MEAI-Vol.3. N1. 002

Design of interactive virtual worlds to strengthen the participation of university students in digital educational environments

Diseño de mundos virtuales interactivos para fortalecer la participación de estudiantes universitarios en entornos educativos digitales

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Received: 27- December-2026 **Accepted:** 25-February-2026 **Published:** 30-March-2026

How to cite this article:
Cabrera Gómez, T. del C., Ríos Venegas, R., González Roblero, S. I., & Rincón Meneses, L. P. (2026). Diseño de mundos virtuales interactivos para fortalecer la participación de estudiantes universitarios en entornos educativos digitales. Medición Y Evaluación Del Aprendizaje Inclusivo, 3(1), 1-20. https://doi.org/10.63688/mzkpd918

ABSTRACT

The purpose of this study was to analyze the conceptions that university students have about the design of interactive virtual worlds as a teaching practice that promotes participation in digital teaching environments. The research was carried out within the qualitative, descriptive-exploratory and empirical approach. The participation was made up of a total of 112 university students from the degrees of Education, Engineering, Business Administration and Social Sciences based on a sampling by intentional criteria. The data were collected from a questionnaire of open questions, discussion groups and observation notes, from a pilot experience of a 3D virtual classroom analyzed from the thematic analysis. The results show how the aspects of immersion, the use of avatars, multimedia resources or collaborative activities encourage motivation, interaction and participation of students in virtual worlds, but also obstacles such as connectivity, dispositive limitations, the learning curve at the beginning of the experience and an excess of visual stimuli. Interactive virtual worlds can achieve university participation but only if there is an academic orientation in their purposes, teaching mediation, technical accessibility and collaborative activities with a pedagogical purpose.

Keywords: virtual worlds, higher education, student participation, immersive learning, digital educational environments.

RESUMEN

El propósito de este estudio fue analizar las concepciones que tienen el alumnado universitario acerca del diseño de mundos virtuales interactivos como una práctica de enseñanza que promueve la participación en entornos digitales de enseñanza. La investigación se llevó a cabo dentro del enfoque cualitativo, descriptivo-exploratorio y empírico. La participación estuvo constituida por un total de 112 estudiantes universitarios de las titulaciones de Educación, de Ingeniería, de Administración de empresas y de Ciencias sociales partiendo de un muestreo por criterios intencionales. Los datos fueron recogidos a partir de un cuestionario de preguntas abiertas, grupos de discusión y notas de observación, a partir de una experiencia piloto de aula virtual en 3D analizados a partir del análisis temático. Los resultados evidencian como los aspectos de la inmersión, el uso de avatares, los recursos multimedia o las actividades colaborativas incitan a la motivación, a la interacción y a la participación del alumnado en los mundos virtuales, pero también obstáculos como la conectividad, limitaciones dispositivas, la curva de aprendizaje al principio de la experiencia y en exceso de estímulos visuales. Los mundos virtuales interactivos pueden lograr la participación universitaria pero siempre y cuando hay una orientación académica en sus propósitos, una mediación docente, accesibilidad técnica y actividades colaborativas con propósito pedagógico.

Palabras clave: mundos virtuales, educación superior, participación estudiantil, aprendizaje inmersivo, entornos educativos digitales.

1. INTRODUCTION

Digital transformation has significantly modified the dynamics of teaching and learning in higher education, especially due to the incorporation of platforms, digital resources and environments mediated by emerging technologies. Al-Qaimari (2025) argues that university institutions face the challenge of integrating digital strategies that not only modernize their processes, but also respond to new forms of academic interaction. Along the same lines, university digitalization has ceased to be understood as an instrumental process limited to the use of platforms, to become a structural transformation that affects management, teaching, evaluation, and the student experience (Díaz-García et al., 2022).

During the last few years, higher education has undergone an accelerated transition towards hybrid and digital models, which has generated opportunities, but also tensions related to student participation, motivation, and interaction. Laufer et al. (2021) warn that digital education can act as a bridge or as a factor of exclusion, depending on the institutional, pedagogical, and technological conditions available. Therefore, strengthening digital competence in higher education is a necessary condition for students and teachers to be able to function effectively in technology-mediated educational environments (Zhao et al., 2021). However, the use of traditional virtual platforms does not always guarantee active student participation. In many cases, digital environments reproduce passive practices focused on the reception of content, without promoting collaborative, immersive or participatory experiences. Shah et al. (2021) point out that motivation in online learning is related to autonomy, interaction, and a sense of belonging within the training process. Similarly, Meroño et al. (2021) highlight that digital pedagogy acquires greater value when it is articulated with cooperative methodologies and activities that require active participation, not just connection to a platform.

In this context, interactive virtual worlds emerge as an alternative to redesign digital educational experiences. These environments allow students to interact through avatars, traverse three-dimensional scenarios, explore multimedia resources, and participate in collaborative activities within simulated spaces. Radianti et al. (2020) identify that immersive virtual reality in higher education offers relevant possibilities to improve interaction, visual representation of content, and experiential learning. Likewise, Kuhail et al. (2022) suggest

that immersive experiences favor the active exploration of knowledge, as long as they are linked to clear pedagogical objectives.

Recent literature also shows a growing interest in the use of virtual reality, metaverse, and virtual worlds in university education. Caballero-Garriazo et al. (2023) show that virtual reality has been applied in different university contexts to strengthen teaching, simulation, and student participation processes. In turn, Conrad et al. (2024) indicate that the effectiveness of immersive learning depends on factors such as the design of the experience, user interaction, cognitive load, and the didactic relevance of the resource. Therefore, the educational value of these environments does not lie only in their technological novelty, but also in the way in which they are designed and integrated into the training process.

The educational metaverse and virtual worlds have expanded the possibilities of social interaction in higher education, by allowing for closer, more collaborative, and visually immersive experiences. Lin et al. (2025) highlight that virtual worlds and the metaverse offer opportunities to analyze learning practices, academic performance, and social interaction in university contexts. In a complementary way, Meléndez Araya et al. (2024) point out that metaverses applied to education require a critical look that considers their benefits, limitations, access conditions, and pedagogical sense. This is relevant, because the mere incorporation of virtual scenarios does not ensure an automatic improvement in student participation.

In Latin America, the use of virtual reality in university education is still in a consolidation phase, with important advances, but also with technical, pedagogical and institutional challenges. Jimbo Román et al. (2024) highlight that virtual reality in higher education offers meaningful experiences for students, although its implementation requires planning, teaching accompaniment, and adaptation to the real conditions of each context. This perspective allows us to understand that the design of interactive virtual worlds must respond to both technological criteria and specific training needs.

Student participation is a central dimension to assess the relevance of these environments. Inman et al. (2020) explain that student engagement can be understood as a multidimensional phenomenon related to behavioral, affective, and cognitive aspects. From this perspective, participating does not only mean attending or connecting to an activity, but also actively getting involved, interacting with others, assuming responsibilities and building

meaning within the learning process. Consequently, interactive virtual worlds can be relevant if they promote motivation, collaboration, communication, and active permanence in the educational experience.

Despite the growth of studies on virtual reality, metaverse, and higher education, there is still a need to deepen the understanding of how university students perceive these environments and which design elements they consider most important to strengthen their participation. Most of the contributions have focused on describing general benefits of technology, but it is necessary to analyze the student experience from an empirical and qualitative perspective. This gap is especially important in university contexts where digitalisation is progressing unevenly and where participation does not depend only on technological resources, but also on teaching mediation, accessibility, activity design and peer interaction.

Based on the above, the present study aimed to analyze the perceptions of university students about the design of interactive virtual worlds as a strategy to strengthen participation in digital educational environments. The research was developed from a qualitative and empirical approach, considering a pilot experience with university students who interacted directly in a virtual world designed for academic purposes. With this, it was sought to identify the elements of design, interaction, motivation, collaboration and accessibility that affect student participation within these environments.

2. METHODOLOGY

The research was developed under a qualitative approach, with an exploratory-descriptive design. This approach made it possible to analyze the perceptions of university students about the design of interactive virtual worlds as a strategy to strengthen participation in digital educational environments. The study was empirical in nature, because the data were obtained from a pilot experience in which participants interacted directly with a virtual world designed for academic purposes.

The study was oriented from an interpretive perspective, as it sought to understand the meanings that students attributed to immersion, interaction, collaboration, and motivation within a three-dimensional virtual environment. This orientation was pertinent because the main interest was not to measure academic performance statistically, but to interpret how participants valued the learning experience and which elements of the virtual design favored or limited their participation.

The sample consisted of 112 university students selected through intentional sampling by criteria. The participants were studying between the third and eighth semester in careers related to Education, Engineering, Administration and Social Sciences. Their ages ranged from 18 to 27 years old. Regarding the distribution by sex, 64 women and 48 men participated. As inclusion criteria, it was considered that the students had previously used digital learning platforms, that they participated in the pilot experience with the interactive virtual world and that they voluntarily agreed to be part of the study. Students who did not complete the pilot activity or who did not respond to the information collection instrument were excluded.

The pilot experience was developed in a three-dimensional virtual classroom designed to promote academic interaction between students. During the activity, participants entered the environment through avatars, toured virtual spaces, reviewed multimedia resources, participated in a collaborative dynamic, and responded to a discussion guided by the teacher. This experience allowed the students' answers to be based on a direct experience with the virtual world, and not only on general opinions about the use of educational technologies.

Information collection was carried out through an open questionnaire applied to the 112 participants. The instrument was made up of questions aimed at exploring the students' perception of immersion in the environment, interaction through avatars, motivation to participate, collaborative work, the teaching role, accessibility, and the technical or pedagogical barriers identified during the experience. This technique allowed us to collect broad and diverse responses, in accordance with the qualitative approach of the study.

In addition, four focus groups were conducted with students selected from the initial sample. Each group was made up of participants from different academic areas, with the purpose of contrasting and expanding the findings obtained in the open questionnaire. The focus groups allowed to deepen the opinions of students on the elements that facilitated participation, the limitations of the virtual environment and the improvements necessary to strengthen its application in higher education.

Observation notes were also used during the development of the pilot experience. These notes made it possible to record behaviors, access difficulties, forms of interaction, levels of participation and relevant situations observed during the use of the virtual world. The incorporation of this complementary technique strengthened the triangulation of

information and made it possible to contrast what was expressed by the students with what was observed during the activity.

The open questionnaire was subjected to a validation process through the judgment of three experts in educational technology, higher education and qualitative methodology. The specialists evaluated the clarity, relevance, coherence and sufficiency of the questions in relation to the objective of the study. Subsequently, a pilot test was carried out with students with similar characteristics to the final sample, which allowed adjusting the wording of some items and improving the sequence of the instrument.

The investigation procedure was developed in several phases. First, students were informed about the purpose of the study and asked to volunteer. Then, the pilot experience was executed in the interactive virtual world. Subsequently, the open questionnaire was applied to the 112 participants and the focus groups were organized. Finally, the responses obtained were transcribed, organized and analyzed along with the observation notes recorded during the experience.

The analysis of the information was carried out through thematic analysis. In the first phase, a general reading of the answers was carried out to familiarize themselves with the data. Then, units of meaning related to immersion, social interaction, motivation, collaboration, pedagogical design, and implementation barriers were identified. Subsequently, these codes were grouped into categories and subcategories, which were revised to ensure internal coherence and direct relationship with the objective of the research.

The final categories of analysis were: educational immersion, social interaction through avatars, student participation, academic collaboration, pedagogical design of the virtual world and implementation barriers. These categories allowed us to organize the results in an interpretative way and to understand the aspects that strengthened or limited the participation of university students in the digital educational environment.

To guarantee the qualitative rigor of the study, criteria of credibility, transferability, dependency and confirmability were applied. Credibility was strengthened through the triangulation of open-ended questionnaires, focus groups, and observation notes. Transferability was addressed through a detailed description of the context, the sample and the pilot experience. The unit was ensured through a systematic coding and categorization

procedure. Finally, confirmability was favored through constant review of data and linking interpretations with participants' responses.

3. RESULTS

The thematic analysis of the open questionnaires, focus groups and observation notes allowed us to identify four central axes associated with student participation in interactive virtual worlds: educational immersion, social interaction, collaborative participation and pedagogical implementation conditions. These axes synthesize the perceptions of the 112 students who participated in the pilot experience and allow us to understand which elements of the environment strengthened or limited their academic involvement.

Table 1

Core Categories of Thematic Analysis

Category	Analysis Approach	Main finding
Educational immersion	Attention, presence and exploration of the virtual environment	The three-dimensional classroom generated more initial interest and favored a more active experience than traditional platforms.
Social Interaction	Communication through avatars and peer relationships	The avatars facilitated digital proximity and promoted greater willingness to participate.
Participation and collaboration	Motivation, initiative, group work and permanence in the activity	Participation increased when tasks were collaborative, clear, and oriented towards a common product.
Pedagogical design and barriers	Instructions, resources, teaching support, connectivity and accessibility	The effectiveness of the virtual world depended on the didactic design and the technical conditions of access.

Note. Prepared by the author based on the thematic analysis of open questionnaires, focus groups and observation notes.

Educational immersion

Educational immersion was one of the aspects most valued by the participants. The three-dimensional classroom aroused curiosity, attention and a more active sense of

presence than that experienced in traditional virtual platforms. The students highlighted that walking through spaces, observing resources and moving within the environment made the activity feel less static and closer to an interactive learning experience.

However, immersion didn't rely solely on visual design. Participants noted that the experience was most useful when the tour was accompanied by clear instructions and a defined academic purpose. In cases where students did not immediately understand how to get around or what they should do, attention was focused on solving technical aspects rather than on academic activity.

Social interaction through avatars

The use of avatars strengthened the interaction between students, because it allowed a visual representation within the same digital space. Participants perceived greater closeness with their peers when observing their movements, locations, and interventions in the virtual classroom. This dynamic facilitated communication during group activities and generated greater willingness to participate.

However, the vicissitudes also required pedagogical guidance. Some students initially focused on exploring or personalizing their digital representation, which generated moments of dispersion. Therefore, the avatar was more effective when it was linked to specific roles, tasks or collaborative dynamics.

Table 2

Elements of the virtual world that favored student participation

Identified Element	How it manifested itself	Contribution to participation
Three-dimensional classroom	The students toured spaces, observed resources and explored digital scenarios.	Increased curiosity and attention during the experience.
Using Avatars	Participants represented themselves digitally and interacted with their peers.	It generated a sense of presence and greater closeness in communication.

Identified Element	How it manifested itself	Contribution to participation
Multimedia resources	Visual materials, links, images and interactive objects were used.	They helped maintain interest when they were engaged in the task.
Challenge activities	The students had to solve a task within the virtual environment.	They promoted initiative, search for information and active participation.
Collaborative work	The groups organized ideas and built common responses.	It favored dialogue, cooperation and shared responsibility.
Teacher feedback	The teacher guided the tour, resolved doubts and guided the discussion.	It reduced the dispersion and gave academic meaning to the experience.

Note. Own elaboration.

Academic participation and collaboration

Student participation increased when activities were organized as challenges, guided tours, or collaborative assignments. The students became more involved when they understood what they had to solve and how their intervention contributed to the group's outcome. This situation showed that the virtual world did not generate participation on its own, but when it was integrated into a clear academic dynamic.

Collaboration was most visible in tasks that required dialogue, coordination, and the construction of a common response. The groups were able to organize ideas and make decisions within the virtual environment, which strengthened peer interaction. However, differences were also identified in the level of participation of some members, so it was considered necessary to assign specific roles, times and products within each activity.

Table 3

Pedagogical conditions necessary for the use of interactive virtual worlds

Pedagogical condition	Description	Involvement for the design of the environment
Clear academic objective	The activity must respond to a defined training purpose.	It prevents the virtual world from being used only as a visual or recreational resource.
Precise instructions	Students need to know what to do, how to get around, and what product to deliver.	It reduces initial confusion and improves the fluidity of participation.
Collaborative activities	The tasks must require dialogue, coordination and joint construction.	It turns the environment into a space for academic interaction.
Relevant Resources	The objects, links and materials must be related to the content of the subject.	Strengthens the connection between technology and learning.
Teacher mediation	The teacher must guide, accompany and provide feedback on the experience.	It maintains the pedagogical approach and avoids dispersion.
Evaluation of the experience	The activity must close with reflection, product or evidence of learning.	It allows participation to be valued and future implementations to be improved.

Note. Own elaboration.

Pedagogical design and implementation barriers

The pedagogical design was decisive for the virtual world to be perceived as an academic resource and not just as a novel technological experience. Participants rated multimedia resources positively when they were related to the activity. On the other hand, visual elements without a clear function were considered distracting or unnecessary.

Barriers that affected the fluidity of the experience were also identified. The most frequent were unstable connectivity, the limitations of some devices and the initial learning curve. These difficulties did not prevent the development of the activity, but they did show the need to plan a brief induction phase before using virtual worlds for academic purposes.

Table 4

Identified barriers and recommendations for improvement

Barrier identified	Effect on experience	Recommendation for improvement
Unstable connectivity	He interrupted the continuity of some participations.	Verify connection conditions before the activity and offer access alternatives.
Device limitations	Reduced navigation fluency in certain students.	Design lightweight environments that are compatible with mid-range equipment.
Initial learning curve	Some participants required time to adjust to the use of the environment.	Incorporate a brief induction phase before the academic activity.
Excess visual stimuli	It generated distraction when the elements were not linked to the task.	Prioritize functional resources and eliminate unnecessary decorative elements.
Scattered use of avatars	Some students focused on moving or customizing the avatar.	Integrate the avatar into specific roles, tasks or collaborative dynamics.
Lack of pedagogical guidance	The experience could turn into exploration with no academic purpose.	Maintain teaching accompaniment during the tour and the final discussion.

Note. Own elaboration.

Summary of findings

The results showed that interactive virtual worlds can strengthen the participation of university students when they integrate immersion, social interaction, collaboration and teacher mediation. The three-dimensional environment generated interest and favored peer communication, but its effectiveness depended on the clarity of the activities and the relevance of the resources used.

Consequently, the design of virtual worlds for higher education must be assumed as a pedagogical process and not only technological. Student participation was strengthened when the environment allowed for action, collaboration, and the construction of responses with academic sense. Conversely, technical barriers, lack of guidance, and excess visual stimuli limited the experience of some participants.

4. DISCUSSION

The findings show that interactive virtual worlds can strengthen student participation when integrated into a clear pedagogical proposal. Immersion, exploration of the three-dimensional classroom and the use of avatars generated greater willingness to participate, but their educational value depended on teacher guidance, the relevance of resources and the clarity of tasks. This result coincides with Barja-Ore et al. (2023), who identify that virtual reality has gained visibility in education due to its ability to expand the forms of interaction and representation of knowledge.

The participation observed in the pilot experience did not occur only because of the technological novelty, but also because of the relationship between activity, collaboration and accompaniment. In this sense, the results are close to what was proposed by Domínguez et al. (2021), who argue that interactive learning in large groups requires structured interventions to improve the perception of the learning environment. Therefore, the virtual world should not be understood as an automatic substitute for the class, but as a space that needs didactic planning to generate real participation.

The use of avatars favored communication between students and produced a feeling of closeness within the digital environment. This finding is related to Domínguez and Vega (2020), who show that interactive environments can favor the organization and synthesis of information when articulated with active learning strategies. In the present study, interaction through avatars made more sense when it was linked to challenges, collaborative tasks or specific academic products.

Likewise, the results show that student participation increased when the virtual environment led to collaborative activities. This allows us to affirm that the social dimension of learning remains central even in immersive digital spaces. Williams et al. (2024) highlight that active methodologies favor learning strategies when they promote student involvement, reflection, and participation. Similarly, in this study, participants valued the virtual world

more when it allowed them to dialogue, coordinate actions, and construct responses with their peers.

Teacher mediation appeared as a decisive condition to prevent the virtual world from becoming a dispersed experience. Students needed guidance to understand the purpose of the activity, navigate the environment, and link digital resources to learning. This finding coincides with Cabero-Almenara et al. (2021), who point out that teachers' digital competence is a relevant factor for the appropriate use of technologies in training contexts. Thus, the success of a virtual world does not depend only on the tool, but on the teaching capacity to turn it into a didactic experience.

Multimedia resources were positively valued when they were related to academic activity. On the other hand, visual elements without a pedagogical function were perceived as distracting. This result is linked to Garrido Astray et al. (2019), who highlight that digital resources contribute to learning when they strengthen specific competencies and are integrated in a coherent way with training objectives. Therefore, the design of virtual worlds must avoid the accumulation of stimuli and prioritize functional resources.

The identified technical barriers, such as unstable connectivity, device limitations, and initial learning curve, show that the implementation of virtual worlds requires minimal institutional conditions. Pinargote Castro et al. (2024) warn that the accessibility of virtual and augmented reality in university education depends on strategies that consider benefits, challenges, and conditions of use. In this study, these barriers did not impede the experience, but they did condition the fluidity of participation of some students.

The findings also dialogue with Escandell Rico and Pérez Fernández (2024), who highlight that simulation with virtual reality can enrich university education when it is oriented towards practical and situated experiences. Although the present study did not focus on clinical simulation, it did show that the immersive experience was more valued when students were able to act, explore and solve tasks within the environment. This reinforces the idea that participation improves when the student stops being a passive receiver and assumes an active role.

Similarly, Galecio Mora et al. (2025) point out that virtual learning environments should be analyzed from their ability to organize resources, facilitate interaction, and respond to specific educational needs. Correspondingly, the results of this study show that the

virtual world was perceived as useful when it integrated intuitive navigation, relevant resources, collaborative activities, and feedback. Without these elements, the environment runs the risk of being valued only as a superficial innovation.

Although the study focused on interactive virtual worlds, its results also relate to recent transformations in assessment and teaching mediated by emerging technologies. Martínez-Comesaña et al. (2023) argue that the incorporation of advanced technologies in education requires a review of teaching and assessment methods to avoid instrumental or uncritical uses. In this sense, interactive virtual worlds must be designed as comprehensive pedagogical experiences, where participation, collaboration and reflection have greater importance than technological novelty.

Overall, the discussion confirms that interactive virtual worlds have the potential to strengthen university participation, as long as they are integrated with clear pedagogical criteria. Immersion and avatars may generate initial interest, but sustained participation depends on meaningful activities, teacher mediation, technological accessibility, and resources linked to academic objectives. Therefore, the contribution of the study lies in showing that the design of these environments should focus on the educational experience of the student and not only on the incorporation of immersive technology.

5. CONCLUSIONS

The interactive dimensions of virtual worlds resulted in the participation of university students as virtual worlds were designed as active, collaborative and guided learning environments. The pilot experience showed that immersion, exploration of the three-dimensional classroom and the use of avatars produced greater initial interest compared to conventional digital platforms.

The participation of the students did not depend only on the technological novelty of the virtual world, but was also engendered by the clarity of the tasks, the opportunity of the employees, the accompaniment of the teacher. In this way, the virtual world was considered sufficient from an educational point of view when it managed to solve tasks, dialogue with students and create academic products with formative meaning.

The use of avatars favored social interaction and the feeling of presence in the virtual environment, but their effectiveness was related to the existence of roles, periodic

instructions and specific cooperation dynamics, because if they are not carried out, they become, at least, a mere distraction.

The main barriers that emerged from the research were: a use of technology with unstable Internet connectivity, the limitations of some devices that seem current, the learning curve or initial learning by users, interfaces with a very visual design (e.g., the use of the aesthetic power of virtual worlds), and the way to socialize the knowledge of one group with another through an explicit communication tool such as chat. These conditions of use indicate that the use of virtual worlds in higher education requires technical planning, for their accessibility of use, and an initial induction stage for students before the use of the virtual world.

The paper concludes by establishing that the design of interactive virtual worlds should be understood as a pedagogical process, not just as a technical process. Its contribution to higher education is to be able to find more participatory digital experiences, as long as they contain defined learning objectives, teacher mediation, group work and functional resources with teaching and learning.

BIBLIOGRAPHIC REFERENCES

Al-Qaimari, G. (2025). Digital transformation in contemporary higher education institutions. En *Strategic Planning for Higher Education Institutions*. Palgrave Macmillan. https://doi.org/10.1007/978-3-032-04788-5_3

Barja-Ore, J., Liñán-Bermúdez, A., & Mayta-Tovalino, F. (2023). Visibilidad, impacto y colaboración en la producción científica sobre la realidad virtual en la educación médica (2017–2022). *Educación Médica*, *24*(5), 100831. https://doi.org/10.1016/j.edumed.2023.100831

Caballero-Garriazo, J. A., Rojas-Huacanca, J. R., Sánchez-Castro, A., & Lázaro-Aguirre, A. F. (2023). Revisión sistemática sobre la aplicación de la realidad virtual en la educación universitaria. *Revista Electrónica Educare*, *27*(3). https://doi.org/10.15359/ree.27-3.17271

Cabero-Almenara, J., Barroso-Osuna, J., & Palacios-Rodríguez, A. (2021). Estudio de la competencia digital docente en Ciencias de la Salud. Su relación con algunas variables. *Educación Médica*, *22*(2), 94–98. https://doi.org/10.1016/j.edumed.2020.11.014

Conrad, M., Kablitz, D., & Schumann, S. (2024). Learning effectiveness of immersive virtual reality in education and training: A systematic review of findings. *Computers & Education: X Reality, 4*, 100053. https://doi.org/10.1016/j.cexr.2024.100053

Díaz-García, V., Montero-Navarro, A., Rodríguez-Sánchez, J. L., & Gallego-Losada, R. (2022). Digitalization and digital transformation in higher education: A bibliometric analysis. *Frontiers in Psychology, 13*, 1081595. https://doi.org/10.3389/fpsyg.2022.1081595

Domínguez, L. C., Carreño, O., & Sierra, D. (2021). Divide y vencerás: Efectos de dos intervenciones para el aprendizaje interactivo en grupos grandes de estudiantes sobre la percepción de la calidad del ambiente de aprendizaje. *Educación Médica, 22*(Supl. 5), 390–395. https://doi.org/10.1016/j.edumed.2020.04.006

Domínguez, L. C., & Vega, N. V. (2020). Efectos del mapa conceptual sobre la síntesis de información en un ambiente de aprendizaje interactivo: Un estudio preexperimental. *Educación Médica, 21*(3), 193–197. https://doi.org/10.1016/j.edumed.2018.08.002

Escandell Rico, F. M., & Pérez Fernández, L. (2024). Simulación de realidad virtual en la formación de los estudiantes de Enfermería: Una revisión sistemática. *Educación Médica*, *25*(1), 100866. https://doi.org/10.1016/j.edumed.2023.100866

Galecio Mora, D. E., Carazas Durand, C. R., & Flores Cueva, M. Y. (2025). Entornos virtuales para el aprendizaje: Una revisión sistemática. *Revista InveCom, 6*(1). https://doi.org/10.5281/zenodo.15447967

Garrido Astray, M. C., Santiago Gómez, G., Márquez, M. G., Poggio Lagares, L., & Gómez Garrido, S. (2019). Impacto de los recursos digitales en el aprendizaje y desarrollo de la competencia Análisis y Síntesis. *Educación Médica, 20*(Supl. 2), 74–78. https://doi.org/10.1016/j.edumed.2018.02.011

Inman, R. A., Moreira, P. A. S., Cunha, D., & Castro, J. (2020). Evaluación de la dimensionalidad del Student School Engagement Survey: Apoyo para un modelo multidimensional bifactor. *Revista de Psicodidáctica, 25*(2), 109–118. https://doi.org/10.1016/j.psicod.2020.02.001

Jimbo Román, F. M., Bastidas González, K. A., & Zaragoza Alvarado, G. A. (2024). Uso de la realidad virtual en la educación universitaria: Vivencias, retos y posibilidades para

la enseñanza en la educación superior. *Sapiens Studies Journal, 1*(1), 1–14. https://doi.org/10.71068/61ca3a87

Kuhail, M. A., ElSayary, A., Farooq, S., & Alghamdi, A. (2022). Exploring immersive learning experiences: A survey. *Informatics, 9*(4), 75. https://doi.org/10.3390/informatics9040075

Laufer, M., Leiser, A., Deacon, B., et al. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *International Journal of Educational Technology in Higher Education, 18*, 51. https://doi.org/10.1186/s41239-021-00287-6

Lin, L. H., Pryor, M. R., & Beckmann, N. (2025). Social opportunities, learning practices, and performance in metaverse and virtual world: A comparative scoping review in higher education. *Computers & Education, 239*, 105391. https://doi.org/10.1016/j.compedu.2025.105391

Martínez-Comesaña, M., Rigueira-Díaz, X., Larrañaga-Janeiro, A., Martínez-Torres, J., Ocarranza-Prado, I., & Kreibel, D. (2023). Impact of artificial intelligence on assessment methods in primary and secondary education: Systematic literature review. *Revista de Psicodidáctica, 28*(2), 93–103. https://doi.org/10.1016/j.psicod.2023.06.001

Meléndez Araya, N. M., Jorquera Pallauta, J. L., & Meléndez Castillo, N. J. (2024). Metaversos en educación: Una mirada desde la literatura. *Ingeniare. Revista Chilena de Ingeniería, 32*. https://doi.org/10.4067/S0718-33052024000100210

Meroño, L., Calderón, A., & Arias-Estero, J. L. (2021). Pedagogía digital y aprendizaje cooperativo: Efecto sobre los conocimientos tecnológicos y pedagógicos del contenido y el rendimiento académico en formación inicial docente. *Revista de Psicodidáctica, 26*(1), 53–61. https://doi.org/10.1016/j.psicod.2020.10.002

Pinargote Castro, M. A., Solórzano Ortega, C. V., Lozano Torres, M. J., & Jiménez Mejía, F. J. (2024). Accesibilidad de la realidad virtual aumentada en la educación universitaria: Estrategias, desafíos y beneficios. *Revista Scientific, 9*(33), 252–275. https://doi.org/10.29394/scientific.issn.2542-2987.2024.9.33.12.252-275

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons

learned, and research agenda. *Computers & Education, 147*, 103778. https://doi.org/10.1016/j.compedu.2019.103778

Shah, S. S., Shah, A. A., Memon, F., Kemal, A. A., & Soomro, A. (2021). Online learning during the COVID-19 pandemic: Applying the self-determination theory in the 'new normal'. *Revista de Psicodidáctica*, *26*(2), 169–178. https://doi.org/10.1016/j.psicod.2020.12.004

Williams, C., López-Entrambasaguas, O. M., Cayul, E., & Gaset-Poblete, J. (2024). Impacto de las metodologías activas en las estrategias de aprendizaje de estudiantes del área de la salud de primer año en la Universidad Finis Terrae. *Revista Médica Clínica Las Condes*, *35*(5–6), 385–392. https://doi.org/10.1016/j.rmclc.2024.02.004

Zhao, Y., Pinto Llorente, A. M., & Sánchez Gómez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, *168*, 104212. https://doi.org/10.1016/j.compedu.2021.104212

Conflict of Interest: The authors affirm that there are no conflicts of interest in this study and that the processes established by this journal have been ethically followed. In addition, they assure that this work has not been published partially or totally in any other journal.

FUNDING

The authors did not receive funding for the development of this research.

AUTHORSHIP CONTRIBUTION:

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