

Metaverse and Artificial Intelligence for Next Generation Educational Technology Platforms

Thanh Vo and Sam Goundar

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This project uses Metaverse and Artificial Intelligence to develop an educational technology platform and training programs that are challenging to offer in real-world setting. MetaEducation has the potential to radically transform the teaching and learning landscape. It's power, though rudimentary is already realised with the use of VR, AR, XR, and MR in existing educational platforms. It has been cheaper, easier, and safer to provide STEM education using these, rather than risking training in real-life scenarios. Trainee neurosurgeons and pilots are a good example. Artificial Intelligence will ensure that the Meta-Education platform follows the rules prescribed by the Teacher. Artificial Intelligence is also the enabler of simulation based STEM training. For learners to be able to get the feel of training in the authentic world, Artificial Intelligence is needed to ensure learners are able to work and learn with intelligent NPC tutors, peers, and other learners.

1 Introduction

Many modern technologies come to life from science fictions. Metaverse is one of such new technologies. The term was firstly coined in the novel Snow Crash in 1992 and the Metaverse concepts were described more vividly in great details in the movie Ready Player One in 2018 by the famous director Steven Spielberg [Mys22] [PK22]. Metaverse has become more and more available for everyone in our daily activities. More than 60% American teenagers play Roblox, an online video game in which gamers interact with the virtual environment and with other people via their avatars. The recent investments from big tech companies such as Meta, new brand name of Facebook Inc, draw more attention from the Computer Science research community.

Nowadays, 2D Learning Environments are so popular and accessible with the developments of Open Education, Massive Open Online Courses which depend on Web applications. However, such environments have many limitations such as low-self perception, no

presence and inactivity of learners, instructors and crude emotional expression [Mys22]. Although the development of Metaverse in Education is still in its infancy, it shows much potential to overcome those issues with 3D immersive spatial environments. Thus, we are in need of a complete Metaverse educational platform. Once such platforms are available for billions of learners on daily basis, the platforms should be self-operation with minimum human monitoring effort. The learners should be able to access the platforms any time and anywhere with as real as possible experience. We can learn and find the solutions to solve this problem from the gaming industry. With the support of AI technologies, Massive Multiplayer Online Games like Warcraft or Smite, populate army of bots which are indistinguishable from the real players. AI technologies seem to be the only solution to provide intelligent NPC (non-player characters) teachers, students in the virtual 3D classrooms.

This research project will explore the possibilities to apply the combination of Metaverse and Artificial Intelligence to build the next generation educational technology platforms.

2 Significance and impact of the research

The impact of the Metaverse in education is positive and effective in different situations[Tli+22]. MetaEd platforms have shown many advantages over 2D online Learning Environment. With immersive 3D learning environments, the students can feel more present, can express more emotions, pay more attention to lectures, are more engaged and interested in learning. By leveraging the characteristics of the Metaverse, educators can design learning activities that favor students' freedom and experience [KH21]. In Meta Education, students are co-owners of virtual spaces and co-creators of personalized curricula. Moreover, Metaverse technology is applied to simulate learning scenarios which are very dangerous and costly in real-life. The MetaEd platform would significantly reduce the cost of flight training, aircraft maintenance training and surgical training. Metaverse is applied to provide safety training for children in outdoor environment with VR Kinect sensor and Unity game engine [PK22]. Metaverse is in the early stages of its development. When the technology is mature, along with Web 4.0, it would completely replace the currently dominant online learning platforms.

In developing countries, millions of students desire to go aboard to get the high-quality education from the developed regions. Many top international universities like RMIT have contributed significantly to realize the dreams of the young generations by establishing many offshore campuses with modern infrastructures and facilities in developing regions. The students also benefit from world-class teaching staffs with great experience working at top-notch educational institutions. However, such opportunities are only available for students from rich families who are able to support 3-4 years studying on-campus. One goal of the project is to create the mirror world of the educational environment at top universities which are available and affordable for students and learners

from the less developed areas.

3 Research Methodology

The research project will be realized through four phases.

Conduct literature review In the first phase, we will conduct a literature review on the fields of AI and Metaverse to find out all possible AI techniques which can be applied in Metaverse to create intelligent NPC tutors and learners.

Design and architect the MetaEd platform In the second phase, we will propose the architecture for the MetaEd platform. We aim to build a large-scale, highly secure and easily maintainable which can be used by billions of learners and educators daily.

Build the MetaEd platform with AI support In the third phase, we will implement the platform based on the architecture proposed in the second phase and the collective techniques or innovative methods applying AI to simulate the real classrooms with intelligent NPC tutors and learners.

Deploy the MetaEd platform in large-scale In the final phase, after the whole platform is completed, we will deploy the platforms for universities in Vietnam and Australia. Then, we will perform an empirical study to evaluate the impact of the platform on improving the education quality in both developing and developed areas.

4 Resources and Facilities

The research project requires intensive use of Virtual Reality, Augmented Reality, Extended Reality, and Mixed Reality devices. The researchers need to be equipped with latest devices to be able to apply all new features of the hardware technology. The researchers need to interact and get support frequently with the participants of the classes and courses that would apply Metaverse in their teaching and learning.

5 Relevant Related Work

In the recent years, many researchers have conducted some early impressive work applying Metaverse in Education. The research group at The Chinese University of Hong Kong, Shenzhen [Dua+21] have built a Metaverse of their campus as a mobile application based on Unity game engine. They proposed simplified three-layer metaverse architecture including infrastructure, interaction and ecosystem. The research group from National Taiwan University of Science and Technology [HC22] provided definitions, roles and identified the potential research issues for MetaEd from AI perspective. The research group from University of Polytechnique Hauts-de-France [Tli+22] sought for a roadmap of future research directions of MetaEd. Our research project would like to investigate the following research topics raised in the articles.

1. Develop metaverse-based educational platforms.

2. Leverage AI technologies to analyze students' behaviors and interaction patterns.
3. Apply blockchain technology to provide security of MetaEd platforms.

References

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