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PSYCHOLOGICAL, COGNITIVE, AND SOCIODEMOGRAPHIC FACTORS ASSOCIATED WITH STUDENTS' READINESS FOR DIGITAL SKILL DEVELOPMENT IN IMMERSIVE METAVERSE LEARNING

The Metaverse as an Emerging Educational Ecosystem

Advances in digital technologies have reshaped how individuals interact, communicate, and learn. At the center of this evolution is the metaverse, an immersive and persistent virtual environment supported by AR, VR, AI, and networked infrastructures. Its educational potential derives from integrating embodied, perceptual richness with the flexibility of digital ecosystems. Scholars increasingly highlight the metaverse as a promising space for deep learning and adaptive instruction (Wei et al., 2023). Unlike traditional e-learning, often passive and two-dimensional, immersive environments offer dynamic, spatial, and interactive experiences grounded in presence and embodied cognition, enabling learners to explore simulated contexts and co-construct meaning.

Learning Styles and Multisensory Processing

Learner variability plays a key role in instructional effectiveness. Classical models (Kolb, 1984; Fleming, 2001) emphasize differences in preferred modalities. Immersive environments accommodate these through natural multimodal engagement—visual, auditory, spatial, and kinesthetic. Cognitive research shows that multisensory integration enhances retention and engagement. Consistent with this, the dataset indicates that individuals drawn to the metaverse prefer visual-nonverbal and kinesthetic learning styles, which align with virtual environments emphasizing imagery, sensory input, and embodied interaction.

Personality Traits and Engagement

Personality significantly shapes receptivity to immersive learning. Traits such as openness to experience, energy, and agreeableness predict stronger engagement with virtual environments (Oleksy et al., 2023). Absorption—the

tendency to become deeply immersed in internal imagery—enhances presence and emotional resonance, supporting more impactful learning experiences.

Embodied Cognition and Immersion

Contemporary theories highlight learning as embodied, shaped by sensorimotor activity and environmental affordances. VR environments simulate action, spatial navigation, and experiential scenarios, activating neural pathways associated with real-world learning. From a constructivist standpoint, the metaverse provides access to contexts otherwise unreachable, fostering situated learning and supporting transfer of knowledge.

Digital Socialization and Motivation

Engagement with digital ecosystems also predicts metaverse readiness. Frequent social media use facilitates virtual communication, identity representation, and comfort in online environments. The dataset confirms that higher social media dependence correlates with interest in metaverse learning, reflecting digital acculturation and expectations for interactive, personalized educational experiences.

Sociodemographic Predictors

Age and educational level consistently influence technology adoption. Younger individuals demonstrate higher adaptability to immersive systems, while higher education correlates with greater openness to innovation and digital self-efficacy. The results support these trends: readiness decreases with age and increases with education.

Toward a Predictive Framework

Integrating learning styles, personality factors, absorption, digital behavior, and sociodemographic characteristics enables a comprehensive model of readiness for metaverse-based learning. The metaverse emerges as a psychologically mediated environment in which adoption depends on the alignment of user characteristics and system affordances. This framework supports the identification of learner profiles suited to immersive ecosystems and informs strategies for inclusive and effective implementation.

Method

A quantitative correlational design was used. Data were collected from 357 participants aged 16–86 ($M = 48.09$; $SD = 13.99$), predominantly Italian (97.8%), and mostly female (65.3%). Educational levels ranged broadly, with

62.7% reporting a university degree. Measures included: Learning Style Inventory (Dunn & Dunn, 1978), Big Five Questionnaire (Caprara et al., 1993), Tellegen Absorption Scale (Tellegen & Atkinson, 1974), and the Social Media Dependence Scale (Meena et al., 2021).

Results

Interest in metaverse learning correlated strongly with interest in digital medicine ($r = .655$, $p < .001$). Age correlated negatively ($r = -.247$, $p < .001$), indicating stronger interest among younger participants. Educational attainment correlated positively ($r = .254$, $p < .001$). Personality traits—energy, agreeableness, and particularly openness to experience ($r = -.372$, $p < .001$)—were associated with higher metaverse readiness. Absorption correlated positively ($r = .107$, $p < .05$). Learning styles significant for metaverse interest were visual-nonverbal ($r = .139$, $p < .01$) and kinesthetic ($r = .104$, $p < .05$). Social media dependence also correlated positively ($r = .264$, $p < .001$). Group-oriented learning styles showed no significant association.

Discussion

The results outline a consistent profile of the metaverse-oriented learner: younger, well-educated, frequent users of digital platforms, and inclined toward visual-nonverbal and kinesthetic learning. They display higher openness, energy, agreeableness, and absorption, all of which facilitate presence and engagement in immersive contexts. The inverse correlation with openness likely reflects two subgroups: highly open digital natives and older individuals open to novelty but cautious toward immersive technologies.

Conclusions

Metaverse readiness arises from interactions among cognitive style, personality, digital experience, and sociodemographic background. Younger age and higher education support engagement, while visual and kinesthetic learning styles enhance navigation and meaning-making in immersive spaces. The link with social media use indicates that digital socialization fosters familiarity and comfort within virtual educational contexts. Future research should employ longitudinal and experimental methods to examine causal pathways and cross-cultural variations. This work contributes to designing evidence-based immersive pedagogies that enhance learning, engagement, and inclusion.

References

1. Caprara, G. V., Barbaranelli, C., & Borgogni, L. (1993). *BFQ: Big Five Questionnaire*. Giunti Organizzazioni Speciali.
2. Chiquet, A., Rieger, J. W., & Mathieu, J. E. (2023). Absorption and immersive learning: Psychological mechanisms underlying presence in virtual environments. *Journal of Experimental Psychology: Applied*, 29(2), 215–229.
3. Dunn, R., & Dunn, K. (1978). *Teaching students through their individual learning styles*. Prentice-Hall.
4. Fleming, N. D. (2001). *Teaching and learning styles: VARK strategies* (2nd ed.). VARK Press.
5. Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
6. Meena, P. S., Mittal, P. K., & Solanki, R. K. (2021). Development and validation of the Social Media Addiction Scale. *Industrial Psychiatry Journal*, 30(1), 121–126.
7. Oleksy, T., Wnuk, A., Zaharia, D. M., & Tużnik, P. (2023). Personality traits, presence, and engagement in immersive virtual environments: A metaverse perspective. *Computers in Human Behavior*, 143, 107673. <https://doi.org/10.1016/j.chb.2023.107673>
8. Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences (“absorption”), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83(3), 268–277.
9. Wei, X., Chen, G., & Hou, H. (2023). Immersive learning in the metaverse: Pedagogical potentials, challenges, and research directions. *Computers & Education*, 194, 104703. <https://doi.org/10.1016/j.compedu.2023.104703>
10. Xinli, S., Zhang, L., & Ma, Y. (2022). Technology readiness and adoption of virtual immersive learning environments among different age groups. *Educational Technology Research and Development*, 70, 2041–2063.