GAMIFIED METAVERSES: PLAYING FOR REAL IN VIRTUAL WORLDS WITHIN THE VIC PROJECT

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Abstract

The Virtual Innovation Consortium (VIC Project [14]) addresses Europe's advanced digital-skills gap by fostering high-impact training ecosystems in Extended Reality (XR). Within this framework, this contribution examines how gamified metaverses can be strategically designed to support learning, engagement, and behavioural change across educational and professional domains. Drawing on insights from game-design research and from practical experience within the VIC project, the authors present a structured reflection on why metaverses must be conceived not as technology-driven "containers", but as meaningful, experience-centred "contents" where engagement occurs.

The paper argues that effective XR environments must trigger curiosity, agency, social connection and experiential coherence. These qualities enable users to navigate virtual spaces not as passive visitors, but as active participants capable of developing competencies, exploring narratives, and transferring knowledge to real-world contexts in educational XR developments. The analysis emphasises the need to move beyond purely technical narratives and instead adopt holistic approaches integrating game design, storytelling, art direction, UX/UI, and production management.

Within VIC's educational mission, such gamified metaverses offer an opportunity to prototype authentic learning scenarios, simulate complex processes, and support behavioural training. Their development requires interdisciplinary co-creation, reflecting the project's emphasis on collaboration between universities, providers, industry stakeholders and learners.

In fact, XR experiences become pedagogically valuable when they are intentionally gamified, narratively meaningful, and designed around user-centred motivational patterns. As VIC deploys new curricula, XR labs, and applied training programmes, gamified metaverses represent a promising pathway to bridge advanced digital skills with real-world needs, enabling participants to "play for real" in immersive virtual worlds.

Keywords: XR, Extended Reality, Gamification, Metaverse, Education.

1 INTRODUCTION

The Metaverse is a persistent, shared digital universe accessed through virtual reality. The concept has been continuously reinforced by contemporary science-fiction narratives portraying fully immersive virtual environments that parallel, extend, or even surpass the physical world. Popular media often frames the Metaverse as a seamlessly navigable, computer-generated realm in which users transition fluidly between physical and digital spaces through VR headsets, augmented interfaces, haptic systems, or emerging interaction paradigms.

Beyond fiction, the Metaverse has progressively evolved into a conceptual and technological framework for reimagining how individuals and organizations interact, collaborate, and create value. These environments enable a shared sense of presence that goes beyond conventional screen-based communication. Participants cohabit the same virtual space, maintain eye contact, and engage through embodied digital avatars, recovering much of the social richness lost in flat, two-dimensional interfaces. In this context, XR technologies as the ones to be educated in within the VIC Project, appear particularly well suited to support such experiences, offering spatial immersion, embodiment, and real-time interaction.

The potential applications of Metaverse environments extend across multiple sectors [8]. Architectural studios can visualise digital building models at true scale, allowing teams and clients to walk through proposed designs before construction. Cultural institutions, concerts, and conferences can be attended remotely, often from vantage points impossible in the physical world. Parallel economic ecosystems emerge as users buy, sell, and exchange digital goods and services, while advances in augmented reality

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and mobile computing increasingly blend virtual content with everyday life. Gesture-based interaction, neural interfaces, and adaptive systems further suggest futures in which users may communicate, manipulate virtual objects, or trigger complex actions through subtle movements or even cognitive input.

Taken together, Metaverses represent not merely digital spaces, but a broader paradigm shift in how humans inhabit, perceive, and co-create environments. They introduce new modalities of social presence, foster emerging cultural and economic ecosystems, and open unprecedented avenues for expression, creativity, and experiential learning. As the boundaries between physical and virtual realities continue to blur, Metaverses stand out as a compelling frontier for innovation in human interaction and digital civilisation.

However, while these environments may be technologically sophisticated, a critical question remains unresolved: do Metaverses, as currently conceived, adequately address the motivational, psychological, and experiential needs of their users? Technological affordances alone do not guarantee sustained engagement, meaningful participation, or effective learning transfer. Without intentional design strategies that account for autonomy, agency, competence, and intrinsic motivation, immersive environments risk becoming impressive yet pedagogically shallow containers.

This raises a central research question guiding this paper: How can gamified metaverses be strategically designed to support meaningful learning, sustained engagement, and behavioural change within educational XR ecosystems?

To address this question, the paper turns to gamification and game design [3] as essential frameworks for transforming Metaverses from technologically advanced spaces into experience-centred learning environments. When thoughtfully applied, gamification can foster motivation, structure participation, and support positive behavioural change grounded in autonomy and free choice, thereby enabling users not merely to inhabit virtual worlds, but to play for real within them.

2 GAMIFICATION AND GAME DESIGN IN XR

Gamification and game design offer a robust conceptual foundation for understanding how XR spaces and metaverse-like environments can foster meaningful engagement and learning [1]. Rather than relying on technological immersion alone, effective virtual experiences must be grounded in motivational theories [7], established design practices from serious games, and a clear focus on transferable skill development. This section therefore examines three complementary dimensions: first, the role of positive psychology theories in explaining why users engage, persist, and learn in gameful environments; second, the adaptation of best practices from mature gaming ecosystems to the design of XR spaces; and third, the range of cognitive, social, and emotional skills that can be practised and developed through immersive, challenge-driven experiences. Together, these perspectives position gamified XR environments as intentional learning systems rather than passive virtual containers, capable of supporting sustained motivation, experiential learning, and behavioural change.

2.1 Positive Psychology as a Foundation for Gamification and Game Design in XR

Game design is deeply rooted in motivational design paradigms that aim not only to foster skill acquisition and competency development, but also to support sustained behavioural change over time. Unlike externally imposed instructional systems, well-designed game experiences are voluntarily adopted by participants and maintained through intrinsic motivation [15]. This characteristic aligns game design closely with principles from positive psychology, which emphasise autonomy, engagement, and personal growth as central drivers of human behaviour.

In this sense, gamification and game design do not merely rely on technological novelty, but on the intentional orchestration of psychological factors that make participation meaningful. When XR experiences are designed following game design principles, users are more likely to perceive them as self-directed and engaging, particularly when they are presented with meaningful choices and alternative paths [11]. Autonomy, understood as the perception of control over one’s actions and decisions, becomes a key element in sustaining motivation, mirroring the dynamics observed in successful video games.

Game design techniques typically combine immersive technologies, interactive systems, narrative structures, and carefully curated content with insights from positive psychology. When these elements are supported by technical rigor and moments of surprise or discovery, they can foster engagement and facilitate knowledge transfer. From this perspective, effective XR learning environments are not designed from technology outward, but rather from psychological and experiential principles that are later implemented through technological means.

A wide range of behavioural and motivational models has informed the use of gamification in educational and applied contexts. Among them, Self-Determination Theory (SDT) [9] has been particularly influential in the design and analysis of video games and gamified systems. SDT posits that intrinsic motivation emerges when three basic psychological needs are satisfied: autonomy, competence, and relatedness. In game contexts, these needs translate into players being able to make meaningful decisions, progressively master challenges, and establish social connections with others.

Within XR environments, SDT provides a robust framework for designing experiences that encourage users to decide what to do, develop mastery over tasks, and share achievements or activities within a community. These dynamics are especially relevant in immersive settings, where embodiment and presence can amplify feelings of agency and social connection which stand for engagement. It is closely linked to the concept of flow. Flow [2] describes a state of deep immersion in which individuals are fully absorbed in an activity, losing track of time and external distractions. And Flow should encompass any educational experience.

For flow to emerge in games and gamified XR environments, several conditions must be met: the activity must be intrinsically rewarding, challenges must be balanced with the user’s abilities, and participants must experience a clear sense of control and understanding of the system’s rules. These conditions reinforce the importance of autonomy and competence as foundational design principles. Moreover, as humans are inherently social beings, opportunities for cooperation and shared experiences further enhance engagement and psychological well-being.

Game design also supports meaning-making by positioning players as active protagonists within a system [5]. By offering clear goals, feedback, and opportunities for both small and significant achievements, games, and therefore “edugames” which stand as educational serious games, foster resilience and encourage reflective thinking. This structure creates positive feedback loops in which challenge, effort, and reward reinforce one another, motivating players to persist and improve.

From a cognitive perspective, games and simulations facilitate learning through experimentation, trial and error, and problem-solving. XR environments extend this potential by enabling situated, embodied learning scenarios in which users can safely explore complex systems. Learning in such contexts is rarely linear; instead, it adapts to user decisions, encouraging imagination, focus, and strategic thinking. This aligns with evidence linking video game play to improvements in problem-solving skills and adaptive cognition in XR spaces and metaverses.

Taken together, positive psychology provides a strong theoretical foundation for understanding why gamification and game design are particularly well suited for XR-based learning environments. By prioritising autonomy, competence, relatedness, and meaningful engagement, gamified metaverses can move beyond superficial interaction and support sustained motivation, experiential learning, and positive behavioural change.

2.2 Adapting Best Practices from Gaming to XR Spaces

Designing meaningful XR spaces requires moving beyond superficial gamification layers and instead drawing from best practices established in mature gaming ecosystems [4]. Well-designed games rely primarily on intrinsic motivation and carefully avoid exploitative mechanisms or dark patterns that resemble gambling behaviours.

A first best practice concerns narrative and meaning making. In successful games, storytelling functions as an emotional scaffold that helps players contextualise challenges, internalise knowledge, and remain engaged over time. In XR spaces, such as metaverses, narrative does not necessarily imply fictional storytelling, but rather the use of meaningful framing, metaphor, and experiential coherence to support understanding. When combined with rational argumentation or non-fictional content, narrative elements foster empathy and sense-making, allowing users to situate their actions within a broader experiential logic.

A second principle relates to technology as an enabler of transmedia continuity rather than an end in itself. Gaming experiences often extend beyond a single platform, reaching users through complementary media such as mobile applications, social networks, audiovisual content, or physical artefacts. Similarly, XR spaces benefit from being conceived as part of a broader ecosystem, where experiences can be accessed, extended, or reflected upon across multiple channels. This approach increases exposure, reinforces learning outcomes, and accommodates diverse user preferences and contexts.

Aesthetic coherence represents another critical best practice. Visual and spatial appeal play a decisive role in capturing attention and sustaining interest, particularly in immersive environments. Aesthetics in XR is not merely decorative; it contributes to usability, emotional engagement, and cognitive clarity. Well-crafted visual design supports orientation, reinforces narrative tone, and enhances the perceived quality and credibility of the experience.

At the core of any effective gaming experience lie game mechanics that structure interaction and progression. In XR spaces, mechanics guide exploration, decision-making, and feedback, ensuring that participation remains enjoyable and purposeful. Clear rules, meaningful challenges, and responsive systems support engagement, behavioural change, and knowledge transfer without overwhelming users with unnecessary complexity.

Long-term engagement in gaming communities is often sustained through social structures and progression systems. Best practices include appointment dynamics that reward periodic participation, reputation-based progression that reflects skill development rather than mere accumulation, and transparent feedback systems that visualise progress toward goals. In educational XR environments, such mechanisms can foster commitment while respecting users' autonomy, particularly when progression is relative, contextual, and socially meaningful [6].

Cooperative dynamics also play a central role. Guilds, teams, or shared objectives encourage participants to contribute collectively, reinforcing social bonds and shared responsibility. In educational or professional XR spaces, cooperation can be leveraged to support peer learning, collective problem-solving, and community building. Importantly, extrinsic rewards such as points or badges should be connected to intrinsic values, such as social contribution, altruism, or real-world impact, rather than functioning as isolated incentives.

Another relevant best practice involves bridging virtual and physical contexts. Successful games often extend beyond the screen, encouraging offline reflection, discussion, or community participation. XR experiences can similarly benefit from integrating online and offline activities, enabling users to transfer insights, skills, or behaviours into real-world contexts. Mobile platforms can facilitate seamless transitions between immersive sessions and everyday life.

Adaptability and personalisation are equally essential. Gaming communities thrive when systems respond to user preferences, behaviours, and evolving motivations. XR spaces should therefore avoid rigid or artificial motivational schemes and instead allow for customisation, adaptive difficulty, and flexible pathways. Such responsiveness ensures alignment with community norms and individual expectations, increasing perceived relevance and trust.

Finally, the design of XR experiences must account for diverse motivational profiles [13]. Research in game studies has identified multiple player types, each driven by different cognitive, social, and behavioural motivations. While classifications vary across frameworks, a common conclusion is that users typically resonate with one or two dominant motivational patterns. XR spaces, particularly in educational or cultural contexts, should therefore be designed to accommodate a range of participant profiles, ensuring that exploration, achievement, social interaction, mastery, and casual engagement are all meaningfully supported.

This approach aligns with the concept of the "total guest experience", originally articulated in theme park design [7], whereby enjoyment and value are ensured regardless of role, age, or motivation. By recognising and designing for motivational diversity, XR spaces can become inclusive, resilient, and engaging environments capable of supporting heterogeneous audiences.

Taken together, these best practices suggest that effective XR spaces should be designed less as static virtual locations and more as living systems shaped by narrative coherence, social dynamics, adaptive mechanics, and user-centred motivation. When grounded in established gaming practices, XR environments can move beyond novelty and become sustainable platforms for engagement, learning, and participation.

2.3 Skills Development and Experiential Learning in Virtual Spaces

Metaverse environments inherit much of their pedagogical potential from video games, which are fundamentally structured around challenge-solving. Regardless of genre, games present players with goals that require overcoming obstacles, making decisions, and adapting strategies, either individually or collaboratively [10]. This challenge-driven structure places players in situations where their existing skills are continuously tested, refined, and expanded [4]. As a result, gameplay naturally becomes a form of experiential learning in which knowledge and competencies emerge through action rather than passive instruction.

Video games, like other cultural forms such as literature, cinema, or music, can be classified into genres that share common characteristics in terms of gameplay mechanics, interaction patterns, narrative structures, and success conditions. These genres are not merely aesthetic labels; they shape the types of cognitive, social, and operational skills that players are required to mobilise. By allowing individuals to select experiences aligned with their preferences and motivational profiles, games create favourable conditions for sustained engagement and skill development.

Positive effects associated with video game play, which are directly transferable to virtual and XR-based learning environments, include improvements in cognitive abilities, enhanced problem-solving and logical reasoning, strategic planning, decision-making speed and accuracy, visuospatial skills, multitasking, and hand–eye coordination. Social and behavioural benefits have also been identified, such as increased prosocial behaviours, cooperation, and collaborative problem-solving. Together, these effects demonstrate how games, and interactive spaces such as metaverses, can simultaneously support the development of both hard skills, related to task execution and knowledge application, and soft skills, encompassing cognitive, social, emotional, and self-regulatory dimensions.

In immersive XR spaces, these dynamics are further amplified through embodiment, spatial presence, and situated interaction. Virtual environments allow learners to experience scenarios that would be difficult, costly, or risky to reproduce in physical settings, supporting a form of “learning by discovery” in which users explore systems, test hypotheses, and observe consequences in real time. Such environments encourage active participation and place learners at the centre of the experience, mirroring the way players engage with complex game worlds.

The skills trained through games and game-inspired XR experiences can be broadly grouped into several interrelated categories. Basic skills include self-discipline, goal setting, time management, and organisational abilities, which are reinforced through progression systems and task structures. Cognitive and physical skills encompass logical reasoning, induction, speed of reasoning, visuospatial abilities, and coordination, often exercised through problem-solving, navigation, and interaction with dynamic environments. Cross-functional skills involve communication, teamwork, people management, monitoring of self and others, and judgment and decision-making, particularly in multiplayer or collaborative scenarios. Finally, emotional skills such as frustration tolerance, stress management, self-confidence, and self-motivation are developed through repeated exposure to challenge, failure, feedback, and achievement.

These skill categories rarely operate in isolation. Instead, virtual experiences require participants to mobilise multiple competencies simultaneously, reflecting the complexity of real-world situations. For example, solving a problem in a virtual environment may demand logical reasoning, creativity, emotional regulation, and coordination with others, all within constrained timeframes. This holistic engagement helps explain why game-based and XR-based learning environments are particularly effective at fostering transferable skills applicable beyond the virtual context.

Importantly, the educational value of virtual spaces does not stem solely from their technological sophistication, but from their ability to align challenges, mechanics, and feedback with meaningful skill development goals. When designed intentionally, XR environments can function as applied simulators that support experimentation, iteration, and reflection, allowing learners to practice competencies in safe yet demanding contexts [12]. In this way, playing and learning converge, reinforcing the idea that virtual spaces can serve as powerful arenas for skill acquisition, rehearsal, and growth.

Taken together, these observations suggest that XR spaces and metaverses can leverage genre-based mechanics, challenge-driven structures, and immersive interaction while supporting the development of cognitive, social, and emotional competencies that are essential for both educational and professional contexts such as the ones within the VIC Project.

3 THE VIC MASTER PROGRAMME IN XR AS AN EXPERIENCE-CENTRED LEARNING ECOSYSTEM

Within the framework of the VIC Project [14], these theoretical and design considerations materialize in the development of a Master's Degree in Immersive Technologies and Artificial Intelligence, a 120-ECTS programme conceived to address Europe's advanced digital skills gap through an experience-centred, interdisciplinary approach to XR education. Rather than structuring learning around isolated technical competencies, the programme is designed as a coherent educational ecosystem in which motivation, engagement, and skill development are intentionally orchestrated through active and applied learning strategies.

3.1 Pedagogical design

The programme responds to the growing demand for XR professionals across sectors such as industry, healthcare, culture, education, entertainment, and public administration among other sectors, while acknowledging the fragmentation of existing educational offerings. Its design reflects the premise advanced throughout this paper: that meaningful learning in immersive contexts emerges when technological affordances are aligned with psychological motivation, experiential coherence, and challenge-driven engagement. Consequently, the programme does not assume a purely technical entry profile. Instead, it welcomes students from diverse academic and professional backgrounds, including technology, arts, design, business, education, and consulting, fostering interdisciplinary collaboration as a core pedagogical value.

Pedagogically, the curriculum is grounded in project-based learning, learning-by-doing, and active methodologies that mirror the dynamics of well-designed gameful experiences.

3.2 The program's structure

As shown in figure 1, foundational courses introduce students to the principles of virtual and augmented reality, computer graphics, artificial intelligence, and human–computer interaction, establishing the technical and conceptual literacy required to engage with immersive systems. These modules emphasise not only how XR technologies function, but how users perceive, interact with, and derive meaning from them, reinforcing the user-centred and motivational perspective discussed earlier.

As the programme progresses, students engage with increasingly applied and complex scenarios. Courses on immersive simulation, physics engines, XR hardware, and advanced artificial intelligence expose learners to systems that require experimentation, iteration, and problem-solving under constraints, closely resembling the challenge structures of games and simulations. In parallel, modules focused on playful, collaborative, and social virtual environments explicitly address motivation, cooperation, and community building, translating insights from game design and positive psychology into educational practice.

The second year of the programme adopts a forward-looking and reflective stance. Topics such as mixed reality, advanced interfaces, ethics, regulation, and innovation management situate immersive technologies within broader societal, legal, and economic contexts. This reflects the understanding that XR designers and developers must not only master tools, but also navigate ethical responsibility, sustainability, and real-world impact. The integration of innovation and technology transfer further reinforces the connection between experiential learning and professional application.

The programme culminates in a final dissertation or applied project, often linked to industry collaboration or research, where students synthesise technical, creative, and motivational design principles into a coherent outcome. Internships and applied projects extend learning beyond the academic setting, enabling students to transfer competencies developed in virtual and simulated environments to real-world professional contexts. In this sense, the programme embodies the concept of "playing for real", as learners engage with complex challenges that mirror authentic industry and societal problems.

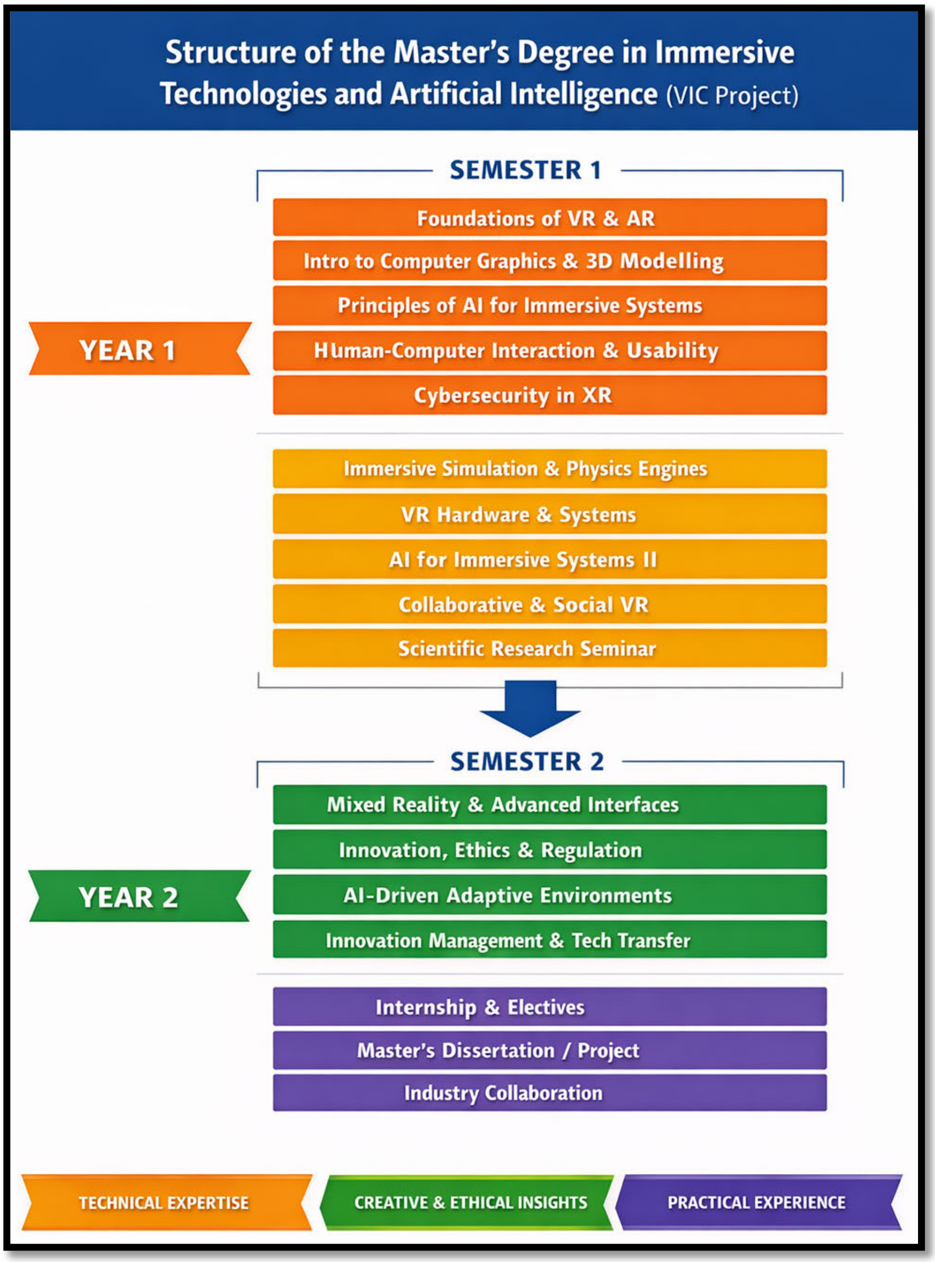

Figure 1. The VIC master programme layout.

Taken together, the VIC Master Programme operationalises the principles discussed throughout this paper. It treats immersive education not as content delivery, but as an experience to be designed, curated, and lived. By integrating gamification, game design logic, and XR technologies within a structured academic framework, the programme demonstrates how higher education can leverage virtual spaces to support sustained motivation, skill development, and meaningful learning aligned with Europe's digital transformation goals.

4 CONCLUSIONS

The design of the Master's Degree in Immersive Technologies and Artificial Intelligence within the VIC Project illustrates how principles from positive psychology and game design can be operationalised in higher education. Rather than treating XR education as a linear transmission of technical knowledge, the programme is conceived as an experience-centred learning system in which motivation, engagement, and skill development are deliberately orchestrated. In this sense, the programme can be understood as an edutainment ecosystem, where learning emerges through active participation, challenge-solving, and meaningful interaction.

Positive psychology principles, particularly those derived from Self-Determination Theory, are embedded throughout the programme's structure and delivery. The curriculum's emphasis on experiential learning, simulation, and applied projects aligns closely with the conditions required for flow, enabling students to engage deeply with content while balancing challenge and skill. By positioning learners as active protagonists within authentic scenarios, the programme promotes intrinsic motivation and sustained engagement, reducing reliance on external incentives. Framing the programme as an edutainment experience does not imply trivialisation or entertainment for its own sake. Instead, it acknowledges that enjoyment, curiosity, and emotional engagement are legitimate and powerful drivers of deep learning. By enabling learners to "play for real" within structured academic contexts, the programme offers a scalable model for XR education aligned with Europe's digital transformation goals and the evolving needs of interdisciplinary innovation ecosystems.

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REFERENCES

[1] M. Ball, The Metaverse: And How It Will Revolutionize Everything. New York: Liveright Publishing, 2022.

[2] M. Csikszentmihalyi, S. Abuhamdeh, and J. Nakamura, "Flow," in Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi. Dordrecht: Springer Netherlands, 2014, pp. 227–238.

[3] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, "From game design elements to gamefulness: Defining gamification," in Proceedings of the 15th International Academic MindTrek Conference, pp. 9–15, 2011.

[4] O. Garcia-Panella, A. Badia-Corrons, E. Labrador-Ruiz, and D. Fonseca-Escudero, "Pleasant learning experiences: Augmenting knowledge through games and interaction," in Educational Stages and Interactive Learning: From Kindergarten to Workplace Training, 2012.

[5] K. M. Kapp, L. Blair, and R. Mesch, The Gamification of Learning and Instruction Fieldbook: Ideas into Practice. Hoboken, NJ: Wiley, 2013.

[6] N. Lazzaro, "Designing emotions for games, entertainment interfaces, and interactive systems," in Human-Computer Interaction: Designing for Diverse Users and Domains, 2009.

[7] Y. Quintana and O. García, Serious Games for Health: Mejora tu salud jugando. Barcelona: Gedisa Editorial, 2017.

[8] J. Radoff, Building the Open Metaverse. Available at https://www.buildingtheopenmetaverse.org/people/jon-radoff. Accessed December 2025.

[9] R. M. Ryan and E. L. Deci, Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness. New York: Guilford Press, 2017.

[10] J. Schell, The Art of Game Design. Burlington, MA: Morgan Kaufmann, 2008.

[11] L. Sheldon, The Multiplayer Classroom: Designing Coursework as a Game. Boca Raton, FL: CRC Press, 2020.

[12] K. Squire, Video Games and Learning: Teaching and Participatory Culture in the Digital Age. New York, NY: Teachers College Press, 2011.

[13] Tondello GF, Mora A, Marczewski A, Nacke LE. Empirical validation of the Gamification User Types Hexad scale in English and Spanish. International Journal of Human–Computer Studies. 2019;127:95–111. doi:10.1016/j.ijhcs.2018.10.002.

[14] Virtual Innovation Consortium (VIC), Project Overview, 2024. Retrieved from https://vic-eu.com. Accessed January 2026.

[15] K. Werbach and D. Hunter, For the Win: The Power of Gamification and Game Thinking in Business, Education, Government, and Social Impact, Rev. and updated ed. Philadelphia, PA: University of Pennsylvania Press, 2020.