SHORT COMMUNICATION

Artificial intelligence and the metaverse: new ways of learning at the university

Inteligencia artificial y metaverso: nuevas formas de conocer en la universidad

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ABSTRACT

This paper explored the epistemological transformation generated by the incorporation of artificial intelligence (AI) and metaverses in higher education. It reflected on how these technologies have expanded teaching and learning processes through immersive, personalized, and emotionally meaningful experiences. It analyzed the role of AI in the design of adaptive environments, the cognitive-affective interaction between users and virtual agents, and the reconfiguration of knowledge in algorithm-mediated virtual spaces. Theoretical and practical contributions of Latin American, European, Asian, and North American authors were contrasted, highlighting the need to integrate principles of epistemic justice and cultural diversity in these environments. Emerging ethical challenges related to data privacy, algorithmic biases, and digital divides were also identified. It concluded that the pedagogical use of AI and metaverses can only be meaningful if it is based on critical ethics, active teacher participation, and a humanistic vision that places the student at the center of the educational process.

Keywords: Artificial Intelligence; Educational Metaverse; Epistemology; Higher Education; Ethics; Emotional Interaction.

RESUMEN

Esta comunicación exploró la transformación epistemológica generada por la incorporación de inteligencia artificial (IA) y metaversos en la educación superior. Se reflexionó sobre cómo estas tecnologías ampliaron los procesos de enseñanza-aprendizaje, mediante experiencias inmersivas, personalizadas y emocionalmente significativas. Analizó el rol de la IA en el diseño de entornos adaptativos, la interacción cognitivo-afectiva entre usuarios y agentes virtuales, así como la reconfiguración del conocimiento en espacios virtuales mediados por algoritmos. Se contrastaron aportes teóricos y prácticos de autores latinoamericanos, europeos, asiáticos y norteamericanos, destacando la necesidad de integrar principios de justicia epistémica y diversidad cultural en estos entornos. Además, se identificaron desafíos éticos emergentes vinculados a la privacidad de datos, sesgos algorítmicos y brechas digitales. Se concluyó que el uso pedagógico de IA y metaversos solo podrá ser significativo si se sostiene en una ética crítica, una participación docente activa y una visión humanista que coloque al estudiante en el centro del proceso educativo.

Palabras clave: Inteligencia Artificial; Metaverso Educativo; Epistemología; Educación Superior; Ética; Interacción Emocional.

INTRODUCTION

The growth of metaverses as interactive and immersive spaces has begun to significantly change how we access, produce, and share knowledge. It is no longer just about what happens in the physical classroom. Education has gradually migrated to three-dimensional digital landscapes, where technologies once seen as futuristic or experimental are now converging: artificial intelligence, blockchain, augmented reality, and complex dynamics of human-machine interaction.[1,2]

Among all these technologies, artificial intelligence has gained a central place. This is not only because it allows teaching processes to be adapted to the needs of each person but also because it intervenes in interpreting cognitive patterns and the automated organization of content used in virtual educational environments.[3,4] So-called intelligent agents are capable of adjusting their behavior in real-time. They can read emotions, respond to decisions, or adapt to different learning styles. In this context, a pedagogy managed by algorithms is beginning to emerge, which occurs within simulated worlds but undoubtedly has real effects on learners.[5]

It is not enough to develop more advanced technology. This profound change also requires a review of the ideas we use to explain what knowledge is, how it is learned, and who mediates it. If the educational process becomes driven, at least in part, by machines or intelligent systems, then traditional theoretical frameworks are no longer sufficient.[6] A different epistemology is needed, or one is beginning to be constructed. It considers not only the rational or technical but also the emotional, social, and experiential. And one that understands that, in the metaverse, all of this happens at once.

This text intends to open that discussion. To explore how we design, use, and evaluate virtual worlds when they are part of a learning experience. And to question, without fear, whether our usual categories—what a teacher is, what a student is, what it means to teach—are still functional or whether we need new ways of thinking about them.

DEVELOPMENT

AI-based cognitive design and mediation in virtual educational environments (metaverses)

Incorporating AI into immersive environments such as metaverses has begun to outline a fundamental change in higher education. It is no longer just about offering digital platforms: three-dimensional spaces rich in stimuli are opening up, where students—represented by avatars—interact in real-time without physical distance limiting the experience.[7,8] In some instances, the logic of face-to-face learning is beginning to be replaced by experiential learning. What is interesting is that this experience can, in many ways, be richer.

Thanks to virtual and augmented reality technologies, metaverses provide access to contexts that are difficult to replicate in the traditional classroom. It is not just a question of visualization but of immersion: actively participating in risk simulations, exploring distant scenarios, or conducting complex experiments as if you were right there.[9] These dynamics, which previously remained in theory or imagination, become accessible and lived experiences. Learning feels different.

In this environment, AI plays a role that is no longer peripheral. It becomes a mediator of knowledge. It personalizes what each student sees, hears, or does; it adjusts activities to the learner's pace; it generates content that changes according to the user's responses. It even acts as a cognitive mediator, offering clues, reorganizing information, and adapting sequences to facilitate comprehension.[10] The same thing is no longer taught to everyone in the same way. And that, in pedagogical terms, changes everything.

The AI-powered educational metaverse points to a model that combines immersion, interaction, and adaptation. It does not seek to replace the teacher. On the contrary, AI takes care of repetitive tasks, provides continuous feedback, and leaves teachers free to do what matters: think up strategies, accompany processes, and attend to emotional and relational issues—in other words, put people at the center. In this more balanced model, technology does not replace but collaborates. It becomes a powerful tool at the service of pedagogy.

And what lies ahead is even broader. This field has only just begun. As these technologies evolve, increasingly sophisticated learning environments are being designed to prepare students for a changing and demanding world of work, where the virtual is no longer an accessory but a constituent part of reality.

Emotional interaction and learning in immersive environments

Learning is not just a matter of understanding concepts or solving exercises. Other factors, such as emotional, social, and motivational factors, carry much more weight than is sometimes acknowledged. In higher education, immersive environments with artificial intelligence have begun profoundly transforming this dimension. They do so through technology and by building experiences that feel closer, more intense, and even more personal.

One of the most potent qualities of the metaverse is its ability to generate a clear sense of presence. Of being accompanied, even if others are hundreds of miles away. That perception—of sharing the same space, even if it is virtual—influences empathy, the desire to collaborate, and the sense of belonging to a community.[11] This is no small thing. The possibility of having avatars that look like you, of moving freely, of talking or looking at others, creates interactions that can be complex and profound and provoke real emotions: enthusiasm,

curiosity, frustration, and satisfaction.[12,13] All this is within an environment that does not even exist physically.

This is where AI comes into play in a significant way. It can read emotions and interpret signals—sometimes subtle—in the student's voice, gestures, or choices. Based on that, it can respond: offer a message of encouragement, change the dynamics of activity, slow down the pace, or pose a greater challenge if it detects confidence. This is not theory: studies with engineering students show how this emotional feedback increased motivation and helped them stay longer on complex tasks.[14,15] This difference may seem small, but it is key to persistence and achievement.

It has also been observed that so-called affective pedagogical agents—virtual tutors with empathic abilities—help create a more human experience, even when learning in total solitude in front of a screen. They reduce anxiety and make learners feel that someone is accompanying them. And that inevitably fosters a different relationship with the educational process.[16,17] Then there is engagement: that combination of attention, emotion, and action that shows how involved a person is in what they are learning. According to several meta-analyses, immersive AI environments achieve higher levels of engagement than traditional virtual classrooms or simpler platforms.[18]

This emotional connection can make all the difference in college, where student autonomy is high and dropout rates are a concern. When students connect emotionally with the environment, the content, or their peers (even if they are avatars), they feel more capable, motivated, and willing to learn.[19] That is why metaverses should not be considered a technical innovation. Above all, they are an opportunity to reimagine teaching from a perspective that also takes care of the emotional side. A sensitive pedagogy, supported by AI that accompanies students on both an affective and cognitive level.

Expanded epistemology: from the physical classroom to the pedagogical algorithm

The emergence of educational metaverses and the deployment of artificial intelligence in higher education has not only changed the way we learn. It has also gradually disrupted the foundations on which we understand what knowledge is and how we construct it. What used to happen almost exclusively in the physical classroom—among books, teachers, and blackboards—now also occurs on digital, three-dimensional, and algorithmic planes. This expansion has led some authors to speak of an expanded epistemology, a way of thinking about knowledge beyond the classic school space involving intelligent systems and virtual experiences that we could not have imagined before.[20]

And it's not just the where that has changed. What has changed, too? Knowledge is no longer limited to the propositional or technical; it is beginning to integrate with the practical, the lived, and the intercultural. The line between academic knowledge and experience is blurring. In these new scenarios, knowledge can also mean collaborating in a virtual environment, solving a problem alongside AI, or designing an avatar representing an identity. All of this, which was not previously considered formal knowledge, is beginning to enter the educational radar. So, the question that inevitably arises is: who produces knowledge now, how is it validated, and with what intentions?

From the traditional classroom to algorithmic collective intelligence

Traditionally, the authority of knowledge was clear: books, teachers, and institutions. Today, however, that authority has fragmented. Algorithms—yes, algorithms—offer content, answer questions, recommend readings, and evaluate progress. They have become new actors in the educational process.[21] As Selwyn pointed out, this phenomenon alters the balance of power in the classroom. It displaces, or at least calls into question, the figure of the teacher as the sole source of truth or criteria.[21] Knox argues that what is at stake is how we understand knowledge itself: whether it remains something that is taught or transformed into something that is produced and validated collectively in dialogue with non-human systems.[21]

The interesting thing is that these questions are not limited to pedagogy. They also touch on philosophy. Steve Fuller, for example, has suggested that the metaverse may become a new form of metaphysics—an environment in which truth is not only a matter of facts or evidence but also of circulation, visibility, and algorithms that prioritize some ideas over others.[22] In these spaces—filled with voices, data, and images—distinguishing between valid knowledge and misinformation becomes much more complex.

Another concern arises: who decides what knowledge deserves attention? Perhaps it is no longer just universities or even professors themselves. It could also be the algorithmic design of a platform. Expanded epistemology, in this sense, not only opens up the field but also forces us to rethink the conditions under which knowledge is produced and shared in an increasingly digital, interconnected, and opaque world.

Latin American contributions and global perspectives

One of the most critical points in this conversation is to broaden our perspective. It is not enough to think about these transformations from a single point of view. We must include voices from the global South, especially Latin America, and contrast them with those from Europe, Asia, and North America to better understand the

issue. For example, our region has a long tradition of critical thinking about who produces knowledge, with what intention, and for whom. Authors with a decolonial approach have been warning that if the design of new technologies is not democratized, they could repeat the same colonial logic of the past. Paola Ricaurte puts it clearly: AI and big data often work with an extractive logic, taking data—mostly from Western contexts— to generate information and knowledge that ends up imposing values from the global North on peripheral communities.[23]

This leads us to think of a "Southern epistemology," but a digital one. One that not only speaks from the local level but actively incorporates it into algorithms, content, and educational design decisions. Boaventura de Sousa Santos talks about the ecology of knowledge and proposes breaking the monopoly of Western knowledge so that knowledge can emerge from multiple places, languages, and cultures.[24] In practice, this would mean designing multilingual metaverses with intercultural references and AI trained with more diverse data. And yes, one of the significant challenges here is how to validate the knowledge produced by algorithms. How to correct their biases. Because data is not neutral, it reflects social inequalities that, if not detected, AI can reproduce without hesitation.[24,25]

Warnings from the Anglo-Saxon world are also on the table. Neil et al.[26] have been among the most vocal in warning that this fever for artificial intelligence should be read with caution. Selwyn insists that these technologies should not be romanticized. They are not impartial. If used without thinking, they could encourage rigid or vigilant educational practices, especially with tools such as learning analytics.[25] Williamson[26], for his part, studies how data and algorithms are increasingly present in pedagogical decisions and show how certain companies are beginning to influence universities through their platforms, generating a kind of algorithmic governance that is not always openly discussed.

These positions remind us that, although the potential is enormous, we cannot simply delegate our educational decisions to automated systems. Expanded epistemology must not become an epistemology that hands everything over to machines. It has to be a critical relationship between the human and the artificial. And for that, preparation is needed.

In Asia, the approach has been more pragmatic. Researchers in Korea, Taiwan, and China have been working on concrete models for integrating AI and the metaverse on a large scale. "Eduverse" is already circulating to name these virtual educational ecosystems with integrated AI. Hwang and Chien, for example, propose a model where AI acts as an intelligent tutor, using non-player characters (NPCs) that accompany the student, give them feedback, and guide them on their learning journey.[27] China has even invested heavily in this type of development. Universities are creating fully virtual, interoperable campuses where students attend classes from anywhere and at any time.[28] The priorities there are clear: scalability, efficiency, and reach.

What happens to the teacher if an algorithm can also deliver knowledge? Well, they need to understand how these systems work. Not in technical detail, but enough to know their limits, internal logic, and possible biases. Otherwise, they will either oppose them out of fear or adopt them without filtering. Both positions are dangerous. During the pandemic, several studies in Latin America showed that many teachers did not have sufficient digital skills to navigate 4.0 scenarios. This makes it clear that ongoing training is needed in tools and how to integrate them pedagogically without losing meaning.

In a reasonably comprehensive review, Zawacki-Richter et al.[29] asked with concern: "Where are the teachers?" in research on educational AI. The most logical answer would be that they need to be included. We need to listen to them more, include their experience in designing these technologies, and generate co-creation processes that allow pedagogical algorithms to reflect the values, practices, and knowledge of the real classroom. Not just the ideals of the technology industry.

Likewise, there are ethical issues that cannot be ignored. Who controls educational platforms? What do they do with student data? Because AI systems collect everything: grades, clicks, times, answers. And if that information is not well protected, the risk is enormous. Privacy, consent, and transparency are also part of this new epistemology. It is not just a technical expansion. It is an expansion that must also be ethical, political, and deeply educational.

CONCLUSIONS

Thinking about education in terms of artificial intelligence and the metaverse is not just about updating resources or exploring new platforms. It is, above all, about rethinking how we learn, what we understand by knowledge, and who participates in its construction. Throughout this text, we have attempted to show that we are facing a technical transformation and a fundamental change: epistemological, pedagogical, and ethical.

AI can personalize teaching, adapt to rhythms and emotions, and collaborate with teachers to build richer experiences. Metaverses, for their part, open up immersive spaces where the cognitive and the affective intertwine. But all of this is meaningless if it is not integrated from a critical perspective, from a pedagogy that puts human beings at the center.

What is at stake is more than the incorporation of technology. It is the type of education we want to

build: one that combines algorithmic intelligence with pedagogical intelligence, one that dares to expand its framework without renouncing its essential values. The challenge is open and collective.

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