communication needs or minimally verbal people. Taking as a starting point the expressive communicative repertoire associated with a 3-year-old child and optimizing it for users with communication difficulties or minimal language skills, a specially designed linguistic corpus of some 400 terms was created. The most remarkable element of this tool is the multimodal approach to communication adopted, where information is presented mainly through visual, auditory and gestural means. It incorporates spoken words, written words, pictograms, real images and videos of sign language interpreters for each of the 400 concepts included in the corpus.

Table 1: Characteristics of EC+.

App logo	
Purpose	EC+ is an application launched in 2018 completely free of charge that offers different means for caregivers or professionals who must communicate with people who possess severe communication difficulties.
Skills developed	<ul style="list-style-type: none"> <li>• Visual perception and discrimination.</li> <li>• Auditory perception and discrimination.</li> <li>• Acquisition or expansion of vocabulary and understanding of its meaning.</li> <li>• Development of working memory and sustained attention.</li> <li>• Development of language skills.</li> <li>• Enhance social interactions in any type of environment.</li> </ul>
Operating system	Android and IOS
Available languages	Spanish, Catalan, English, German, German, and Dutch

To date, no studies have been found that employ language-assisted stimulation activities for individuals with ASD combined with CE+. Furthermore, there is scant research comparing these types of supports with paper-based AAC resources during interventions in these contexts (Marble-Flint, Strattman, & Schommer-Aikins, 2019). This may be attributed to the constant evolution of this field and the underutilization of these resources, due in part to a lack of understanding of their purposes (Marzal Carbonell et al., 2023).

## 1.2. Objectives

The general objective of this work is to determine whether the combination of assisted language stimulation with multimodal ICT support such as EC+ improves the most affected areas in children with Grade 3 ASD: communication, social skills and behavior (Velarde-Incháustegui, Ignacio-Espíritu, & Cárdenas-Soza, 2021). In this context, the following secondary objectives were raised:

- Objective 1: To evaluate the efficacy of intervention based on assisted language stimulation combined with the EC+ app compared to training with paper pictograms in improving the communicative component.
- Objective 2: Determine if there is an increase in social skills in participants with ASD using EC+ and assisted language stimulation compared to paper-based resources.

- Objective 3: To examine whether the combined intervention of CE+ and assisted language stimulation contributes to the reduction of disruptive behaviors in individuals with ASD, compared to intervention with paper-based resources.

## 2. Methodology

### 2.1. Participants

Sample selection was purposive, focusing on participants with specific characteristics relevant to the study objectives from the province of Malaga, Spain. Initially, 20 potential participants were identified and underwent a rigorous selection process to ensure the homogeneity of the sample and the reliability of the study. Finally, 12 met the following inclusion criteria: (a) school-aged boys and girls, aged 6 to 12 years, selected for their diagnostic stability (De Pimentel, 2024) and for being a critical stage of development, leading to the acquisition of fundamental social, communicative and academic skills (Lima & Laplane, 2016); (b) with Spanish as their native language of instruction; (c) diagnosed with ASD classified as Grade 3, assessed by clinicians using DSM-5 criteria (APA, 2013); (d) with complex communication needs, evidenced by limited functional communicative exchanges through human verbal language (speech, signing or writing); (e) with low levels of language comprehension and expression; (f) able to concentrate on an activity for at least 10 minutes, as reported by teachers and caregivers; (g) without visual or hearing impairments; and (h) with parental or primary caregiver consent. These 12 participants were assigned a number in order of consultation and randomly distributed into two groups. Group A received an intervention based on assisted language stimulation using the EC+ app; while group B received the same intervention strategy with paper-based pictograms, without exposure to any ICT support or assistive technology.

Prior to the start of the study, participants were assessed to accurately document their characteristics (Table 2). The Adaptive Behavior Composite (ABC) measure of the Vineland-3 Adaptive Scale was used to measure complex communication needs, providing a comprehensive understanding of functional abilities in children with ASD (Sparrow, Cicchetti, & Saulnier, 2016). The ABC aggregates scores from the Communication, Daily Living Skills, and Socialization domains, with a percentage score of less than 1% indicating extremely limited performance. Intellectual Quotient (IQ) was measured with the TONI-4 Nonverbal Intelligence test, suitable for people with verbal, auditory or motor difficulties (Fopiano, 2021). To assess language comprehension and expression, the Protocol for the Assessment of the Linguistic Communicative Profile of People with Complex Communication Needs and Intellectual Disability (PCL-DIS-NCC) was used, which covers comprehension, variety of interlocutors, communicative functions, modes of communication and conversational topics (Calleja Reina, Luque, & Rodríguez Santos, 2021).

**Table 2: Description of the Participants' Means.**

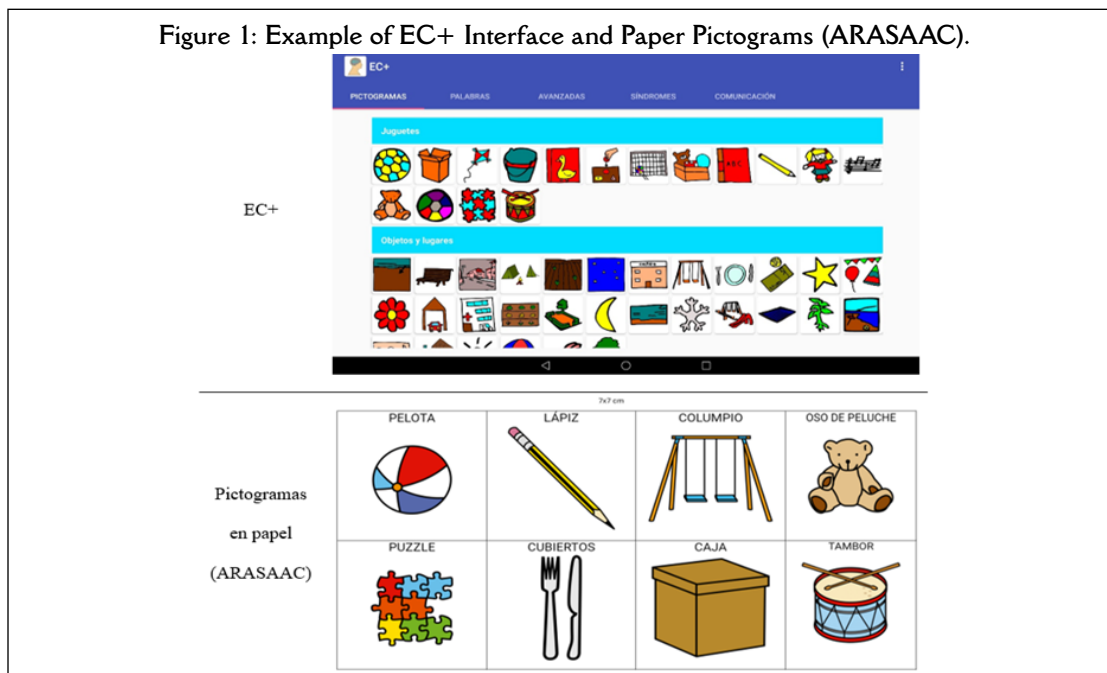
	Group A (EC+)	Group B (Pictograms on paper)
Sample size	n=6	n=6
Genre	4 male / 2 female	5 male / 1 female
Mean age and standard deviations	7.33 years (SD=1.75)	6.33 years (SD=0.81)
TONI-4 (Mean IQ and standard deviations)	65.67 (DT=4.32)	64.00 (DT=5.82)
Vineland-3 (ABC)	Percentile = <1	Percentile = <1
PCL-DIS-NCC (Mean and standard deviations)	<ul style="list-style-type: none"> <li>• PCL-EC: 22.17 / 48 (DT=3.76)</li> <li>• PCL-EE-VI: 19.17 / 48 (DT=1.21)</li> <li>• PCL-EE-FC: 22 / 48 (DT= 2.50)</li> <li>• PCL-EE-MC: 19.83 / 48 (DT= 5.11)</li> <li>• PCL-EE-T: 15.5 / 48 (1.96)</li> </ul>	<ul style="list-style-type: none"> <li>• PCL-EC: 23 / 48 (DT=2.31)</li> <li>• PCL-EE-VI: 21.17 / 48 (DT=1.03)</li> <li>• PCL-EE-FC: 22.83 / 48 (DT=2.23)</li> <li>• PCL-EE-MC: 20.5 / 48 (DT=4.7)</li> <li>• PCL-EE-T: 18 / 48 (DT=2.69)</li> </ul>

Note: IQ: Intelligence quotient; ABC: Adaptive Behavior Composite; PCL-EC: Comprehension scale; PCL-EE-VI: Variety of interlocutors; PCL-EE-FC: Communication functions; PCL-EE-MC: Communication modes; PCL-EE-T: Themes and preferences.

### 2.2. Materials

AAC resources based on designated pictograms were used for each group, selected for the study because of their distinctive characteristics that warranted comparison between the two (see Figure 1 for an example). Each resource presents its own set of pictograms, which meet key criteria to be considered representative and useful for people with ASD (Hervás et al., 2020).

Figure 1: Example of EC+ Interface and Paper Pictograms (ARASAAC).



For Group A, the EC+ app was selected. This app offers more than 400 specially designed pictograms with clear and colorful drawings on white backgrounds to enhance iconicity and minimize distractions (Dowse, 2021). Vocabulary terms are categorized by semantic fields: “Actions”, “Food and drinks”, “Animal”, “Qualities”, “Quantifiers and items”, “Games, routines and social formulas”, “Toys”, “Objects and places”, “Objects and places in the house”, “Body parts”, “People”, “Prepositions and locatives”, “Clothes”, “Time”, “Vehicles” and a last modality called “Uncategorized”, where the expression of sign language is found (Luque et al., 2018). Users can enlarge pictograms and images with a single click and customize them to suit their communicative and cognitive needs. EC+ provides informative documents based on scientific evidence, including concepts of Total Communication and other pathologies. Users can adjust multimedia resources in three resolutions to improve compatibility and reduce storage usage. Words are organized into basic and advanced lists, including prepositions and determiners. The academic portal allows users to log in to edit items in the app through the web service. When the app is launched, it connects to the service to update and download resources in the selected language. The academic portal facilitates the availability of these changes in the EC+ app and allows other users to update their lists with new items (Chicano & Luque, 2017). The app was installed on a Huawei® MediaPad M5 Pro tablet with a 1920 x 1200 resolution and a 10.8-inch screen. This configuration was specifically chosen to improve the visualization of the items, facilitating effective interaction with users (Alzrayer, Banda, & Koul, 2019; Lozano Martínez et al., 2016; Yazicioglu y Kanoglu, 2022).

In Group B, pictograms were obtained from the Aragonese Augmentative and Alternative Communication Portal (ARASAAC) (Gobierno de Aragón, 2007). This offers a wide range of AAC resources covering different semantic areas and available in several languages and formats. ARASAAC pictograms stand out for their high degree of iconicity and personalization, which makes them especially effective for communication and understanding of people with ASD. In addition, they offer advanced editing options to adapt to the unique characteristics of each user (Cabello Luque & Mazón Morillas, 2018). In this study, 7x7 cm laminated pictograms printed in color on a white background were used to enhance iconicity (Dowse, 2021; Hervás et al., 2020). The pictograms included vocabulary of objects, food, clothing, people, verbs and concepts relevant to the child. Each pictogram included the corresponding written word in uppercase black letters at the top to help associate the graphic representation with the written term.

### 2.3. Procedure

All sessions were conducted in multidisciplinary centers, specifically in the speech therapy office.



Communication contexts included play with toys and other objects, social interaction with the interlocutor, and quantification of problem behaviors during the session. A consistent set of motivators (toys, food, and resources) was identified through preference assessments and interviews with family members prior to the study. These motivators, along with AAC supports, were strategically placed on the table to control participants' impulses and enhance the intervention strategy (Holland, Blanche, & Thompson, 2020; Wang & Li, 2024). Each week, a new item from the original set, not previously used, was introduced during the intervention periods.

The study sessions were conducted individually, lasting 15 to 30 minutes, and took place 2 to 3 times per week, depending on the availability of the participants and the center's schedule. To avoid fatigue and frustration, 5-minute breaks were strategically included after various activities. These breaks did not count toward the total intervention time, ensuring that children remained focused and engaged throughout the sessions. The intervention had a user-centered focus.

Participants sat in a chair facing a table equipped with the tablet or paper pictograms, along with relevant materials and motivators. The speech therapist was nearby to guide and facilitate the interaction, pointing to the pictographic symbols to aid comprehension and association with real-world objects or situations. The goal of this approach was to provide effective linguistic input, reinforce responses, and promote successful interactions (Holland et al., 2020; Taubaldiyev et al., 2024). Intervention through assisted language stimulation involved integrating natural social and communicative routines, such as playing with toys, engaging in activities, and interacting with the interlocutor. It was ensured that children had at least twenty opportunities to communicate during each activity, following the approach described in the study by Mutiah et al. (2022). To ensure comparison between the two groups and that there were no differences between formats, all pictograms were presented in list format.

The selected activities were compatible with both types of resources and were structured as games and joint action exercises (Hassan, Pinkwart, & Shafi, 2021). These activities addressed aspects such as awareness of the environment, emotion recognition, category classification, object discrimination, associations between two items, formulation of requests, literacy concepts, and the creation of simple sentences composed of a given article (singular and plural, masculine and feminine: "el", "la", "los", "las"), a noun and an adjective. Emotional and behavioral concepts were also introduced to prevent disruptive behaviors such as self-injury, damage to the environment and to the materials themselves (Martínez-González & López Gil, 2019).

All sessions were documented using written notes, skill checklists, and video recordings to ensure thorough recording and analysis of the procedures. The written notes provided real-time qualitative observations, while the skills checklists systematically tracked participants' progress through the various tasks. Video recordings were used for detailed analysis and verification of data accuracy. The Vineland-3 scale quantitatively assessed participants' performance at key moments.

## 2.4. Measurements

The information collection instrument was the Vineland-3 Scale in its Spanish version. This standardized test is an appropriate tool to measure social and communicative maturity in minimally verbal individuals and individuals with ASD (Pepperdine & McCrimmon, 2018). It assesses communication, daily living skills, socialization, motor skills, and behavior (Comprehensive Form). Scores are based on a Raw Score, which quantifies age-appropriate behaviors, with three possible response options: 2 = Usually or often; 1 = Sometimes; and 0 = Never (Sparrow et al., 2016). The Raw Score is then converted to a Scale-*v* Score using the corresponding scales classified by age groups (Domain-Level Form). To meet the objectives of the study, the total Scale-*v* Scores of the following areas were analyzed:

- Communication Range: Perception (receptive language), interpretation and transmission (expressive language) were assessed by scores on the "Listening and Understanding" (39 items), "Speaking" (49 items) and "Reading and Writing" (38 items) subtests.
- Social Rank: The user's social ability was quantified through the sum of scores of the subtests "Relationships with Others" (43 items), "Adaptive Skills" (33 items) and "Play and Use of Leisure Time" (36 items).
- Behavioral Range: Data were obtained from the "Problem Behaviors" subtest, which includes Section A (13 items), Section B (11 items), and Section C (20 items). These sections assess disruptive behaviors such as self-injury, environmental and material damage, and interference with learning (Ali, 2022; Martínez-González & López Gil, 2019). A higher score in this area indicates a greater presence of disruptive behaviors.

Following the procedures described by Pepperdine and McCrimmon (2018), the reliability of the

measurements was confirmed by Cronbach's Alpha coefficient, with results indicating a satisfactory level of internal consistency and test-retest reliability for the skills assessed. None of the participants scored the highest in any of the areas assessed.

## 2.5. Research Design

A quasi-experimental study was conducted with two independent groups over a 16-week intervention period. The design aimed to compare both AAC resources and to determine whether EC+ produced better results by assessing participants' progression. The independent variable was the application of the assisted language stimulation strategy using pictograms from the EC+ app (ICT support) and ARASAAC (paper pictograms). The dependent variables were the scores obtained on the Vineland-3 Scale in the communication, social skills and disruptive behavior indexes. These scores were evaluated on a scale ranging from 0% (no correct answers produced independently) to 100% (5 or more correct answers produced independently), with an increase of 20 percentage points per correct answer.

Due to the number of participants, the study did not start on the same day for everyone. To address this, each participant's schedule was calculated from their baseline assessment, ensuring that everyone received the same number of intervention days and assessment times. In total, 45 sessions were conducted. The study design and the three main assessment moments were structured as follows: at Moment 1 baseline measures of Communication, Social and Behavioral Range (pre-intervention assessment) were established. From Week 2 through Week 13, Group A received EC+ assisted language stimulation, while Group B used ARASAAC pictograms (intervention period). At Time 2, participants' progress was assessed at Week 7 (interim assessment). Finally, at Time 3, a last assessment (post-intervention assessment) was performed at Week 16 after a 15-day break without training, to measure skill retention and evaluate changes in the different areas of the participants.

All procedures performed in the present study complied with the ethical standards of the institutional and national research committee, as well as with the Declaration of Helsinki and its subsequent amendments. This study has the approval of the Experimental Ethics Committee of the University of Malaga (reference number: 19-2023-H). To protect confidentiality, the personal identification data of the participants were not communicated individually.

## 2.6. Data Analysis

Data analysis was performed using SPSS® Statistics version 27.0 software. The mean scores between the two groups were compared using Student's *t*-test and repeated measures ANOVA, considering the intersubject factor. A significance level of  $p < .005$  was chosen to determine the differences between the groups. An independent observer reviewed the scores and recordings, achieving 70% agreement at Time 1. Agreement was defined when both observers identified independent or elicited responses. Interobserver reliability was calculated, averaging 90% during the intervention and maintenance sessions (Moments 2 and 3). After each session, a procedural checklist was completed, with a reliability of 95% for all three assessment moments.

## 3. Results

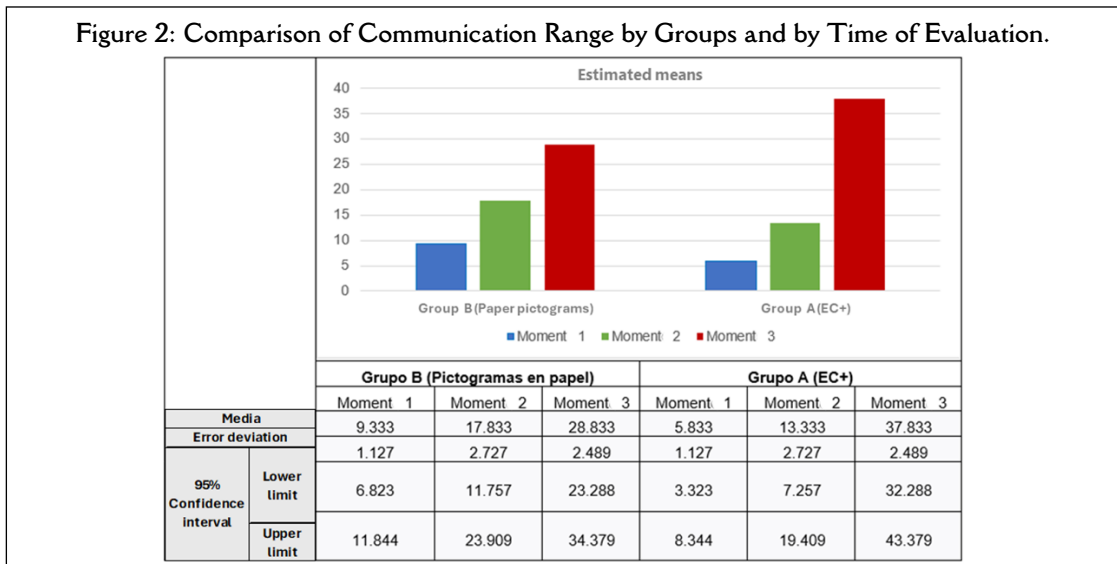
In the present study, differences were found in the components analyzed between participants who received intervention with CE+ and those who did not.

- Objective 1: To analyze the efficacy of the intervention based on assisted language stimulation in the improvement of the communicative component of Group A versus Group B.

First, performance on the Communication Range was evaluated, comparing the scores obtained according to the type of resource. Statistically significant differences were found in the measures of the adaptive behavior scale throughout the three moments evaluated. At Moment 1, a mean difference of 7.58 ( $t=8.19$ ,  $p < .005$ ) was observed; at Moment 2, the difference was 15.58 ( $t=7.95$ ,  $p < .005$ ); and at Moment 3, the mean difference reached 33.33 points ( $t=15.44$ ,  $p < .005$ ). In addition, the mean differences between groups A and B were analyzed. The results showed an improvement in the Communication Range of Group A of 32 points ( $SD=5.81$ ) compared to 19.5 points ( $SD=6.36$ ) for the control group. Figure 2 illustrates the differences between the first and the last evaluation of the participants.

Finally, a repeated measures ANOVA was performed, which revealed that the intervention combined with EC+ scored statistically significantly better than the intervention with paper pictograms that did not include ICT supports ( $F_{(1,72)} = 12.42$ ,  $p < .005$ ,  $\eta^2 = .554$ ,  $\beta = .979$ ).

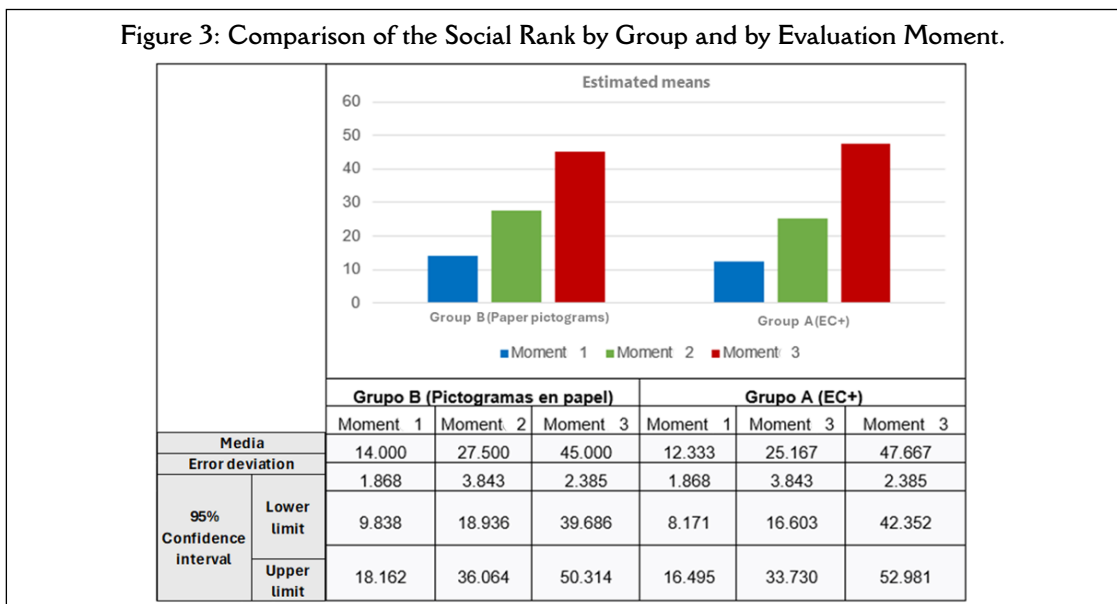
Figure 2: Comparison of Communication Range by Groups and by Time of Evaluation.



- Objective 2: Is a differential increase in social skills observed in participants according to the type of resource used?

To address this question, an initial analysis was conducted to determine the Social Rank among participants. Statistically significant differences were found in the developmental test measures at different evaluation moments. At Moment 1 a mean difference of 13.17 ( $t=10.25, p<.005$ ) was observed; at Moment 2 the difference was 26.33 ( $t=10.07, p<.005$ ); and at Moment 3 the difference reached 46.33 ( $t=27.95, p<.005$ ). Subsequently, the mean differences between groups A and B were analyzed. The results indicated an improvement in Group A's mean Social Rank of 34.5 points ( $SD=5.98$ ) compared to Group B's 31 points ( $SD=5.69$ ). Figure 3 illustrates the differences between the participants' first and last assessments. Finally, a repeated measures ANOVA was conducted, the results of which indicated that there were no significant differences in Social Rank when comparing the two resources after 16 weeks. However, the intervention with EC+ showed slightly superior results ( $F_{(1,37)}=2.65, p>.005, \eta^2 = .209, \beta=1=.375$ ).

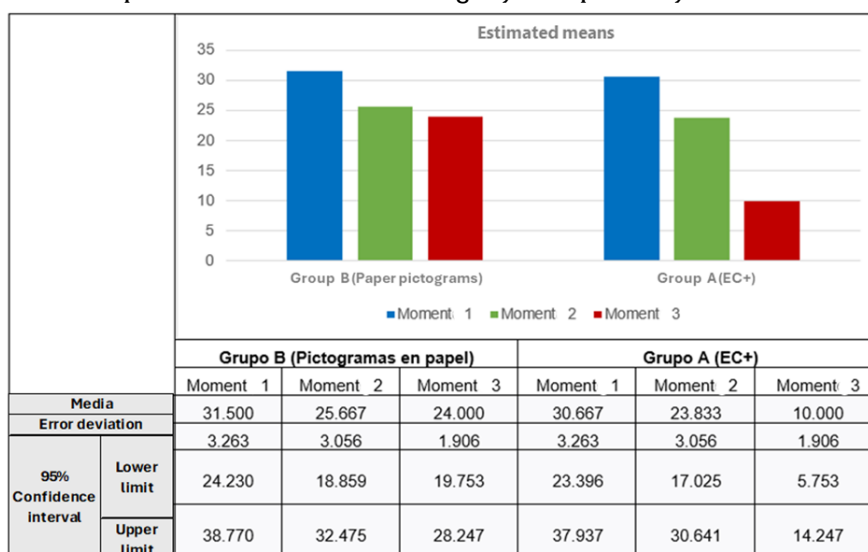
Figure 3: Comparison of the Social Rank by Group and by Evaluation Moment.



- Objective 3: To determine whether the combined intervention with EC+ influences the reduction of disruptive behaviors compared to the intervention with paper pictograms.

Finally, the same procedure was followed as in the previous analyses. First, an initial analysis was performed to evaluate the evolution of the Behavioral Range among participants. Significant differences were found in the developmental test measures at the three evaluation moments in both groups. At Moment 1 there was a mean difference of 31.08 ( $t=14.1$ ,  $p<.005$ ); at Moment 2 the difference was 24.75 ( $t=11.9$ ,  $p<.005$ ); and at Moment 3 the mean difference was 17 ( $t=6.88$ ,  $p<.005$ ). Next, the differences in means between groups A and B were analyzed, and an improvement in the mean Behavioral Range of Group A of 20.67 points ( $SD=3.89$ ) was found versus the improvement of 7.5 points ( $SD=5.32$ ) for Group B. Figure 4 shows the differences between the first and the last evaluation of the participants. Finally, a repeated measures ANOVA was performed. The results indicated that the intervention combined with the EC+ app produced a significant decrease in disruptive behaviors, compared to the intervention with paper pictograms, after an intervention period of 16 weeks ( $F_{(2)}=26.37$ ,  $p<.005$ ,  $\eta^2 = .725$ ,  $\beta-1=1$ ).

Figure 4: Comparison of the Behavioral Range by Groups and by Evaluation Moments.



#### 4. Discussion and Conclusions

In the present study, the use of the EC+ app stands out for its multimodal nature, a feature that differentiates it from previous research in the field of ASD intervention. Multimodality, which combines visual, auditory, and tactile stimuli, offers a comprehensive approach that enhances language-assisted stimulation. This type of intervention has not yet been sufficiently explored in the literature, especially in this population, and complements existing research, which has focused on more unidimensional methods, such as the use of pictograms on paper or specific software without integrating multiple sensory modalities (Durán Cuartero, 2021; Therrien et al., 2016). These interventions, although effective, tend to be limited to a single communication channel, which may restrict their impact on improving communication, social and behavioral skills. In contrast, the use of a tool such as EC+ allows for a richer learning experience tailored to the individual needs of each user, taking advantage of the natural affinity of children with ASD for digital resources, which has been reflected in the results.

Both the intervention with paper pictograms (Group B) and the intervention combined with the EC+ app (Group A) showed improvements in the areas assessed. However, Group A had a considerable increase in the Communication Range compared to Group B, indicating greater interaction with their environment, people and surrounding elements. The use of a tablet can be particularly engaging for children, as it captures their attention more effectively than traditional paper-based methods (Marble-Flint et al.,

2019). The interactive and engaging nature of the app can make learning more enjoyable, increasing the likelihood of maintaining attention, the level of engagement during activities and increasing the motivation of participants (Aspiranti et al., 2020; Marzal Carbonell et al., 2023).

Regarding the Behavioral Range, a significant difference in favor of the ICT support was also observed. Group A showed a greater reduction in disruptive behaviors compared to Group B, suggesting that the combined strategy with EC+ support has a strong impact on reducing such behaviors compared to the paper-based resource methodology. Tablet use can offer considerable behavioral benefits (Esposito et al., 2017). The structured and predictable nature of tablet activities, specifically with EC+, can provide a sense of security and routine in children with ASD, helping to maintain their focus and reduce potential instances of frustration that often lead to disruptive behaviors (Charitaki, 2015).

The absence of significant differences in the Social Range between the study groups may be explained by the effectiveness of both types of resources in promoting social interaction, although Group A has relatively higher scores. Both formats provide structured visual aids that help children with ASD understand and participate in social interactions. The systematic use of visual cues, routines, and interactive activities in both groups helps develop social skills such as eye contact, turn-taking, and communication initiation (Alzrayer et al., 2019). The individualized approach, combined with the nature of the language-assisted stimulation strategy, may explain the similar social skills outcomes observed in both groups (Hassan et al., 2021).

Some limitations of the study include the relatively small sample size. Similar to studies such as those by Esposito et al. (2017) or Marble-Flint et al. (2019), this may limit the generalizability of the results, especially considering that the ASD population is very heterogeneous, creating a wide range of communicative, cognitive, functional, and sensory profiles within the spectrum (Mottron & Bzdok, 2020). This diversity is reflected in the results of the study, where significant differences were found between groups A and B from the initial assessment. To prevent this from becoming a problem, efforts were made to make the participants in both groups as homogeneous as possible. Also, the duration of the study could be longer, to assess the sustainability of the effects of the intervention over a longer period of time.

It is important that future research focus on examining how assisted language stimulation can be adapted to other emerging educational and therapeutic contexts driven by the increasing use of educational technology. It is essential to understand the extent to which these advances can benefit individuals with ASD and how their potential benefits manifest themselves in comparison to the use of paper-based resources. ICT supports provide unprecedented opportunities for personalization and accessibility of interventions in any setting, but it is vital to explore how these new supports can be integrated into existing learning programs to complement and enhance current approaches. It should be emphasized, however, that the application of ICT should not detract from the importance of human interaction and the therapist-user relationship, as these forms of support are critical to the success of education.

The present study provides evidence describing the usefulness of combining ICT supports such as the EC+ app with the assisted language stimulation strategy. Promising results have been obtained in children with Grade 3 ASD in a Spanish-speaking context who present severe difficulties in communication, as well as in social and behavioral areas, thus confirming the advantages of this technological resource. In conclusion, the results highlight the value of integrating this type of support by providing an interactive and effective approach to enhance the overall development of children with ASD. This integration can serve as a valuable complement to paper-based resources, also recognizing their importance in this field.

## Support

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# Perceptions and behaviors of university students in the face of online hate speech: a comparative analysis between Spain and Italy

Percepciones y comportamientos de estudiantes universitarios frente al discurso de odio en línea: un análisis comparativo entre España e Italia

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## ABSTRACT

Hate speech is evidence that social networks do not always favor modern democracies; there are more and more issues related to their misuse, putting Western values at stake. This phenomenon has increased with the COVID-19 pandemic. The aim of this paper is to investigate in Spanish and Italian university students their perceptions of hate speech such as sexting, grooming, cyberbullying, to analyze their online behaviors as victims and aggressors and to explore the forms of hatred towards people who have played a relevant role in the COVID-19 pandemic. Using a quantitative-descriptive methodology, 418 university students from both countries participated, recruited through non-probabilistic sampling. The results obtained show that in both countries there is an increase in the perception of hatred during COVID-19. In this context, the most increased forms of violence are sexting, gender violence and cyberbullying; among the most affected categories are healthcare workers, supermarket workers, and people with disabilities. Therefore, the results highlight the need to address hate speech with an educational approach oriented towards both critical and responsible media literacy as well as respect for diversity, interculturality, and emotional education.

## RESUMEN

Los discursos de odio son una evidencia de que las redes sociales no siempre favorecen las democracias modernas; cada vez hay más problemáticas relacionadas con un mal uso de estas, poniendo en juego los valores occidentales. Este fenómeno ha aumentado con la pandemia del COVID-19. El objetivo de este artículo es investigar con estudiantes universitarios de España e Italia las percepciones que tienen sobre los discursos de odio tales como sexteo, «grooming», ciberacoso, analizar sus comportamientos en línea como víctimas y agresores, y explorar las formas de odio hacia personas que han tenido un papel relevante en la pandemia del COVID-19. Mediante el uso de una metodología cuantitativa-descriptiva, participaron 418 estudiantes universitarios de ambos países, reclutados con muestreo no probabilístico. Los resultados obtenidos evidencian que en ambos países hay un aumento de la percepción del odio durante el COVID-19. En este sentido, las formas de violencia más incrementadas son: sexteo, violencia de género y ciberacoso; entre las categorías más afectadas se encuentran los trabajadores del sector sanitario, de supermercados y las personas con discapacidad. Los resultados ponen de relieve la necesidad de tratar el discurso del odio con un enfoque educativo orientado tanto al sentido crítico y responsable de los medios de comunicación como al respeto a la diversidad, la interculturalidad y la educación emocional.

## KEYWORDS | PALABRAS CLAVE

Hate Speech, Cyberhate, Covid-19, Social Networking Sites, University Students, Comparative Study.  
Discurso de Odio, Ciberodio, Covid-19, Redes Sociales, Estudiantes Universitarios, Estudio Comparado



## 1. Introduction

Hate speech research is an interdisciplinary field where intercultural, media-educational and applied research approaches converge. Since the Internet became part of people's daily lives, violent communication exchanges and socially negative attitudes have characterized a part of online relationships. In recent times, due to the advent of social networks on the one hand and the pandemic on the other, online manifestations of hate have increased considerably. In fact, social networks have been configured as scenarios in which episodes of intolerance and violent expressions directed at people who have an ethnic or religious background, a different sexual orientation or a disability are consummated.

Although online hate is recognized as a social problem on a global scale (Malecki, Keating, & Safdar, 2020), to date there is no univocal definition of "online hate" in the literature. Hate speech (Waldron, 2012) indicates any expression (written or oral, verbal or nonverbal, explicit or implicit), containing insults, offenses, or any form of discrimination against individuals or specific social group (Gheno, 2019; Hammooode et al., 2022). Authors such as Galán del Rey (2017) and Megías et al. (2020), define it as a type of symbolic violence that is detrimental to diversity. Other authors propose something similar (Amores et al., 2021; Paasch-Colberg et al., 2021), although they qualify that these are narratives that, depending on their intensity, can be constituted as hate crimes, and occur in the online world as well as in the real world. It is therefore a harmful discourse that feeds on misinformation, and whose purpose is to cause harm to the recipient (Anindita, Sadiyah, & Khoiriyah, 2022; Civila, Romero-Rodríguez, & Aguaded, 2021; Megías et al., 2020; Paris-Albert, 2021; Richardson-Self, 2018). However, online hate acquires specific characteristics (UNESCO, 2015) such as permanence in time, itinerant nature of the message, anonymity and transnationality of the contents.

The expression "hate speech" was introduced in the 1990s, and the exploration of this phenomenon, as well as the commitment to counteract it, are not new in the world of education. In recent years, it has focused on racial hatred and anti-Semitism, having evolved in contemporary society to include religious minorities, especially Muslims (Binny, 2022), as well as women, LGBTQI+ people and disabled individuals. During the COVID-19 pandemic, new categories of people representative of online hate have emerged, e.g., virologists who provided medical and life-related advice in the pandemic by participating in TV shows and talk shows (Barile & Panarari, 2020; Nazem et al., 2023). Healthcare workers became targets on which to vent frustration and aggression over restrictions (Pasta, 2021). Therefore, it is important to investigate how hate speech has evolved during the COVID-19 pandemic, affecting categories of people who were not previously considered.

This approach to hate speech is carried out from different methodological approaches and theoretical approaches. Psychology reflects on this feeling, considering it as an affective disorder defined by a constant need to hurt someone or something. Hatred arising in rivalry, resentment, anger, in the dynamics that animate social differences, in the desire for revenge, ends up increasing these emotional states increasingly charged with violence. According to Sternberg's "triangular structure theory of hatred" (2007), this feeling is characterized by the same dynamics identifiable in love: intimacy (denied), passion and commitment (Bagnato, 2020). From this perspective, hate should not be understood as the antithesis of love; the opposite of hate is not love but indifference. Those who hate, like those who love, want to keep the object of their feelings to themselves. The person who hates lives with his object of hatred on a daily basis, just like the person who loves. Hate, like love, generates dependence on another, and the disappearance of this other can leave the person in sadness and discouragement. Returning to the characteristics, to speak of denial of intimacy means to observe distances from something perceived as negative. It is the "cold hatred" or that feeling of repulsion for the other that pushes the person to take distance from the different perceived as repugnant; an example of this is racial prejudice. Passion has to do with the definition of hatred as anger or fear. In this sense we must speak of "warm hatred" or those who, filled with rancor, attack or flee from the other perceived as harmful. Finally, "cold hatred" understands hatred as excessively belittling the other through contempt and perceives others as inferior.

Sociology, for its part, has reflected on hatred through the so-called "sociology of emotions" that was born in the 1920s with Simmel (1921); recently, new advances in research have defined it as a means of responding to perceived threats. In particular, hatred is interpreted as a social process whose characteristic elements are: the subject possesses a value system that includes intolerance towards groups or individuals, the subject's belonging to a group that shares his or her values, and the perception that his or her values are recognized and justified by the surrounding world.

At the cultural level, hate feeds specific ideologies that seek to justify the emission of aggressive behaviors with

the sole intention of claiming superiority (Bagnato, 2020; Rungfasangaroon & Borwornnuntakul, 2022). Today, digital media have become an integral part of people's lives, they have invaded multiple dimensions of everyday practices; it is a topic of scientific relevance to analyze the impact that their effects have on individual and social life in terms of educational challenges. The continuous overexposure that occurs on the Web through the production and sharing of content, pushes the individual to also have to endure negative manifestations that are of increasing concern worldwide. To try to understand the reasons for the expansion of the hate speech phenomenon, it is necessary to reflect on the advent of Web 2.0. With it, the social nature of the network has come to the forefront. Boyd (2008), in relation to the nature of the social relationships that characterize "connected publics", speaks of four characteristics: 1) the permanent and consistent recording of the traceability of online communicative exchanges; 2) replicability, i.e. the possibility of duplicating content on the network, 3) scalability, i.e. the enormous potential of the visibility of digital content, and 4) searchability.

In this complex situation, the pandemic had a great impact, affecting the consumption of information and news through social networks (Casero-Ripollés, 2020; Demirdağ, 2022). This is because the pandemic, which represents the greatest health challenge that humanity has had to face in this century (OMS, 2021), has had consequences not only in the field of health but also in different spheres of the social space (Ahmed et al., 2020). One of its greatest impacts has resulted in having to endure an information overload that has led to greater dissemination of fake news and greater "toxicity" of messages posted on social networks, particularly Twitter (Aleixandre-Benavent, Castelló-Cogollos, & Valderrama-Zurián, 2020). A study published by the Reuters Institute of the University of Oxford (Majó-Vázquez et al., 2020) found that, in the United States, for example, the percentage of toxic messages posted on Twitter during the pandemic was 25% at the most difficult times. Added to this is the fact that international mobility restrictions emerged during the pandemic. Suffice it to say that, by mid-March 2020, 93 countries had already closed their borders (Pedroza, 2020). International health authorities had even recommended giving priority to movements considered essential such as emergencies, humanitarian activities, return to country of origin and supply of basic necessities (Gursoy & Chi, 2020). However, there is a fine line between the restrictions, partly recommended and partly imposed, by governments and the instrumental use of the pandemic as an argument against international migration considered a threat to the security of states, particularly in Germany, France, Italy, Spain and other European countries (Vega Macías, 2021).

From these references, there are many investigations that address hate speech, but few that do so from an educational approach, and even fewer focused on a population of young university students born between 1995 and 2010 belonging to "generation Z". In this sense, the works of Bazzaco et al. (2018) provide a series of indicators that allow establishing a clear differentiation between hate speech and hate crime, taking into account the content and form of the message, the sender and receiver, the intentionality and channel through which the message is transmitted, as well as the geographic location and social, economic and political climate in which it is carried out. From another perspective, the work of Al Serhan and Elareshi (2019) based on Allport's (1954) scale on prejudice and discrimination, provides us with a gradation of hate levels configured in a pyramidal structure that scales hate speech from prejudicial activities (level 1) to genocide (level 5). Other research is dedicated to delve into the roles that can be exercised within online hate speech, all with the aim of deepening this problem. Exercising the role of troll, "hater" or "stalker" makes us see the need not to stigmatize certain groups because labels increase the depersonalization and vulnerability of the victims; hate speeches are not consubstantial to any particular group. In the first instance, there are neither victims nor aggressors, but rather interchangeable roles (Gao, Liu, & Yaacob, 2022; Megías et al., 2020).

In short, these studies show that the university is no stranger to this problem and lines of research are emerging that focus on the study of individuality versus diversity, emotional education and the narrativity of victims and aggressors in order to build consistent counter-narratives. Therefore, it is necessary to deepen the study of university students' perception of online hateful behaviors, extending the study to a transnational scope that allows comparing different realities. Two apparently similar countries, such as Spain and Italy, approach the issue of online hate differently. Spain is more attentive to raising awareness through information campaigns and national educational projects and has a specific law defining and punishing online hate speech. In Italy, however, awareness campaigns lack national coordination and enforcement of legislation is often lacking (Jubany & Roiha, 2016; Qozmar et al., 2023).

Comparing these two realities is useful to draw guidelines for the construction of a common European policy framework to promote guidelines on responsible and prosocial citizenship with digital literacy (Gaffney et al., 2019) to prevent negative online situations.

## 2. Material and Methods

### 2.1. Hypothesis and Objectives

Social media has contributed to generating new forms of hate communication (Wachs et al., 2022). The COVID-19 pandemic has led to an exponential increase in the use of social media to communicate, and this has increased the risk of becoming online victims or aggressors toward groups of people about whom forms of hate already existed, e.g., homosexuals, women, minors. The combination of these conditions led to the generation of forms of hate towards groups of people who played specific roles during the COVID-19 pandemic (e.g., virologists) or who were targeted for their professions or conditions (e.g., supermarket workers, healthcare workers, vulnerable people) through communication channels. University students belong to “generation Z” and are the first generation in history to have access to the internet and social tools from birth. However, they are not always able to distinguish hateful content, becoming promoters of actions and content that are not recognized and therefore not skillfully managed.

Based on these considerations, our study has the following objectives:

1. To investigate what are the perceptions of a sample of Spanish and Italian university students in relation to the increase of already known online hate speech (e.g. sexting, grooming, cyberbullying, etc.).
2. Analyze their online behaviors as victims and aggressors based on their hate speech.
3. To explore their perceptions regarding the level of online and offline dissemination of forms of hatred towards groups of people who played specific roles during the COVID-19 pandemic.

### 2.2. Participants and Procedure

This study involved 418 university students from Spain and Italy; specifically, 216 Spanish students ( $M=85$   $F=131$ ) and 202 Italian students ( $M=78$   $F=124$ ), selected by “snowball” sampling. This is a non-probabilistic type of sampling that does not allow inferring the entire population covered by the survey, but has the advantage of involving subjects who are more motivated to respond.

The age range was between 18 and 46 years ( $M=21.96$   $SD=3.293$ ),s 46 years ( $M=21.96$   $SD=3.293$ ). The students are undergraduate and master’s degree students at the University of Seville (Spain) and the University of Calabria (Italy). The methodology adopted is quantitative-descriptive, useful both to better conceptualize the phenomenon under study and to formulate hypotheses that will be subjected to empirical control in subsequent research. Data were collected through the administration of an online questionnaire designed ad hoc, from October to December 2021 using two platforms: Google Forms for Spain and Limesurvey for Italy.

At the beginning of the procedure, the student had access to all the information related to the objective, confidentiality and anonymity of the research, as well as the possibility of being able to interrupt his or her participation at any time without having to provide a justification. The average time to complete the questionnaire was approximately 20 minutes.

The research design was conducted in accordance with the research ethics standards established by the Research Ethics Committee of the University of Seville and the Italian Association of Psychology (AIP).

### 2.3. Design of the Instrument

The instrument used for data collection is a self-report questionnaire developed ad hoc and divided into two sections: a) Sociodemographic information and b) Social networks and hate speech.

The first dimension incorporates variables such as age, sex and studies completed by the participants. The dimension on social networks and hate speech is structured in 3 groups of questions: Increase in hate speech with 7 items that are measured with a Likert scale from 1 to 4 points. The second dimension, acted or experienced aggression, is structured by questions in which the participant has to answer whether he/she was aggressor or victim through 11 different forms (e.g. identity theft, insults, image manipulation, etc.).The last dimension, new forms of online and offline hate in times of COVID-19 pandemic, investigates the spread of new forms of hate through 13 items for and 13 items against on specific categories of people; the response options being “no”, “yes, mainly online”, “yes, mainly offline”.

#### 2.3.1. Reliability and Validity Analysis

To determine the degree of reliability of the questionnaire, Cronbach’s Alpha coefficient is applied. This index

measures the degree of agreement between the different items. The reliability coefficient of the questionnaire as a whole is 0.887. This value indicates that the questionnaire presents a good level of reliability. Dimensions D3 Online hatred during COVID-19 (6 items) and D4 New forms of online hatred during COVID-19 (26 items) have a coefficient of 0.833 and 0.912 respectively. Dimensions D1 Aggressor situations and D2 Victim situations have a coefficient of 0.667 and 0.669 respectively. All of them are within the established limits.

To determine the internal validity of the questionnaire, an exploratory factor analysis (EFA) of principal components was performed. We previously applied the Kaiser-Meyer-Olkin sampling adequacy test and Bartlett's test of sphericity in order to verify the relevance of carrying out the aforementioned analysis. For the interpretation of the KMO value, the indications of Kaiser (1974) were taken as a reference. It should be specified that, of all the dimensions presented above in the reliability analysis, only D3, which refers to the forms of online hatred during COVID-19, is susceptible to this analysis because it is the interval variable. The result obtained in the first test is .793 and in Bartlett's test we obtained a Chi-square = 964.152  $gl = 15$  and Sig. = .000, which indicates that it is pertinent to proceed with the factor analysis. The exploratory factor analysis applied yields a single factor that explains 54.664% of the total variance, with a significance level of  $p = .000$ . The values obtained for each of the items are racism ,740; xenophobia ,733; cyberbullying ,730; gender violence ,777; grooming, 764; sexting ,688.

### 2.3.2. Data Analysis Techniques

With the data collected in the two countries, a single data file was created and analyzed with the IBM SPSS Statistic program, version 26. The results showed that the sample was unbalanced by gender, with a greater presence of women. Similarly, according to the respondents, it was not possible to create groups with respect to age. This is an unintentional selection bias which, however, did not prevent controlling for the variable Country, on which subsequent bivariate analyses were performed to identify any correlations and differences between two or more variables.

## 3. Results

The results obtained in relation to the research objectives of the study are presented below.

### 3.1. Forms of Online Hatred

In relation to the first research objective, the results shown in Table 1 provide the information obtained. In general, we can highlight that in both contexts an increase is perceived in all forms of online hate presented to the participants. A more detailed analysis of the same, taking into account the sum of the "quite a lot/much" scores, we can see that in both countries they perceive the increase of cyberbullying. In the case of Spain there is a higher perception in the increase of sexting (89.3%). And in the case of Italy there is a greater perception of the increase in cases of racism (77.7%) and gender violence (84.2%).

Table 1: How Much do You Think Hate Speech has Increased? During the Covid-19 PAndemic?

	Spain and Italy		Spain		Italy	
	None/Little	Fairly/Much	Nothing/ Little	Fairly/Much	Nothing/ Little	Fairly/Much
Racism	30,2%	69,9%	37,5%	62,5%	22,3%	77,7%
Xenophobia	34,3%	65,8%	37,1%	63,0%	31,1%	68,8%
Cyberbullying	14,6%	85,4%	14,4%	85,7%	14,9%	85,1%
Gender violence	21,0%	79,0%	26,0%	74,1%	15,8%	84,2%
Grooming	34,2%	65,8%	35,1%	64,8%	33,1%	66,9%
Sexting	18,2%	81,8%	10,7%	89,3%	26,2%	73,8%

### 3.2. Role of Aggressor

In relation to the second research objective, 167 (40%) of 418 subjects answered this question; the modalities in which the participants exercise online violence are in the variants of spreading rumors, insulting other people and disseminating compromising videos or photos, with percentages of 49.1%, 34.1% and 23.4% respectively.

Going deeper into the data on the profile of the aggressor, according to the country variable (Spain/Italy), in Table 2 we find that, with the exception of the variable related to the dissemination of videos or

photos online, where Spain presents a higher percentage in this form of online violence, in the rest of the situations it is the Italian context that acquires higher percentages.

**Table 2: Contingency Table of Online Aggressor by Countries.**

		Spain	Italy	Responses	% of Cases
Insults towards another person	NO.	20	37	57	34,1%
	% in Country	22,5%	47,4%		
Insults towards another person with the participation of a third party	NO.	8	20	28	16,8%
	% in Country	9,0%	25,6%		
Threats	NO.	0	12	12	7,2 %
	% in Country	0,0%	15,4%		
Social Networking Account Theft	NO.	2	26	28	16,8%
	% in Country	2,2%	33,3%		
Theft and impersonation	NO.	4	10	14	8,4%
	% in Country	4,5%	12,8%		
Disseminate private information	NO.	9	23	32	19,2%
	% in Country	10,1%	29,5%		
Compromising videos or photos	NO.	22	17	39	23,4%
	% in Country	24,7%	21,8%		
Image manipulation	NO.	6	20	26	15,6%
	% in Country	6,7%	25,6%		
Social exclusion in networks	NO.	4	23	27	16,2%
	% in Country	4,5%	29,5%		
Spreading rumors	NO.	43	39	82	49,1%
	% in Country	48,3%	50,0%		

In summary, we can say that the role of aggressor is configured by three online behaviors: insults to other people, compromising videos or photos, and spreading rumors. If we analyze this aggressor profile according to country of origin, we can conclude that in both countries the most repeated behavior is spreading rumors, to which we can add insulting other people in Italy.

### 3.3. Role of Victim

From the role of victim, 247 (59.1%) of 418 subjects responded to this question, the situations of online violence suffered are the fact of receiving insults (47%), the spreading of rumors (36.8%) and the theft of their accounts in social networks (30%). Once again we see how the participant's country variable interferes. Starting with the origin of the participants, in Table 3 we find the associated information. In the case of Spain, the victim profile would be around the actions of insults to me, with and without the participation of third parties, threats, identity theft and impersonation, dissemination of compromising videos or photos and rumors. In the case of Italy, we find account theft in social networks, dissemination of private information and exclusion in the networks.

**Table 3: Contingency Table of Online Victims by Countries.**

		Spain	Italy	Responses	% of Cases
Insults to me	NO.	69	47	116	47,0%
	% in Country	51,9%	41,2%		
Insults about me to others	NO.	30	18	48	19,4%
	% in Country	22,6%	15,8%		
Threats	NO.	30	15	45	18,2%
	% in Country	22,6%	13,2%		
Theft of my Social Media account	NO.	30	44	74	30,0%
	% in Country	22,6%	38,6%		
Theft and impersonation	NO.	25	18	43	17,4%
	% in Country	18,8%	15,8%		
Disseminate private information	NO.	17	17	34	13,8%
	% in Country	12,8%	14,9%		
Compromising videos or photos	NO.	14	7	21	8,5%
	% in Country	10,5%	6,1%		
Image manipulation	NO.	9	8	17	6,9%
	% in Country	6,8%	7,0%		
Social exclusion in networks	NO.	13	23	36	14,6%
	% in Country	9,8%	20,2%		
Spreading rumors	NO.	51	40	91	36,8%
	% in Country	38,3%	35,1%		

Consequently, the role of victim is configured by three online behaviors: receiving insults, theft of my social network account and spreading rumors. If we analyze by country of origin, we can conclude that in both countries the most repeated behavior is spreading rumors and insults against me, to which is added in Italy social exclusion from social networks and the theft of my social network account; in Spain this profile also takes the form of threats, identity theft or impersonation and insults about me to others.

### 3.4. Hate Speech During the COVID-19 Pandemic

Finally, we address the third objective of this research. For the analysis of this dimension, the variables are grouped according to the following categories:

1. People (health personnel, supermarket personnel, virologists, people from other countries, people with disabilities).
2. Governmental guidelines/decrees (vaccine, Covid certificates, schools).
3. Ideologies (conspiracy, religion, political ideology, sexual orientation).

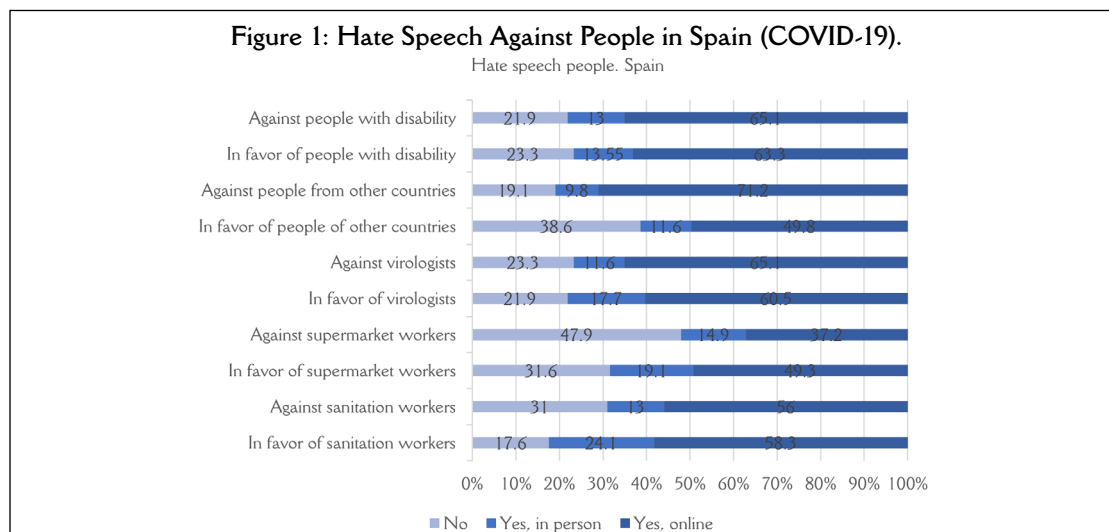
The data obtained are presented in Table 4.

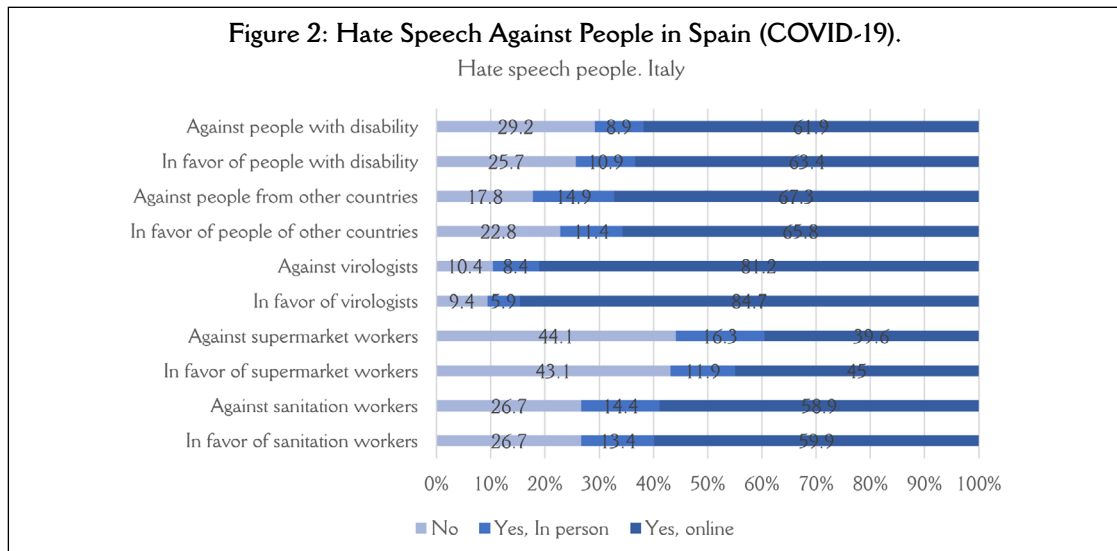
Table 4: Hate Speech.

	Spain and Italy			Spain			Italy		
	No	Yes, in person	Yes, Online	No	Yes, in person	Yes, Online	No	Yes, in person	Yes, Online
In favor of the people	26,03	14,21	59,76	26,48	17,50	56,02	25,54	10,69	63,76
Against individuals	27,13	12,54	60,33	28,52	12,50	58,98	25,64	12,57	61,78
In favor of governmental guidelines	11,72	19,08	69,20	15,51	20,49	64,00	7,67	17,57	74,75
Against governmental guidelines	10,29	19,08	70,63	13,43	18,29	68,29	6,93	19,93	73,14
In favor of ideologies	23,56	13,70	62,74	26,27	14,93	58,80	20,67	12,38	66,96
Against ideologies	23,56	13,22	63,22	26,85	13,54	59,61	20,05	12,87	67,08

In general, we conclude that these new forms of hate violence are significantly manifested in their online variant, exceeding 55% in all cases. If we look at the three macro areas established, the results show that most of the new forms of hate speech refer especially to government actions related to vaccination, COVID certificate, schools, being slightly higher in Italy (in favor 74.75%; against 73.14%) than in Spain (in favor 64%; against 68.29%). However, we thought it would be interesting to include the graphs below regarding hatred towards people, because during the COVID-19 pandemic new categories emerge that are affected by this type of discourse. In Spain, people with disabilities and people from other countries are the most affected by online hate; in Italy, virologists, supermarket workers and health workers are the most affected by online hate.

Figure 1: Hate Speech Against People in Spain (COVID-19).





#### 4. Discussion and Conclusion

When communicative situations arise, points of disagreement can be generated between people, in which individual positions are opposed, which leads to ignoring or even to attacks against those who think differently (Robles et al., 2022). In this sense, the results obtained allow us to affirm that the Internet, even during the COVID-19 confinement, has performed its communicative function by expanding and compensating the need for socialization, but at the same time manifestations of hatred have continued to occur online, in which users expressed emotions related to anger, rage and confusion (Adesokan, Madria, & Nguyen, 2023; Fteiha et al., 2024). Generically, we can conclude that there are no significant differences between the two countries in relation to the spread of online hate during the COVID-19 pandemic. This allows us to hypothesize that the pandemic has had a global effect (Amaral, Basílio-Simíµes, & Poleac, 2022; Hsu & Tsai, 2022; Mora-Rodríguez & Melero-López, 2021). Based on the results obtained, the perception regarding the most increased forms of violence during COVID-19 were: sexting, gender-based violence and cyberbullying.

In addition to social relationships, many young people have had to resort to electronic tools to maintain their romantic relationships during confinement (Lindberg et al., 2020), with an increase in online sexual activities, including sexting (Alpalhão & Filipe, 2020; Lindberg et al., 2020), a practice suggested by public health institutions as a safer alternative to prevent contagion (ISSWSH, 2020). Many young people were accustomed to casual sexual encounters or noncommittal sex, which was largely prohibited during the pandemic (Wignall et al., 2021). Again, sexting and online sexual activities may have been a safer way to satisfy sexual desire. In general, many young people have been confined to their homes with their families, a condition that has drastically reduced their independence (Hall & Zygmunt, 2021) and change of daily habits (Gassó et al., 2021), therefore, online sexual communication has become one of the few available means to express one's sexuality.

Women's participation in the online space has always been marked by concerns about their safety and particularly the issue of their vulnerability to online sexual predators (Jane, 2014; Vitis & Gilmour, 2017). Since the onset of the pandemic, the scale of domestic violence has increased, as has online gender-based violence through the sharing of nonconsensual images and videos, including consensual sexting content shared without consent. The increase in this phenomenon may be due on the one hand to the pandemic that has exposed high levels of anxiety and stress (García-Fernández et al., 2022; Servidio et al., 2021), and, on the other hand, home confinement that requires forced and prolonged cohabitation 24 hours a day between aggressors and victims.

Studies on cyberbullying confirm that the high disinhibition provided by being behind a screen pushes people to expose themselves by saying and doing things that in a face-to-face situation they would not do. This is because they have the certainty that they cannot be identified (Smith & Berkun, 2017). Consequently,

being in a homebound condition with the relative increase in time spent using the Internet and electronic tools has contributed to increased levels of cyberbullying (Palermi et al., 2022). In this sense, it becomes necessary to educate by offering strategies to manage conflicts, develop the ability to manage negative emotions and frustration management to avoid hate speech (Wachs et al., 2022).

Regarding the dissemination of forms of online hate in established areas (people, governmental guidelines, ideologies), governmental guidelines must be influenced, thus imposing some restrictions (Mora-Rodríguez & Melero-López, 2021). In this context, people have been forced to be vaccinated in order to have access to services, work, as well as the possibility of moving within the local, national and international territory. The fact that students are perceived as the most affected category is determined by the impact that these measures have on their personal freedom, which was limited.

Moreover, the analysis of the results shows an increase in hatred towards some new categories of people, compared to the categories that had so far been considered by the Pre-COVID hate speech literature, e.g., women, homosexuals, disabled, etc. (Ponziano, 2020). Our results provide that, during this period, the categories most affected by the online hate phenomenon were those directly related to the pandemic, e.g., health care workers, supermarket workers and people with disabilities. These results allow us to advance research on hate speech.

Probably the increase of hatred towards these categories was due to the fact that some of them were more exposed to public opinion. Some, such as virologists, were called to intervene in two phases, the first related to information on the spread of the virus, the second linked to the vaccination awareness campaign. In both cases, their visibility fueled online hate sentiments based on the roles they assumed (Crescentini & Padricelli, 2023).

In general, being an active part of the community leads individuals to take responsibility for their actions, which have repercussions not only on the individual, but also on the community as a whole (Gomez-Baya et al., 2020).

The purpose of the media during the vaccination campaign was also to raise awareness about vaccination for personal and community benefits. The different positions of those who have had media prominence have also made the public take extreme positions that, in many cases have been translated into online hate actions, because the means of communication used by virologists have been many times the social networks. Another important aspect to underline is the hatred towards some other categories such as supermarket staff or health personnel, who on the one hand were considered privileged, being the only ones who could continue to lead an almost normal life, while at the same time being considered as possible spreaders of the virus.

It is necessary to mention the limitations of this study, the first being the focus on two specific contexts, Spanish and Italian, and it may be of interest to extend the study to other contexts in order to consolidate the evidence obtained so far. Likewise, as future lines of research, it would be advisable to deepen the study by addressing the narratives of the participating population, thus delving into the perceptions of the subjects referred to the object of study, as well as the motivations that lead to the perpetration of hate speech (Wachs et al., 2022). In the case of racism, it would be of interest to delve into how it affected people of Asian origin, since this is the continent where the pandemic originated (Odağ & Moskovits, 2024).

In a prospective sense, it would be interesting to investigate with future research whether the data obtained in this investigation have undergone any modification throughout the evolution of the pandemic: identifying whether perceptions are maintained or have changed would allow us to verify whether these categories definitively become part of the target groups of hate speech.

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