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REVIEW

A critical review of multimedia design and its transition to immersive education

Una revisión crítica del diseño multimedia y su transición hacia la educación inmersiva

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ABSTRACT

This article presented a critical review of multimedia design in education and its transition toward immersive environments, particularly the metaverse. Far from approaching it as a mere technical innovation, it was conceived as a symbolic habitat: a projected construction in which subjectivities, bonds, and ways of knowing were reconfigured. From a technohuman perspective, it was argued that design was not a neutral aesthetic, but a cognitive and affective architecture that taught—not through content, but through the form that gave it structure. Drawing on the cognitive theory of multimedia learning, connectivism, and critical digital literacy, it was analyzed how immersive interfaces conditioned the educational experience. It was not enough to digitize content or transfer the classroom to a virtual environment; it was necessary to rethink the educational act as an ethical, situated, and sensitive design gesture. Each texture, each avatar, each navigational rhythm embodied an implicit pedagogy that configured the dwelling of knowledge. The article articulated seven chapters that traversed from the visual language of design to the ethical dilemmas and subjective implications of interaction in the metaverse. It was not about celebrating immersion for its novelty, but about questioning it for its effects. Because teaching in these new territories was not about dazzling with stimuli, but about igniting critical thinking. Everything else was mere scenography.

Keywords: Multimedia Learning; Immersive Education; Metaverse; Digital Subjectivity; Technohumanism; Multimedia Learning; Instructional Design.

RESUMEN

Este artículo propuso una revisión crítica del diseño multimedia en educación y su transición hacia entornos inmersivos, particularmente el metaverso. Lejos de abordarlo como una simple innovación técnica, fue concebido como un hábitat simbólico: una construcción proyectual donde se reconfiguraron subjetividades, vínculos y formas de conocimiento. Desde una mirada technohumana, se exploró cómo el diseño no es una estética neutra, sino una arquitectura cognoscitiva y afectiva que enseñó —no desde el contenido, sino desde la forma que lo organizó. A partir de la teoría cognoscitiva del aprendizaje multimedia, el conectivismo y la alfabetización digital crítica, se analizó cómo las interfaces inmersivas condicionaron la experiencia educativa. No bastó con digitalizar contenidos o trasladar el aula al entorno virtual; fue necesario repensar el acto educativo como un gesto de diseño ético, situado y sensible. Cada textura, cada avatar, cada ritmo de navegación encarnó una pedagogía implícita que configuró el habitar del conocimiento. El artículo desarrolló

siete capítulos que recorrieron desde el lenguaje visual del diseño hasta las implicaciones subjetivas de la interacción en el metaverso, pasando por los dilemas éticos de su aplicación educativa. No se trató de celebrar lo inmersivo por su novedad, sino de tensionarlo por sus efectos. Porque enseñar en estos nuevos territorios no fue iluminar con estímulos, sino encender pensamiento crítico. Todo lo demás, fue escenografía.

Palabaras clave: Aprendizaje Multimedia; Educación Inmersiva; Metaverso; Subjetividad Digital; Technohumanismo; Diseño Instruccional.

INTRODUCTION

Education as the construction of symbolic habitats

Inhabiting is not simply occupying a space; it is producing meaning in it. Teaching, in this same gesture, is not about transferring content: it is about constructing possible worlds from the interface".[1,2] *Today, one of these worlds is starting to be called the metaverse.*

The rise of the metaverse is not just a symptom of technological expansion but a more profound transformation in the ways of being, learning, and relating to knowledge and others. We are witnessing the emergence of a new symbolic habitat — not just any three-dimensional virtualization, but a hybrid, sensory, and cognitive environment — in which immersive technologies, interactive structures, and visual, affective, and social narratives converge.[3,4,5]

As Heidegger points out, to inhabit is to care[6] and if teaching is, at heart, to inhabit the space of the other —to accompany them in their becoming—then designing immersive educational experiences is also an act of ontological care—a way of sculpting presence in territories that are not tangible but intensely real.[7]

From the earliest digital environments, interface design adopted a skeuomorphic graphic language—a visual translation of the desire for physical and digital continuity. Already in the early years of the 21st century, authors such as Neo and Neo warned that multimedia design's emergence was technical and sensory. An attempt to amplify the educational experience by integrating digital media, bodies, and atmospheres.[8,9,10] With the technological maturity of users, this aesthetic gave way to flat design, a more abstract and functional visuality that opted for visual cleanliness, geometric simplicity, and chromatic hierarchy. Currently, pleomorphism is being explored as a new point of equilibrium: interfaces that subtly evoke three-dimensionality, recovering a certain tactility without returning to the visual mimicry of skeuomorphism.[11]

This evolution, observed in the analysis of various educational design practices, reveals conceptual shifts beyond the visual; they involve ways of teaching, perceiving, and inhabiting knowledge.

This article aims to critically review the evolution of digital design in education, from its multimedia foundations to its current deployment in immersive environments such as the metaverse. According to Craig and Kay, these spaces amplify learning outcomes and inaugurate new forms of presence, agency, and practice in higher education.[12] Drawing on the cognitive theory of multimedia learning,[13,14] connectivism,[15] and critical digital literacy,[16] we will analyze how digital interfaces, environments, and aesthetics shape ways of learning, interacting, and perceiving. But beyond technical or functional analysis, this text starts from an epistemic and affective premise: education is an act of design, and all design is a form of embodied ideology. From a technohuman perspective, Macdowell and Lock propose that designing for immersion also involves planning for care, community, and situated creativity.[17,18]

Inspired by the theory of habitat and its circuit of occupation and production of space, formulated by Doberti,[1] I have developed —in previous research— the model of the Virtual Habitat as a way of rethinking education from its spatial, symbolic, and projective dimension.[2] It is not simply a question of incorporating technology into the classroom; it is about understanding education as a projected habitat, as an ecosystem of social practices, shared presences, and sensitive structures. Designing digital learning environments is not just a technical action; it is also the art of projecting, interpreting space, reading, and writing in the graphic language that connects us.

Design as language: from interface to cognitive landscape

Design is not a tool: it is a syntax; like any language, it operates with rules, emphasis, pauses, and gestures. Designing an interface is like writing a discourse that is not expressed with words but with visual hierarchies, spatial paths, and interactive rhythms; in digital education, that language becomes cognitive architecture: a project framework that not only organizes the visible and the possible but also models how knowledge is constructed in interaction with the environment.[19]

Since its first digital manifestations, the design of educational environments has evolved as a visual narrative that goes from skeuomorphism to the abstraction of flat design and, more recently, to the tactile subtleties of pseudomorphism. This evolution is not limited to aesthetics; each visual shift entails an epistemological stance

on how knowledge should be inhabited.[20] As already mentioned, Skeuomorphism appealed to familiarity: imitating the analog to tame the digital. The flat design eliminated these references to affirm the autonomy of the virtual environment, a sober, geometric, functional visuality. Pneumorphism —still in its infancy— is trying out a third way: an aesthetic that suggests relief without volume, depth without matter, an invitation to touch without weight, to inhabit the intangible.

But this graphic evolution is more than a timeline: it is a visual pedagogy. As Manovich asserts, digital design functions as a cultural interface that translates the invisible structures of contemporary culture into visual forms that teach.[21] Each icon, button, and distribution of elements on the screen not only mediates interaction; it constructs meaning.

Within this framework, the concept of interface expands; it is no longer just a bridge between human and machine; it is a symbolic membrane between subject and knowledge. Designing an educational interface is, then, projecting a space for thought, and that space has layers: cognitive, sensory, affective, and even ideological.

From a techno-human perspective, these layers are not designed to facilitate information consumption but to enable meaningful cognitive experiences that connect the sensible with the symbolic. Digital education cannot be reduced to transmitting content supported by visual embellishments. The interface is not a set: it is a living structure that translates ideas into forms, channels affections and organizes ways of looking and inhabiting.

This visual pedagogy is not confined to the two-dimensional plane; as Macdowell and Lock [11]argue, design in immersive environments is no longer limited to organizing screens but configures habitable atmospheres, sensory narratives, and symbolic learning spaces. Here, design is topology, choreography, and dramaturgy: a poetics of the environment where learning is not only functional but experiential, affective, and collective.

In other words, the design also teaches, and in the context of the metaverse, this statement is intensified because we no longer design flat interfaces but navigable worlds; we do not organize buttons but presences. For this reason, the language of design cannot be relegated to superficial aesthetics: it is a form of project intelligence —an embodied visual pedagogy— that organizes the possible and enables ways of learning, abiding, and reconnecting.

Theories of learning and multimedia: basis for the training metaverse

No educational technology is neutral; every interface teaches not from the screen but from the logic that organizes it. In the case of immersive environment design, that logic not only arranges content but also directs experiences. What is projected is not only an object of study but a way of being, looking, and interacting. For this reason, thinking about the educational metaverse requires a return to the learning theories that underpin —or should underpin— its symbolic architecture.

Among them, the cognitive theory of multimedia learning, developed by Richard E. Mayer, has been one of the most influential in the dialogue between design, cognition, and technology.[22,23,24] This approach is based on an essential premise: human beings process information through verbal and visual channels, and learning improves when both are integrated coherently. It is not a question of accumulating stimuli but of organizing meaning; it is not enough to combine text and image; it must be done without saturating the working memory, taking care of the cognitive load, guiding attention, and structuring the experience.

From this perspective, each visual element is not decorative but didactic. Color, movement, spatial arrangement, rhythm, and even visual silence — which are not shown — can be strategies to facilitate understanding. Designing is also teaching in this context, and poorly calibrated design can disorient, overload, or distract. For this reason, concepts such as segmentation, signaling, redundancy, or coherence are not technicalities; they are pedagogical decisions that modulate learning through form.

However, a balance between sensory channels is not enough; as Ausubel pointed out, learning implies connecting the new with what is already present in the subject's mental structure; meaningful learning does not occur through exposure but through anchoring. In this sense, the educational metaverse can be an opportunity or a trap. A chance, if designed to activate previous connections, favors reflective exploration and builds environments of comprehensive immersion. It is a trap if it remains in the spectacularity of the stimulus without dialogue with the subject who learns.

This is where it becomes essential to think about the relationship between form, content, and educational experience. They are not superimposed layers but interdependent dimensions of the same design gesture. In the metaverse, the interface becomes atmosphere; the visual architecture is transformed into a cognitive landscape; the interaction ceases to be functional and becomes a symbolic experience. Form not only envelops content; it models it, conditions it, and exposes it to be experienced.

Therefore, it is not a question of adapting learning theories to the metaverse; it is a question of re-reading them in the light of the immersive, of reconfiguring their principles for contexts where learning is no longer limited to looking or listening but implies inhabiting.[25] If design also teaches, the educational metaverse

should be thought of as an expanded didactic: a three-dimensional, affective, navigable pedagogy, not as an empty simulation, but as a space where theory becomes digital flesh, and where each design gesture is also an act of epistemic care.

The metaverse as an emerging habitat

Inhabiting the metaverse is not simply entering a virtual environment; it is accepting an invitation to relearn ways of being, of looking, and of constructing presence. Immersion occurs not only in technology; it appears in the body, mind, and relationship between subject, space, and meaning. Therefore, when we talk about the metaverse as a habitat, we are not naming a scenario; we are talking about a form of projected existence.[26,27]

The metaverse —like any digital environment— is not a neutral space; it has grammar, architecture, and ideology. Each texture, each avatar, and each visual structure responds to design decisions that shape ways of inhabiting: they orient the gaze, limit movement, suggest certain forms of connection, and exclude others. In this sense, the metaverse is not an educational resource but a symbolic ecosystem; as such, it is necessary to read, interpret, and stress it.[7,11]

Thinking of the metaverse as a habitat implies recognizing that it involves spatial, ethical, affective, and cognitive relationships. It is not just a question of integrating content into a three-dimensional environment but of projecting possible worlds where knowledge is not transmitted but constructed, embodied, and shared. Education in the metaverse cannot be reduced to the logic of access or interactivity; it has to attend to the situated experience, the density of the encounter, and the formative atmosphere that is gestated between bodies, even when those bodies are avatars.[28,29]

From this perspective, the metaverse is configured as an emerging habitat, not because it is new, but because it is being inhabited; it is being constructed by those who explore it, design it, and intervene in it with pedagogical intentions.[13] A habitat is not defined by its technical infrastructure but by the practices that run through it, the meanings generated there, and the relationships it enables or restricts.[30] Just as architecture shapes physical habitation, immersive design shapes symbolic habitation: what we can be, feel, and think in that environment.

At this point, the metaverse intersects with education not as a medium but as a formative space, not as an extension of the classroom but as a reconfiguration of the school itself. If teaching is about accompanying the act of inhabiting a world — as we said at the beginning — then teaching in the metaverse is about designing the conditions for that inhabiting to be meaningful, ethical, and human. The rest is scenography.

Interaction and subjectivity in the metaverse

There is no interaction without subjectivity, and there is no subjectivity that is not modulated in the interaction. In the metaverse, this relationship is intensified: it is no longer a question of clicking or swiping screens but of entering the scene, inhabiting a digital body, moving through a symbolic environment, and leaving a trace of presence. The experience is no longer peripheral; it becomes immersive, enveloping, and compelling.

In this new habitat, interacting is not just about browsing but about exposing oneself, activating a choreography of links, gestures, and gazes mediated by avatars, environments, and code structures. Interaction in the metaverse does not occur between isolated subjects but between projected identities and subjectivities reconfigured by the interface. In this symbolic mediation, action and the self are produced.

As Macdowell and Lock point out, in immersive environments, subjectivity does not disappear; on the contrary, it is amplified, aestheticized, and multiplied in new forms of presence and identity.[11] It is not a question of assuming that there is a "true reality" outside the virtual environment; it is a question of understanding that the metaverse is also real insofar as it generates experience, bonds, and memory. Subjectivity, then, is not suspended: it is rewritten in each gesture, design decision, and interaction type that the environment allows or limits.[3]

From the cognitive model of multimedia learning, we know that meaningful interaction does not occur through the accumulation of stimuli but through articulating meanings. If the metaverse is to be educational, it must go beyond sensorial spectacularity; it must take care of the interaction conditions so that they are formative and not alienating. An interface that overloads, an experience that overwhelms, or an aesthetic that displaces reflection through impact are also decisions that affect the subjectivity of the learner.[8,10]

For this reason, thinking about interaction in the metaverse is also about pedagogical subjectivity: who is this subject that learns in an environment where their body is an avatar? What kind of relationship do they establish with themselves, knowledge, and others? It is not enough to celebrate the freedom of movement or the simultaneity of experiences; we must also ask ourselves what kind of self is constructed when space is no longer physical when the voice can be synthesized, and when an algorithm can guide the gaze.

In these scenarios, design is a politics of subjectivity; each interaction option — from the personalization of an environment to the possibility of modifying one's avatar — models a way of being in the world. What

is allowed and hidden, what can be touched, said, built, or shared, are not technical details but ontological gestures. In the metaverse, teaching is not just about guiding the learning of content; it is about accompanying the formation of a techno-human subjectivity, aware of its presence, critical of its environment, and capable of reading its symbolism.

In this sense, the metaverse is not just a space for interaction but a territory of subjectivation. All territory of subjectivation implies ethical, aesthetic, and pedagogical responsibility. Teaching there is not simply activating an immersive experience; it creates conditions for the subject to inhabit themselves, even when they project themselves as someone else.

Applications in education: between fascination and resistance

All educational technology generates fascination, especially with the promise of immersion, engagement, motivation, and the future. The metaverse is no exception; its entry into pedagogical discourse has been accompanied by terms such as revolution, disruption, and innovation. However, all pedagogical fascination—when not questioned—runs the risk of becoming a fetish: an illusion of change that reiterates old logic in new clothing.

In education, the applications of the metaverse range from creative exploration to superficial dazzle. From immersive experiences in virtual laboratories to simulations of historical contexts, three-dimensional classrooms augmented reality campuses, and gamified assessment dynamics, the possibilities are wide-ranging but not always meaningful.[3,7,14] The risk is to confuse interaction with learning, spectacle with understanding, novelty with depth.

As UNESCO warns, introducing new technologies in education has not always reduced inequalities; in many cases, it has widened them, especially when implemented without considering the sociocultural context or access conditions.[29] The metaverse—if it is not thought of in terms of equity, accessibility, and critical pedagogy—can become yet another sophisticated but empty tool of digital exclusion.

For this reason, discussing applications in education cannot be reduced to listing platforms or describing experiences; it implies analyzing what kind of subjectivity, pedagogical link, and educational ecosystem is constructed behind each technological decision. What is gained, but also what is lost, when the classroom is moved to an immersive environment? What kind of presence is activated? What forms of knowledge are prioritized, and which vanish in the interface?

Faced with technological fascination, pedagogical resistance is not denial but active criticism, a way of guarding against the mirage. To resist is not to reject technology but to sustain the question of its meaning. Designing an immersive experience cannot be just a technical achievement; it must be an ethical commitment. Manzano Rivera points out that every educational interface is also a discourse: a way of symbolizing the world and inhabiting it.[2] Therefore, applying the metaverse in education is not a question of access but of intention.

Education does not need more stimuli; it needs more awareness. If the metaverse can be a formative habitat, it can also be a space of alienation. The difference lies in how it is designed, inhabited, and narrated. In an environment where everything shines, pedagogy will be the ability to turn off the glare and turn on thought.

DISCUSSION

Towards a techno-human pedagogy of the metaverse

The metaverse is not the future of education; it is its contested present. In this present, there is a combination of amazement at the immersive possibilities, criticism of their symbolic implications, and the urgent need to rethink what it means to teach in digitally intensified environments.

In the previous chapters, we explored design as language, the interface as a cognitive landscape, subjectivity as a projected form, and interaction as the politics of the digital body. This leads us to recognize that it is not enough to understand the tools; we must read their epistemological and affective effects. It is not enough to explore the new: we must ask ourselves what kind of humanity we are designing when we design educational worlds.

A techno-human pedagogy of the metaverse is not built with enthusiasm or rejection but with critical awareness. It implies assuming that each immersive environment is also an architecture of meaning, that each avatar, each interaction, and each virtual aesthetic shapes the experience of learning and of being. As Macdowell points out, immersive design cannot be limited to the functional: it must be a space for care, meaningful connection, and symbolic construction.[13]

From this perspective, the metaverse should not be seen as a neutral environment but as a semiotic and political habitat. Its power lies not in its three-dimensionality but in its capacity to house sensitive, critical, emancipatory pedagogies. Otherwise, it will be just a scenography that repeats the same old thing with brighter textures.

Technohuman pedagogy does not fetishize technology; it questions it. It does not use it to motivate but to provoke thought. It understands that learning is not a response to stimuli but a situated relationship with

knowledge, the other, and the world.[22] In this framework, the metaverse can be more than an environment: it can be an opportunity to reimagine education as an act of ethical and practical design.

But that opportunity does not come automatically; it depends on how it is taught, how the environment is designed, and what kind of presence is enabled. The challenge is not technological but pedagogical: How can we train subjects capable of inhabiting the digital world without losing their humanity? How can we build immersive spaces where the thought is not diluted but intensified?

This proposal aims towards that. Not towards using the metaverse as a resource but towards thinking of pedagogy as meta-design: the art of constructing possible worlds where technology does not substitute but amplifies meaning. Where education is not reduced to content but becomes a projected way of life. A life that learns, connects, and transforms, even when inhabited by an avatar.

CONCLUSIONS

It is not about innovating for the sake of it; it is about teaching without betraying the meaning of being human. In this critical review of multimedia design and its transition towards immersive education, we have seen how the ways of teaching are also ways of inhabiting, perceiving, and existing.

The metaverse is not a simple tool or a pedagogical fad. It is an emerging habitat full of possibilities and dangers. Designing it from a position of naive fascination can lead us to reproduce the same patterns of exclusion, superficiality, and technological fetishism that we already know. But thinking about it from a techno-human pedagogy — conscious, situated, ethical — allows us to imagine it as a space for nurturing and constructing critical subjectivity.

An interface is not neutral; it teaches. An immersive environment is not empty; it molds. Design is not an accessory; it is ideology incarnate. For this reason, teaching in the metaverse cannot be reduced to transferring three-dimensional content but instead requires a profound reflection on how bonds, presences, knowledge, and bodies are constructed in these new symbolic landscapes.

The pedagogy we propose does not celebrate the digital for its own sake. It celebrates the possibility of designing habitable worlds where the immersive does not displace the reflective, where aesthetics do not eclipse ethics, and where technology does not extinguish thought but rather ignites it.

The metaverse can be a classroom, but it can also be a threshold. A space where we can ask ourselves again not only what we teach but what kind of humanity we are inviting to inhabit what we teach.

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