THE BENEFITS OF VIRTUAL REALITY TECHNOLOGIES IMPLEMENTATION IN NON-NATIVE LANGUAGE LEARNING CLASSES OF CENTRAL ASIA

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Abstract

In the language teaching research field, there are a widely differing views on the usage of virtual reality (VR) technologies, as according to certain researchers' studies, VR technologies is nonbeneficial in terms of teaching foreign language (TFL), while other studies concern that computer-generated environment has become a powerful and invaluable tool in teaching and learning processes. This article aims to make the review and discussion of VR potential in non-native language learning classes, as well as defining key point of its inapplicableness.

Introduction

With the staggering advancement of informational technologies, the process of teaching foreign language is coming across with the progressive improvement. In a modern reality, informational technologies are being successfully implemented in a language learning environment, increase of motivation and potential among the learners and enlargement of teaching capability. Virtual Reality is represented as a contemporary element of giant world of IT and according to researcher at the Cyprus Interaction Lab, Department of Multimedia and Graphic Arts of the Cyprus University of Technology (CUT) Antigoni Parmaxi, VR is considered one of the emerging and highly promising technologies for learning and training. The incorporation of the specific technology in the instruction confronts researchers with endless opportunities in terms of access to experiences that would be otherwise inaccessible (e.g. visit to the moon or standing in front of the muscular system). Even though several researchers have underlined the positive impact of VR in education, there is also evidence which demonstrates that teachers and trainers still hesitate to incorporate it in their teaching practice due to the need of advanced technical knowledge or the high cost of VR devices (Parmaxi, Stylianou, & Zaphiris, 2017).

It is not a novelty that the academic community is trying to conduct systematical aggregated VR research findings to gain a better acknowledge of how the concrete item of IT is pushing for a progress in learning and training processes. To the contrary, the insufficiency of new-era-technology studies is standing as an obstacle for defining fully featured picture of how VR is capable of advancing teaching process. In order to cover the gap of insufficiency, this article tries to specify the definition of VR first, following with determination of benefits, disadvantages and further discussion of possible VR usage methods in NLLC.

1.   Definition of virtual reality

The origins of the word "virtual" (from Latin virtus - imaginary) comes from scientists of quantum physics to define ephemeral elementary particles that arise and exist only in the process of interaction of other particles. In the "Virtual Psychology" N.A. Nosov provides with the example of early usages of the term virtus (virtual) in ancient philosophy and medieval scholasticism. Regarding to the studies of N. A. Nosov, virtus was one of the central categories, denoting a possible, potential, referring to the reality of a different (higher) order. But after a while, the definition of the abovementioned word faced with fundamental transformation. "Virtual" began to oppose to the meaning of material, ephemeral; defining artificial recreation of reality. Subsequently, this concept was used to designate three-dimensional computer macromodels, and then rapidly expanded its terminological boundaries, becoming one of the universal characteristics of information activities as such (V. Dobrova, Virtual Reality in Teaching of Foreign Languages). H. Reingold identifies VR as an experience in which a person «is surrounded by a three-dimensional computergenerated representation», where it is possible to move around in the virtual world, to see it from different angles, to reach into it, to grab it, to reshape it, thus getting experience (H. Rheingold, "Virtual Reality").

V. Dobrova describes VR as the technologies of headmounted displays, arm-mounted displays and surround-screen projection-based displays. A head-mounted display consists of a pair of miniature displays positioned in goggles or in a helmet strapped to the user's head so that each eye sees one display. On the other hand, S. McGlashan and T. Axling define VR as graphical two dimensional or three-dimensional interface for interaction between the user and the computer that applies to computersimulated environments that can simulate places in the real world, as well as in imaginary worlds.

V. Dobrova underlines the seven main features of virtuality as following:

1.   Relevance: virtual objects exist only up to date, only "here and now";

2.   Autonomy: the laws of the existence of virtual objects do not coincide with the laws of the existence of reality, generating them;

3.   Generation: these objects are produced by the activity of some other reality external to them, and exist only while this activity lasts;

4.   Interactivity: virtual objects can interact with the reality that generates them as ontologically independent of it;

5.   Ephemeral: virtual objects are artificial and changeable;

6. **Non-materiality of impact:** not being material, virtual objects can produce effects characteristic of the real;

7. **Fragmentation:** the freedom to enter virtual reality and the freedom to exit from ensure the possibility of arbitrary interruption and renewal of its existence.

In pedagogy, "VR" is mainly used as a special information space, where the student can receive certain information, carry out contacts, elements of scientific and educational and project activities (V. Dobrova, Virtual Reality in Teaching of Foreign Languages).

According to Piovesan, Sandra Dutra, Liliana Maria Passerino, and Adriana Soares Pereira, VR is defined as a computer application that enables its users to experience immersive, three dimensional visual and audio simulations, as well as actively interact in this new learning environment. Oyelere in his research "Exploring the trends of educational virtual reality games: a systematic review of empirical studies" highlights three possible types of virtual environments:

1. Non-immersive;
2. Semi-immersive;
3. Immersive.

Non-immersive virtual environments which are immersive implementations of VR technology with the lowest level of immersion that can be accessed by using high resolution monitors.

Semi-immersive virtual environments that allow its users to partially immerse in the virtual environment (e.g. flight simulators).

Immersive virtual environments where users feel a realistic experience, since they are immersed in a 3D virtual environment, with the use of Head-Mounted Displays (HMDs), the user has a great field of vision (e.g. VR apps).

 VR provides both teachers and students with a great potential since it allows for the use of multiple senses (e.g., touch, sense of heat, smell), which are used simultaneously during the learning process (Oyelere). Research shows that the visual aspects and interaction with the multimedia system are the most preferred features among university students in comprehending the subject matter (Nooriafshar, Mehryar, Ron Williams, and Tek Maraseni). Especially in education, VR facilitates and enhances students' understanding of abstract concepts in a realistic way (Oyelere).

2. **Benefits of VR in TFL (How it can be used in TFL, advantages)**

Continuous advancement of technologies opening brand new horizons of possibilities in every field of human existence. After pandemic experience, the researches commenced giving higher attention to the development of virtual environment, as the lack of capabilities in pandemic period leaded to various unexpected preventions. In fact, VR made it possible to find and operate in environments that were not accessible to people due to time, distance, scale and security. Although VR is being mainly implemented in the field of biomedical science, there is a wide advantageous perspective of VR technologies in the sphere of education as well.

According to J. Cromby, P. Standen, D Brown and M. Bricken, there are five main beneficial outpoints of VR in education field:

1.   Visibility;
2.   Security;
3.   Involvment;
4.   Focusing;
5.   Presence.

Visibility. Using 3D-graphics, one can detail the various processes and phenomena. VR is able not only to provide information about the phenomenon itself, but also to
demonstrate it with any degree of detail.

Security. Surgical operation of heart, control of a super-high-speed aircraft, fire-one can immerse the viewer in any of these circumstances without the slightest threat to life.

Involvement. VR allows one to change scenarios, influence the course of an experiment, or solve problems in a playable and understandable form. During the virtual lesson, one can see the world of the past through the eyes of a historical character, go on a journey into space, make an ascent to Mount Everest.

Focusing. The virtual world, which surrounds the viewer from all sides, will allow to concentrate entirely on the material and not being distracted by external stimuli.

Presence. A first person view and a sense of one's presence in the painted world is one of the main features of virtual reality. This allows one to conduct lessons entirely in
VR (J. Cromby, P. Standen, D Brown, "Using Virtual Environments in Special Education"; M. Bricken, "Virtual Reality Learning Environments: Potentials and Challenges").

Regarding to the abovementioned various capabilities of VR technologies, it is obvious that TFL classes can get improved by implementing VR as:

-       a real situation interaction such as an interview at employment, the situation in a restaurant, at an airport, etc.

-       stimulation of task-based interaction, enhancing motivation and task engagement through meaningful and authentic communication tasks such as task-based activities in a specific environment and etc.

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Virtual space can vary depending on the objectives, language level, time frame, number of participants, real or animated characters, used devices, etc. It offers students flexible and convenient access that is a key driver for the use of technology in learning.

With the help of virtual environment, it is possible to broaden capabilities of a conservative learning style and reduce the amount of occurring difficulties. Regarding to the studies of Oyelere, VR provides both teachers and students with a great potential since it allows for the use of multiple senses (e.g., touch, sense of heat, smell), which are used simultaneously during the learning process (Oyelere, Solomon Sunday, Nacir Bouali, Rogers Kaliisa, George Obaido, Abdullahi Abubakar Yunusa, and Ebunayo R. Jimoh). Research shows that the visual aspects and interaction with the multimedia system are the most preferred features among university students in comprehending the subject matter (Nooriafshar, Mehryar, Ron Williams, and Tek

Maraseni. (2004) "The use of virtual reality in education", in American Society of Business and Behavioral Sciences). Special position it takes in education field, as facilities of virtual environment provokes learners' understanding of abstract concepts in a realistic way. Due to this, VR is widely used in health and engineering sciences, where students, with the assistance of VR, have an opportunity to try out simulated realistic scenes. According to recently conducted bar chart data of Hamilton (fig.1 below), VR was mainly used in biology, chemistry, physics, engineering and architecture, and medicine, while other sciences were present only marginally.
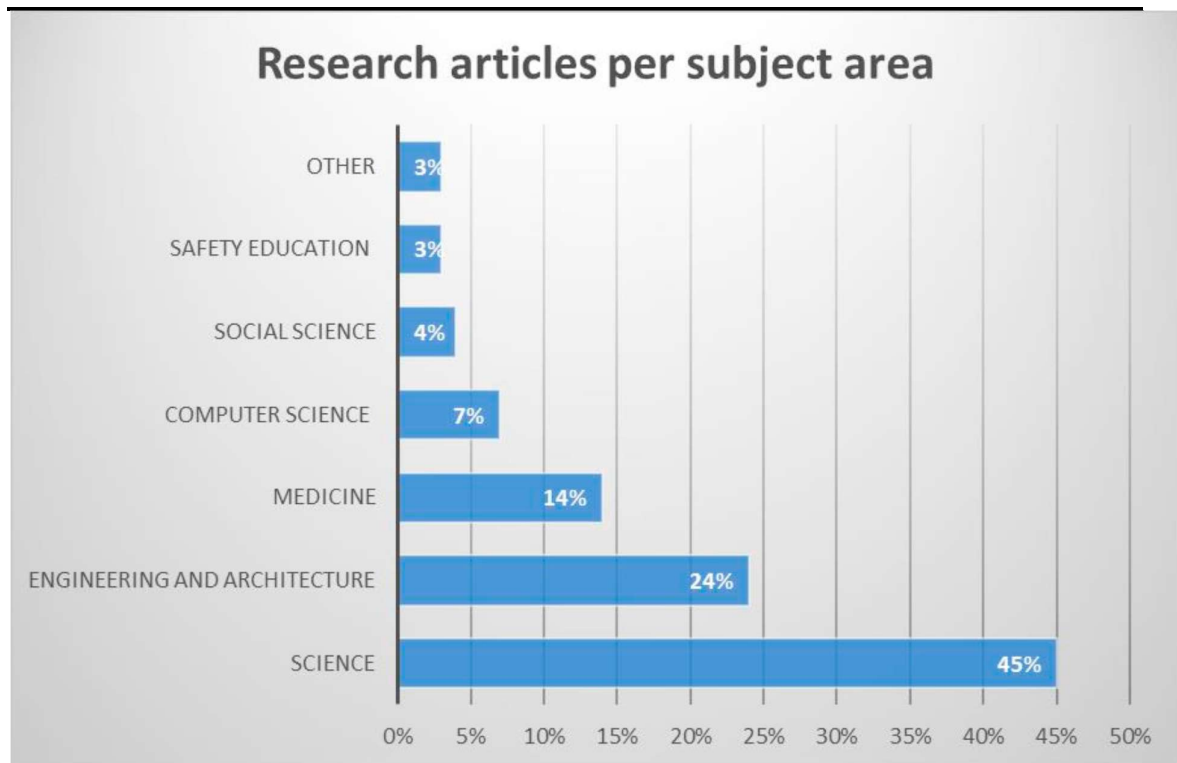

Fig. 1. Percentage of articles per subject area, modified according to [6].

In "Theoretical bases for using virtual reality in education" writers outline that VR is closely related to the theory constructivism, which claims that knowledge is constructed through a person's experience and interaction with the environment. VR provides an exploratory learning environment in which a learner interacts with virtual objects in real time and thus s/he acquires new knowledge or skill through experimentation.

Therefore, it can be admitted that VR is becoming a powerful tool in providing training in commercial and enterprise environments. In the studies of "The impact and potential of virtual reality training in high-consequence industries." authors offer the following benefits:

- it helps increase safety in on-the-job training
- it is relatively low-cost;
- it contributes to the increased productivity;

- it saves time and money with remote learning;
- it meets different learning styles;
- it makes training enjoyable and engaging;

Regarding to the studies of Antigoni Parmaxi from Cyprus University of Technologies, it was found that there were positive practices of the beneficial implementation of VR.

In general, the VR corpus demonstrates cases where the use of VR has brought significant increase not only in student learning, but also in the development of 21st century skills -for example, the study of Mroz (2015) found that the use of a *collaborative virtual learning environment* in which students had to communicate in the target language to solve a problem led to language gains and increased critical

thinking skills for the participants. The potential of *VR in providing access to places and situations hardly accessible* in a traditional classroom has also been explored. As an example, in studies of Park in "Words in Motion: Kinesthetic Language Learning in Virtual Reality", Virtual Reality is considered as a means to assess aviation English.

The impact of this research remained positively, as, interactive tasks in a virtual world facilitated the employment of a variety of strategy types, illustrating strengthening of relationships between test scores of participants and the quantity of cognitive/metacognitive strategies. However, VR was not capable of making significant positive changes in every field of study. In his research, Antigoni Parmaxi created a clear table that demonstrates the benefits as well as limitations of Virtual Reality, as they are reflected in the VR corpus.

Type of Virtual Reality	Benefits				Limitations
Second Life [15]*	Provide authentic assessment of target language (Park, 2018)	Promote cultural learning (Chen, 2018)	Offer oral practice in the target language (Chen, 2016a; Melchor-Couto, 2018; Lan, Kan, Sung & Chang, 2016)	Enhance vocabulary acquisition in the target language (Lan, Hsiao, & Shih, 2018)	Lack of multimodal resources (Tan, O'Halloran & Wignell, 2016)
	Enhance listening performance (Lan, Fang, Hsiao, & Chen, 2018)	Facilitate student participation through teacher's different discourse functions and roles (Wang, 2015)	Foster communicative competence (Lan, 2015; Hsiao, Kao, Tsai, Lin, & Lan, 2016)	Stimulate task-based interaction, enhance motivation and task engagement through meaningful and authentic communication tasks (Chen, 2016b)	Negative experience of VW anonymity by students with high self-efficacy beliefs (Melchor-Couto, 2018)
	Help students construct agentive experiences of storytelling (Liang, 2018)	Decrease Foreign Language Anxiety levels (Melchor-Couto, 2016)	Progress toward higher levels of critical thinking (Mroz, 2015)		Unstable technical difficulties (Chen, 2016a)

Virtual world developed in a platform for hosting virtual worlds (e.g. OpenSimulator) [5]	Develop sense of immersion and presence (Wang, Petrina & Feng, 2017)	Promote learner autonomy (Yeh & Lan, 2018)	Facilitate collaborative exchange (Zheng, Schmidt, Hu, Liu, & Hsu, 2017)	Acquire contextualized communicative competence (Yamazaki, 2018)	Time-consuming and complex tool in its alignment with pedagogical goals (Kozlova & Priven, 2015)
	Facilitate teacher training (Kozlova & Priven, 2015)				
Words in motion [1]	Promote vocabulary acquisition in the target language (Vázquez, Xia, Aikawa & Maes, 2018)				
Google Street View virtual environment [1]	Enhance cultural learning and raise positive attitudes towards the target culture (Shih, 2015)				
Combination of tools [4]	Facilitate collaborative exchange (Levak & Son 2016; Dooly & Sadler, 2016)	Promote cultural learning (Zhang, et al., 2016)	Enhance learning through immersion and immediate feedback (Guo & Chen, 2018)		

*Number of studies under each VR system.

Fig.2. Benefits and limitations of VR in studying field

Five concrete types of VR, such as, "Second Life", "Virtual world development in a platform for hosting virtual worlds, Words in motion", "Google Street View virtual environment" and "Combination of tools" were investigated in the abovementioned research. As demonstrated in the Table, Second Life provides a wide range of benefits in terms of authenticity in the assessment of target language, fostering interaction, motivation, task engagement, vocabulary acquisition and promotion of cultural learning and decrease Foreign Language Anxiety levels. Similarly, other Virtual Worlds (e.g. Virtual worlds developed in OpenSimulator) can cultivate communicative competence and learner autonomy, build a sense of immersion and presence and facilitate collaborative exchanges (Antigoni Parmaxi). Yet, limitations need to be noted for different types of VR and include unstable technical difficulties (Chen, 2016a) and lack of multimodal resources (Tan, O'Halloran & Wignell, 2016).

In order to increase the possibility of maximum benefit from VR, Japanese researchers from Kanda University of International Studies put forward the four possible aspects of VR application: immersive capacity, cognitive load, purpose, and communicative capability. Researchers believe that by applying the VR Application Analysis Framework to existing

applications it is possible to determine which aspects of an application need to be scaffolded for the language classroom. By analyzing an application through the four lenses, immersive capacity, cognitive load, purpose, and communicative capability, it is possible to create materials and activities to make VR accessible to any classroom. With this framework, teachers can have the confidence to apply VR to their classroom rather than continue to wait for relevant educational content to be created. As more teachers look to VR to redefine their language learning classroom activities, this framework will contribute to the body of research that aids in positioning VR as a commonplace tool for language learning.

3.   Disadvantages of VR

Notwithstanding the opportunities in studying process VR provides with, there are some obvious and hidden deficiencies that may become an obstacle in the implementation of VR in TFL process. To analyze the negative sides of VR, we addressed to the studies of Antigoni Parmaxi again. In the fig.2, he provides with the list of limitations in VR usage that can be defined as disadvantage of virtual environment. As an example, in studies of of Tan, O'Halloran and Wignell (2016), raises the issue of the relative effectiveness of 3-D virtual worlds for language teaching and learning, putting forward the need to address the complexity of multimodal learning environments and the various challenges for CALL.

Another obvious sign that can be defined as a disadvantage is unstable technical

difficulties highlighted by Chen. In other words, implementation of VR requires high IT acknowledgement from TFL teachers. Being aware of traditional lesson delivery methods are insufficient for VR lesson conduction. At least, lesson conductor must have basics of IT for beneficial usage of VR technologies in a class. Moreover, VR implementation needs special knowledge in a usage process. As a suggestion, Antigoni Parmaxi provides with the idea of Cross-discipline research. Cross-discipline research, such as the cooperation among the researchers in e-learning, second language acquisition, and neuroscience research can be an appropriate solution for cross cultural knowledge exchange, as this approach would be able to uncover the effects of virtual interaction on humans' learning and would not demand for a heavy expenses. Apart from this, another considerable disadvantage of VR is its inaccessibility, as sufficient number of developing countries in terms of Central Asia are incapable of affording the opportunity of VR supply. There is a high risk of the situation, where high-tech system of a heavy price can be remained in a request status with no further provision and delivery. Additionally, Studies of A. Parmaxi outline the disadvantages of VR followingly: fully immersive VR systems are still limited in spite of the availability of relatively cheap google cardboards. In addition, VR technologies are mainly used in university settings with focus on teaching English as a foreign language. Research also indicates that VR employs especially lower-level cognitive skills, while higher-level cognitive skills are being slightly neglected. Another considerable disadvantage of VR is lack of purpose-built educational applications. Researchers from Japan, in "Making virtual reality accessible for language learning: applying the VR application analysis framework" article mention that VR is a powerful tool that can be used to enhance language learning experiences. However, there still remains a distinct need

for more education-focused VR applications. Despite the lack of purpose-built applications, there is a wealth of commercial off-the-shelf experiences that can be taken advantage of until more specific educational content becomes available. Identifying and adapting these applications to fit the pedagogical needs of educators can be tedious and difficult.

Conclusion

Although there are several insufficiencies that must be considered in further studies, in general, VR can be considered as a perfect learning tool, and the capabilities of its facilities for teaching and learning have extremely significant potential for application. This article attempted to give a solid definition of VR and study its compatibility with TFL process, as well as considering disadvantages of its application. In a process, it was found out that existing problems such as insufficiency of teachers' acknowledgement or the lack of purpose-built applications can have simple solutions that demand little effort. Moreover, as VR is recognized to be a progressive tool, the question of its implementation in TFL process remains open for a further enhancement.

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