9th International Conference on Higher Education Advances (HEAd'23)
Universitat Politècnica de València, València, 2023
DOI: http://dx.doi.org/10.4995/HEAd23.2023.16157

Let's experience learning in the metaverse

Eman AbuKhousa
Faculty of Computer Information System, Higher Colleges of Technology, United Arab Emirates.

Abstract

The metaverse and learning experience design (LXD) are shaping the future of learning and teaching in higher education. The metaverse is a virtual extension of the physical world that frees learning from time and space constraints while LXD is a learn-centric approach to design technology-mediated learning. LXD focuses on cognitive and affective engagement of learners with the learning experience; and the metaverse promises the adaptive infrastructure and flexible design space to realize digital learning as a journey of a series of ongoing, intensively personalized, immersive, adaptive, and competency-based experiences. In this paper, we discuss and reflect on how the potentials of metaverse can expand the effectiveness of LXD to address certain aspects of learning experience such as the influence of prior experiences, emotions, motivation, and attention. The metaverse presents unique opportunities to manage these aspects and to offer more attractive environments for learning activities.

Keywords: *The metaverse; learning experience; learning experience design; empathy mapping; cognitive engagement; affective engagement.*

This work is licensed under a Creative Commons License CC BY-NC-SA 4.0
Editorial Universitat Politècnica de València

1. Introduction

The metaverse is the new virtual universe for us to connect, socialize, play, share, experiment, create and trade. It is an online, collective, immersive, and interactive space that represents a digital extension to everything we experience, including learning. While it is still not fully developed, metaverse is constantly evolving with more potential applications to improve education and learning (Hwang & Chien 2022). The creation of learning experience (LX) in the metaverse is discussed in previous work (AbuKhousa et al., 2023) as the process that involves the development of 3D virtual learning environments and the creating of virtual representations of learners (avatars). It also includes designing and implementing learning activities which users can access and interact with through immersive interfaces and controls. While more frameworks are emerged to describe the technological aspects of metaverse education (e.g. Dahan et al., 2022; Cui et al., 2023); still little attention is paid to address cognitive and affective aspects that drive individuals to access the learning experience on metaverse to learn what they need verse what they want and to keep them engaged in the learning process. On the other hand, learning experience design (LXD) is an emerging area of learning design and technology (LDT) that integrates modern methods and processes such as design thinking, user experience (UX) and human-computer interaction (HCI) to focus on all the aspects of the learner's interaction with the learning tasks during technology-mediated learning. This includes the cognitive engagement as well as the affective response and subsequent engagement (i.e., level of involvement and participation) with the learning context (Tawfik et al., 2022).

The objective of this article is to explore how principles of LXD can inform the creation of learning experience on metaverse; and how the adaptation capabilities of metaverse may contribute into expanding the LXD to create multiple, equally effective learning experiences to support diverse and emerging cognitive and emotional needs of the learners. What faculty and learners in high education want in their virtual learning experience is not only a personalization of the content but also an adaptive competency-based learning process with more personalized assessment of the outcomes (Shearer et al., 2020). The autonomy and individualism focus should not be limited to the "pace" learners need to complete the learning tasks or to achieve certain level of learning outcomes. Learning journey should be designed as a set of ongoing experiences until desired competence is achieved (Clark, 2022; AbuKhousa et al., 2023).

In the following sections, we present a discussion of design thinking process in LXD and the potentials of the metaverse to enhance the creation of effective learning and growth-production experiences.

2. Learning Experience Design (LXD)

The dictionary by Merriam-Webster defines experience as "act or process of directly perceiving events or reality." Learning is also a process during which learners develop perceptions and responses as result of their presence and interacting with the learning environment. They notice, interact, and interpret events in the physical and social surroundings and make changes in accordance with their intents and resources available for them in this process (Boud, 2008). It is the never-end situated sensing and doing activity with outcomes that remain in the memory and affect our behavior. Understanding the influence of the affective context on learning leads to designing good learning experiences that encourage and sustain learning (Clark, 2022). On the other hand, and according to common elements theory, learning happens through a series of experiences that engage learners in inferential reasoning and metacognitive activities to produce adaptive responses to problems in their environment (Butterfield & Nelson, 1989). Investment on these cognitive efforts is influenced by personal mental frameworks and associated with dispositional individual differences in self-control and goal-directed behavior (Kührt et al., 2021). For example, learners high in cognitive motivation, i.e., who have a high tendency to engage in and enjoy effortful cognitive tasks, will require integration of additional motivational attractions into their learning experience to avoid cognitive boredom. Other learners are subjected to the risk of cognitive overload if they are required a high interaction to complete the learning task (Wang et al., 2014). Thus, designing effective learning experiences requires understanding not only of learners, their needs, and the context in which they are embedded, but also the concepts and theories of learning, attention, memory, cognitive efforts, engagement; then making empirical evidenced decisions on how to create learning experiences that stick.

Based on a qualitative content analysis of 15 book chapters, Schmidt and Huang (2022) introduced a definition of LXD that is "*a human-centric, theoretically grounded, and socio-culturally sensitive approach to learning design, intended to propel learners towards identified learning goals, and informed by UXD methods.*" The authors also proposed a conceptual model of LXD that presents the complex nature of LXD as a convergence of design, disciplinary, theoretical, and methodological perspectives, with a central focus on learning. Another present LXD as a confluence of two major constructs: (a) interaction with the learning environment focusing on UX elements and learner's utility of technology such as interface customization, content placement on the interface and functionality of presented components; and (b) interaction with learning space focusing on engagement elements and how learners perceives the interface items and interact with the content (Tawfik et al., 2022). Learning is already a challenging process and LXD is all about making the efforts to consider the socio-cultural, design and technological influences and factors to encourage effortful and long-term learning; or as Clark (2022) states "it is a matter of design for both head and hear."

In their open-access book "*Learner and User Experience Research,"* Schmidt et al., (2020) put significant efforts into presenting theories, methods, and design models of LXD as well as examples of applied LXD processes to create digital learning experiences. Such work serves as an essential guide for the learning designers on how to design and operationalize learning experiences for a variety of contexts.

3. Design Thinking Process in (LXD)

Design thinking emphasizes empathy, i.e., develop an immersive understanding of the users for whom the products, services, or learning experience are being created, and combines it with rapid prototyping, and adductive reasoning to deliver the best possible evidence-based solution (Siricharoen, 2021). The design thinking process in LXD goes as follows:

1. Empathize: This stage involves understanding the learners, their needs and emotions, and the problem space. Learners are not approached as a population but as "personas" i.e., specific segments of learners who share goals, motivations, behavior patterns and challenges. Empathy involves research, observation, and interaction with learners to experience their feelings and understand what it is like to have their learning needs or challenges.
2. Define: In this stage, the learning problem is defined based on the insights gathered during the empathize stage. This involves understanding the opportunities and constraints presented by analyzing the learner, learning context, and learning task.
3. Ideate: The ideation stage involves generating potential solutions or experiences to the learning problem.
4. Prototype: The prototype stage involves creating virtual representations of the most promising ideas for the learning experience generated during the ideation stage.
5. Test: In this stage, prototypes are tested with real learners to validate or invalidate assumptions and to gather feedback. Based on the results, the design process may loop back to any of the previous stages or move forward to the implementation stage.

Schnepp and Rogers (2022) described the above design thinking framework as an effective and accessible method to produce effective learning experiences; and suggested a practical straight-forward steps on how to implement it for LXD in higher education. However, it is a more complicated matter as the design thinking with its sensitivity to learners and their needs may potentially undermine the perspectives of learning theories and how learning occurs (Clark, 2022). Plus, the testing part will involve assessment of many technical aspects and their influence on cognitive efforts, affective engagement and learning outcomes achievement. Not to mention the learners' desire to be able to negotiate assessment expectations and to incorporate their input in the design, evaluation and evolving of their

learning experiences. Professionals in higher education will be required to develop a wider set of knowledge, skills, and competencies across a range of disciplines to be able to incorporate LXD into their practices (MacLean and Scott, 2011; Olney, 2023).

4. LXD in the Metaverse: Expanding the LX

The metaverse provides an adaptive infrastructure and a flexible design space that enables creation of interactive and customizable profiles (i.e., avatars), and opportunities for considering not only sociocultural factors but also the physical biometric markers and track their influence on cognitive performance; all of which are required to meet the demands for learning experiences in the digital age (Shearer et al., 2020). In the adaptive learning environment, the learning context and elements are dynamically adjusted according to the outcomes of learner's behaviors and actions while providing instant feedback and support. The artificial intelligence (AI) component of metaverse provide capabilities first to gather insights about the learners; second to create the problem space (i.e., simulating a real-life situations and learning tasks) including the generation of the non-player characters (NPCs) to interact with learner and augment the learning experience; and third to track and analyze the learner 's behaviors and actions while solving the problem (living the experience and engaging with the space objects); and finally to adjust the learning space and experience according to the outcomes of learner's solution to the problem (Hare & Tang, 2022; AbuKhousa et al. 2023).

Clark (2022) states that the art and science of LXD lies between three words: emotion, motivation, and attention. The empathy mapping in LXD focuses on understanding and articulating the thoughts, feelings, and behaviors of a particular persona of learners. The goal is to emotionally motivate learners to engage actively in the experience. Boud (2008) argues that for maximizing learning from any experience, the new experience should be based on personal foundation of learner's feelings and prior learning experiences. The challenge remains for online learning experience is how to use learners' prior offline experiences to design the new experiences and how to link these new experiences to the learners' emotional drives. Moreover, how to analyze the emotions and feelings presented during and after the experience to seize the opportunities for further learning or understand enhancements for the experience growth-production. Prior experiences also influence attention and the attempts of LXD to sustain learner's attention. Attention of learners is mostly affected by their personality characteristics (Van Calster, 2018). The efficacy of external attention technique (e.g., sound cue, visual cue, etc.) may increase the individual's focus and stay on the task, but it does not indicate the learning happens.

In the metaverse, the virtual world and physical world will interact at the highest level of independence, i.e., changes in one of world will be reflected in the other world. The real time

synchronization between the two worlds will enable the achievement of experience-duality, where learners use avatars to experience situations and find solutions in virtual spaces that are closely paired-up with their real-world counterparts. On the other hand, and as in real life, they will experience events in virtual space that are out of control and where learning happens unintentionally as they experiment solutions to handle these events. Lifelong learning is that exact informal learning that occurs through interests, practice, and self-development (Clark, 2022). Learning experience design in the metaverse is envisioned to deliver learning as a situated practice within environments prepared to present the real practice space and the networks of actions and interactions among human and non-human objects. Besides the BIG data and AI capabilities to profile learners (i.e., develop empathy based on online/offline repository of life-time data) and to produce learning scenarios that serve the unique, multiple and the continuously changing individual needs and interests, learners will be driven to immerse themselves in the learning experience as part of living their life! The emotion, motivation and attention aspects are addressed by the reciprocal intentions in the space, i.e., understanding the actions of other players and the ability to interpret surrounding signals and manage unforeseen events as they arise from the context. The component of the metaverse where learners generate and trade digital content or assets; and where they can gain tangible (e.g., private space, premium avatar customization, virtual merchandise) and intangible rewards (e.g., social status in the virtual community, unique experiences, access to exclusive virtual spaces or the ability to interact with NPCs in new ways) can drive the engagement and interaction with the learning experience environment.

5. Concluding Remarks

The emerging LXD approach adopts empathy mapping technique to understand the perspectives, needs, and motivations of learners; and to identify challenges, and opportunities for creating learning experiences that meet their needs. The challenge lies in the complex relationships between the individual learner, learning tasks, technology and learning context; and how the elements of these constructs are influencing the cognitive and affective aspects of the learning. To maximize learning, more emphasis should be put on motivation, attention, engagement, and practice. In the metaverse, the experience is a series of immersive real-time social activities where learners with their unique identities in the virtual world connect, communicate, practice, exchange, trade, and share contents within a context that is governed by rules and norms, just as in real life communities. In this essence, the metaverse offers unique opportunities for LXD to generate more engaging learning experiences that can be customized to meet the needs of individual learners. Also, it offers opportunities to manage attention such as the ability to switch/teleport between different environments and activities in real-time. It is expected that the metaverse will continue to evolve and to offer more realistic and immersive virtual spaces that is more to be a more attractive alternative to

physical environments for many activities including learning. It is time for higher education to consider living and teaching in the metaverse.

References

AbuKhousa, E., El-Tahawy, M. S., & Atif, Y. (2023). Envisioning Architecture of Metaverse Intensive Learning Experience (MiLEx): Career Readiness in the 21st Century and Collective Intelligence Development Scenario. Future Internet, 15(2), 53.

Boud, D. (2005). Locating Immersive Experience in Experiential Learning. In Conference program; University of Surrey: Guildford, UK, 2008; p. 9.

Butterfield, E. C., & Nelson, G. D. (1989). Theory and practice of teaching for transfer. Educational Technology Research and Development, 37(3), 5-38.

Clark, D. (2021). Learning experience design: How to create effective learning that works. Kogan Page Publishers.

Cui, L., Zhu, C., Hare, R., & Ying, T. (2023). MetaEdu: A New Framework for Future Education.

Dahan, N. A., Al-Razgan, M., Al-Laith, A., Alsoufi, M. A., Al-Asaly, M. S., & Alfakih, T. (2022). Metaverse framework: A case study on E-learning environment (ELEM). Electronics, 11(10), 1616.

Hare, R., & Tang, Y. (2022). Hierarchical deep reinforcement learning with experience sharing for metaverse in education. IEEE Transactions on Systems, Man, and Cybernetics: Systems.

Hwang, G. J., & Chien, S. Y. (2022). Definition, roles, and potential research issues of the metaverse in education: An artificial intelligence perspective. Computers and Education: Artificial Intelligence, 3, 100082.

Kührt, C., Pannasch, S., Kiebel, S. J., & Strobel, A. (2021). Dispositional individual differences in cognitive effort investment: establishing the core construct. BMC psychology, 9, 1-14.

MacLean, P., & Scott, B. (2011). Competencies for learning design: A review of the literature and a proposed framework. British Journal of Educational Technology, 42(4), 557-572.

Olney, T., Rienties, B., Chang, D., & Banks, D. (2023). The Learning Design & Course Creation Workshop: Impact of a Professional Development Model for Training Designers and Creators of Online and Distance Learning. Technology, Knowledge and Learning, 1-19.

Schmidt, M., & Huang, R. (2022). Defining learning experience design: Voices from the field of learning design & technology. TechTrends, 66(2), 141-158.

Schmidt, M., Tawfik, A. A., Jahnke, I., & Earnshaw, Y. (2020). Learner and User Experience Research: An Introduction for the Field of Learning Design & Technology. EdTech Books. https://edtechbooks.org/ux

Schnepp, J., & Rogers, C. (2022). A Practical Approach to Learner Experience Design. International Journal of Teaching and Learning in Higher Education, 34(1), 161-169.

Shearer, R. L., Aldemir, T., Hitchcock, J., Resig, J., Driver, J., & Kohler, M. (2020). What students want: A vision of a future online learning experience grounded in distance education theory. American Journal of Distance Education, 34(1), 36-52.

Siricharoen, W. V. (2021). Using empathy mapping in design thinking process for personas discovering. In Context-Aware Systems and Applications, and Nature of Computation and Communication: 9th EAI International Conference, ICCASA 2020, and 6th EAI International Conference, ICTCC 2020, Thai Nguyen, Vietnam, November 26–27, 2020, Proceedings 9 (pp. 182-191). Springer International Publishing.

Tawfik, A. A., Gatewood, J., Gish-Lieberman, J. J., & Hampton, A. J. (2022). Toward a definition of learning experience design. Technology, Knowledge and Learning, 1-26.

Van Calster, L., D'Argembeau, A., & Majerus, S. (2018). Measuring individual differences in internal versus external attention: The attentional style questionnaire. Personality and Individual Differences, 128, 25-32.

Wang, Q., Yang, S., Liu, M., Cao, Z., & Ma, Q. (2014). An eye-tracking study of website complexity from cognitive load perspective. Decision support systems, 62, 1-10.