Virtual Reality for Language Learning

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Abstract
Optimal language learning requires exposure to the language in authentic contexts while providing an opportunity to interact in an immersive environment. As such, virtual reality (VR) can serve as a new modality with improved potential for language learning. VR is immersive, interactive and engaging, and it can spark wonder in learners of all ages. Such affordances of VR are thus ideal for teaching foreign languages. Yet, language teachers are unsure of how to best use this technology for their teaching. To understand the effectiveness of VR for language education, it is imperative for us to investigate inquiries such as: (i) what added value VR can bring to our language education; (ii) what types of learning activities are best suited for VR; and (iii) how VR can co-exist with our existing classroom activities and language curriculum. This paper aims to tackle these questions.

Keywords: Virtual Reality, Multi-Modalities, Meaningful Learning, Empathy

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1. Introduction

Technology provides new opportunities for language learning, and virtual reality (VR), being immersive and interactive, is a new modality with great potential for enhancing language learning. VR has unique affordances suited for language acquisition. For instance, VR enables learners to interact in a 3D-space that simulates real context. This is an important affordance of VR because language learning requires exposure to authentic contexts in which the target language is being used. In addition, VR can spark wonder in learners of all ages and its gamification elements make learning a new language fun. In short, VR can be a powerful instrument for language learning, transforming the way we learn foreign languages.

However, when incorporating VR into existing curricula, we need to understand why and when to use VR. To do so, inquiries such as, "what advantages (or disadvantages) can VR offer language learning?", or "what types of learning activities would most benefit from VR?", need to be investigated. This paper aims to address these questions.

The organization of the paper is as follows: Section 2 presents a VR-based application that we have developed for language learning in order to illustrate the effectiveness of kinesthetic learning on language acquisition.[1] We argue that VR's body-tracking technology enables us to do kinesthetic learning inside VR, enhancing learner's memorability of vocabulary. Section 3 aims to support the use of VR for language learning through the lens of psychology. To this end, I introduce two notions: (i) "meaningful learning" (Ausubel 1968) and (ii) "empathy". I argue that VR's immersive and interactive environment facilitates learners to relate what is learnt to their existing knowledge and in this respect, it can create a more meaningful learning environment. I also argue that VR can foster learners' empathy through putting them in the other person's shoes (Milk 2015), and this, in turn, helps learners enhance their competence in communicating with people from different cultural backgrounds. Accordingly, language learners can benefit from VR. Section 4 discusses some obstacles that one might encounter when incorporating VR into the actual learning environment, and Section 5 presents my concluding remarks.

2. Kinesthetic Learning in VR

Kinesthetic learning is a learning style based on learners' physical movement, such as motions or gestures. VR can offer one of the best environments for this learning style because of its body-tracking technology. However, it remains to be seen how effective a kinesthetic learning style in VR can be in the context of language learning. In order to investigate this inquiry, we developed a prototype VR application called "*Words In Motion*" (Vázquez et al. 2018).

Words in Motion utilizes the body-tracking technology of HTC Vive, and it enables us to do kinesthetic language learning inside VR. The rationale of its design is based

[1] The VR applications presented in this paper have been developed in collaboration with the Fluid Interfaces Group at the Media Lab, Massachusetts Institute of Technology (MIT), Cambridge, U.S.A. and Kanda University of International Studies, Chiba, Japan.

on our hypothesis that a kinesthetic learning style can enhance learner's memorability of vocabularies (Macedonia 2013, 2014, Tellier 2008). Inside *Words in Motion*, learners can learn new vocabularies kinesthetically through their actions; learners perform a certain action, which then triggers the corresponding name of the action to appear. This way, learners associate their body action with the name of the action kinesthetically. Figure 1 provides a series of snapshots for the action-word pair of "drop" in *Words In Motion*.

picking up the carrot dropping the carrot the word, "drop", appears

Figure 1: Action-word pair of "drop" inside *Words In Motion*

In order to measure how this kinesthetic learning would affect the memorability of vocabularies, we conducted an experiment with 57 participants.[2] We divided them into three groups: (i) text-only; (ii) VR with no kinesthetic component; and (iii) VR with kinesthetic component.[3] We asked the participants of each group to learn 20 Spanish words. All groups were tested immediately after the training session and exactly one week after. The following lists the results from this experiment that are relevant to our discussion.

- [Result 1] The text-only learners initially outperformed the kinesthetic and the non-kinesthetic VR ones.

- [Result 2] One week after, there is no significant difference in performance between the text-only learners and the kinesthetic VR ones. The non-kinesthetic VR learners, on the other hand, performed significantly lower than the text-only and the kinesthetic VR learners.

- [Result 3] Among the kinesthetic VR learners, there was a correlation between the number of times a word was remembered and the number of times the action associated with that word was seen.

Result 1 implies that the participants in VR are probably initially distracted by the novelty of the system; that is, the VR participants (whether kinesthetic or non-kinesthetic) were previously not exposed to VR as a tool for vocabulary learning, resulting in their underperformance.[4]

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[2] These participants were recruited from the student community at MIT. For more details about the methodologies and the results of the experiment, see Vázquez et al. (2018).

[3] The text-only and the kinesthetic VR groups consisted of 20 participants, and the non-kinesthetic VR group consisted of 17 participants.

[4] This trend (i.e., the participants' familiarity to the learning style based on the text (as opposed to VR) is also reported in Dylan, et al. (2016).

Result 2 and Result 3 provide support for the hypothesis that kinesthetic learning style impacts language learning, in particular, with respect to the memorability of vocabularies.

VR's body-tracking technologies enable us to do kinesthetic learning in an authentic context, and this is VR's unique and important feature, as none of the traditional media (such as audio or visual) can facilitate such kinesthetic learning experiences. In addition, the kinesthetic learning offered by VR enables learners to engage in more active learning activities (as opposed to passive ones). As such, VR may be a powerful instrument for language learning and it could revolutionize the way we teach and learn foreign languages.

3. Support for VR through the Lens of Psychology

The use of VR for language learning finds support through the lens of psychology as well. To show how, I would like to introduce two notions: (i) the notion of "meaningful learning" (Ausubel 1968) and (ii) that of "empathy" (Milk 2015). I argue that VR can provide learners with various types of purposeful and meaningful learning experiences that may enhance the memorability of what they have learnt.

3.1 Meaningful Learning

Ausubel (1968) argues that the process of linking between newly learned knowledge and the existing knowledge in one's cognitive structure is a key to learning, while introducing the notion of "meaningful learning". This notion is often contrasted with "rote learning" and it has been studied and promoted by some scholars in the field of language acquisition as well. For instance, Brown (1980) argues that this notion plays an important role in long-term memory; in particular, with respect to the memorability of vocabulary. The following is cited from Brown (1980, p.87):

> *…rote learning involves the mental storage of items having little or no association*
> *with existing cognitive structure……*
> *On the other hand, meaningful learning may be described as a process of relating and*
> *anchoring new material to relevant established entities in cognitive structure.*
> *As new material enters the cognitive field, it interacts with, and is appropriately*
> *subsumed under, a more inclusive conceptual system.*

In the context of language teaching, activities such as "mechanical drills" or "pattern practices" probably fall under the category of rote learning because they can be done in an isolated fashion and do not require any processes that relate new knowledge to the pre-existing knowledge.

In contrast, project- or task-oriented activities could provide a more meaningful learning environment. These activities engage learners to relate what is learned to real-world situations and often involve a recognition of the links between concepts and knowledge. Pedagogical approaches that elicit such activities include: project-based language learning (Smith 2005), problem-based language learning, community-

based learning (Burnaby 1988, Rivera 1999), and situated learning (Lave & Wenger 1991).

Here, I would like to argue that VR's affordances help us instantiate activities that would fall under the category of "meaningful learning": inside VR, learners are immersed in authentic contexts and can interact with all sorts of objects, using different modalities (e.g., visual, audio, kinesthetic). As such, it is feasible to assume that VR encourages learners to relate what they learn to their real-world experience and may help them to integrate the new knowledge into their existing knowledge base. Accordingly, they could have a long-term memory of what they have learnt.

Although my hypothesis above is anecdotal, studies like Dale (1969) can be of support. Dale argues that the more direct experience one has, the more effective his/her learning can be. VR can provide a "semi-real" 3D-space in which learners can have various types of purposeful learning experiences using different sensory systems. It is quite reasonable to hypothesize that VR may be a powerful instrument for creating a meaningful learning environment for language learners.

3.2 Empathy

Technology has enabled us to work and communicate globally with much greater ease. As a result, our social interactions are increasingly digitally mediated. The resultant lack of in-person communication may indicate a need to cultivate "empathy" in learning settings (Boltz, et al. 2014).

Language teachers have also begun acknowledging the importance of teaching "empathy" through language education; the ultimate goal of our language education is to enable us to communicate with people from different linguistic and cultural backgrounds. As such, "empathy", which puts people "in other people's shoes", can be a great asset for language learners to have.

VR can be expected to help us with empathy because it enables users to see, hear, or move objects from the "first person" perspective (Milk 2015). Thus, VR has the potential to enhance one's empathy toward others. For this reason, as well, it is worth investigating the use of VR in language education so that our students can best develop their 21st century communication skills.

4. Obstacles

Language teachers understand that VR's immersive and interactive nature may provide an optimal environment for language learning, and some of them are investigating how to integrate VR into their classes. In so doing, however, they often run into certain obstacles. The first one is financial: VR headsets are still very costly, and many teachers or schools cannot afford them. The second one is related to time: it is time-consuming for teachers to learn how to use VR hardware and software. Accordingly, many teachers are reluctant to even attempt adopting VR into their language classes. These time and cost-related obstacles are the main reasons for language teachers' delaying the adoption of VR into language education.

In addition to the above, the lack of flexibility in authoring contents is another obstacle. VR applications targeted for language learning are already available. But most of them are commercial-based and do not grant language teachers the opportunity to create their own content or modify the existing content. This lack of flexibility in content authoring makes it less attractive for teachers to adopt such commercial-based VR applications for their classes.

All these obstacles, however, should diminish as technology advances; VR headsets will become more accessible to everyone in terms of cost, and the content-authoring issue will be eventually resolved, making it possible and easier for teachers to modify content. What is missing is an answer to the inquiry of what pedagogical issues need to be considered and what activities would best benefit our students. Although we currently have little empirical evidence to verify the impact of VR on language learning, we have an ample amount of conceptual and theoretical support to promote the use of VR for language learning as discussed in this article. VR has been adopted into other fields of education already and will continue playing a critical role for the advancement of our future education. As such, it is time for us to take an action, rather than to contemplate.

5. Concluding Remarks

This paper provides support for the use of VR in language learning, both conceptually and empirically. We demonstrated that the kinesthetic learning style enabled by VR assists learners to increase their memorability of vocabularies by showing the results from the experiment using our prototype VR application. Our results indicated that kinesthetic VR learners had a higher vocabulary retention, as compared to text-only and/or non-kinesthetic VR learners. Although the sample size in our study is relatively small, the results justify a more widespread adoption of VR for language learning.

We also supported the use of VR for language learning from the lens of psychology, while introducing the notions of "meaningful learning" and "empathy". We argued that VR's unique affordances (i.e., being immersive and authentic) help us to create an environment in which learners can engage in meaningful learning experience, and accordingly, they may have a better memory of what they have learnt.

We also argued that VR appears to help learners foster their empathy through immersing themselves into an authentic virtual context. The goal of language education is to enable one to communicate with people from different linguistic and cultural backgrounds. As such, nurturing empathy through language education is critical, and in this respect as well, VR is a powerful instrument for our future language education. I hope that this paper can encourage more language teachers to start using VR and exploring innovative language pedagogy for the 21st century.

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Resources

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