The Virtual Presence Pedagogy (VPP): A sistematic review of foundational elementes in immersive digital ecosystems (2023- 2025)

Sorin TOPOR

National Institute for Research & Development in Informatics – ICI Bucharest, Bucharest, Romania

sorin.topor@ici.ro

Abstract: *The emerging digital ecosystem, centered on the Metaverse, promises profound transformations in education, moving from transmissive learning to deeply immersive, collaborative, and personalized experiences. This transition requires a new pedagogical framework that manages socio-technological and ethical challenges. Although traditional theories define presence as physical, recent research extends it to virtual environments through multisensory interactions. Thus, an integrative discipline that defines and optimizes authentic human presence in these augmented spaces is lacking.*

Using the PRISMA 2020 protocol, this study conducted a systematic review based on OpenAlex data (period 2023-2025), identifying 132 relevant records. Bibliometric analysis using VOSviewer confirmed that emerging pedagogical transformation is strongly related to cutting-edge fields, especially Computer Science, Virtual Reality and Psychology.

Based on this synthesis, the research proposes "Virtual Presence Pedagogy" (VPP) as a fundamental discipline, which redefines the notion of human presence in education by expanding it into three complementary dimensions: cognitive presence, social presence and identity presence.

We conclude that VPP will represent an appropriate methodology for creating an integrated educational ecosystem, transforming the Metaverse from a digital space into a pedagogy of augmented proximity, essential for the 21st century skills formation.

Keywords: Advanced technology, Metavers, Educational trends, Pedagogy, Virtual presence.

1. Introduction

The global context is defined by accelerated technological change, automation and digitalization, with over 60% of current professions expected to undergo major transformations (Di Battista et al., 2025). These developments require the educational system to transition from a teacher-centered model to a student-centered one (Gabor, Iftimoaei & Vevera, 2024), oriented towards the development of 21st century skills, such as critical thinking, complex problem solving, cognitive flexibility and resilience.

The metaverse, as a persistent and immersive digital ecosystem, represents a continuation of the efforts to digitize education post-COVID-19. It promises to be not just a tool, but an environment capable of ensuring deeply immersive,

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collaborative and personalized learning, facilitating the formation of those skills necessary to adapt to the major challenges of the 21st century.

However, integrating the Metaverse into education requires a solid theoretical framework. Although the literature addresses the technological aspects (learning through 3D virtual environments, artificial intelligence, augmented reality and virtual reality) and the benefits of immersive learning, there is a gap in defining and authentically managing the human experience in this space. Thus, it is necessary to create a new discipline that combines traditional learning theories with new technologies.

The paper presents a vision through which traditional education can be transformed into an authentic virtual presence, into an augmented educational ecosystem. By systematically analyzing and reviewing emerging academic trends for the period 2023-2025, which define the intersection between pedagogy and immersive digital ecosystems, we consider it necessary to propose and substantiate a new methodological framework, which we call "Virtual Presence Pedagogy" (VPP).

2. Background - the main challenges of the transformation from traditional pedagogy to that of virtual presence

In classical educational theories, presence is associated with the physical participation of teachers/instructors and students in the educational process. Recent research in this field (Ahmed, 2024) emphasizes that presence can be recreated in virtual environments, through multisensory and collaborative interactions, thus generating an authentic perception of human presence, beyond the simple substitution of real space.

The literature defines three complementary dimensions of virtual presence (Kaczkó & Ostendorf, 2023), which can be expanded through PPV:

1. Cognitive presence: Active student involvement in constructing educational meaning, stimulated through interaction and immersive practical experiences;
2. Social presence: The authentic and empathetic communication capacity of participants, facilitating effective collaboration of participants in virtual spaces;
3. Identity presence: The form of expression and self-reflection on the purpose of learning through the educational avatar.

All these dimensions define the epistemological framework of PPV, providing the structure for transforming the pedagogy of physical presence into a virtual one.

3. Method (systematic review- PRISMA 2020)

Using the PRISMA 2020 methodology (Page et al., 2021), we conducted a systematic review of studies identified in academic, open source databases, namely the OpenAlex database (Web of Science, Scopus, etc.). Focusing on recent academic trends (2023-2025), we targeted those works associated with the main

criterion "pedagogy of virtual presence". The key terms used in the searches included variations such as: Metaverse, pedagogy, virtual presence, immersive learning and education.

Using the bibliometric mapping tool VOSviewer, the searches yielded 132 records. The application was used to visualize term correlations, identify thematic clusters, and establish interrelationships between domains.

The bibliometric analysis of the 132 records generated 70 topics, of which the most relevant, ordered by the number of citations, are: Virtual Reality Applications and Impacts (21), Online and Blended Learning (14), Educational Innovations and Challenges (5) and Innovative Educational Technologies (4).

Mapping the co-occurrence relationship of terms (Figure 1) revealed eight main thematic groups at the intersection of education and the Metaverse. The most prominent are: Computer Science, Psychology, Mathematics, Pedagogy, Sociology, Human-Computer Interaction, Virtual Reality and Multimedia.

Subsequently, we applied three search filters for the criterion Human Interaction in Metaverse, in the domains of Life Sciences, Physical Sciences and Social Sciences, obtaining a series of inter-relationships between the searched terms (Figure 2), with Pedagogy, the main subject of the analysis. Thus, we obtained a thematic model from which we can deduce the emerging trends of transformation of the educational process through Metaverse.

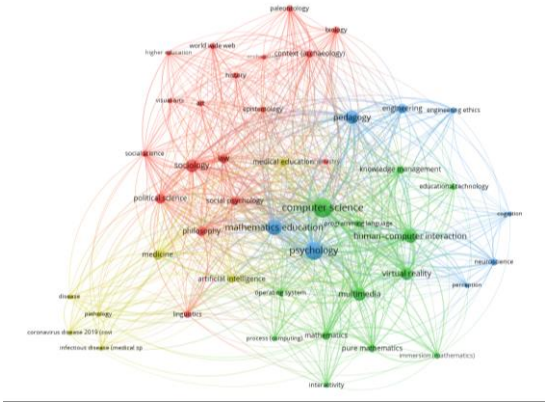

Figure 1. Interrelationships and main thematic groups of related fields

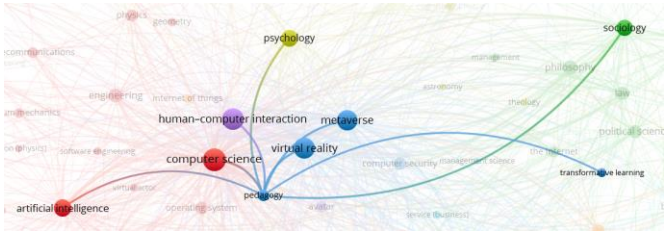

Figure 2. Interrelationships of pedagogy with socio-technological fields

The strongest interrelationships of the Metaverse and the Pedagogy domain are established with the Computer Science, Psychology and Virtual Reality

domains (Figure 3) compared to the interrelationships of metaverse technologies (Figure 4).

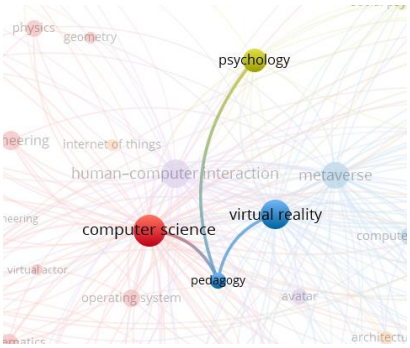

Figure 3. Strong relationships of pedagogy with some thematic groups

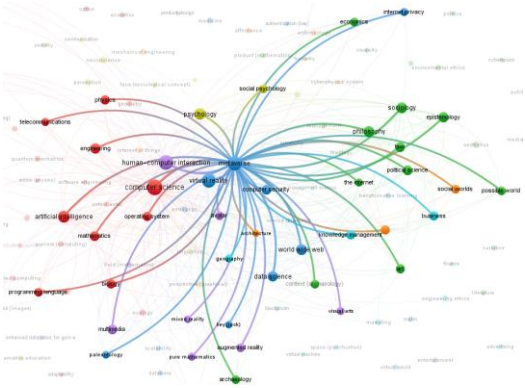

Figure 4. The strong interrelationships of the metaverse with related thematic groups

4. Results – emerging qualitative aspects

Thus, the thesis is supported according to which the socio-technological fields "Virtual Reality" and "Computer Science" are the pillars of educational transformation:

- Through Virtual Reality, it is emphasized that the metaverse has the potential to become a tool with an important role in the teaching-learning process, being able to create immersive and interactive environments (Crivellaro & Mandaio, 2023);
- Through Computer Science, some technologies related to Metavers are already educational tools. We have identified projects implemented in the educational process for the inclusion of students with special needs, for the disciplines of history, philosophy, operating systems theory and architecture (Maneita et al., 2024). Due to the increasing digitalization of society, computational thinking has become an increasingly important component in education, especially in primary education (Coelho et al.,

2025). Moreover, in Brazil, a perspective of teaching philosophy has been realized, through OCHE pedagogical practices, centered on Eurocentric models, in order to obtain a global, theoretical and practical, critical and transformative knowledge, adapting the educational process to forms that transcend the simple transfer of content to one adapted for reflection and transformation (Freire & Rodrigues, 2025).

Positive use case of Metavers in pedagogy: Through the perspective of transforming pedagogical methods to the new digitalized context, we support the following advantages that emerge towards the most promising scenarios:

1. Immersive, interactive and experiential learning is more effective and engaging in practical contexts, with mixed virtual environments allowing the recreation of scenarios that cannot be easily replicated in reality (da Silva et al., 2025);
2. Personalization and adaptability create a flexible educational environment, centered on individual needs. Metaverse can support various pedagogical methods, from autonomous to collaborative learning, based on problem solving, through tools adapted to the diversity of students (Tlili et al., 2022; Soviany, Gheorghe & Gheorghe-Moisii, 2024);
3. Extended learning communities, through Metavers, will integrate multimedia resources, complex simulations and transdisciplinary collaborations that are difficult to achieve traditionally (Almeman et al., 2025);
4. Developing creativity, critical thinking, communication skills and collaboration through real-life or near-real-life services can become an ideal space for activated pedagogies, projects and problem-based learning (Tlili et al., 2022);
5. Democratizing access to education and developing the model of lifelong continuous education (continuous training, professional retraining, on-formal courses, etc.) can be achieved through Metavers (De Felice et al., 2023).

5. Discussions: Implications of virtual presence pedagogy

The analysis demonstrates that a new pedagogy must adapt to the changes in the digital society, including the need to develop resilience, emotional intelligence and self-management, aspects increasingly sought after in the labor market. To combat the superficiality of vocational training, it is essential that the academic environment provides tools that stimulate curiosity and life-long learning.

This new discipline, which we call Virtual Presence Pedagogy (VPP), will constitute a pedagogical method that responds to this requirement because:

1. Ensures authentic co-presence: The virtual presence of the teacher/instructor becomes an authentic perception of human

co-presence, generating augmented cognitive and emotional experiences, not simple substitutions;

2. Promotes higher engagement: Although digital education is accessible, PPV can bring higher cognitive and emotional engagement, fostering collaboration, empathy, and self-reflection;
3. Reconfigures the role of the teacher: The teacher/instructor becomes a guide in navigating information resources and validating sources of knowledge, capable of creating learning communities and coordinating cognitive reflection.

In this new educational ecosystem, being present does not just mean participating but experiencing knowledge that combines multimedia resources, complex simulations and transdisciplinary collaborations.

6. Conclusions

Virtual Presence Pedagogy (VPP) fundamentally redefines human presence in education, expanding it in cognitive, social and identity terms. By integrating Metaverse technologies, VPP transforms the traditional model into a pedagogy of augmented proximity, eliminating not physical presence, but the distance between knowledge and experience.

PPV transforms the metaverse into an instrument of relationship and reflection, shaping a future of the ecology of presence that coherently integrates the real, the digital and the immersive into a whole oriented towards the development of the Society 5.0 model, where technologies support the well-being and continuous development of citizens.

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