

Connection of Computer Use and School Effectiveness among Primary School Students

Dario Šincek
Primary school Domašinec
E-mail: dario.sincek@gmail.com

Tedo Vrbanec, Tea Pahić
Faculty of Teacher Education, University of Zagreb
Ante Starčevića 55, 40000 Čakovec, Croatia
E-mail: {tedo.vrbanec, tea.pahic}@gmail.com

Summary

The computer has gradually sneaked into every corner of our lives, work and relationships. New forms of entertainment, games, communication and learning by the means of computers have become common among school age children. The age level of children who start using computers is becoming lower across time, and the number of hours spent in front of the computer is increasing. The authors of this work have tried to answer the question which worries both parents and experts: Does the increased number of hours spent in front of a computer affect the children's school efficiency and if so, is it positive or negative. The pilot survey was conducted on the target sample of grade 7 and 8 students from the Međimurje County, Croatia.

Key words: Primary education, Computer usage, School efficiency

1 Introduction

The interaction between children and computers can be seen through several aspects which depend on the observer and the area of interest, and it is usually psychological, sociological, pedagogic, methodical, didactic, content-related or similar (Aarsand, 2007, p. 10). By studying these areas of interaction, one may conceive many sociological patterns of children's behavior in today's postmodern society.

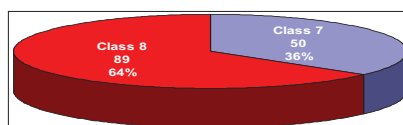
We are using the word interaction because children do not consider a computer to be just a tool for processing data; it also becomes a subject in their lives. Children communicate with the computer and computer helps them to satisfy the great majority of their needs for social life, entertainment, games, research... and, most importantly, the computer incorporates all of these things in a meaningful unity for a child (Aarsand, 2007, p. 7-8). In the life of children computers are becoming increasingly important, becoming almost the center of their world. They take over the parents' and school's primary role of the bearer of upbringing and education. Does that remind us of the "upbringing" of the street from previous times? That was the first circle of the problem.

The second circle arises when parents start realizing that the relationship they had with their children has been disturbed “by courtesy of the computer in general“, meaning by the defect of both quantitative and qualitative communication among them and their children (Mehdi, 2010, p. 115-116). A certain fear of losing control i.e. the fear of the inability of implanting the norms and the patterns of behavior and the transfer of life attitudes between them and their children emerges here. Some parents consider the computer to be not (only) a learning tool or a companionship tool, moreover, they consider it to be another problem they have to deal with. Parents are often aware of the positive sides of a computer, but they decide to ignore them or they subordinate them to the negative sides. The computer is often blamed for the child’s unsocial behavior, lack of positive behavior patterns, lack of empathy, aggression, bad marks in school etc (Mehdi, 2010, p. 113).

The authors have decided to explore the latter and answer the question if there is a connection between the time spent at the computer and the success in school.

2 About research

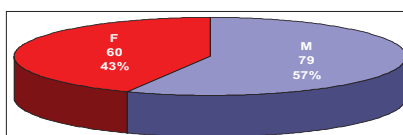
The pilot research was conducted via the poll method by the end of 2010 in five primary schools of Međimurje County, Croatia: Primary school Gornji Mihaljevec, Primary school Prelog, Primary school Donja Dubrava, Primary school Domašinec and 1st Primary school Čakovec. The research included 139 seventh and eighth graders out of 2653 students of higher classes in the total student population of Međimurje County, which makes 5,22% of the population. There were 50 seventh graders or 36%, and 89 eighth graders or 64% (Picture 1).



Picture 1: Relation of the number of students, according to classes

The unexpected disproportion between the number of seventh and eighth graders derived from their sizes, not due to the disproportion in the number of classes included in research. The eighth classes are unexpectedly much bigger; in some schools they have up to 30 students, while the seventh classes have around 20 students.

Regarding the gender, the sample consists out of 79 or 57% of schoolboys and 60 or 43% schoolgirls (Picture 2).



Picture 2: The gender of students

The research was based on the study of four most represented categories in which students spend most of the time:

7. using Internet services,
8. playing computer games,
9. education via computers and
10. using multimedia contents.

The aim of the research was to establish which variables are connected to the students' success, and whether is the total time spent in front of a computer, or even more precisely, whether is the time spent in individual categories of using the computer connected to the primary school students' success, and also to find out if there is a need for conducting a wider research on a representative sample for the whole Republic of Croatia. Finally, the conducted research was aimed to establish possible deficiencies of tools used for the implementation of the research – the questionnaire.

The tool for the implementation of the research is a questionnaire with 13 questions referenced to the aspects of the students' use of computers. Most of the questions were questions of multiple choice and students were supposed to choose one of them, questions of YES/NO type and two questions were answered with quantitative expressions, with arbitrary time units. The students filled out the questionnaire on voluntary basis with previous parents' consent in a written form, but also with consents of schools' headmasters.

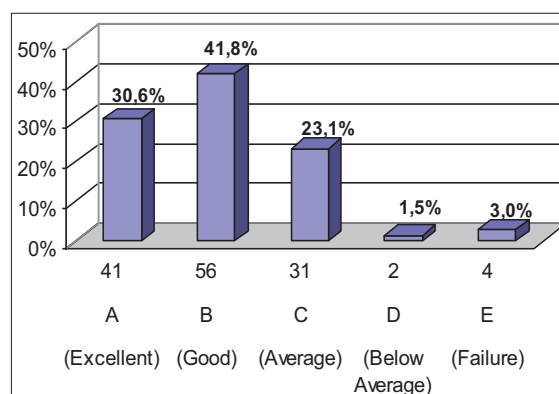
Statistic analyses were conducted in IBM SPSS Statistics, and they were shown by using graphic presentations in Microsoft Excel.

3 The poll's results

The results were grouped according to areas with regard to the aimed sample and its distribution in groups within one region. It was a pilot research and results are shown in the domain of descriptive statistics.

3.1 The success of learning as measured by average rating

The authors used the poll in order to gather the information on students' achievement at the end of the first semester of the school year 2010/2011 (Picture 3), in order to compare them to the time spent in front of a computer and other factors of the research.



Picture 3: Final grades at the end of the first semester

The study identified gender differences in student's achievement (Table 1). It is noticeable (from the mean values), that girls achieve better results (higher final grades as a measure of achievement), then boys: 4.29 (F) vs. 3.69 (M).

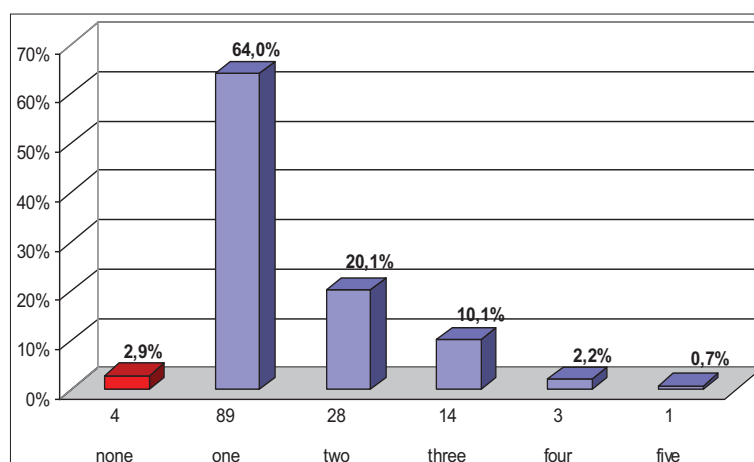
Table 1: The table of students grades by gender

	Gender	N	Min.	Max.	Mean	SD
<i>Final grade at the end of semester</i>	M	75	1	5	3,69	0,972
	F	59	2	5	4,29	0,767

The average success in boys' population is 3,69 while the standard deviation is 0,972, and the girls' success is 4,29, while the standard deviation is 0,767. Difference is significant at the level of 1% ($t = -3,850$, $df = 132$, $p < 0,01$).

3.2 Quality of computer equipment and Internet acces

We can say that the students' families from the sample of primary schools in Međimurje County (more precisely, the families of seventh and eighth grade students on which the research was focused), are well equipped regarding the computers. Only 3% of students do not own a computer. Equally rare are the ones who own three or more computers in their households. Two thirds of students or 64% of them own one, and 94% own one to three computers in their households (Picture 4). One third of students own more than one computer in their households. The majority of sample students use the ADSL connection to the Internet (80,6%). Smaller number of students use a modem connection (16,3 %) and ISDN connection is used at least (3,1 %).

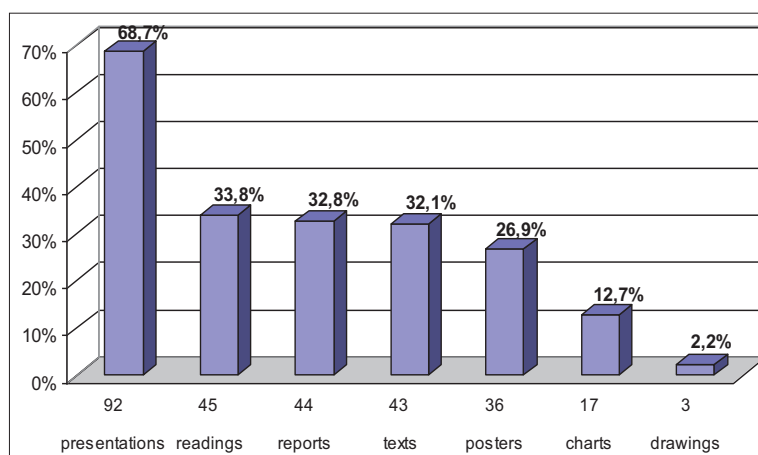


Picture 4: Number of computers per household

Furthermore, there is connection between the grade at the end of the first semester and owning a computer where those who own more computers in their households show better success ($r = 0,182$ and the correlation is significant at the level of 5%). The better socioeconomic status, as was shown in previous researches (Gregurović and Kuti, 2010), is connected with students' success and in our interpretation it reflects through a higher number of computers.

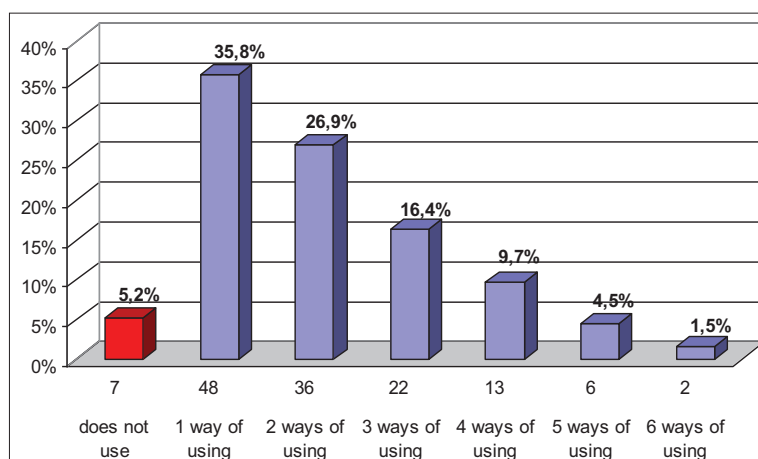
3.3 Computer usage for learning/school

When students use a computer for the activities connected with school or “learning”, they mainly work with an office package (Picture 5): they mostly read or make presentations (over two thirds of them). Each out of suggested ways of processing texts, like reading/writing reports and other documents, is even-handedly used by each out of the third of the students from sample. It is interesting that more than one quarter of students at some point of the time had the obligation to make a poster for the purpose of schoolwork. Computer use for drawing activities takes only 2,2% of computer use in a school purposes.



Picture 5: Computer usage for school and learning

Picture 6 shows the summation of all individual ways of using computer for learning per individual student, and it shows that 5,2% students do not use computers for learning, 35,8% use it for only one of the cited activities, 26,9% use it for two activities, 16,4% use it for three activities etc. In general, students are inclinable to use computer for only one way of working, and the more versatile they are when using computer the fewer they are. Nevertheless, more than half of students use computer for more purposes.



Picture 6: The summation of different ways of computer use for school purposes

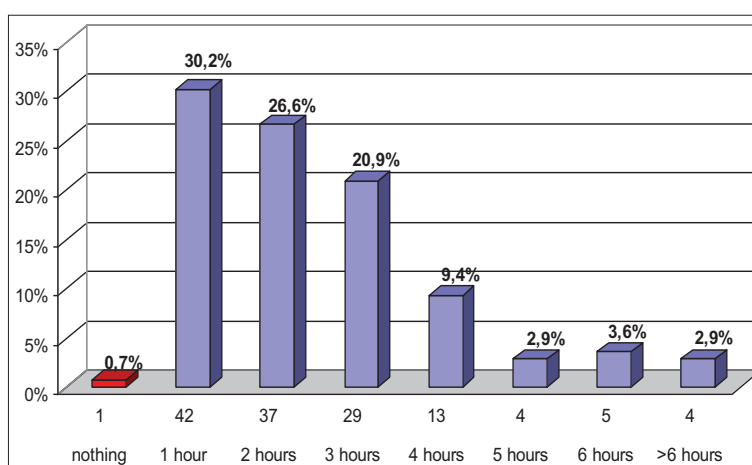
The study also identified gender differences with respect to the number of computer activities used in school purposes. The results show that girls use computer for more activities than boys and the difference between them is significant at the level of 5% (Mean_{girls}=2,39, Std.dev.= 1,278; Mean_{boys}=1,87, Std.dev.= 1,331; $t = -2,255$, $df = 132$; $p = 0,026$).

Students' achievements are correlated to the number of activities for which students use the computer for school purposes. Better students use the computer for more of such activities, ($r=0,325$ and the correlation is significant at the level of 1%).

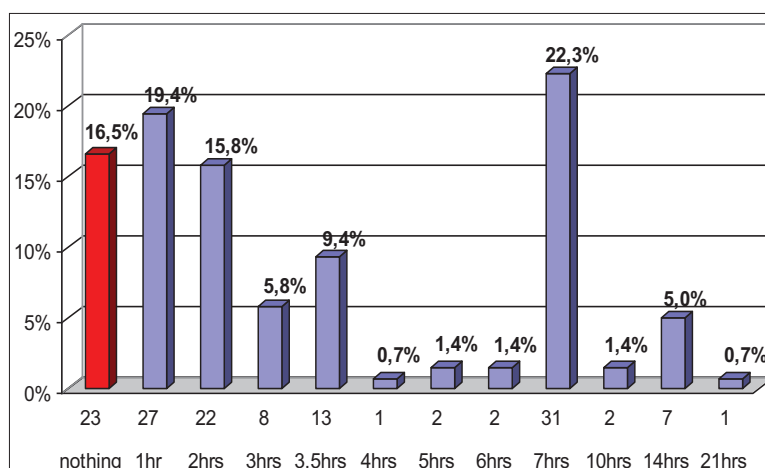
3.4 Overall use of computer

If one tries to roughly calculate the amount of "free" time of a primary school seventh or eighth grader (7 hours of sleep, 7 hours school, 1 hour hygiene, 1 hour of travelling to/from school, 1 hour of alimentation = 17 hours), without any family or social contacts, activities and commitments, not to mention without learning and doing homework also, then let us say that a student is "left" with 7 hours of unplanned time.

Exceptionally small number of students, (if shown with an absolute number, only one student or 0,7%), do not use the computer at all. The majority of examinees (Picture 7) is located within reasonable frames (although, who could determine what a reasonable frame is?): up to two hours of daily use, i.e. 56,2% of them. Within the frame of increased use, 3-4 hours daily, are 30,3% of examined students, and in the exaggerated area, 5-6 hours, are 9 students or 6,5%. We can express our worries for the overall physical and emotional development of four students from the last group who use the computer for more than six hours daily. This group would be actually called "the addicted".



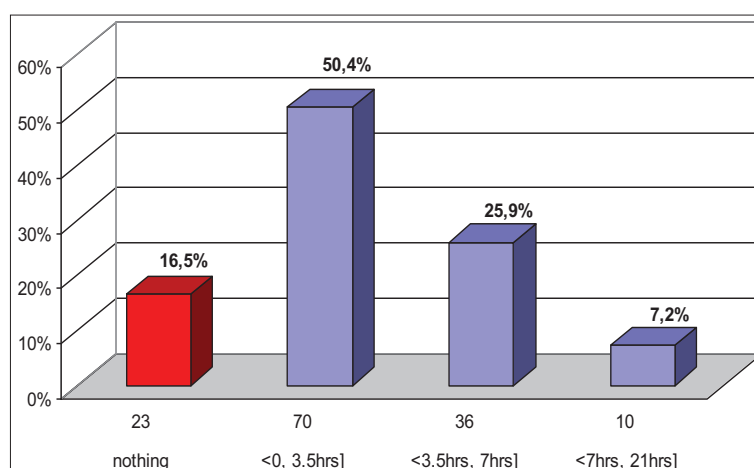
Picture 7: Total daily use of computer



Picture 8: Total time of using computer for studying per week

Picture 8 shows the distribution of students' time they weekly spend in learning with the help of computer. It is noticeable that every sixth student, i.e. 16,5%, do not use the computer for studying. Students were able to write any arbitrary time they spend in learning with computer, i.e. a choice of range was not offered. Consequence of such method resulted with one positive and one negative consequence. Positive consequence is that the students' answers were not influenced in any way. Negative consequence is that the answers were very scattered in wide range. It was necessary to form statistic groups in order to gain conclusions so we grouped the results in four groups (Picture 9).

The picture with grouped results (Picture 9) clearly shows that one half of students use a computer less than half an hour per day (up to 3,5 hours weekly) for the purpose of studying, a quarter of students use a computer for the same purpose up to one hour daily, and 7,2% use computer significantly more, up to three hours daily (Picture 8).



Picture 9: Total time of using computer for learning per week (grouped results)

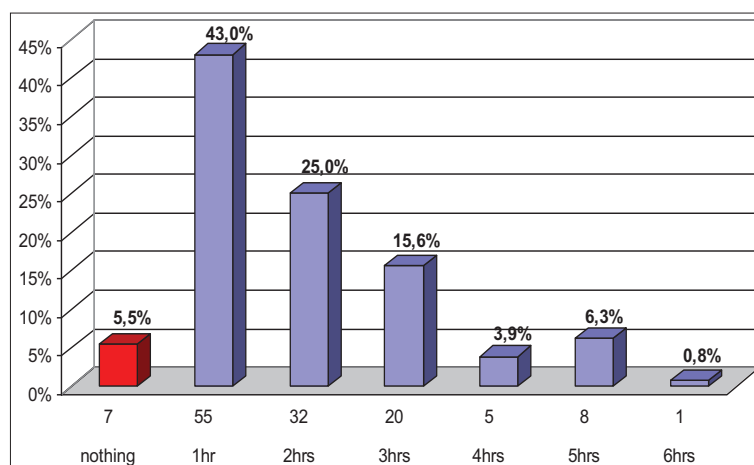
Considering the time spent in front of the computer the study implies that children rarely reach for the computer for educational purposes on a daily basis. The reasons could be sought in teachers who rarely give homework or other types of activities connected with computer.

Student's book and workbook are still primary tools for doing homework and other types of activities connected with studying.

3.5 Internet

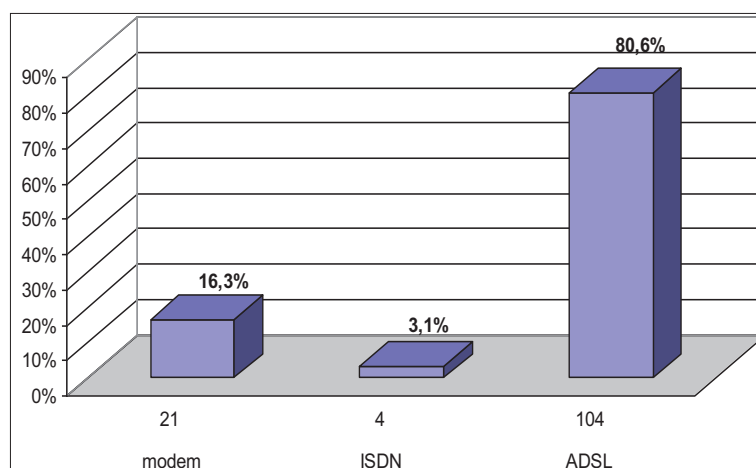
In today's world computer and Internet are connected more than ever (Norman and Lutz, 2010, p. 16-17). Many papers focusing on Internet, usually describe it as a socio-psychological phenomenon (Shotton, 2005, p. 16-17), (CARNet, 2010). The majority of these papers referenced security as one of the primary goals in protecting children. Why security? First, one could conclude that computer increasingly becomes a tool which is intended to access the Internet, and second, the time spent using the Internet is increasing.

The research conducted by the Croatian Education and Teacher Training Agency in 2008 (NetAkademija, 2008) shows that students would spend more time using the Internet if they had more money and/or time. The problem is that increased time spent using the Internet increases the problem of child's security. Nevertheless, the main problem is usually not the time they spend on the Internet but contents that children consume. What proportion of time spent on the Internet makes accessing educational content available via the Internet? How long is it (in the absolute values)? Do educational facilities create a better foundation for learning? Is this reflected in better grades?



Picture 10: Total use of Internet per day

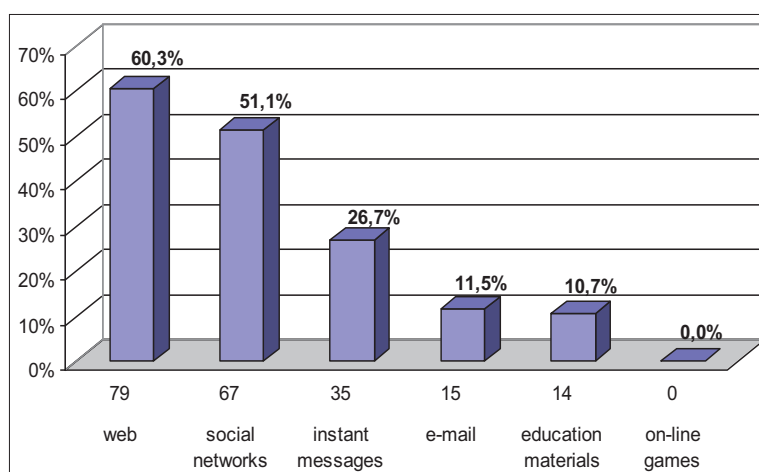
The majority of students who took part in this poll (94,5%) are using the Internet (Picture 10). Almost half of them, 43%, spend on the Internet up to one hour daily while the same percentage of students spend two to three hours daily. 11% of students spend on the Internet four to five hours daily.



Picture 11: Internet Access Technologies

All students from the sample use one out of three ways to connect to Internet: analogue modem, ISDN TA (Terminal Adapter) or ADSL modem/router (Picture 11), although there are various other possibilities of going online in Međimurje County, such as WiMAX, WiFi or other mobile technologies (“HomeBox” or USB stick like) and by different ISPs. The absolute majority of students in this sample go online via ADSL.

While working on their computers and using the Internet, students most often visit web pages (60,3%), half of them use social networks, a quarter of them use instant message service, only one ninth of them use e-mails, and the least number of students use the Internet in order to reach educational contents (Picture 12). Consequently, the assumption of Croatian Education and Teacher Training Agency (NetAkademija, 2008) that seventh and eighth graders spend more time using computer in comparison with fifth and sixth graders due to a bigger magnitude of using educational contents is questionable. One could notice that the time spent on activities connected to school and extracurricular activities is relatively insignificant when compared to the total time spent using the Internet. The data from this study do not indicate a statistically significant correlation between Internet use and the students' success.



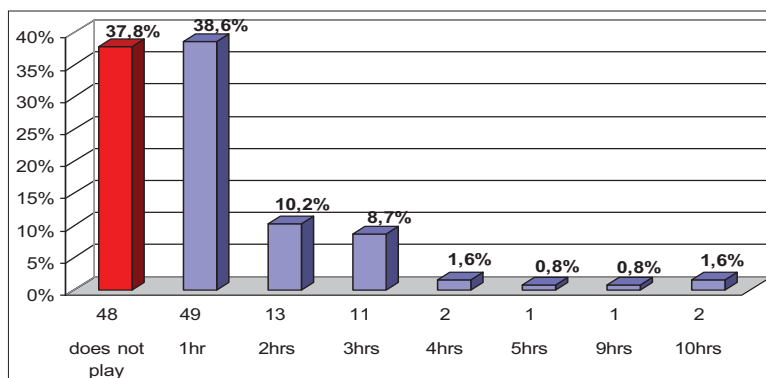
Picture 12: The purpose of Internet usage

3.6 Games

Instead of playing games with their peers and toys as it was until decay or two a common thing, today's children increasingly play computer games. Children spend less time outside their homes to "on the air", play less "classical" games, and participate in a smaller number of (real) social activities. They consider computer games as a synonym for playing. It is thus understandable that parents and teachers who find playing and learning as two totally opposite activities cannot bring these two activities in a positive relationship (Fromme, 2003).

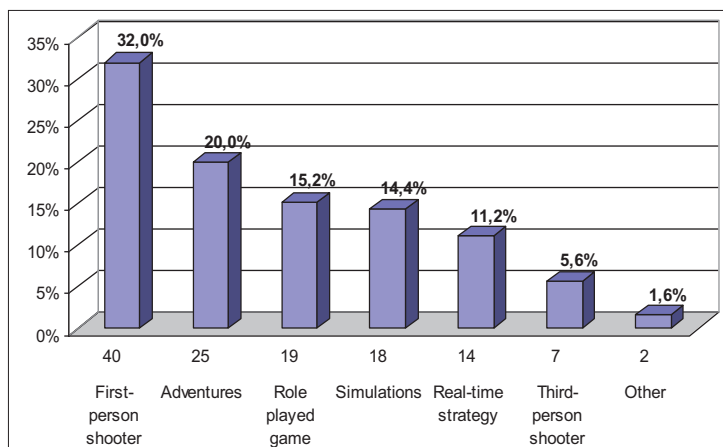
A game is a completely normal children's activity in the process of growth and maturing and it cannot be suppressed in favor of learning. Therefore, synergies could be achieved in merging these two activities together. Recently, there has emerged a new term called "edutainment" (the expression was formed by merging words education and entertainment) (Laniado and Pietra, 2015, p. 42) which connect playing and learning in the way that assumes that education should be the purpose of the game. Although learning through play – edutainment – can be a solution, so far it has been applied in a limited range due to a small number that kind of games.

In the context of the goal of our research, the results are somewhat surprising in the meaning that even 37,8% of students from the sample do not play computer games at all. Furthermore, a lot of students (38,6%) play computer games up to one hour per day, and only a quarter of the students play computer games more than one hour per day (Picture 13). There are some students who play computer games much more then others but they are rare and we could call them a special cases. Our results differ considerably from other similar researches (CARNet, 2010), (Hrabri telefon, 2004) which have shown that school children spend a significantly much more time on computer games.



Picture 13: The average duration of playing computer games per day

Considering the choice of computer games students from the sample have shown the greatest interest toward the so-called "First Person Shooters" – almost one third of the examinees. The rest of the genres are quite equally represented (Picture 14).



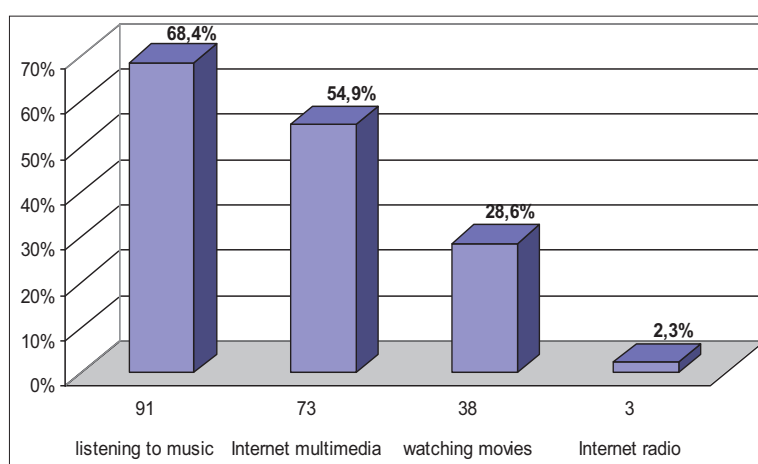
Picture 14: Affinity for the type of game

Computer games improve peripheral vision, sensory motor system and concentration (Papert, 1993), but also spending the time. According to the results of this research, the statistic correlation between time spent in a game and the students' school achievement has not been proved.

3.7 Multimedia

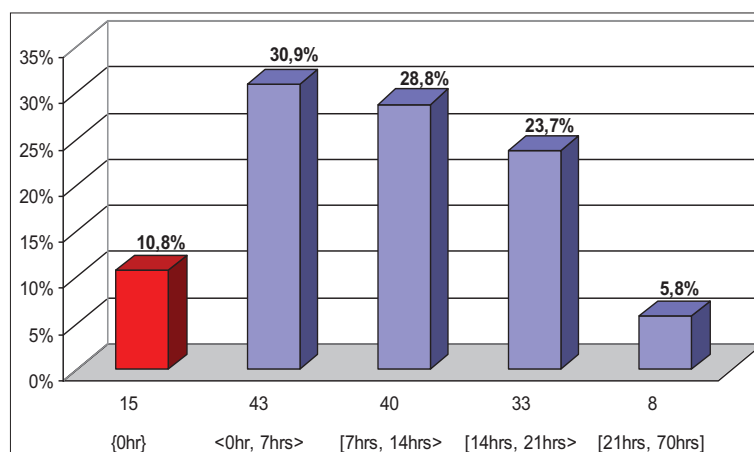
Multimedia gives great possibilities of simultaneous learning and entertainment. The authors' experience is that teachers use the multimedia in the educational process increasingly. Multimedia should also incorporate students in the active learning process. The question here is whether the students exploit the full potential of multimedia (do their results reflect this)? With respect to the results that follow the answer is negative.

Regarding the type of using the multimedia contents, over two thirds of students from the sample listen to music, more than a half of students watch multimedia contents on Internet (YouTube etc.), more than a quarter of students watch movies on their computers, and (only) three students listen to radio stations via Internet (Picture 15).



Picture 15: Using the multimedia contents

More than 10% of students from this sample do not use the multimedia contents on their computers (Picture 16). Over 30% of students use their computers for multimedia less than one hour per day on average. There is the equal number of students who use it up one to two hours per day. Students were able to freely write their daily or weekly amount of time they spend in such activities so we grouped their data from various modalities. Picture 16 shows the grouped values on a weekly level.



Picture 16: Weekly use of computers for multimedia

The full potential of multimedia in studying and teaching has obviously not being used. According to this research, the amount of time spent using the multimedia contents and the way these contents are used do not affect the students' success in the educational process.

4 Related works

The research conducted by the Brave Phone Associations (croat. “Hrabri telefon”) in collaboration with Clinic for child protection of the City of Zagreb (croat. “Poliklinika za zaštitu djece Grada Zagreba”) in 2004 shows very valuable results. This research conducted on the sample of 4000 children in 24 schools from different parts of Croatia (Hrabri telefon, 2004), showed that 90% of children own a computer and even 73% of children have experience in Internet use. The Internet is in the most cases used for aimless “surfing” and searching (53%), downloading music (48%), learning and school activities (40%), chat (43%) and e-mails (24%).

The research conducted by the same organizations in 2008 shows very similar results. It was conducted on a somewhat smaller sample of 2700 children from 6 towns in Croatia (Hrabri telefon, 2008) and it shows that the percentage of owning a computer has increased up to 95% and Internet use has increased to 91%.

Croatian Education and Teacher Training Agency conducted a research in 2008 (Jelavić, 2008) on a sample of 488 students from the fifth to the eighth grades. This research shows that the children would, if they could, spend more time online than they do now. Concerning the Internet activities the seventh graders prefer playing games, writing blogs and searching for some specific expressions, while the eighth graders primarily looking for definition of terms related to learning and school.

The latest research was conducted by CARNet in 2010 on the sample of 230 students from the fifth to the eighth grades of primary schools (CARNet, 2010). The results show that 93% of the seventh graders and 96% of the eighth graders use the Internet. The most active users among the sample students are the seventh graders who lead in the Facebook (83%) and MSN (52%) usage. Furthermore, it is important to mention that the eighth graders (35%) spent the most of time working on computer (more than 4 hours), while even 73% of these students spend all of this time using the Internet.

5 Conclusions

The research resulted in a multitude of results and conclusions. The authors emphasize some of them:

- Almost two thirds of surveyed students use the computer for just one or two applications.
- The great majority of students use the broadband Internet access connection (ADSL).
- A relatively small number of students use an e-mail.
- More than third of surveyed students do not play computer games at all.
- The dominance of aggressive computer games such as „First Person Shooter” is smaller than expected (Ihori et. al., 2007), (PewResearchCenter, 2008).

Students consider multimedia mainly as an entertainment tool. The use of multimedia content is a common activity which is successfully linked to other types (surfing, playing computer games etc.) Teachers or educational system do not use multimedia sufficiently, so there are great potentials regarding multimedia for the future activities.

The most important, the authors found that the time spent at the computer, or the time students spend using the computer for school purposes does not show a connection to the students' school achievement, which was the working hypothesis before the research started. Furthermore, there are no evidence that the time spent working on computer (regardless the type of use) is in a significant (substantial) connection to the school efficiency.

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About authors

Dario Šincek works as a teacher at Primary school Domašinec, Croatia, where he has been teaching Physics and Computer Science from 2008. In 2000 he gained a diploma at Music school in Varaždin. He graduated in 2008 with a degree in Primary Education and Computer Science at Faculty of Teacher Education Zagreb, Department Čakovec. From 2010 he has also been working at Center of Excellence in Međimurje County where he teaches Computer Basics and Multimedia. His hobbies are all connected to Computer Science: picture, sound and video editing, designing newspapers and Internet web sites.

Tedo Vrbanc works as a senior lecturer at the University of Zagreb, Faculty of Teacher Education Zagreb, Department Čakovec. He teaches various courses from the fields of Computer and Information Sciences. He is author or co-author of many scientific and professional papers in the field of computer and information sciences and has received three awards during his studies and work. His areas of interest are computer and network security, free and open source operating systems / software and scientific usage of peer-to-peer systems.

Tea Pahić works as an assistant at the University of Zagreb, Faculty of Teacher Education Zagreb, Department Čakovec since 2009. She teaches developmental psychology, motivation and social relationships, and the psychology of learning and teaching. In 1994 she gained a bachelor's degree in computer science and worked for 8 years in an IT company. She graduated in Psychology in 2006 and worked as a school psychologist for 3 years. She is currently undertaking postgraduate studies in early education. She is a member of the Croatian Psychological Association, Croatian Association for Behavioral and Cognitive Therapy, and ENSEC – the European Network for Social and Emotional Competence.