Virtual Reality Based Language and Culture Education

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***Abstract*— The arrival of new and advanced virtual reality headsets opens up more opportunities and applications. This article deals with the current status of virtual reality and its application in education. With the increasingly globalization of the world, interaction with people from different cultures than ours is more likely than ever. Knowing how to correctly approach and interact with people that have different social norms than us is a necessary condition to live in this multicultural world. This project provides a tool to learn how to adapt the way we behave. This is achieved using a virtual reality environment as a way to train interactions, with focus on the interpersonal distances we take.**

***Index Terms*—Virtual Reality, Serious Games, Student Experiments, Proxemics language, culture, language feature, English teaching, English study**

I. INTRODUCTION

Today international interactions and mutual dependencies are growing in scope and importance. The open policy of our country provides more communications and cooperation's with foreign countries than ever before. The focus of English study used to be more on reading, which was included in the syllabus. The urgent situation of international communication and cooperation, however, calls for the shift of focus. To learn a second language is a goal shared by many, from children in bilingual environments to adult immigrants seeking employment to people wishing to travel abroad. However, many people find it difficult to engage and also to learn vocabulary and grammar in context. Although many people learn languages through popular online tools like Duolingo and Rosetta stone.

Much of the vibrancy of real-world experiences that can make language learning relevant and fun do not translate to these systems. On the other, end studying abroad provides ample opportunities to be exposed to a foreign language, assimilate into another culture, and apply language in context. Indeed, many studies have analysed the advantages of studying abroad on language acquisition. However, studying abroad is not an option for all due to financial cost, lack of opportunity, or insufficient time. Ideally, we would have immersive language tools that simulate the experience of being in a foreign language environment as deeply as possible, so that an aspiring learner can learn both language and culture from observation, as well as harness their potential for motivation.

The emergence of high-quality, low-cost virtual reality headsets in recent years has sparked a surge in interest in the technology, including for educational purposes. Virtual reality has also been used for virtual tourism to situate people in other places without actually being present. In this paper, we explain our experiences in designing a virtual reality game for learning language. We explored whether we could use VR to design game mechanics around culturally-relevant embodied physical interaction. Our results provide initial evidence that porting to VR and adding VR-specific game mechanics was useful for increasing involvement in learning culture and teaching players languages. However, players encountered some challenges, including feeling sick while using the virtual reality headset. The impact on learning itself was also inconclusive. Nevertheless, this formative evaluation indicates that we were able to leverage some benefits of VR, which will inform future development of the game. Furthermore, the integration of physical cultural artefacts has implications for the design of language learning technology and virtual reality games.

II. SOLUTIONS

Interactive VR Game

Interactive VR games can be made in which there is an environment which involves a particular place, and the player has to say and act according to the task given in the game. For example, the game can be based in a Japanese environment and the task can be to greet a person by saying Konichiwa ("Hello" in Japanese) while bowing down.

Spelling and grammar correction using voice and text:

An android app can be implemented which takes the user's voice as input, checks for errors and return the results in the form of text.

Hearing and learning:

An app/ website which gives audio lessons to the user and the user learns using these audio clips.

Language game using smart objects:

Various games can be implemented using smart objects. The objects can be detect by the phone camera using augmented reality and based on this concept various games such as quiz', board games, etc. can be implemented.

Quiz:
Quiz games involve series of questions and answers which the user can learn about in order to learn the language.

III. VIRTUAL REALITY

There have been several incarnations of VR in the build up to its present state. Firstly, it should be noted that, historically, VR does not necessarily mean using goggles and motion capture technology, although in some cases it does. One aspect of VR that is currently being used in language learning and education at large is Virtual Worlds (VW) A Virtual World can be defined as visual environments that "have been developed further from three-dimensional (3-D) web-based technologies to form multi-user virtual environments (MUVEs) such as Second Life". A Virtual Environment (VE) is a representation that "capitalizes upon natural aspects of human perception by extending visual information in three spatial dimensions". The typical image of a person in goggles, pawing at the air as they experience a VE/VW is a common misconception of what VR is, but this interface of VR is one which is highly immersive for the user. Educational Virtual Worlds are commonly known as a Visual Learning Environments (VLEs).

IV. HISTORY OF VLES IN EDUCATION

VLEs were first developed "as early as the 1960s, but the computer advances of the 1980s and 1990s allowed the creation of learning systems that are recognizable today as Internet-based media". Commonly, the types of tasks that were being taught usually had an element of prohibitive danger or cost to them, for example military or medical procedures. Over time, educational software has developed alongside video game technology, and computer games with 3-D VLEs having become commonplace in many differing arenas of education. As a result of VR technology becoming more accessible and affordable, research into what types of knowledge bases benefit from VLEs are developing a better picture of what effective practice entails.

V. GAME-BASED PEDAGOGY

Although contentious, using video games to teach has proven successful in a variety of ways, including language acquisition. Not surprisingly, students report increased enjoyment in learning when video games are used as a teaching tool. This in turn has been reported to increase student motivation, something that was previously mentioned as a key problem with distracted students in classes. Not only motivation, but engagement in gamified virtual environments also has also been decided as a key benefit of educational computer games.

VI. LANGUAGE LEARNING TOOLS

There are many computer-based tools for learning languages. MicroMandarin utilizes the user's real-world location to suggest vocabulary words. Tip Tap Tones trains its users to recognize tones in Chinese. Dearman et al. used a desktop wallpaper to teach vocabulary. We improvise on these ideas and make them more engaging by creating a holistic experience in a 3D virtual reality video game. Rosetta Stone is a highly successful tool that mainly teaches language through a series of pictures. A typical task features a set of five or more pictures that each show a certain situation, such as a boy eating or a girl running, and asks the user to identify the image that most closely matches a phrase in the target language. Rosetta Stone offers many advantages over traditional curricula: the learner receives immediate feedback, information is presented in a visual context, and meaning is often learned through inference. Our work builds on these ideas, but also features an interactive 3D environment that provides a deep virtual reality context and prioritizes experimentation and completion of tasks and goals in that environment.

DuoLingo is another successful tool that teaches language by asking the learner to translate sentences. DuoLingo also has a highly structured learning progression and has achievements and point systems to motivate users. Although 34 hours of DuoLingo has been shown to be equivalent to a first-semester college course in Spanish, many students stopped using it within 2 hours. Our work also uses game elements to incentivize users, but it teaches linguistic concepts in a situated physical context rather than through pure translation. There are existing video games that focus on teaching languages. A good summary can be found in. For example, Sanjigenjiten uses a 3D environment to teach vocabulary words. This game makes use of visual information to teach vocabulary meanings, but it does not provide a deep learning progression. Zengo Sayu is a virtual environment for learning Japanese in which the player explores a location and hears audio cues of words. However, it is not really a game.

Our app is a 3D language learning game that teaches language material in its physical context, motivated by the theories of situated cognition and encoding specificity. The game provides opportunities for players to learn words from context and gamifies language learning through a quest system that requires players to solve challenges that involve learning new words and using them to construct target sentences. Both studies showed statistically significant learning gains.

VII. VR AND LANGUAGE EDUCATIONAL THEORIES

When considering practice, it is always important to first look to theory. Of the numerous 3 applications for virtual worlds, the following are some educational aspects that have been found as effective from a compendium study on virtual worlds in the classroom:

- problem-based learning;
- enquiry-based learning;

- game-based learning;
- role playing;
- virtual quests;
- collaborative simulations (learn by simulation);
- collaborative construction (building activities);
- design courses (game, fashion, architectural)
- language teaching and learning;
- virtual laboratories;
- virtual fieldworks;
- Attending lectures or classes.

Although this list includes language teaching and learning, it is the only subject unto itself, whereas the other items are mostly types of educational methods. However, many of these activities and learning philosophies are mainstays of language education.

VII. POTENTIAL ADVANTAGES OF VR IN LANGUAGE LEARNING

Practice & Confidence

One of the qualities of scaffold language learning is the relative amount of practice that is required to produce this outcome. In regards to the potential application of virtual worlds, practice by a student could be easily applied both in and out of the classroom. One study actually found increased confidence and willingness to speak when Thai high school students participated in a virtual world type game that had them practice English using both text and speech. This gives rise to the notion that all skills (writing, listening, speaking reading, etc.) have the potential to be exercised through virtual world type games. Practice in productive skills such as speaking and writing will therefore lead to more confidence in students' day-to-day interaction with their target language. With increase in both practice and subsequently confidence, VR could "lead to improved transfer of knowledge and skills to real situations through contextualization of learning"

Immersion

One of the reasons students travel abroad to places like Canada for English language learning is the widely regarded notion that immersion is key to language fluency. With this in mind, because of access of cost and affordance of time, Taiwan has taken a novel approach by creating so-called English Villages. These are areas in Taiwan that have English signage and English-speaking service people. Essentially, these have been created as a place for students to practice English. Even though these have a varying degree of success, there are still logistical access issues, i.e. not every village can be an English village. One of the ways that this is being addressed is through VLEs to reproduce even more authentic English language environment. This has in turn shown to benefit learn in their syntactic and conversation abilities, and also generally enhance their performance. On the other hand, whether a virtual English world or Taiwanese English as a Foreign Language (EFL) classroom is more authentic to an actual language classroom in a country that speaks English is certainly up for debate.

Teaching Your Audience

Due to the context in which many students have grown up, integrating technologies that they are accustomed to, like mobile devices and video games, seems like a natural fit for teachers. However, generalizing Millennials into a universally shared experience is certainly a fallacy. Regardless, many students in the language-learning context have experience with VLEs. Many potentially educational VLEs are akin to the video games that students have grown up with, and students are increasingly engaging with mobile devices to play and learn. For example, the Multi-User Virtual Environment (MUVE) game Second Life has been studied in regards to the experience of Millennials, and also that of language learning students. Combining mobile technology, VLEs, and language learning theories of immersion, practice and confidence building is indeed an amicable goal, although an integrated curriculum is lofty at this moment.

VIII. FORMATIVE USER STUDY

We conducted a formative user study in order to gain initial insights on the design of our VR port of our app. The study focused on evaluating the following questions: (1) Does VR version of the game improve language acquisition and stimulate interest in the language's culture more effectively than the non-VR version, and (2) Could players can be taught cultural behaviours, through the help of VR? To test these hypotheses, we conducted a study with a total of 6 participants. The only requirement to participate in the study was a self-reported lack of familiarity with language and culture and experience with developing any VR related application. To assess the impact of the addition of virtual reality and the bowing mechanic on the effectiveness of the game design, we created two versions of the demo. The first was played without virtual reality on a regular computer screen. The second was played with the Oculus Rift head-mounted display. The VR and the non-VR versions were same except that the VR version included bowing.

We adapted a 3D language-learning game, to virtual reality by adding integration with the Oculus Rift. In particular, we explored if we could use virtual reality to design game mechanics around culturally-relevant embodied physical interaction. We conducted a user study to evaluate the design of the ported game. Through adding VR, we observed a statistically significant increase in the participants' sense of cultural involvement. However, there is no obvious evidence that the language learning outcomes improved thus far. In future, we plan to take steps to increase the sense of immersion further, such as exploring speech recognition as a primary input mechanism. Speech input would also reduce dependence on UI, which we expect will decrease player confusion with interacting with the UI in VR. We also hope to release the VR and non-

VR versions of the game online to gather longitudinal data and investigate whether participants would return to the game. As 3D reconstruction technology improves, this provides additional opportunities to feature real locations for language learning exercises. We plan to evaluate whether this will increase engagement, as well as develop techniques to "gamify" these locations by adding non-player-controlled characters and interactive situations.

REFERENCES

[1] Noah Snavely, Sameer Agarwal, Ian Simon, Steven M Seitz, and Richard Szeliski. 2009. Building Rome in a day. 2009 IEEE 12th international conference on computer vision. IEEE, 72–79.

[2] Eleanor O'Rourke, Erik Andersen, Yun-En Liu, Rich Snider, Jeff Lowdermilk, David Truong, Seth Cooper, and Zoran Popovic. 2012. Impact of tutorials on games of varying complexity. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, 59–68.

[3] Alexander Renkl, Robert K Atkinson, and Mary Margaret Merrill. 2003. Transitioning From Studying Examples to Solving Problems: Effects of Self-Explanation Prompts and Fading Worked-Out Steps. Journal of Educational Psychology 95, 4 (2003), 774.

[4] Mark Hancock, Mahdi Azmandian, Hrvoje Benko, Eyal Ofek, and Andrew D Wilson. 2016. Haptic Retargeting: Dynamic Repurposing of Passive Haptics for Enhanced Virtual Reality Experiences. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. ACM, 1968–1979.

[5] BBC. 2015. British Museum offers virtual reality Tour of Bronze Age. http://www.bbc.com/news/technology-33772694, BBC News (2015).

[6] Christian Holz, Hrvoje Benko,Mike Sinclair, andEyal Ofek. 2016. NormalTouch and TextureTouch: High-fidelity 3D Haptic Shape Rendering on Handheld Virtual Reality Controllers. In Proceedings of the 29th Annual Symposium on User Interface Software and Technology. ACM, 717–728.