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TEACHERS' COLLABORATION IN VIRTUAL REALITY ENVIRONMENTS

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Abstract

Teachers have to renew their teaching methods for aligning them to the needs of students of the new generations. They have to find new ways of information presentation making it more interesting, motivating and understandable. Technology provides wonderful and smart tools for this work. Virtual reality (VR) environments and applications bring big changes in many fields such as information systemization and presentation, motivation, creativity. In this research we examined the change of the behaviour and working methods of teacher training students (on computer science teacher training) during their work in our VR laboratory. We used several situations and gave various tasks: developing curricula, collaborating with their colleagues, planning their students' collaborations. We examined whether (a) the VR environments can increase their creativity, (b) they involve the new possibilities provided by the new working space in their work and in their teaching methods, and if they do how they change their ideas about the teaching methods, (c) they use this space for collaboration and communication in they work outside the classroom, and if they do how they use it. In this paper we present the most interesting and important results of this research. We found that the VR increased their motivation on specific areas where they wanted to use VR in their work inside and outside the classrooms. We present how they started to use the VR spaces and what kind of services they apply, how their creativity was affected. We found that there are some areas that avoided their attentions.

Keywords: Immersive virtual reality, VR, MaxWhere, teachers' collaboration, teacher training, online education.

1 INTRODUCTION

In teacher education there are two main areas that we have to deal with:

(a) Students have to learn the curricula. For achieving an effective learning we have to offer new ways, new educational methods that fit better to the students' needs. They are the members of a new generation, they use computers since their childhood, and the Internet connection is in their everyday life.

(b) Students have to learn how to teach, so they have to learn how to be creative in teaching, and how they can use new technologies and platform in their future work. They will teach new generations that do not know the life without internet and without connectivity. They will need absolutely new methods in teaching. It means that our students have to be opened for new developments and new teaching methods. For achieving developing these skills, they should learn about and use as many new technologies, platforms and teaching methods as they can.

We can adapt the proverb "The more languages you know, the more you are human" to our case: The more technologies and teaching methods you know, the more you are teacher.

Another important area that we have deal with is the collaborative learning. Collaborative learning has wider and wider palette in education. Virtual reality environment can provide a convenient and rich framework for the teachers making the students active, cooperate and collaborate during their work. It can have some kind of connections with gamification that uses the technologies and methods of popular virtual reality games.

2 IMMERSIVE VIRTUAL REALITY IN TEACHER EDUCATION

First of all briefly we present the virtual reality (VR) technologies that we used in this research.



2.1 ViRCA – The First Application we Used

We started to use a collaborative online immersive virtual reality system, the Virtual Reality Collaborative Arena (ViRCA) some years ago (see, e.g. [6]). ViRCA offers tools for collaborative working in a virtual area, even if the project needs remote robot controlling. One of our most important aim was to provide possibilities for our students in teacher education to find new ways in their teaching methods. As a first step, we designed a smart virtual book shelf ([2]) and later a first version has been implemented in the ViRCA. In that year the developers of ViRCA presented a new project, the MaxWhere, a new virtual collaborative environment that is more flexible and portable.

2.2 MaxWhere – Immersive Virtual Reality

MaxWhere is the first immersive VR operating system that provides convenient three dimensional spaces (buildings, gardens, beaches, lakes, etc.) to users for creating their own working area. The system has some default spaces that people can use and where they can design and create their own comfortable working environments. The system provides an easy to use interface for applying the designed and equipped environments.

This collaborative and immersive virtual reality system provides possibilities to develop applications in it, and to develop people's own spaces, as well. After drawing a given space with views and objects, it can be imported into MaxWhere and can be used as an immersive virtual reality environment for collaboration (see Fig. 1).



Figure 1. MaxWhere – An immersive VR space with collaborative content in it.

It gives possibility to use the spaces in an easy way not only for those who are programmers or information technology experts.

The MaxWhere environments are improvable. Users can design and create more objects, they can choose different backgrounds and surroundings as well as the colors or the number and positions of the objects can be changed.

We can insert a point for informational sheet anywhere in a given 3D space, at in any position. Fig. 1 shows a space that we used for collaboration. There are browser windows with the contents we needed. The opened documents in the browser windows are editable and sharable, users can use them as they do it outside the MaxWhere. It means that people can work together on the shareable documents that ameliorates the user experience, the collaborative level of the environment.

MaxWhere offers the necessary functionalities for creating a presentation-like environment that contains predefined order for moving between the specified pinned points of the space that contain information. The menus can be seen on Fig. 2. Users can choose between the predefined order, and their own way to discover the contents. The predefined order can be omitted, people can move in the space where they want without any limitation. The space usage is not limited to the walls, people can use the floors, roofs as well as the sky or the water.

Users can immerse in these environments by using Oculus Rift headsets, as well.

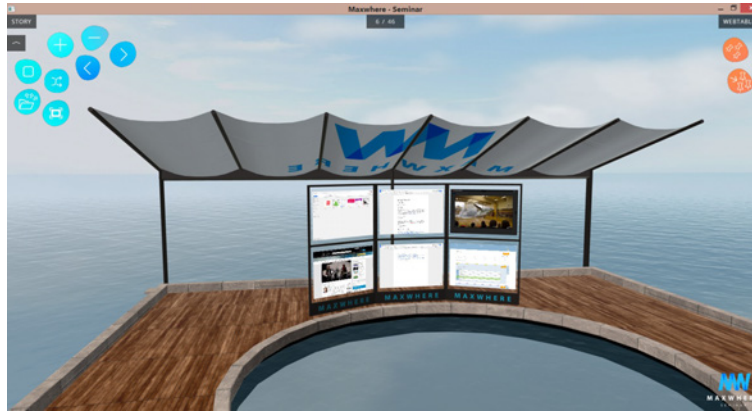


Figure 2. MaxWhere.

Menu on the left side: creating and deleting a new point, step to next or previous point, import and change contents, full screen mode, autoplay.
 Right menu: save the points, restore to the saved pinned points,

3 NEW INNOVATIONS IN EDUCATION

3.1 Disruptive Technologies and Innovations

The term “disruptive technologies” was introduced to business life by Christensen ([3]) who conceptualized the idea and the principles. New technologies have risks to introduce and apply in businesses. He offered methods how to handle the situation when firms have to apply disruptive technologies, how to reduce the risk of failure. After a while these technologies can become sustaining, but some of them disappear from the market. He offered that companies have to pay more attention and invent more effort into the usage of such technologies and inventions.

This term can be used in the instructional theory for those technologies which are new and can be used in teaching methods. Christensen describes the disruptive innovation as “an innovation that makes a complicated and expensive product simpler and cheaper and thereby attracts a new set of customers” [4]. The usage of these innovations in education needs more attention and more endeavour from the teachers but can make the teaching process more effective and can motivate the students.

The information technology (IT) brings always new challenges into education. We can mention here the Internet of Things (IoT) that brings wide range of various applications that can be used in the education, too. Sharing economy services emerged in the last some years. It has features that education can apply. Some parts of gamification technology, innovation and methodology can be regarded as sustainable but we can use always really new ones that can be classified as disruptive categories (see some in [5]). Cloud computing is also a typical disruptive innovation. Virtual reality is a typical representative of the disruptive technologies, and there are many innovations in this field which can be called disruptive ([9]).

3.2 Immersive Virtual Reality in the Education

We can see in the literature of VR that students can use many virtual reality applications in their studies. They can use it to learn in various fields, for example, of psychology ([1]), chemistry ([10]), language ([10]), marketing ([3]), mathematics ([11] , [8]), physics ([7]), and many other fields of sciences. In most cases the students can use ready-to-use applications for learning in the VR environment.

The MaxWhere system inspired us to use its spaces for introducing the teacher students into the virtual reality from a creative side last year. The system offers many benefits to the teachers for creative thinking, how to develop a collaborative learning and working area for their students. They can design quite freely their own environments, they can design the spaces, rooms that can fit their pedagogical and didactical goals, and after the design phase they can develop this area. These environments are shareable environments that have various possibilities for defining roles with special

access rights, and gives many options for personalization. The collaborative environment developed on the MaxWhere system can be ideal for working together during face-to-face classes as well as designing and performing collaboration, cooperation and knowledge transfer in distance education.

4 ABOUT THE RESEARCH

4.1 Scopes

During this research we examined our students at the teacher training on two areas: How they use these immersive virtual reality areas for their education, in their learning processes. If they build the technology and the methodology into their teaching methods.

We wanted to examine whether

- a) the VR environments can increase their creativity,
- b) they involve the new possibilities provided by the new working space in their work and in their teaching methods, and if they do how they change their ideas about the teaching methods,
- c) they use this space for collaboration and cooperation with their colleagues in they work outside the classroom, and if they do how they use it.

4.2 Methodology

Only computer science teacher students participated in this research at our faculty. The result is simply the lack of more computers that can drive the 3D VR environments. We have a VR Laboratory at the faculty with computers with enough strong parameters and the additional devices, but this laboratory is not enough for work of hundreds of students. (We plan to spread the research to more students at more universities.)

In this research, students got accessibility to the laboratory during a semester. They could use a virtual space that you can see on Fig. 1. They could use the predesigned objects and they could insert informational points wherever they wanted. They could design the content, the place and type of the information, they could collaborate, communicate with their colleagues during solving their tasks. Because the space is capable to contain any Web 2 application, students had wide range of possibilities to fill the area.

Every student had a task, a topic that they had to teach to their students. They chose a topic. The topics were not necessarily different from each other. Students had to prepare the given place for their students, for sharing it with them during their work in the classroom.

At the end of the semester we checked the prepared VR learning environments. We spoke about the possibilities the used or not used, they compared the environments and learn about those methodologies that they can use in their profession.

4.3 Results

We got positive and negative results, as well.

4.3.1 What we missed

We found that there were some areas that avoided their attention:

The Web 2.0 style services that they could use for demonstrating and practicing the learning materials were not presented in their learning environments.

There was not enough tasks that used the creativity of their students were presented only in some cases. It seems they prefer more the traditional teaching instead of the new styles where the creativity has more important role. We have to have a stronger focus on this point in the future.

They did not instruct the students for using mobile applications.

They cooperated but not collaborated at a desirable level. For example, there was no video chat point inserted into the spaces.

4.3.2 Positive results

We found that the VR increased the students' motivation to work in. They had creative ideas concerning the places of pieces of information. They grouped many related content, various learning materials and many videos and interesting web sites, web pages and pictures on the Internet for making the content more understandable.

Students were motivated to work. They spend lot of time by collecting the materials, by designing and placing them into the space. They were motivated to use these spaces in the face-to-face teaching. They used VR in their work inside and outside the classrooms.

The content they collected was manly "Web 1.0 style". It was accurately collected and they were from wide range of areas.

From the Web 2.0 services they applied shared documents, where their students could work on the same documents. They used some web sites that has social media functions and that provides content sharing possibilities. From this group of services they used slide sharing, video sharing and curricula sharing web sites mainly. One student prepared an online quiz with 5 questions for their students to check their knowledge on a specific topic (see Fig. 3).

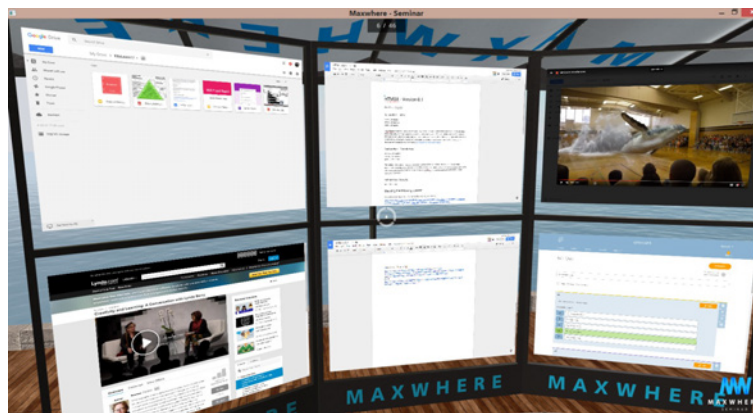


Figure 3. Learning environment with a quiz in MaxWhere.

The spoke about the positive effect that the VR learning environment made on their students. They saw that the new technologies of games can be used for teaching, and that the gamification is a possible tool for making the students more motivated. And this experience inspired our students for working more on their learning environments.

5 CONCLUSIONS

At the end of the semester we analyzed the VR learning environments that they prepared. The missing services and possible applications were highlighted. Students understand more the deep meaning and relevance of these environments in teaching methods.

They understood that leaning and using new – maybe disruptive – technologies in teaching can have deep impact on their work and its efficiency.

This semester provided important experiences and data for teacher education. We see more precisely those fields that need more attention and focus during the next years. From these results we can see that we have to examine the generations for understanding how they work, what they use, where are the lack that we have to focus on. By virtue of these results we will reform the next years' curricula of some courses.

Of course we do not think that the technology can solve everything in teaching. But if we "speak" some common IT language with our students, it can have positive effect on the efficacy of teaching work.

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