How Pupils Learn in Virtual and Traditional Classroom in Primary Education

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Abastract

Virtual classroom or *online* learning is a digital world of visual, auditory and textual information through which students acquire specific knowledge or develop different skills. Preliminary research with qualitative analysis was conducted in order to test the hypothesis: **Are there differences in the quality of acquiring knowledge for pupils in primary education during the process of teaching and learning educational content in the virtual and traditional classroom**? The study was conducted in the year 2009 with 19 third-graders of the elementary school "Rapska" in Zagreb. The research analyzed the curriculum content of two subjects, "Mathematics" and "Nature and Society", in two different class types – *data analysis and data repetition (exams)*. The study examined pupils' reaction in their first encounter with the *online* learning in which they have no direct contact with their teacher. The advantage of the virtual classroom compared to traditional teaching assumes that pupils can learn with their own dynamic (without having to adjust to the rest of the class), that they can learn teaching materials by focusing on the task exercises, data repetition and content analysis. Although the virtual environment motivates pupils to involve themselves more in their work – *problem solving, decision making, persistence, development of critical thinking*, it can not replace the teacher and his/her main role – guiding pupils in their learning process through intra-personal and inter-personal communication. Educational process requires a harmonious relationship between the virtual environment and classical communication. This preliminary research has shown us that pupils can equally well acquire and adopt curriculum content in the virtual and in traditional classroom. Since the certain number of pupils within the research have worked with the computer for the first time, and also within the virtual environment, we can only conclude that technical incompetence have affected the outcome of the research in favor of traditional classroom in these specific cases. The main assumption for further research is based on the fact that pupils have a prior computer experience in *online* learning which would go in favor of learning in virtual environment. The article provides preliminary results and as such opens the way for further research in this area.

Key Words

Virtual classroom, traditional classroom, e-learning, child, computer, communication.

Introduction

In the last 20 years a digital world has created a new perception of business, scientific, social and educational world. Focus from traditional teaching is being slowly directed towards a virtual or *online* education which *a prior* requires the use of computers and the Internet. The question that now requires all of our attention is: **are we forgetting the Truth that in this whole virtual/traditional educational process the main role has a child/pupil/student**?

Virtual classroom is a form of e-learning where teaching and learning of the educational content takes place entirely *online* and where there is no physical encounter between the teacher and pupils (*distance* education). Virtual education encompasses teaching of digital content by using information and communication technologies including the Internet and other digital sources and materials. Virtual schools were first launched in the mid 90-es and currently most of them gather the selected group of students who are academically motivated, independent learners (Barbour, Michael K. Reeves, Thomas C., 2009). If e-learning involves a combination of activities and content teaching both in traditional classroom (face-to-face components) and in *online* environment then it is called a blended/hybrid learning and mixed mode course.

In theory, virtual schools offer many advantages over traditional classes – high-quality materials (audio, video, images etc.) for teaching and learning, improving pupil's computer skills and performing administrative tasks in more efficient way. This kind of teaching requires information-literate communication specter of students who is motivated for independent learning. Unfortunately, this doesn't represent the picture of today's educational system. Research conducted with 33 students in a Social Statistics course at California State University, Northridge, in 1996 has shown that students in virtual environment scored 20% higher then the traditional class on both examinations. According to research, post-test results indicate that students who achieved higher results in virtual class had more peer contact ("traditional" interaction and thoughts sharing) during the class and more flexibility, understanding of the material. This "group" communication proved to be crucial point in learning within the virtual environment (Jerald G. Schutte, 1997). Many studies from around the world have shown that computers enable social interaction and cooperation; it helps children to make friends and achieve constructive work within the group (Wartel & Jennings, 2000).

Schrum & Hong (2001) completed a survey with 70 institutions and found eight dimensions that affect student success in learning process in an *online* environment – *access to tools, technology experience, learning preferences, study habits, goals, purposes, lifestyles, and personal traits*. This only proves how child/pupil/student is a complete personality and how teaching within virtual environment requires fulfillment of all these aspects and it can not be analyzed only through one aspect – technology. Human being is a social being and transferring knowledge from traditional environment with inter-personal and intra-personal communication to virtual environment, if it is not done properly in all aspects, can harm a child in his/her most important dimension – spirit. Although the digital world seeks the way to replace traditional class in some cases to make learning more creative, innovative, visually inspiring and motivating, the role of the teacher can never be replaced and his main task stays the same in all environments – to observe, notice, recognize and guide students in their work through communication (felling, thoughts,...). The key of using computer technology in education is a well-balanced curriculum adjusted to the children development in all aspects. It is necessary to take into account several factors: social interaction (teacher-student, student-student and student-computer), computer-based learning and the computer-based curriculum (AAAS 1999). Only then will pupils develop social and computer skills. Faux and Black-Hughes (2000) compared traditional, *online*, and hybrid sections of an undergraduate course in social work to determine the effectiveness of *online* learning. They found that 41.7% of the students (33 students) did not feel comfortable learning from the Internet in their *online* course because students wanted more instructor feedback and auditory stimulation (*they wanted to listen to, rather than read about historical material*).

Through his life work, Seymour Papert has presented a "*grander vision of an educational system in which technology is used not in the form of machines for processing children but as something the child himself will earn to manipulate, to extend, to apply to projects, thereby gaining a greater and more articulate mastery of the world, a sense of the power of applied knowledge and a self-confidently realistic image of himself as an intellectual agent* (Seymour Papert & Professor Emeritus, 1970)." Together with the Dewey, Montessori and Piaget, Papert believes that "*children learn by doing and thinking about what they do. And so the fundamental ingredients of educational innovation must be better things to do and better ways to think about oneself doing these things.*" Papert proposes "*creating an environment in which the child will become highly involved in experiences of a kind to provide rich soil for the growth of intuitions and concepts for dealing with thinking, learning, playing* (Seymour Papert & Professor Emeritus, 1970)." Papert is giving us a firm foundation for education based on intuitive learning and acquiring knowledge in which every child can prosper with his own specific personality, needs, learning dynamics and interests. His teaching approach can be applied in all digital and virtual environments in education. Virtual environment is an abstract set of terms – set of visual, auditory, textual informations. The main question is how to correctly apply this media in education, where children will not learn by acquiring information which is so easily served to them in an extreme amount but how will they transform this information through their own being by experiencing it all. What ever we give to children we should let them enrich it and fill it with their own spirit and intuition, let them create and express themselves. "*The child's awareness plays the key role in this whole process, and therefore the primary role of the novelties in education is to enable the students to upgrade their approach to work and simultaneously to form the proper self-image* (Papert, 1980)."

In Croatia, since the year 2000, The Ministry of Science, Education and Sports once a year collects IT projects through which many *online* courses and textbooks have been developed. Many universities in Croatia are doing *online* courses and use virtual environment as part of their teaching curriculum. Some virtual materials used in these educational processes are stored on the website of the Ministry under the name "Virtual University[1]".

[1] http://www.mzos.hr/virtus/kolegiji.asp

This preliminary research included 19 pupils of third grade in two subjects: "Mathematics" and "Nature and Society". Some pupils did not have previous encounter with the computer or virtual environment. The pupils had no prior motivation or introduction and they have been working solely with the computer. The study was conducted using WebCT (*Web Course Tools*) software tool that is used in *distance* education (teacher and student spatially distant, physically not present in the same room) or as a supplement to traditional learning. WebCT was developed by university employees (Murray W. Goldberg, etc.) of the Computer Department of University of British Columbia in the year 1995 for their personal needs and the needs of the University. The tool has proven to be very intuitive for work and it provides enrichment for the traditional class with multimedia elements – audio, video, photos, Internet links, etc.; *online* assessment and examination of students with assignments and tests (dynamic approach – in different times); self-assessment of students' knowledge, the creation of the index and dictionary of major terms that appear in the lessons; integration of existing web resources in teaching content, students and teachers' communication in the form of *forum* or *chat*.

Research method

Preliminary research with qualitative analysis was conducted in order to test the hypothesis: **Are there differences in the quality of acquiring knowledge for pupils in primary education during the process of teaching and learning educational content in the virtual and traditional classroom**?

There were 19 examinees of the third grade at Elementary School "Rapska", Zagreb, Croatia, participated in this research. The examinees were with uneven relevant factors (socio-economical family status) and they were of the same age and homogeneous according to the educational level. Data about the sex of the examinees were not taken because the authors were interested in attitudes not regarding to the sex. As the research was taken in the same primary school it was supposed that the conditions of work within the school are the same.

The research was conducted in parallel way, where two teachers simultaneously, at separate places, dealt with the same teaching material, with one part of class working in a virtual environment and other part in traditional classroom:

1. The first half of the class did the curriculum in the virtual environment within the subject "Mathematics" with the teaching content: "Three-digit number division with one-digit number" (data repetition and exercises) and the curriculum in the traditional class within the subject "Nature and Society" with the teaching content: "The Adriatic Sea".
2. The second half of the class did the curriculum in traditional class within the subject "Mathematics" with the same teaching content and the curriculum in the virtual environment within the subject "Nature and Society" with the same teaching content.

Procedure

In virtual class pupils learned exclusively *online*, they did not have any direct communication with the teacher.

Teaching material for the subject "Mathematics" was processed in the following way:

Pupils were welcomed with an open WebCT interface with a message to start the class and to rewrite the title of the class unit into their notebooks: "Repetition of three-digit number division by one-digit number (S, J and D are not divisible by the divisor)". Within the program students *moved* from left to right through following dialog boxes:

1. **Quiz – repetition**, in the form of Power Point presentation of 21 slides. Pupils first write the assignment into their notebooks, solve the problem and choose one of the given solutions. Quiz has visually motivating icons which inspires pupils and accomplish program interactivity.
2. **Exercises (examination)** – series of 6 tasks. After solving the tasks pupils can see what tasks he/she did wrong/correct.
3. **Repetition – three-digit number division with single digit number** – 6 task quiz with feedback information on the success of solving problems (Picture 1).
4. **LINK – dividing numbers up to 1000** – This link opens another *web* page with mathematical quiz for the pupils who have a desire to work more and upgrade their knowledge.

Picture 1. Power Point slides (quiz) of the teaching content: "*Repeating three-digit number division with one-digit number*"

After 45 minutes, pupils filled and evaluation paper for analyzing the effectiveness of the class.

Teaching material for the subject "Nature and Society" was processed in the following way:

Pupils were welcomed with an open WebCT interface with a message to start the class and to visit two dialog boxes:

1. **Adriatic coast –** Power Point presentation of 41 slides in a form of an interactive story as a conversation between the characters (led by and animation character Spider). After the story, pupils solved 6 questions quiz.
2. **Quiz for repetition** – quiz of 10 questions.

After 45 minutes, pupils filled and evaluation paper for analyzing the effectiveness of the class.

Picture 2. Few examples of the Power Point slides of the teaching content: "*The Adriatic coast*"

Research variables

In this research demographic variables were not collected except of the grade of examinees (that covers the chronological age).

Independent variables are: midterm grades from subjects "Mathematics" and "Nature and Society".

Dependent variables are: grades after the virtual and traditional class from subjects "Mathematics" and "Nature and Society". Precise list of grades (midterm, virtual class, traditional class) for each pupil is given in Table 1.

Midterm grades (MAT-Mathematics, NAS-Nature and Society)			**Grades after the V/T class** (V-virtual, T-traditional)			
			NAS		MAT	
Number	**NAS**	**MAT**	**V**	**T**	**V**	**T**
1.	3	3	3			1
2.	5	5	5			5
3.	5	5	5			3
4.	4	4	5			3
5.	4	5	4			5
6.	3	3	5			4
7.	4	5	5			5
8.	3	4	4			4
9.	3	3	3			1
10.	4	5	3			5
11.	2	3		1	4	
12.	4	4		5	1	
13.	3	4		5	2	
14.	4	5		5	5	
15.	4	4		4	2	
16.	4	4		2	1	
17.	4	4		5	1	
18.	4	5		5	5	
19.	3	4		3	2	

Table 1. Midterm grades and pupil's grades in the virtual/traditional class

Data processing

Data processing was conducted with Spearman's Rank Correlation Coefficient in order to see the strength between two sets of data in four combinations: virtual class (NAS) – midterm grades (NAS), traditional class (NAS) – midterm grades (NAS), virtual class (MAT) – midterm grades (MAT), traditional class (MAT) – midterm grades (MAT). Spearman's Rank Correlation Coefficient for each combination is given in Table 2.

Correlation	**Spearman's Rank Correlation Coefficient, ρ**
Virtual class – Midterm (NAS)	0,58
Traditional class – Midterm (NAS)	0,60
Virtual class – Midterm (MAT)	0,54
Traditional class – Midterm (MAT)	0,78

Table 2. Spearman's Rank Correlation Coefficient

Hypotheses

1. Pupils achieve better results working in virtual environment then in traditional class in the subject NAS.
   1.1. Pupils achieve better results in the virtual environment then on midterm in subject NAS.
   1.2. Pupils don't achieve better results in traditional class then on midterm in subject NAS.
2. Pupils achieve better results working in virtual environment then in traditional class in the subject MAT.
   2.1. Pupils achieve better results in virtual environment then on midterm in subject MAT.
   2.2. Pupils don't achieve better results in traditional class then on midterm in subject MAT.

Results and discussion

The **first main hypothesis was not confirmed** by the research results. The rank correlation of the subject "Nature and Society" in the virtual environment versus the midterm success is **moderate**. It shows that pupils **achieve equally good** results learning in **both environments**.

- Examining the original data from Table 1 shows that pupils achieve better results in the virtual environment in comparison with their midterm grades. Although the rank correlation is moderate (ρ = 0,58), it only means that better success in the virtual environment is not the only cause of this improvement.
- Examining the original data from Table 1 shows that pupils achieve better results in the traditional teachings in comparison with their midterm grades. The research also obtained a moderate rank correlation, (ρ = 0,60), which indicates that there is no large variation in learning in traditional way in comparison with midterm success and also with virtual environment.

The success which pupils achieved is evenly distributed between the traditional and the virtual environment. Possible reasons for these results are: small amount of teaching material versus amount of material which pupils are faced with at the end of the semester; the fact that during the testing within virtual environment new factors were present: *completely new learning environment* and *curiosity*. These factors influenced some pupils in motivating way and they achieved far better results in the virtual environment while on others it had blocking effect since they had no previous experience working with computer technology.

The **second main hypothesis was not confirmed** by the research results. The rank correlation of the subject "Mathematics" in a virtual environment versus the midterm success is **moderate**, while the correlation of the same subject in traditional environment versus the midterm success is **high**. It shows that pupils achieve better results learning in traditional environment then in virtual environment in comparison with their midterm success. Midterm grades were taken as independent variables, since they are relatively stable strong points (constants). In relation to that stable situation the introduction of new learning circumstances (virtual environment) were observed and progress in pupils' achievement of mastering the teaching curriculum of mathematics in both environments was measured.

- Examining the original data from Table 1 shows that pupils do not achieve better results in the virtual environment in comparison with their midterm grades. Although the rank correlation is moderate (ρ = 0,54), it only means that better success in the virtual environment is not the only cause of this improvement. The reasons why correlation is moderate towards virtual environment is the same as in first hypothesis – the technology had motivating or blocking effect on pupils.
- Examining the original data from Table 1 shows that pupils do not achieve better results in the traditional environment in comparison with their midterm grades. But we can see high oscillations – some pupils had more success while some had very low success. The research obtained high rank correlation, (ρ = 0,78), which indicates that in this experimental environment pupils prefer learning mathematics in traditional way more then in virtual because the final results in traditional environment were better then in virtual in comparison with the midterm success.

In this case the presence of the teacher, her nonverbal communication which gave pupils directions for their work, was the key factor that effected pupils in a motivating or in a blocking way. That is the reason why some pupils were very successful and some even less successful then on midterm. Virtual environment does not include "teacher factor" so there are no high oscillation in the results but also there are no better improvements in learning mathematics in comparison with midterm success.

This research results show how the current situation in this elementary school in Zagreb is completely opposite from the world research on virtual learning (shown in the introduction part) where pupils almost always achieve better results in testing in virtual environment then in traditional. There are two possible reasons for this:

1. Teaching material which pupils learn in virtual and traditional environment needs deeper logical understanding and for that pupils need someone to guide them and help them in their thinking process. Since pupils were directed only to content, assignments and themselves visual effects of the virtual environment did not help.
2. The fact is that some pupils did not have previous encounter with the computer and with virtual environment and this novelty affected them in a way that they put their attention on technology as a new challenge more then on the teaching material.

We can only conclude that virtual environment could give better and stable results in the environment that has a combination of continuous computer work and teacher factor. For future research it is vital to have:

1. Continuous acquisition of computer knowledge.
2. Teaching virtual material that will adopt as much different aspects that effects pupils' success in learning process in an *online* environment – access to tools, technology experience, learning preferences, study habits, goals, purposes, lifestyles, and personal traits (Schrum & Hong (2001)).
3. Teacher who is well pedagogically and technologically trained so that he/she may know when/how/why to use virtual environment.

Conclusion

Preliminary research with qualitative analysis was conducted in order to test the hypothesis: Are there differences in the quality of acquiring knowledge for pupils in primary education during the process of teaching and learning educational content in the virtual and traditional classroom? The study was conducted in the year 2009 with 19 third-graders of the elementary school "Rapska" in Zagreb. The research analyzed the curriculum content of two subjects, "Mathematics" and "Nature and Society", in two different class types – *data analysis and data repetition (exams)*. This preliminary research has shown that pupils can equally well acquire and adopt curriculum content in the virtual and in traditional classroom. Since the certain number of pupils have worked with the computer for the first time, and also within the virtual environment, we can only conclude that technical incompetence have affected the outcome of the research in favor of traditional classroom in these specific cases. The main assumptions for further research are based on the fact that pupils have a prior computer experience in *online* learning, that the teaching virtual material adopts as much different aspects that effects pupils' success in learning process in an *online* environment and that the teacher who guides pupils is well pedagogically and technologically trained.

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