

# Effects of Integrating Glossarial Visualization of Virtual Reality in Students' Learning

Ruiqian Su

**Abstract**—This study was conducted to evaluate how the Glossarial Visualization Program of Virtual Reality (VR) technology affects the visual interactivity among Chinese Rural Dyslexic Students in social studies content. The study employed a qualitative research method, where students were selected to engage in virtual reality, after which access an article online and write a reflection of the article. Writing samples and interviews were used to review the responses. The research was conducted in a high school in Quanzhou, China. The results proved that virtual reality technology could give rural dyslexic students the advantage of visual compensation and stimulate their interests in learning social studies content to improve the quality of teaching. So, it is a great innovative approach to explore the significance of reforming rural dyslexic students' teaching mode.

**Index Terms**—Glossarial visualization, rural dyslexic students, social studies content, virtual reality technology.

## I. INTRODUCTION

The integration of technology in the teaching fraternity has become a significant element in the ever-transforming technological universe. These are the technological devices that help students in preparing papers and compiling notes. Nevertheless, there seems to be inadequate or little effort in the quest to educate students on the ways of selecting and using technology that designs an efficient and flawless career practice.

Advancements in technology have allowed employment of new approaches in the education sector. The integration of the software is advantageous in the process of learning as it makes it interesting for the learners. Among the innovative technologies meant for enhancement of the learning process is Virtual Reality. It refers to computer technology used to replicate or simulate a real environment for the users to experience a sense of being there and interacting with the simulated environment physically. It is used to break the barriers between computers and humans by immersing the people involved in a stereoscopic environment generated by a computer. The tridimensional settings generated have improved interaction forms that contribute to learning motivation. Additionally, it is essential in helping the students gain more skills and knowledge on the subject they are taking. This is done by being able to give them the practical experience of the real phenomenon. Notably, the integration of Virtual Reality can potentially raise new educational possibilities.

Virtual Reality education has always been highly anticipated as a field of profound significance, and more and more urban schools are integrating Virtual Reality education. However, the development of Virtual Reality education for rural students does not spread out smoothly, especially in rural dyslexic

students, and faces many practical problems. So, it is vital to explore if Virtual Reality in rural education can have contributed to the dyslexic students. Virtual reality technology plays a key role in the development of dyslexia and has great potential for rehabilitation for people with specific neurological disabilities [1]. Unlike printed textbooks, VR technology can help teachers' awareness of customizing layouts according to the needs of dyslexic students [2]. The purpose of this research study is designed to explore the impact of visual glossary strategies implemented by VR for Chinese Rural Dyslexic Students on reading comprehension in social science class. First of all, the definitions of visual glossary should be clarified. In this prospectus, breadth of glossarial knowledge refers to the number of words of which one has at least some superficial knowledge of the meaning. In some previous studies by Phillips [3], the visualization of glossarial knowledge demonstrated in a learning process, and reading comprehension was discovered to be the only effective factor for accelerating reading fluency and comprehension. In addition, reading comprehension in social science class is one of the most important for students. It has long sought to find effective strategies and methods to help students develop their reading skills by visualizing [4]. Visual aids and strategies on the glossary have great effects on students' vocabulary knowledge [5]. Among them, as an immersing learning experience with semantic format, Virtual Reality (RV) is considered to be an effective way for teachers to provide support to learners and promote the development of students' reading skills in social studies [6].

The first approach maintains that any kind of teaching should be aimed at solving a problem. Someone's capability to detect a problem helps them have an easy time finding the solution by requesting technological assistance. Communication and theoretical understanding, in this case, is fundamental because it allows a disabled student to develop creative thinking and ideas. Students cannot be competent enough if all they can do is to memorize specific texts. However, they can boost their strength through technology-oriented learning such that they would easily find solutions to complex problems likely to be encountered in the near future. Some of the researchers have been conducting studies on the impact of digital content created by students. The findings have led to the conclusion that in regards to technology, students present the highest curiosity. Therefore, they are in a better place to come up with content that will be consistent with their demands and modes of study. Some law schools have been offering student contests to help learners compete in the creation of content. This acts as a major trigger of the students' creativity. If the creators of content are students, it means they will be able to share it with their colleagues by banking on technology-based strategies. They can share the creativity with their friends in class or the entire institution, or even across different web-based platforms. When students are competent enough technologically, they will have an easy time in seeking out jobs.

Manuscript received August 10, 2020; revised March 12, 2021.

Ruiqian Su is with University of South Florida, USA (e-mail: suh@usf.edu).

## II. THEORETICAL FRAMEWORK

In the process of shifting to the digital learning system, there have been several theoretical explanations established. One of the study's main aims is to integrate advanced technology into the regular learning curriculum in support of improved learning. Any technological advancement includes an amalgamation of something selected and that which was not. Technology is also a collection of something predictable and that, which cannot be predicted, as well as the desirables and undesirables. It is an educational setting meant for simplified learning and mostly relies on the learning techniques of students. When learners and tutors interact, the process of learning becomes highly promoted through models that focus on learners. The research is mostly based on the technology-oriented system process that is centered on learners. The study has also received guidance from the theory of learning power. The framework is mainly focused on the process of adopting technology to enhance the process of law learning. It also stresses the different correlating factors, such as a community setting, interaction, norms, and existing technological activities. Other significant aspects include the institutional models, leadership support, technology accessibility, and the technology application scope.

A group of researchers undertook a systematic review involving electric learning, digital learning, and mobile learning. In general terms, they unearthed that the two main subsets of d-learning include mobile and electric education. They also termed all these learning systems as technology-oriented and that they have a significant contribution to the process of learning and teaching. Some researchers undertook research on supporting technology in legal knowledge. Their main focus was the mode used to deliver education. They confirmed that with the right technology, education could be transformed into the outcome-oriented from the input-oriented. Some researchers concerned with the technology implementation practices have noted that although students benefit from technology featured in learning, it was somehow challenging to implement software, especially for the technological-wise approach. Some researchers have been concerned with the introduction of information into the d-learning setting. They have discovered that an inter-modal d-learning positively affects law learning, although there are variations between participants. Therefore, one of the leading players in technology-oriented learning includes the internet because of its rich information.

Competing theories of glossarial knowledge are the basis of learning and the key to improving reading ability. A number of theoretical perspectives of glossarial knowledge and advanced reading comprehension were found about the breadth and depth of glossarial knowledge. The breadth and depth of vocabulary knowledge are two main things, and they are included in most of the various Vocabulary Instruction [7]. Based on variable reading tests for students in social science literacy reading teaching, the theory was to investigate whether the students' reading comprehension outcomes just only can be tested through the practice of the breadth of glossarial knowledge. In recent years, glossarial knowledge has seen an important teaching skill in the social science classroom. Lexical –Chunk theory can be viewed as one of the most important teaching tasks in social science content teaching, especially for students with low reading and writing proficiency [3]. According to those previous empirical studies, most of them focused on the students' breadth of vocabulary knowledge. This study is based on the theory of lexical competence, word knowledge framework [8], and the theory of instrumentalist hypothesis.

Also, the competing theory, interference theory [2], focused on a correlation between glossarial knowledge and reading comprehension ability. This theory attempted to explain whether reading section of social studies with the different difficulty of vocabulary affects different level proficiency learners' reading skills in the class and whether the visual of words can improve learners' reading skill [9].

## III. RESEARCH DESIGN AND METHODS

In this paper, in order to objectively and accurately reflect the actual situation, after using Virtual Reality, two selected students must read a social science article online each week and write down their reflection on the article. This case study is used as a qualitative research method. In response to research questions, this study used research tools such as writing samples and interviews. (a) Writing samples. Two reflections from students will be randomly selected. The similarities and differences between the two will be compared in terms of vocabulary accuracy and extensive reading, correction results, and comments, which mainly cover the Glossarial Visualization Program's evaluation the effect after use. (b) Interview. The study will also conduct semi-structured interviews for teachers and students to understand the evaluation of the Glossarial Visualization Program by teachers and students. By Using an action methods design, this study is designed to answer the following question: How does the Glossarial Visualization Program of Virtual Reality (VR) technology support glossary knowledge and increase reading comprehension in social studies content for Chinese Rural Dyslexic Students? I used semi-structured interviews. The interview outline focuses on two main points. The first point is the time, place, duration, and amounts of tasks. The second one is which functions of Glossarial Visualization Program of Virtual Reality (VR) are used, what are the contents of VR, and what Memory words help the most. Besides, I also collected data about the learners' learning background, work experience, interest in learning, motivation, difficulties, attitudes toward the social science classroom. Most of the interviews were face-to-face interviews plus recordings. However, since individual subjects live far away from me, it was not easy to conduct face-to-face interviews; they also took online video interviews and recorded them. The data analysis process of this study is guided by reading the transcripts of the interviews word by word and continuing to encode and refine them, which finally form this research's viewpoint.

## IV. FINDINGS

After data analysis, the results are as follows : (a) Glossarial Visualization can improve orthographic deficit ability of high school students in rural China to a certain degree; (b) Glossarial Visualization can improve the visual reading and thinking skills of high school students, especially in memorizing glossary, explanation, and evaluation, but the improvement in analysis and interpretation is not obvious.

## V. ANALYSIS

I believe that Glossarial Visualization in high school class is helpful to cultivate students' reading and critical thinking. Glossarial Visualization by VR can improve students' orthographic deficit ability and help their visual reading and

thinking skills in social science reading class, especially in interpretation, evaluation, and inference. Additionally, employment of Glossarial Visualization in learning institutions is a way of motivating the students as they normally develop a positive attitude towards studying. It is a strategy of grabbing and retaining the students' devotion, as it is enjoyable and challenging to create and interact with objects in the virtual environment. On the same note, it allows visualization of processes and objects that would have otherwise been hard to portray in reality, which helps the students comprehend the lessons better. It sharpens the students' imagination as it exposes them to abstract views. It is key in offering them a student-centered learning experience, which is essential for the improvement of their performance. Generally, Glossarial visualization using Virtual Reality plays a major role in improving the students' performance and motivating them to get more engaged in their studies.

In essence, Virtual Reality employment in learning centers is key in encouraging the students to become active learners as it allows autonomous exploration, promotes decision making among the students, comprehension of complex concepts, learning through practice, and creation of new experiences. The students were found to have more knowledge when reflecting on the articles compared to those who had not used virtual reality. This can be attributed to the real-time interaction, which allows visualization of results on a real-time basis, making the students make decisions according to the instant results so as to achieve their learning targets, hence improving their cognitive skills and consequently performance. Glossarial Visualization encourages students' engagement and discourages distractions, hence assisting them to achieve their academic goals quickly.

However, the usage of Virtual Reality in learning portrays various challenges apart from the many desirable benefits. One of the challenges is that the integration of Glossarial Visualization in educational centers can result in a significant drop in interactions between the students. Interactions with humans are far more enriching than interactions with a simulated environment. This is because other students can help you get different skills and learn other things while building teamwork skills. Virtual reality will only help a student perfect on the skill they are learning, will encourage individualism. It will significantly affect the student-teacher interactions negatively.

Another limitation noted by the study is the high costs of installing the programs in schools. Some of the local schools do not have the necessary IT and WiFi infrastructure to support the tools' simultaneous use. This makes the program to be a bit expensive for some of the educational and training institutions. However, comparing the technology and some of the applications that were integrated into the creation of music and video content years ago, it can be deduced that the technology is not more costly or complicated. Therefore, educators can follow the same system they used to integrate the applications to ensure that the education system includes Glossarial Visualization.

Based on the research findings, virtual reality is definitely the next step in the interactive learning evolution. For the tool to be sufficiently integrated into the education system,

educators need to examine the associated training towards making the technology an everyday learning tool. Although the concept of Glossarial Visualization may seem to be a little bit advanced to be incorporated in the learning environment, it is not actually diverse from some augmented reality depicted in some of the applications in use today. Therefore, integration into the learning institutions may not require much of the training, as the concept is not complicated as it may be perceived.

While the advantages of Glossarial Visualization integration in learning centres may be universal across all broader subjects' variety and learning styles, the proper approach for incorporating the strategy may be different from one school to another, or one classroom to another. However, when people have the right information and support on how Virtual Reality can increase the learners' interest in learning and comprehension, making the technology to be present in the classes is entirely likely. Despite incorporating Virtual Reality in a learning environment is essential to transform the education process in any learning environment, the implementation process doesn't have to be revolutionary.

## VI. CONCLUSION

This study was conducted to investigate the visual effects of glossarial knowledge on reading proficiency in rural students' social science classes. By controlling other factors such as the types of visual glossary by VR, it is hypothesized that the visualization of glossarial knowledge students would acquire the most comprehension in reading, supporting the theory of interference theory [2]. By reviewing some relevant theories and studies in this field, this study confirmed that the importance of glossarial knowledge in social reading comprehension for dyslexic students. The study results reveal that vocabulary size can no longer be regarded as a simple matter of recognition of reading the meaning. Vocabulary knowledge has not only breadth but also depth. The visual effects of glossarial knowledge can help dyslexic students [10]. The importance of the visual effects of glossarial knowledge in reading comprehension has been established in the present study based on empirical pieces of evidence.

## CONFLICT OF INTERESTS

The authors declare no conflict of interest.

## ACKNOWLEDGMENT

This research received funding in 2021 from the University of South Florida.

## REFERENCES

- [1] M. Tassos, "A virtual reality test for the identification of memory strengths of dyslexic students in higher education," *Journal of Universal Computer Science*, Vol. 19, pp. 2698-2721, 2013.
- [2] L. Postman and B. J. Underwood, "Critical issues in interference theory," *Memory and Cognition*, vol. 1, no. 1, pp. 19-40, 1973.
- [3] Z. Xiao, "Lexical - Chunk theory and English vocabulary teaching," Master's Thesis, Shandong Normal University, 2007.
- [4] D. Passig, "The impact of virtual reality on educators' awareness of the cognitive experiences of a dyslexic student," *Teachers College Record*, vol. 113, no. 1, 2011.
- [5] D. Kim and D. A. Gilman, "Effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning," *Educational Technology and Society*, vol. 11, no. 3, pp. 114-126, 2008.

- [6] C. Dede, M. Salzman, R. B. Loftin, and K. Ash, "Using virtual reality technology to convey abstract scientific concepts," *Learning the Sciences of the 21st Century: Research, Design, and Implementing Advanced Technology Learning Environments*, 2000.
- [7] B. Laufer and P. Nation, "Vocabulary size and use: Lexical richness in L2 written production," *Applied Linguistics*, vol. 16, no. 3, 1995.
- [8] N. Schmitt, "Vocabulary testing: Questions for test development with six examples of tests of vocabulary size and depth," *Thai Tesol Bulletin*, vol. 6, pp. 9-16, 1995.
- [9] P. Jie, "A different kind of reading instruction: Using visualizing to bridge reading comprehension and critical literacy," *Journal of Adolescent and Adult Literacy*, vol. 55, 2012.
- [10] M. Phillips, "The effects of visual vocabulary strategies on vocabulary knowledge," Theses, Dissertations and Capstones, 2016.

Copyright © 2021 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).



**Ruiqian Su** is from Quanzhou, Fujian province, China. He was born in February 16, 1993. He received the master's degree in education at Auburn University in Alabama State on August 2018 since he graduated with his bachelor's degree in Beijing Institute of Technology, Zhuhai, China.

Currently, Su is talking Ph.D program in interdisciplinary education. studies focus on social studies (visual anthropology/sociology) and digital media arts in educational areas at University of South Florida. Ruiqian Su's research centers on social studies in education area. Broadly, his research touches upon how interactive visualization address students transform text into powerful visuals in the applications for the classroom with visual methodologies. Also, he is exploring about the examination the socioeconomic status of marginalized students in global education. In addition, he is interested in the research group about how to engage in research and grant development to enhance the teaching and learning process by advanced teaching technology for Pre-K.