A Meta-Analytic Review: The Implications of Virtual Reality with Immersion on Secondary Language Acquisition

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Abstract

How can a curriculum be built to fully utilize the capabilities of Immersion in Virtual Reality (VR) and make it applicable to a classroom learning and individual learning environment? The generalized goal and outcome intended following this research is discovering how to build a sample curriculum for English Language Learners (ELL) to help foster memorable and applicable secondary language acquisition. Research linked to both virtual reality and augmented reality has proved the capability for building immersion and engagement in a virtual space where learning processes are presentable and educational output is maximized. The immersion and engagement offered throughout VR is demonstrated to foster retention, recollection, and knowledge utilization in this meta-analysis. Therefore, we deem it as an invaluable platform to construct a curriculum for English language learners across all levels and intend to research the most beneficial ways to map and write a curriculum within the VR space.

Keywords: Virtual Reality (VR), Immersion, Engagement, Curriculum, English Language Learner (ELL), Virtual Reality Learning Environment (VRLE), Knowledge Retention, Secondary Language (SL)

The Implications of Virtual Reality with Immersion on Secondary Language Acquisition

Virtual Reality (VR) is an emerging form of interactive visualization media and is already being incorporated in some educational settings despite a lack of its use in curricula. The primary component of VR that motivates its usage is Immersion. Immersion for the purpose of education represents the capability for an individual to connect to and involve themselves within a discipline. VR fosters a virtual reality learning environment (VRLE) that can generate physical resources in the virtual space, allowing for greater capacity to create immersive experiences to pair learning with, generating maximized knowledge comprehension and retention (Lan, 2020). Curricula has evolved to include various immersive programming through interactive mediums to increase student engagement and facilitate learning. As established prior, VR can offer these same benefits to a greater degree in both traditional and experimental curricula due to the innate Immersion fostered within (2020). We take two approaches to the proposed development of a VR curriculum, one being instructor-led and the other being independently completed.

We propose that a VR curriculum would be most beneficial as a secondary language (SL) acquisition curriculum. To proceed, we must establish virtual reality's potential to serve as an immersive bridge for English language learners (ELLs) to help students progress from simply understanding a concept to the ability to apply these concepts, as illustrated by Bloom's Taxonomy (Bloom, 1956). Various researchers have already proven how the Immersion component of VR helps all populations, especially ELLs, retain knowledge and gain understanding to a higher degree (Lee et al., 2019; Lan, 2020; Frazier et. al, 2021; Qui et al., 2021; Pack et. al, 2020; Emrah et al., 2020; Bonner et al., 2018; Nicolaidou et al., 2021; Tseng et al., 2019). Essentially, ELLs are especially disadvantaged in regards to concept comprehension

as well as concept application, and VR as a learning medium provides the most direct support regarding these skills. SL curricula are also in dire need of innovation and restructuring regarding its lack of second language retention and overall application. The language learning process must be built for ease of practice and ease of functionality, referring to the learning being easily applicable and built from functional knowledge and verbs that allow a learner to easily express the self. We emphasize the self because we define literacy in a language as the extent one can express and advocate for themselves.

To ensure the most suitable VR-based curriculum for SL acquisition, we will synthesize information gathered from research to create a list of considerations and implementations for a successful VR curriculum. We plan to use this research to inform prototypal development of curriculum in a VR space for ELLs.

Methodology

The following premises were used to select studies for inclusion within this meta-analysis. The explored research studies are peer-reviewed and largely facilitated through post-secondary institutions. We aimed to gather VR education research from varying global perspectives to inform key considerations for a VR curricular prototype. For the purpose of this research, we limit VR to refer to commercially designated VR devices such as the Oculus Quest and HTC Vive. The target audiences for an experimental/prototypal VR curriculum would be focused on undergraduate and graduate programs, justifying these specifications. In order to test a reliable prototype program, a post-secondary audience would provide the greatest meta-cognitive insight and hold the most technological literacy regarding learning in VR. Additionally, post-secondary institutions are most likely to have spaces equipped with VR

technologies, supporting software, and trained staff to maintain and monitor the equipment. We intend to pitch a largely experimental curriculum as opposed to a traditional curriculum to make the most use of VR's immersive capabilities.

Discussion

Learning in VR is enhanced through embodied and extended cognition, both of which emphasize the inextricable connection between the mind and the environment, referred to as "cognitive activity as grounded in bodily states and activities." (Atkinson, 2010 as cited in Bonner et al., 2018). What these conceptions of cognition have adjacent to the existing learning curriculum is the common role of the physical world in our thinking and by extension our understanding. A VRLE allows its physical world to be manipulated to better demonstrate, clarify and improve learning.

For the functions of this research paper, the extended cognition offered through a VRLE will be referred to under Immersion, as its inherent values to the learning experience is thoroughly evidenced (Lee et al., 2019; Lan, 2020; Frazier et. al, 2021; Qui et al., 2021; Pack et. al, 2020; Emrah et al., 2020; Bonner et al., 2018; Nicolaidou et al., 2021; Tseng et al., 2019). With this in mind, engagement should be defined as interactables built into a VRLE. While Immersion refers to being immersed within an activity in a VRLE and how it extends cognition to promote SL learning and knowledge retention, Engagement refers to the activities themselves that stimulate the learning.

There have been very few instances of VR curriculum prototypes being created, and those of which were created did not utilize the immersive and experimental capabilities to reinforce learning within the VRLE (Akmen, 2020; Pack et al., 2020; Nicolaidou, 2020). In

practice, they were largely copy and pastes of traditional classroom assignments inside of a VRLE. This signifies the express need for curricula developed for a VR space to be based on theories of alternative and experimental learning, as those will best utilize the immersive capabilities of the VR space.

Approaches

There are two main applications towards building an immersive VR-based curriculum for the most reliable SL acquisition. It should serve as a foundation as to how curriculum building will translate into immersive engagement experiences that will ensure SL acquisition, make use of the Immersion of a VRLE, and be assembled into a suitable framework to assist developers in the programming of a functional prototype. We propose two main avenues; instructor-paired curriculum and independent curriculum.

VR-Based Curriculum with Instructor

The three most probable applications of VR curriculum with an instructor would be co-curricular to a traditional schooling experience, in an intervention setting with a focus on specific skills, or paired with a curriculum in platforms such as Canvas. A VR-based curriculum should foster primary learning experiences within the VRLE. Through VR-based education, educators should not act as technicians, and the VR program should not demand high technical prowess from an instructor. Nonetheless, to implement virtual reality effectively into a curriculum, an educator must become a strategic thinker and practitioner. To ensure this, a VR program should be able to communicate results to a Canvas or specific program for retrieval by the instructor. Feedback will be an integral consideration in terms of a VR-based curriculum and should display evidence for acquired data and results to the instructor. Communication will be

key to build an instructor's trust in the program. Data should likely be focused on various specific language and literacy skills for ease of communication. Instructor autonomy over curricular lessons should also be provided so that the VR curriculum would best suit a classroom and its population's needs.

VR-Based Curriculum Independently Completed

In a VR curriculum that is independently completed, other considerations will become large priorities as well, such as user-friendly interface and learner autonomy. In addition, data feedback communication should be revised to ensure data does not demotivate students. Feedback might also require functionality to be given in a learner's native language to allow the most metacognition of the learner's own strengths and weaknesses (Frazier et al., 2021). Opportunities for collaboration with other learners could also provide immense benefit to learners. The question of autonomy might also introduce the question of whether the curriculum should be linear or semi-linear depending on what experiences a student would most desire to experience. Due to the raised considerations for an independent curriculum, it will be costlier and more demanding from a programming perspective. Though an independent curriculum's functionality holds immense potential, it will likely not be explored until post-prototype development. Independent curriculum will offer integral SL instruction in an innovative format to make the language learning process much less intimidating across a broad market with proper investment and implementation around VR's inherent Immersion.

We determine that VR is a necessary step towards improving the landscape of SL curriculum, and empowering language education across the globe. Through these considerations, VR curriculum may change global literacy altogether should a successful prototype be funded.

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