Stepping Out of the Classroom
Anticipated User Experiences of Web-based Mirror World Like Virtual Campus

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ABSTRACT
While three-dimensional virtual learning environments have attracted plenty of research interest, mirror-world-like virtual campuses have been used mainly for virtual tours, promotions, or for simulation purposes. In this article, the authors investigate the use of geographically accurate mirror-world-like virtual campus models as an interactive learning environment. The initial prototype of the virtual campus covers about 2,300 m² of a university campus and contains basic pedagogical, communicational, and content creation functionalities. A qualitative study with 14 participants explored their anticipated user experiences as well as their needs for the services and functionalities of the virtual campus. The findings suggest that a more profound link of reality and virtuality than just mirroring physical spaces in the virtual realm is needed. A hybrid reality approach is required to foster social community building and collaboration, 3D space design, and service integration. Finally, stepping out of the classroom introduces privacy issues that should be considered carefully.

KEYWORDS
3D, Anticipated User Experience, Hybrid Reality, Mirror World, User Evaluation, Virtual Campus, Virtual Environment

INTRODUCTION
The boom of e-learning and especially 3D Virtual Learning Environments (3DVLEs) began with the digital age. It coincided with the technological advances that revolutionized other fields of human living in past decades. As networked computers and their capabilities have shaped the basic modalities and affordances of writing and passing knowledge, their influence on education has been unavoidable (Beetham & Sharpe, 2013). During the past two decades, the rise of 3DVLEs has been witnessed. Ubiquitous high-speed networking, powerful personal computers, and 3D web technologies have made 3DVLEs more accessible, as they can be used with web browsers on low-cost personal computers (Chittaro & Ranon, 2007). 3DVLEs are also of interest to educators and educational institutions as they afford rich learner engagement by allowing the exploration, construction, and manipulation of virtual objects, structures, and metaphorical or abstract depictions of ideas (Dalgarno & Lee, 2010). Another important property of 3DVLEs is their ability to convey the feeling of being there (Heeter, 1992); the stronger this feeling of presence is, the more meaningful experiences are gained (De Lucia, Francesca, Passero, & Tortora, 2009). The full potential created by the interplay between the physical

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reality and the affordances of the virtual realm has not been realized in existing 3DVLEs. While a substantial amount of studies has been conducted with 3DVLEs in the context of small class rooms and group work, there is still lack of understanding of for what purposes such virtual spaces are designed for (Minocha & Reeves, 2010; Reisoğlu, Topu, R. Yılmaz, T.K. Yılmaz, & Göktas, 2017). Further, prior research has not addressed the design of 3DVLEs as mirror worlds of corresponding large real-word indoor spaces. Also, the hybrid reality (De Souza e Silva & Delacruz, 2006) type of linking of services in university level 3DVLEs has not been thoroughly investigated. To fill this knowledge gap, an anticipated user experience (AUX) study with an initial virtual campus model built as an accurate mirror world of the main campus of the University of Oulu (Figure 1) is conducted. In virtual campus an existing commercial 3DVLE, the Finpeda Virtual Space (FVS) (Finpeda, n.d.), is used for providing pedagogical content, communication means, and avatars. FVS was chosen because it is a commercial product that has been used and evaluated in different pedagogical contexts, such as in primary school (Arhippainen, Pakanen, Hickey, & Mattila 2011) and vocational education (Mattila, Krajnak, Arhippainen, & Brauer, 2012). The purpose of this study was to guide the subsequent design of the virtual campus by answering to two research questions:

1. How do users experience the initial web-based mirror world like hybrid reality linking the virtual campus?
2. What are the needs of students, teachers, researchers and staff members for the design, services and functionalities of the hybrid reality linking the virtual campus?

This paper is organized as follows. First, related work on 3DVLEs and the authors’ perspective on them serving as mirror worlds are described. Next, the creation of the initial version of the virtual campus used in the study and the commercial 3DVLE platform are presented. Then, the AUX study with 14 participants and its qualitative findings are reported. Finally, the findings are discussed with conclusions.

![Figure 1. AUX study in progress in Virtual Campus model of University of Oulu](image-url)
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