

Generative AI and XR in Education: Student Co-Created Metaverse Worlds in an International Virtual Exchange

Masako HAYASHI

Tohoku University, JAPAN

masako.hayashi.c5@tohoku.ac.jp

Abstract: This study explores the use of Generative AI (GenAI) in student-led Metaverse world creation within an international virtual exchange course involving 34 students from 10 countries. GenAI was utilized to enhance audience engagement and stimulate idea generation, facilitating a more streamlined and creative project development process. However, challenges arose in implementing AI-generated ideas, especially for beginners. The findings emphasize the potential of GenAI and XR technologies in fostering intercultural understanding and collaboration, while highlighting the need for improved prompt design to support novice learners.

Keywords: Generative AI, XR and the Metaverse, Intercultural Understanding, International Collaborative Learning, Audience Engagement

1. Introduction

The "XR Metaverse International Virtual Exchange" course at Tohoku University utilizes XR and metaverse technologies to connect students from diverse backgrounds across the globe. This innovative educational initiative seeks to enable cultural exchange with international partner universities virtually, eliminating the need for physical travel. Within this framework, Japanese, international, and overseas students collaborate to share their cultures through presentations.

In the spring semester of 2023, the creation and presentation of metaverse worlds was implemented into the course to deepen the students' intercultural understanding (Hayashi, 2024). Most of the domestic students involved were in their first year of university and had little to no expertise in creating 3D content. Furthermore, students only had 4 to 5 hours in class to work on their worlds and there were few teaching assistants available to help.

To address these challenges, GenAI was introduced for the spring semester of 2024. The goal was to create a world that not only encourages audience engagement and understanding but is also lightweight enough to run on a standalone head-mounted display (HMD). This study aims to clarify the effects of utilizing GenAI and to identify any challenges associated with its implementation.

Research Question 1: In the context of an international virtual exchange (VE) within XR metaverse environments, what merits does the introduction of generative AI have when students collaborate to create metaverse worlds?

Research Question 2: In the context of an XR Metaverse international VE, what challenges might arise when students use generative AI to create Metaverse worlds?

2. Literature Review

Yano (2023) effectively uses GenAI to enhance ideation and creativity, focusing on domestic students. While his work offers valuable insights into GenAI's role in student presentations, our study builds on this by incorporating international collaboration. In our program, we emphasize cross-border teamwork among students from different countries, aiming to foster connections with overseas students. To support this, we integrated GenAI into the ideation process, using prompts designed to enhance audience engagement. These audience

engagement ideas were proposed by Hayashi et al. (2024), with reference to the principles of Mercer & Dörnyei (2020).

3. Methods

This study was conducted during the spring semester of 2024 in the "Multicultural Communication" course. Thirty-four undergraduate students from 10 countries participated, including 18 Japanese, 8 international students, and 8 overseas students.

Students were divided into four large groups, each assigned a different theme, and further subdivided into smaller teams of 2-3, ensuring that each team included at least one international or overseas student and one Japanese student to foster intercultural understanding and creativity. The course consisted of fifteen 90-minute lectures, during which students were tasked with creating Metaverse worlds with their team using Unity while focusing on audience engagement principles. Most students had no prior experience with Metaverse world creation or GenAI.

To assist with world creation, teaching assistants (TAs) were requested to create a Unity package based on the findings from previous semesters. This package included common functions, such as image, video, and music integration, object manipulation, and seating for the students to use in their Metaverse worlds. The tools were designed to be user friendly and to ensure that students could create their worlds within the allotted time. Additionally, the package was optimized to create lightweight worlds that would be compatible with VR headsets. TAs also provided tutorials on using Unity and creating 3D content, ensuring students had the technical support they needed.

During the first six classes, students were introduced to audience engagement principles and the Unity tools. By the 6th class, students had developed initial ideas for their presentations. They were then instructed to use GenAI to refine and expand these ideas. A GenAI prompt was provided, explaining that students were beginners, had limited time, and needed to design lightweight worlds. The prompt also included details about using the Unity package's available functions. Students were encouraged to modify the prompt to fit their topics and audience engagement needs. Students without access to ChatGPT4o were able to request that the instructor run the prompt for them, though some just used ChatGPT3.5.

From the 7th to the 10th classes, students worked on building their Metaverse worlds, using both their initial ideas and AI-generated suggestions. Presentations were held from the 11th to the 14th classes, where students experienced the worlds and discussed the themes. The final class was a tour of the worlds, and students shared the goals and challenges they faced during the project. Fig. 1 illustrates examples of the Metaverse worlds co-created by the students, as well as scenes from their presentations.

At the end of the semester, a survey was conducted to gather feedback on the process. Students were asked about their initial ideas, the prompts they used, and whether they incorporated AI-generated suggestions. They were also asked to evaluate the AI responses and provide suggestions for improving the prompts. For qualitative responses, we employed thematic analysis using the classification method for free descriptions proposed by Matsukawa et al. (2024), allowing us to extract and classify key categories related to student engagement and creativity. For the numerical evaluation, students were asked to estimate the percentage of their project influenced by GenAI.

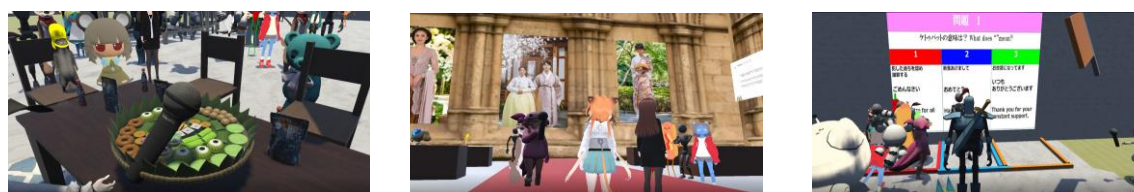


Fig.1 Co-created Metaverse World Examples

4. Results

The survey received 27 valid responses from 18 Japanese, 8 international, and 1 overseas student. Surveys submitted late were excluded. Feedback was categorized into common themes, with both positive and negative views.

Regarding difficulty for beginners, four respondents found the provided suggestions manageable for beginners within the given timeframe. However, seven noted that some AI-suggested ideas were too complex for beginners.

Audience engagement received mostly positive feedback, with 8 students praising the clear strategies for enhancing engagement. In terms of idea generation, seven students were able to gain ideas such as incorporating songs or mini games, though two felt the ideas lacked originality.

Six respondents appreciated the specific examples and processes provided, which helped clarify ideas and guide the creation of their Metaverse worlds. Concerning the feasibility of AI-generated prompts, three respondents found the AI suggestions helpful for moving forward, while three others struggled with unclear instructions, likely due to using ChatGPT3.5 instead of 4.0o.

Additional comments included how GenAI was useful for providing specific ideas, along with suggestions to improve prompts and address the limitations of generative AI.

For the question regarding how much influence AI had on the projects, the average response was 38.12% based on twenty-six valid responses, with scores ranging from 8% to 90%.

5. Discussion

Regarding Research Question 1, GenAI was effective in enhancing audience engagement by suggesting the use of interactive elements, such as music and videos. These strategies aligned with the course's goal of fostering intercultural understanding through engaging presentations. GenAI also aided in ideation, offering creative additions such as mini-games and songs, which enriched students' projects. Beginners found the AI's specific suggestions helpful, providing clear direction and enabling them to complete their work within time constraints.

Regarding Research Question 2, some challenges arose, particularly for beginners. AI-generated suggestions were sometimes too complex for those with limited experience. The feasibility of AI-generated prompts also varied, with clearer, more practical advice from ChatGPT4.0o compared to 3.5. Additionally, some students felt that the AI's ideas lacked originality, suggesting that human input is still important for creating unique and culturally meaningful projects. Students recommended improving the prompts.

6. Conclusion

This study examined the integration of GenAI in student-led Metaverse world creation within an international virtual exchange course. The findings revealed that GenAI enhanced audience engagement and idea generation, helping students improve their presentations and structure their projects more effectively. However, challenges emerged, particularly for beginners, with some AI-generated ideas being too complex. The study emphasized the need for refined prompt design and more accessible AI tools, such as ChatGPT4.0o. Future research should investigate specific strategies for improving AI-generated prompts and conduct long-term studies to assess the impact of AI-assisted collaboration, particularly in intercultural and collaborative learning contexts.

Acknowledgements

This research was supported in part by a grant from JSPS (JP23KK0037, JP24K06075) and The Open University, as well as by a joint research project by the Research Institute of Electrical Communication at Tohoku University. Thanks to the cooperation of VRChat, Inc., as well as Abe Manato, Hayama Hirokazu, and Caleb Paice. I would like to thank all the people who helped prepare this paper.

References

- Hayashi, M. (2024). *Exploring the Impact of Metaverse World Creation on Intercultural Understanding: A Comparative Analysis of Multimedia in International Collaborative Presentations*. The 2nd International Conference on Metaverse and AI Companions in Education and Society.
- Hayashi, M., et al. (2024). *Quantitative Research on Enhancing Engagement through Learner-Created Metaverse Worlds in International Collaborative Learning*. International Conference on Japanese Language Education (ICJLE).
- Matsukawa H et.al (2024) *Proposal of a Classification Method for Free Descriptions Using a Large Language Model*. Proceedings of the 44th National Conference of the Japan Association for Educational Technology.
- Mercer, S., & Dörnyei, Z. (2020). *Engaging Language Learners in Contemporary Classrooms*. Cambridge University Press.
- Yano, K. (2023). *AI時代のメタバース教育を考える. [Considering Metaverse Education in the Age of AI.]* The 64th Cyber Symposium on Online Education and Digital Transformation in Universities and Other Institutions.