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Co-Creating Collaborative Learning Spaces in the Metaverse to Foster Online Teamwork and Belonging

Marie-Luce Bourguet, Elise Gasser Omfalos and Megan Jones

Queen Mary University of London, London, UK
marie-luce.bourguet@qmul.ac.uk

Abstract. This study seeks to transform how students, academic staff, and professional services staff perceive and utilise co-created metaverse spaces to enhance online learners' collaborations. By evaluating the power of immersive virtual meeting spaces to foster online communication, teamwork, and a sense of belonging, the project aims to redefine and enhance the learning experience. At its core, this co-created metaverse initiative empowers students to take the lead in designing and developing virtual collaborative learning spaces, fostering ownership and innovation. By enabling learners and educators to co-create immersive environments tailored to their specific needs and aspirations, the project paves the way for a truly student-centred and dynamic approach to online education. Through this exploration, the team seeks to demonstrate how student-driven, collaborative online learning in the metaverse can become a blueprint for building stronger connections and fostering effective teamwork among remote learners, setting a new standard for inclusive, engaging, and impactful education.

Keywords: Collaboration Online, Metaverse, Co-Creation, Belonging.

1 Introduction

Engaging in online teamwork within higher education distance learning poses numerous challenges. While teamwork is essential for fostering collaborative learning and developing communication skills, it is often difficult to implement effectively in virtual settings. One major challenge is the sense of isolation and disconnection that distance learners frequently experience. Without physical interaction, building rapport and trust—critical for effective teamwork—becomes significantly harder. Additional barriers, such as navigating time zone differences and addressing technological challenges, further complicate collaboration. The absence of face-to-face interactions can also hinder the development of interpersonal skills that are vital for successful teamwork.

Addressing these challenges requires innovative strategies, including leveraging advanced technology for seamless communication and creating opportunities for social interaction. This study explores the research question: "To what extent can co-created virtual spaces in the metaverse effectively support online teamwork and enhance the sense of belonging among distance learners?"

The metaverse can be described as "a virtual environment where individuals, represented by avatars, interact, create, and explore in a shared digital space" [1]. It is already being used for socialising, working, gaming, attending events, conducting business, and learning. Increasingly, educators are using the metaverse to design dynamic, virtual learning environments that promote teamwork and creativity (e.g., [2–4]). Within these shared virtual spaces, students can collaborate on projects, solve problems, and exchange ideas in real-time [5].

Following social constructivist learning theories, engaging with the metaverse offers students opportunities to experience diverse forms of communication and learn from this exchange. Research has shown that active learning environments in higher education foster social interactions and collaboration, while both formal and informal university interactions contribute to a stronger sense of belonging [6]. Potential benefits of the metaverse include increased engagement with learning resources, improved spontaneous collaboration, a greater appreciation for group work, as well as improved sense of belonging and well-being by cultivating inclusive and interactive environments.

2 Pilot Study

In January 2024, our university launched a three-month pilot study, supported by its Technology Enhanced Learning Team and IT Services, to explore the potential of the metaverse for fostering collaborative learning, co-creation, and student engagement. Using Mozilla Hubs, six undergraduate students in a Telecommunication Engineering programme participated in creating virtual spaces. These spaces, designed to support teamwork (see Fig. 1) and to showcase coursework outcomes (see Fig. 2), allowed students to collaborate through avatars, share materials, and build connections in an immersive environment.

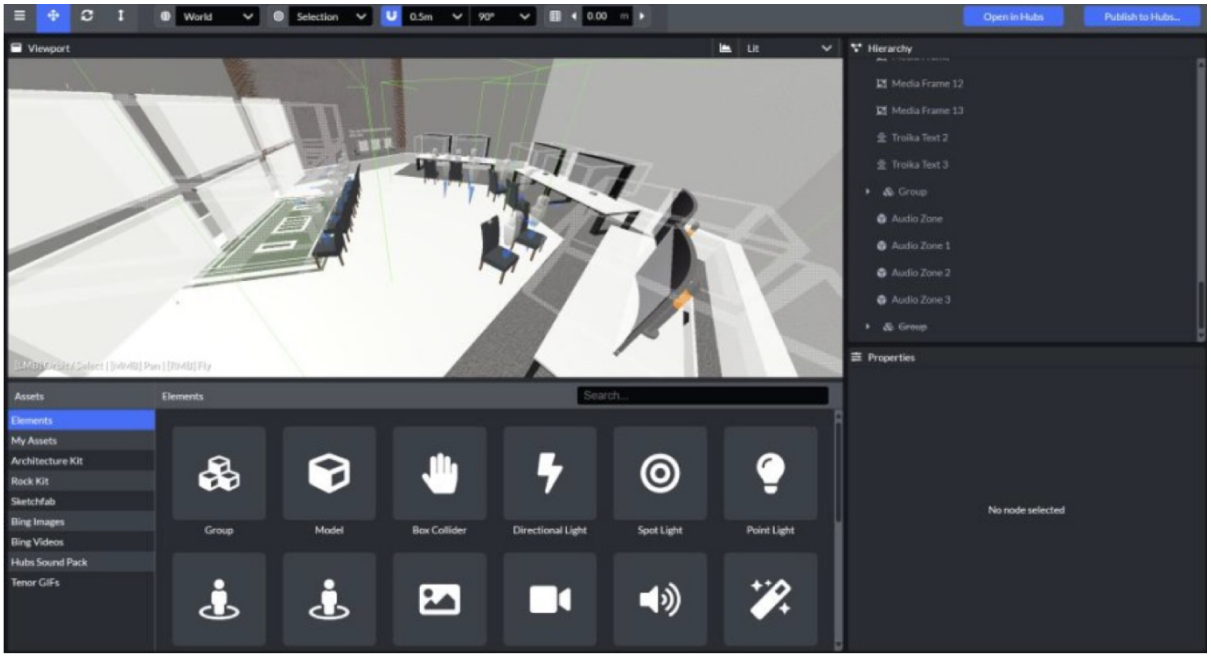

Fig. 1. Student-led creation of a collaborative working space using Mozilla Spoke software.

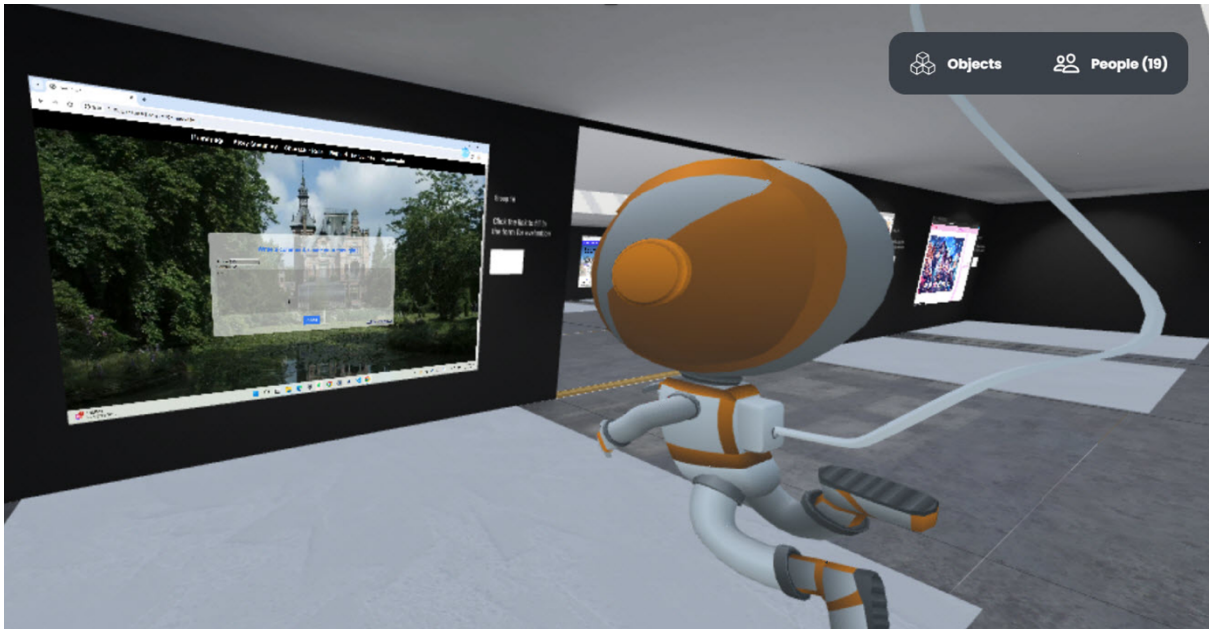

Fig. 2. Student-created exhibition hall in the Mozilla Hubs metaverse to showcase students' group work and collect peer evaluations.

The spaces were then used and tested by fellow students, with 86 survey responses collected (a 41% response rate). To access Mozilla Hubs, only a web browser is needed, no additional software installation is required. All

experiments conducted and reported in the paper were conducted using the laptop interface to Mozilla Hubs, with no specific hardware or software requirements beyond a laptop and a web browser.

Most students (77%) rated their overall experience with the platform highly (4 or 5 on a scale of 5), citing improved collaboration, increased engagement, and greater enjoyment of the learning process. 74% of the students either agreed or strongly agreed with the statement: "The metaverse could transform my learning experience." However, some noted issues like dizziness, lag, and a preference for traditional web interfaces.

Interviews with the co-creators highlighted the platform's immersive and flexible features, such as seamless movement between discussions and presentations. Faculty feedback underscored the metaverse's potential for enhancing adaptability, creativity, and mental well-being, with applications for icebreakers, inductions, and experiential learning.

The pilot's success was reflected in a student receiving a SEED (Student Enhancement Engagement and Development) Award for their contributions to educational development opportunities across the University. Findings were presented at the iLRN2024 Conference, affirming the metaverse's promise as a tool for innovative, student-centred education [7].

3 Ongoing Co-creation Project

Building on the initial pilot's success, the project team secured a Teaching and Research Award from the Centre for Online and Distance Education [8] to further explore the metaverse's role in enhancing student collaboration. The new study, using FrameVR for its accessibility and cost-effectiveness, aims to evaluate the impact of metaverse-based collaborative learning spaces across the university. With FrameVR, users can create an account and then enter a virtual space by navigating to a specific Frame link; again, no additional software installation is required, and it can be used on both desktop and VR headsets, as well as mobile phones.

The project plan includes three phases:

- Phase 1 (Preparation): Identify suitable courses, recruit up to 10 student co-creators, and establish metrics to assess the spaces' effectiveness in supporting teamwork.
- Phase 2 (Development): Students co-design virtual spaces under faculty guidance and onboard learners and lecturers.
- Phase 3 (Evaluation): Collect feedback via surveys, interviews, and analytics to assess user experience, collaboration, and engagement. Compare the metaverse to traditional collaboration methods, adapting spaces as needed.
- Phase 4 (Dissemination): Document findings, share insights, and present outcomes.

Ethics approval for the study was obtained in early August 2024. We then engaged with the directors of education across the university's three faculties—Science and Engineering, Humanities and Social Sciences, and Medicine and Dentistry—to connect with module organisers incorporating group work into their courses. Over August and September 2024, we held extensive discussions with around 15 instructors to introduce the project and outline its objectives and requirements. Beginning in September 2024, all meetings were conducted within the metaverse (see Fig. 3).

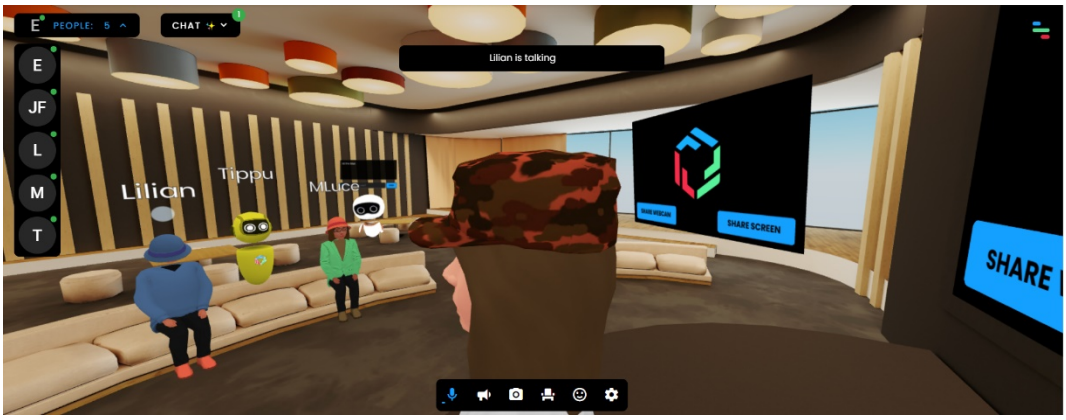

Fig. 3. Project meeting with collaborators in FrameVR.

We have selected three modules and programmes to participate in the project (Phase 1):

1. **Chemistry** – A programme-level assessment spanning three first-year undergraduate modules, focused on group oral presentations addressing sustainability topics.
2. **Skills and Methods in Sustainable Management** – A postgraduate module in the School of Business and Management, requiring students to deliver group presentations for external clients.
3. **Fresher to Thresher (F2T)** – A mentorship training programme for engineering students, designed to support senior undergraduates mentoring junior students in the UK and in China.

Recruitment efforts led to eight paid student interns starting designing spaces (Phase 2) equipped with collaborative tools like whiteboards and interactive features (see examples in Fig. 4 and 5). They have been suggested to use a Design Thinking approach to conceptualise their metaverse spaces.

Feedback tools, including questionnaires, semi-structured interview questions, and focus group prompts, have been prepared for Phase 3 of the project. Participation in the project will be voluntary, with all participants required to provide informed consent prior to data collection. Following each visit to the metaverse, student participants will complete an online survey. Midway through the group work, selected groups of students will take part in short semi-structured interviews to provide detailed insights into their user experience and the functionality of the virtual spaces. This feedback will inform necessary adjustments and enhancements. Upon completing the group work, randomly selected teams will join a focus group to reflect on their collaborative experiences within the metaverse.

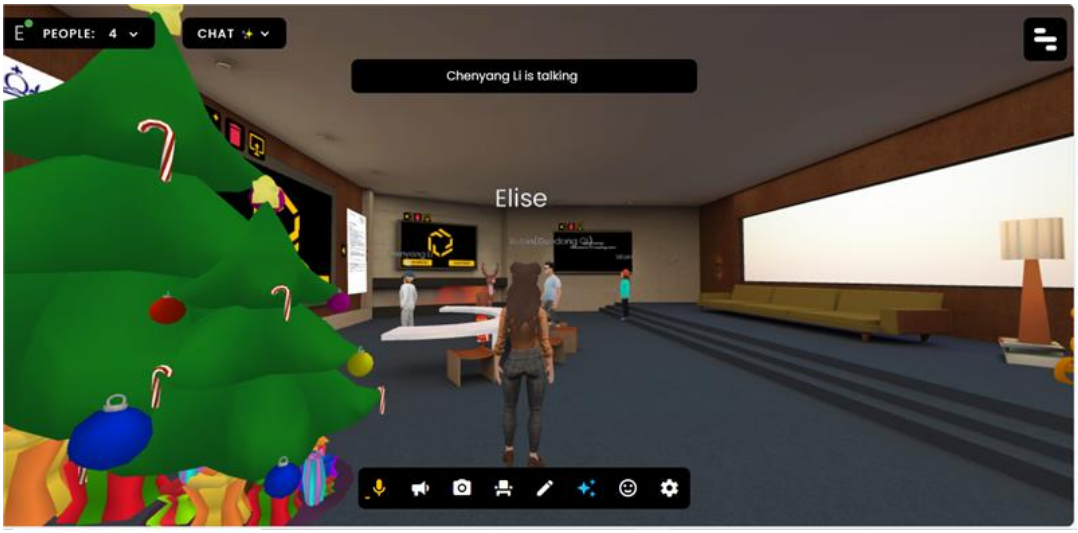

Fig. 4. Student-created metaverse space with a festive Christmas feel.

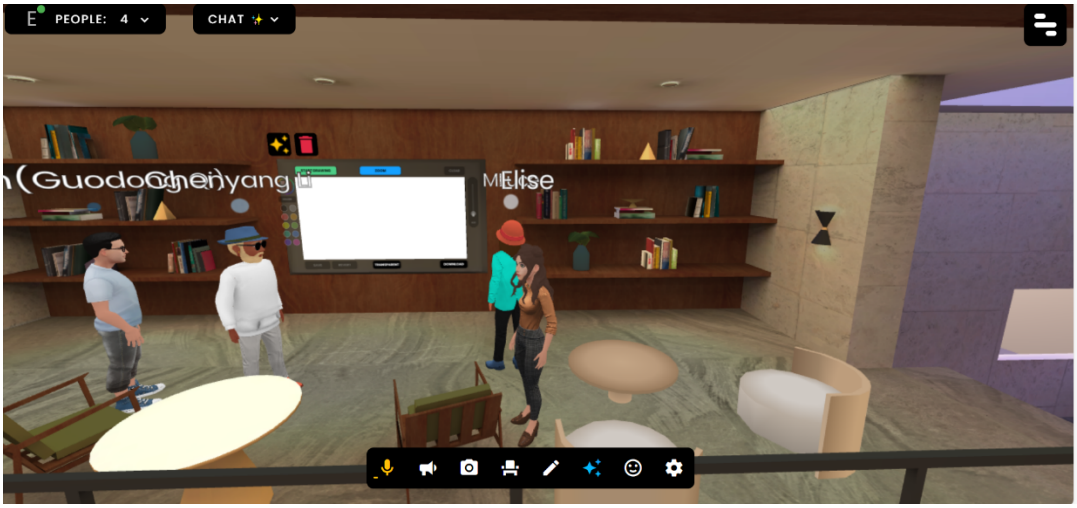

Fig. 5. Collaborative exploration of a student-created metaverse space.

By June 2025, the project aims to deliver tailored metaverse environments for group collaboration and mentoring, integrating interactive features to foster engagement and innovation, which will be showcased at iLRN 2025. Findings will inform best practices for using metaverse tools in education, offering insights into their potential to enhance learning outcomes and interpersonal dynamics.

4 Discussion and Conclusion

The studies reported in this paper focus on the potential of the metaverse to support group work and collaboration among students, addressing key skills for career readiness and academic achievement. A comparative analysis with traditional tools such as Zoom and MS Teams, as well as face-to-face meetings, is ongoing. Semi-structured interviews will probe participants on their experiences of using traditional tools and face-to-face meetings compared to their experiences of collaborating in the metaverse. Early results indicate that meeting frequency has increased in the metaverse and that students feel more productive.

Ethical approval was obtained for both the pilot and the current study, with no additional ethical concerns identified compared to traditional meeting tools. However, we acknowledge that ethical concerns such as data privacy and surveillance risks remain generally underexplored.

We also acknowledge that scalability and sustainability, including costs, infrastructure, and institutional adoption, are critical factors that require thorough consideration. In future studies, we aim to explore these dimensions more comprehensively to ensure a holistic understanding of the metaverse's potential in supporting group work and collaboration among students.

References

1. Ritterbusch, G.F., Teichmann, M.R.: Defining the Metaverse: A Systematic Literature Review. IEEE Access, vol. 11, 12368–12377 (2023).
2. Poolsawas, B., Chotikakamthorn, N.: Using Mozilla Hubs for Online Teaching: A Case Study of an Innovation Design Method Course. In N. Callaos, J. Horne, B. S´anchez, M. Savoie (Eds.), Proceedings of the 17th International Multi-Conference on Society, Cybernetics and Informatics, pp. 7-12 (2023).
3. Han, Z., Tu, Y., Huang, C.: A framework for constructing a technology-enhanced education metaverse: Learner engagement with human–machine collaboration. IEEE Transactions on Learning Technologies, 16(6) (2023).
4. Glaser, N., Yang, M., Li, S.E. et al.: The Museum of Instructional Design: an Examination of Learner Experiences and Usability in a Collaborative 3D Virtual Learning Environment. TechTrends (2024).
5. Li, C., Jiang, Y., Ng, P. H. F., Dai, Y., Cheung, F., Chan, H. C. B., Li, P.: Collaborative Learning in the Edu-Metaverse Era: An Empirical Study on the Enabling Technologies. IEEE Transactions on Learning Technologies, vol 17, 1107–1119 (2024).
6. Peacock, S., Cowan, J.: Promoting Sense of Belonging in Online Learning Communities of Inquiry in Accredited Courses. Online Learning 23 (2), 67–81 (2019).
7. Bourguet, M.L., Omfalos, E.: Work-in-Progress—Student's Co-creation of Collaborative Learning Spaces on the Metaverse. Immersive Learning Research - Academic, 1(1), 217-233 (2024).
8. Centre for Online and Distance Education Homepage, https://www.london.ac.uk/centre-online-distance-education, last accessed 2025/2/21.