

Learning and Retention Through VR and Serious Games: Aviation Safety as a Paradigmatic Example (Abstract of Keynotes)

Luca Chittaro

Human-Computer Interaction Lab, Department of Mathematics,
Computer Science, and Physics, University of Udine, Italy
<http://hcilab.uniud.it>

Abstract. Virtual reality (VR) and serious games are increasingly used in a variety of domains, including health and safety. This keynote will present research efforts to improve the theoretical grounding as well as the practical effectiveness of serious games and educational VR. Aviation safety will be used as a paradigmatic example, and novel pedagogical techniques will be illustrated through practical demonstrations of real-world applications we deployed. The presentation will discuss their effects on user’s knowledge (learning, transfer, retention) as well as on different psychological constructs such as engagement, presence, self-efficacy, and locus of control.

Keywords. Virtual Reality · Serious games · Learning · Education · Training · Aviation safety

Outline of the Keynote

Virtual reality (VR) experiences and serious games, i.e. digital games to further education objectives, are increasingly used in a variety of domains, including health and safety. However, compared to entertainment games, their design and evaluation can be more complex because it needs to take into account additional, multidisciplinary factors such as knowledge retention and attitude change. This keynote talk will introduce and discuss recent research and development efforts [1–7] by our lab to improve the theoretical grounding as well as the practical effectiveness of serious games and educational VR. The presentation will use aviation safety as a paradigmatic example, and demonstrate novel pedagogical techniques through practical examples of real-world, deployed applications that have a very large user base. For example, “Prepare for Impact”, the most popular of our publicly released serious games for air traveler education [8], has been installed and played by more than 8 million persons as of April 2020.

The keynote will also highlight the main findings [1–6] about serious games and educational VR obtained in international aviation research projects we carried out under US Federal Aviation Administration (FAA) grants. In these projects, we tackled

the notoriously difficult problem of effectively educating air travelers about safety. This problem is relevant, because the level of aviation safety knowledge in air travelers is a key factor to survive aircraft accidents. Airlines currently educate passengers about safety through the routine preflight briefing and printed safety cards. Unfortunately, both methods suffer from a serious lack of effectiveness, as shown by empirical studies, interviews of accident survivors, and reports by government investigative agencies. Two major reasons for the failure of current methods is lack of engagement that leads passengers not to pay attention to the safety information, and lack of comprehension that leads to misunderstand the information even when attention is paid [5]. Moreover, information that has been understood correctly is subject to rapid decay.

We investigated the creation of novel digital experiences to educate air travelers about safety with different methods: exploring different game genres and VR contexts; identifying psychological theories that could guide the design of the experiences; conducting user studies of the developed serious games to assess their effects on player’s knowledge and competence (learning, transfer, retention) as well as effects on psychological constructs such as engagement, self-efficacy, and locus of control; publicly deploying multiple, freely available apps. While studies in the VR and serious games literature often evaluate engagement and immediate learning, retention is rarely considered. For this reason, the talk will give particular emphasis to knowledge retention.

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