

# 3D Multiuser Virtual Environment in Mother Tongue Education

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**Abstract** As in a virtual space there are no geographical borders or time limitations, we consider this environment naturally useful also for teaching at universities or in the lifelong learning courses. We use 3D multiuser virtual environment in mother tongue education of university students. We have provided research aimed to find out the appropriateness of its use in mother tongue teaching as well as to explore the student's opinions on this environment. The 3D virtual classroom in the 3D virtual building of Faculty of Education at Palacky University and several 3D virtual teaching objects in MUVE Second Life were created which were presented to the university students of Czech language and literature field. This contribution presents the particular results regarding the experience of students with 3D virtual teaching and learning, which, in contrast with traditional teaching, has its specifics. It outlines the process of comparison of these two types of teaching, but most importantly, it describes experience and opinions of students who experienced this kind of teaching.

**Key words:** e-learning, 3D multiuser virtual environment, mother tongue education

## 1. INTRODUCTION

3D multiuser virtual environment (MUVE) is a virtual world where people can communicate with each other in a way that resembles communication in the real world. The users, depicted by avatars, can move about freely and communicate with each other vocally, as well as by means of text messages or video conferencing. It allows communications between more people in real time which means the principle of social network transferred into virtual reality. The advantage of this model is its orientation on the student, the revolutionary broadening of possibilities in the use of computer technologies within the teaching environment. 3D virtual model enables 3D visualised teaching where the authors try to simulate the environment graphically in such a way that would resemble a common school building with classrooms, a library, a place where students can meet etc. The added value for both the teacher and student is the possibility of equipping the classrooms exactly for teaching specialised subjects (where, in reality, it is often not possible for economic or other reasons) or for training skills which would not be possible to do in normal classes because of safety reasons or cost (for example, learning to fly a plane or carrying out brain surgery).

A great advantage of using MUVE, at least as a supplement for present e-learning forums, is providing the feeling of social interaction, feeling of belonging and immersion, thus enhancing the motivation of the student. The feeling of having spent time together in a commonly shared space is also enhanced by using non-verbal communication including proximity. Avatars can approach each other, form discussion groups, use gestures, haptics, and are also able to use facial expressions in a limited way.

Many universities have discovered the possibilities of MUVE and have built the virtual campuses in MUVE. We can currently find more than 60 American higher education institutions, such as Harvard University, University of Plymouth, Ohio University, British Universities such as Oxford University, Coventry University and so on. In the Czech Republic, MUVE was initially used also by universities (Mendel University of Agriculture and Forestry, Brno and the Philosophical Faculty and Faculty of Education of the Palacky University, Olomouc). This environment provides a great advantage to both Czech and foreign universities in terms of the possibility of mutual interconnection, as well as interconnection with other scientific workplaces. The result of this is the sharing of information, research results, and the possibility of mutual help at solving problems.

MUVE is currently used especially for language education because it enables the participants to meet with people who speak in different mother tongues and also because many more computer devices can be utilized than in a traditional class setting. MUVE can be used not only in relation to language learning but to illustrate a certain phenomenon, or to examine the relationships between them.

### 1.1 The pros and cons of using MUVE

As discussing the suitability of MUVE in education it is necessary to introduce the pros and cons of its use. The most frequently mentioned benefits in the current literature are the following:

- 1) **Gamification** (school game) which allows playfully perform tasks that may be seem boring in „traditional“ teaching and should be consider as based on the pedagogical principle of **project teaching**.
- 2) **Immersion** which allows to empathize better with the situation and can be consider as based on the pedagogical principles of **situational learning** or **experiential learning**.

3) **Creativity** which means working with 3D objects and create them in a virtual environment. It allows students to access **learning creatively** (e.g. in teaching architecture and geometry etc.).

4) **Time and space-saving** which means a very flexible, fast editable environment. The learning objects can be created very cheap comparing to the similar objects in real-life situations. Teaching takes place regardless of the particular time and space as well.

5) **Social networking** which means that MUVE is the same type of social networks with communication options similar to the traditional social networks (e.g. Facebook). Communication takes place in 3D simulation of the real world, which strengthens the aspect of social contact.

6) **Crowdsourcing** means that MUVE gives the opportunity to obtain answers to learning questions not only from users with superior authority (mostly the teachers), but in a community of other users (e.g. classmates). In the community of users with similar interests can draw additional suggestions or users can find already created materials and objects.

The most common disadvantages of use MUVE in education are the following:

- 1) Health risks (eyesight, musculoskeletal system etc.)
- 2) Increasing of ICT addiction of users
- 3) Reducing of social contact in the real world
- 4) Dependency on the condition of technical equipment
- 5) Dependency on the digital competences of students or teachers which can have an impact on the overall performance or the teaching results.
- 6) The digital gap between teachers and students ICT competences levels

## 2. OUR RESEARCH OF MUVE

Faculty of Education at Palacky University in Olomouc has used MUVE since 2005 as a part of teaching subjects *New Media and Cyberculture* and *Internet and Multimedia in the Czech Language Education* and every year has used this environment for more than 90 students. We use the virtual worlds Second Life and Kitely (SL). As we have started to work in SL, the research regarding the impact of MUVE on study objectives was necessary. Main aim of our research was find out to what extend MUVE can improve and make mother tongue teaching in e-learning environment more efficient.

### 2.1 Objective and methods

As one part of our research partial aims, a comparative study on teaching effectiveness of MUVE started since 2014. This research compared the effectiveness of teaching in an experimental group in the Second Life with teaching in a control group in a traditional lesson focused on textual form. The traditional lesson was defined as a traditional frontal teaching of teacher using of the printed study materials for students. The goal was to compare the traditional and 3D virtual teaching and find out whether visualisation, which is possible owing to the 3D virtual reality, has an influence on the amount of remembered information.

Second part of the research was a qualitative investigation, surveying the opinions of the students of the experimental groups on the used type of teaching environment. After the end of the whole research these opinions will be processed on the base of the anchored theory. The result should be a finding how this untraditional method affects the students and which trends can be traced in their attitudes. Therefore, our goal is not only to find out if and how effective the 3D virtual teaching is, but also to determine whether the future teachers are willing to work with this educational tool in their own teaching.

We used the mixed research design because the results obtained by the grounded theory method might help identify the factors which can then be verified within the framework of quantitative research. Data obtained by analysis of the respondents' answers might also help us interpret some potential ambiguity or problematic issues coming out of the preceding quantitative inquiry.

The research group of preliminary study consisted of 26 respondents (aged 20-22). The group was divided into two sub-groups, each with 13 respondents, according to their ICT competencies (they evaluated their ICT skills by themselves by pre-prepared criteria). The experimental group took part in teaching and learning in MUVE and the control group took part in traditional teaching and learning in the classroom. Both groups were given an entrance didactic test before the teaching and learning started, and when it finished, they did the final didactic test. The first and the second versions of the didactic tests were the same both for respondents learning in MUVE and for respondents undergoing traditional teaching unit. After the teaching, the experimental group was given questions in a written form, mapping their opinion on teaching and learning in MUVE.

Research aim 1: Finding the effectiveness of mother tongue teaching in MUVE:

Regarding the conducted pre-research and planning of the following research, we are primarily interested in using SL for mother tongue teaching. Therefore, the group of university students – future teachers of mother tongue – has been chosen. The research was conducted in the form of pedagogical experiment. Methods of large-scale data acquisition were used in all stages by means of created didactic tests – the entrance and final ones. For each component of the mother tongue (grammar, style and literature), two forms were made – the entrance and the final one. During the process, the contents of the entrance and final test were identical for each component of the mother tongue. The didactic test was statistically assessed according to the specified criteria given in advance (we made a point or percentage scale, according to which the success rate in the test was assessed). As it was the first distribution of the test to respondents, validity and reliability of individual tests were verified. Validity was determined by appraisal of a corresponding expert. Reliability was verified by the Kuder-Richardson reliability coefficient and also by the split-half method using the Spearman-Brown formula. The Student's T-test was used to compare the effectiveness of both teaching methods. By using the Student's t-test, we can compare two collections of data which we gained by measuring in the two groups, in our case the two groups of students, and decide if they have an identical arithmetic mean. Thus, by using the T-test we can verify if the differences in the results of teaching are statistically significant and whether we can, or cannot, attribute it to coincidence.

Research aim 2: Finding out the students' opinions on mother tongue teaching in MUVE:

As MUVE is a relatively new matter, we consider it important to find out the respondents' opinion on this type of 3D virtual environment. Using the method of semi-structured interviewing with open-ended questions (Maňák and Švec, 2004), the respondents' opinion on teaching and learning in MUVE was identified. Assessment of the obtained data will be carried out by the method of grounded theory (Strauss and Corbin, 1999) in the nearly time period. We have set the criteria in advance (Marešová, 2012) which we will purposefully examine. It was: motivation, the sense of achievement, the sense of identity, the sense of immersion, the sense of social interaction, the sense of reality, control of avatar, a new incentive. The question items leading to gaining material for the anchored theory assessment was

only given to students from the experimental group and it was conducted in written form.

## 2.2 Findings

There were prepared 3D virtual educational situations for teaching of mother tongue in MUVE – for grammar, literature and the style for the teaching of experimental group. The control group worked with the textbook and worksheets.

Our pre-research stage provides results first of all for the purpose to the correct set up of questions in the didactic test and the verification of its validity and reliability for assessment of the question items in semi-structured interviews, and for verifying the appropriateness of the designed teaching objects for MUVE. But we can already deal with some particular observations which can initiate the trends for the next research.

Research aim 1: Finding the effectiveness of mother tongue teaching in MUVE

To compare the both of types of teaching, the research question No.1 was defined: *Are the results of respondents in experimental group taught by MUVE better than in the control group of students taught by traditional teaching methods?* Substantive hypothesis was defined as: *Teaching in MUVE will lead to the better study results comparing to traditional teaching.* Statistical hypothesis  $H_0$  was defined as: *There is not a statistically significant difference between experimental group taught by MUVE and control group taught by traditional teaching methods.*

We summed the results of didactic tests of respondents in each group before teaching and after and counted up the difference between the two results. The Table 1 shows the results of didactic tests of respondents (the literature topic).

Table 1. Results of didactic tests (DT) for the literature topic.

Number of respondent	Score of experimental group (difference between DT 1 and DT 2)	Score of control group (difference between DT 1 and DT 2)
Respondent 1	4	37
Respondent 2	9	27
Respondent 3	2	26
Respondent 4	21	52
Respondent 5	16	28
Respondent 6	7	41
Respondent 7	20	25
Respondent 8	-4	30
Respondent 9	7	23
Respondent 10	4	31
Respondent 11	23	46
Respondent 12	15	30
Respondent 13	-3	41
Total score	128	437
Aver. percent. improvement	9,84 %	33,6 %
Mean	9,3	33,6
Deviation	7,45	7,52
T-test result	3,848/(3,055, p = 0,005)	

According to Student T-test, we found a statistically significant difference ( $p = 0,005$ ) between the experimental and the control

group, therefore we can confirm the alternative hypothesis  $H_A$ : *There is a statistically significant difference between experimental group taught by MUVE and control group taught by traditional teaching methods.*

Research aim 2: Finding out the students' opinions on mother tongue teaching in MUVE

Qualitative research assessed the opinion of students on working in SL. Here are some examples of survey questions: *Question No. 1 Did you feel motivated for learning in the Second Life environment? Question No. 2 How would you describe yourself by the experience of learning in Second Life? No. 3 How do you describe your feeling of identity in Second Life (did you feel as yourself, were you able to identify with your avatar etc.)?* There were prepared 3 levels of scale for evaluation the respondents opinions – 1 = positive opinion (feeling of motivation, excitement, novelty, increased attention, taste for working on tasks), 2 = negative opinion (demotivation, confusion, disillusionment, annoyance, surfeit of information), 0 = respondent was not sure with the answer or did not answer the question.

The results of our qualitative research can partially support the positive opinion of university students on MUVE. Regarding the *motivation* results, 60,2 % respondents showed a positive opinion, 30,1 % showed a negative opinion, 9,7 % did not answer. Regarding the *immersion* results, 48,6 % showed a positive opinion, 43,3 % showed a negative opinion and 7,8 % did not answer. The most common type of answers was focused on the novelty of such environment which also had (according some respondents) a positive influence on their concentration or on the will to work on tasks. In the part of negative responses, it was mainly the disturbing influence of motion avatar control or control of moving in the environment.

## 2.3 Discussion

According to the opinion of some authors, 3D visualization has been shown to enhance student learning (Ives and Junglas, 2008). With the respect of current constructivist approach to pedagogy, which focuses on the active construction of knowledge by the learner, we can implement the methods of collaboration, co-creation and experiential education by using of MUVE within the educational process to help student provide the productive learning. Some authors reminds also the advantage of socialization and synchronous communication in case of MUVE (Minocha and Roberts, 2008).

According to our results, we have received “sheepish” feedback from our respondents in some aspects so far. Moreover, regarding the first results of didactic tests, there were occurred better study results in the control group of students which was statistically significant ( $p = 0,005$ ) comparing to the experimental group. This result was quite opposite to our presumption given by the substantial hypothesis *Teaching in MUVE will lead to the better study results comparing to traditional teaching.* These results can be caused mainly by the fact that in the case of control group the traditional way of teaching was used in which students was familiar with, so they could better focus on the actual content of teaching while the “novelty” of MUVE in the experimental group could be understood as a disturbing factor for respondent's concentration. We consider also the level of ICT competences of respondents in the experimental group as an important influencing factor on the didactic test results while in the control group was this factor irrelevant.

Mixed results observation in case of MUVE described also Siau (Siau et al, 2010) who, based on the respondents results, did not recommend SL especially for short meetings or for the tasks that feed into real world project. The similar conclusions found out Heaney and Arroll (Heaney and Arroll, 2011) who examined the qualitative survey

attitudes of teachers and students in SL. Both groups of respondents highlighted the potential of SL for activities such as exercises, role playing, solutions-based learning scenarios and student presentations, but they were less sure of its effectiveness and suitability for frontal teaching or other forms of group instruction.

We have obtained positive responses of our respondents especially in case of literature topic. Therefore we can suggest that SL can be useful in educational situations with the need for a better illustration of circumstances or helping the better empathize the atmosphere of literary work. Similar observation was made also by the other authors who used SL in teaching literature – Spoto et al. (Spoto et al., 2011) describes some student's expression after the teaching of Hemingway's literary work in SL. Our results may be (except for small numerical sample of respondents), distorted by an insufficient knowledge the MUVE by the respondents, and thus the overall feeling of uncertainty in the environment. However, this is a partial study, which was to indicate a trend in the attitudes of students to this new teaching method. The systematic long-term study, which can assess the effect of long-term and systematic study of the MUVE should be the goal of our following research that would indicate any changes in the attitudes of students over a longer systematic work in this environment.

### 3. CONCLUSIONS

The MUVE allows the participants a real time communication thanks to avatars who are 3D virtual representatives of real persons in the 3D virtual reality. Its educational potential, however, had been recognized soon enough and many universities now build their virtual buildings or whole campuses there. The aim of our comparison of traditional and virtual teaching was to find out whether 3D visualization, which is possible owing to the 3D virtual reality, has an influence on the amount of remembered information and also to evaluate the opinion of current university students on working in this environment in the field of language education. The aim was not only to find out whether and how effective the virtual teaching was, but also to determine whether the student are motivated to work with this educational tool in their own teaching. Our research results can

confirm some possibilities of use of MUVE in education only partially so far and numerous research topics could be still examined to better understand whether MUVE can be used as a useful platform for education.

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