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High school students' and teachers' computer training: Awareness, participation and motives

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After a brief introduction, the paper gives an overview and interpretation of the results of empirical research conducted on high school students (N = 601) and high school teachers (N = 129). The aim of the study was to examine students' and teachers' awareness of the possibilities of computer training (both inside and outside of the school) and their participation in the training. Besides that, it was determined the readiness of high school students and teachers to participate in computer training, as well as the motives for computer training. Finally, we examined the influence of many monitored independent variables (socio-demographic characteristics) within the sample of examinees (particularly for the sample of students and for the sample of teachers), and the significance of identified differences between the research sample of high school students and the sample of high school teachers. The study started with the assumption that high school students are at an advantage compared to their high school teachers when it comes to tested dependent variables: therefore, high school students have wider opportunities to build their computer skills, they are better informed about them, they show a greater willingness to participate in computer training and they are differently motivated. The analyses of research results showed more cases of significant differences between the two samples of examinees and the number of statistically significant differences among subjects were found even within each samples based on the monitored socio-demographic characteristics. After the presentation and interpretation of the research results the research hypothesis is partially confirmed, and the initial hypothesis was corrected and formulated new one, based on the results of empirical research. Ultimately, the need for further researches of this issue is expressed, as well as possible future directions.

Keywords: Computer training, empirical research, high school students, high school teachers

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Introduction

Education in elementary and high schools must include education in the field of information and communications technology (ICT), to enable children and young people to systematically understand the basics of this technology, to build the foundations for its productive use in everyday life and learning and to open the way for competitiveness in the labour market. In addition, the creation of a more thorough general education characterized by greater autonomy of students is necessary, along with facilitation of the development of analysis and critical cognition skills. These measures should enable young people to learn independently in the broader idea of lifelong learning, and thus easier adapt to changes of jobs, which will be more frequent in the future.

Guidance of students and teachers to ICT and improvement of connections of fundamental, applied and developmental studies, as long-term support of the development strategy, should be increased in higher education. Young, highly educated people should be trained for effective and creative use of ICT in their profession. At the same time, they should also develop understanding of the basics of this technology for an easier use of various tools of the modern era that will be developed during their working lives. In addition, the number of highly educated people specialized in ICT should be increased significantly. They would represent the fundamental core of research, development, various implementations and improvement of this technology in the Republic of Croatia.

The improvement of the Croatian education system through IT projects is evident through the following activities carried out in the past decade in the Republic of Croatia:

- Procurement of modern computer technology and equipping of educational institutions;
- Establishment of the Croatian academic and research network - carnet, which serves for a systematic networking of elementary and high schools, school libraries and dormitories in a single computer network;
- Building of the information system of higher education institutions - isvu, with which all universities, colleges and dormitories are linked into one computer network. It includes valuable databases and enables the registering for an exam, informing about curriculums etc. It also provides transparency in university enrolment with the project "my choice", and is based on the acceptance of the results of the state graduation as a basic criterion for the registration of the desired study program;
- Development of the "net at school" project, which aims to enhance the learning process by using the internet in classes and research of students from home and to set the foundations for a new learning culture based on openness to new ideas, new media and technologies;
- Development of the unique croatian project "e-islands" which provides connectivity of smaller island schools to the mainland through a modern videoconferencing system;
- Equipping of high schools with interactive whiteboards, creation and introduction of educational contents in mathematics, chemistry, physics and biology in electronic form (e.g., The program nikola tesla for natural science subjects available via carnet);
- Training of teachers to use computer technology (within the program for the ecdl certificate).

Although these are the praiseworthy initiatives, we must emphasize that these activities are primarily directed towards development of a basic infrastructure necessary for the advancement of the education and science system. Schools in the Republic of Croatia are equipped with networked computers, but the question of their sufficiency and placement within educational institutions, the question of their accessibility and usability (who and for what purpose uses them within the institution) arises. Furthermore, computer training of teachers and the obtaining of the ECDL certificate is implemented, however this program enables teachers to build skills of IT (computer) but not of information literacy. The question of involvement of the management of educational institutions, expert associates (pedagogue/educator, psychologists, defectologists, speech therapists) and members of the administrative services in these programs arises. Their IT and information literacy is necessary to implement the program of improvement of ICT use in education and to build an information system of the school. This computer training does not include the building of knowledge and the development of skills and competencies necessary for the specific use of computer technology in educational work, i.e. computer training adapted for teachers and other educational workers. University curriculums for computer and information training of future teachers, where more extensive changes are needed to enable the new generation of teachers to use modern technology in their work, also represent a particular problem. So, the above activities are oriented towards improvement of the educational system through the use of ICT, but they represent only the beginning

Applied Innovations and Technologies
ISSN: 1804-4999

and must be continued. It is essential to achieve internal changes at the level of the teaching practice and organization of educational work so that teaching and learning in the school and university context can experience a real change.

School and extracurricular computer training in Croatia

In high schools in the Republic of Croatia, informatics has been conducted as a mandatory subject since 1993, while at primary school level, informatics still remains outside regular classes (and is implemented as an elective or facultative subject, in clubs of young technicians and informaticians or organized as an additional subject that occasionally intensifies before a competition or a contest). This is one of the reasons why high school informatics classes have students with very different previous knowledge. The informatics teacher, who must not ignore these differences but take them into account, has the most important role. With an individual approach, the teacher should allow students with modest prior knowledge to become more confident and eventually more equal with students who already possess significant knowledge, who, in turn, should not be bored during informatics classes (Marinović and Čičin-Šain, 1999).

Primary school students have the opportunity to acquire basic computer literacy within the non-mandatory subject of informatics, while this is a mandatory subject in high school education. Informatics classes are conducted in order to develop the creative abilities of students who, in addition to the development of skills of computer handling and programming, also learn the basic principles of recognition, solving and design of algorithmic type program solutions. Informatics classes should provide the students with a real picture of the computer role, help develop a logical way of thinking, enable independent and creative work, the appropriate use of computers and independent development of curriculums and curriculum documentation (Lipljin, 1999). After acquiring basic computer literacy through their primary and high school education, the students are expected to become information literate (Kralj, 2006). However, within the framework of the aforementioned levels of education, there is no systematic approach in developing information literacy skills.

As high schools are very diverse, due to the curriculums implemented, it is clear that informatics curriculums for high schools should not be universal. Given the diversity of high school education, the requirement for curriculums adapted to specific professions is emphasized. Although most part of the curriculum should be sufficiently general allowing its use in all high schools, specifics of each profession should be taken into account. Since the use of computers has a motivating effect on the students, if it is appropriately correlated with professional subjects, it allows a better understanding and easier mastering of professional tasks. The students acquire knowledge about the possibilities of the computer as a supporting tool in their future work. Such education is the first step in a broader introduction of computers in professional subjects. This way opens a possibility to achieve a valuable social goal - educated people who use modern computer technology, which will allow them faster, easier and better performance of their activities (Marinović and Čičin-Šain, 1999).

With the introduction of ICT in the educational process, the classic didactic triangle has long before outgrown into a quadrangle and is further expanding into a didactic polygon. The teacher's role in the emerging digital environment is not reduced; it is still significant, but it is significantly changed. So, thinking that the teacher might become redundant in the educational process is overcome. However, in order to allow the teacher to change his actions, it is necessary to improve the quality of his training.

The training of future teachers involves building competencies from five basic fields. These are (Mrkonjić, 1992; Turković, 1996; Mrkonjić and Vlahović, 2008):

- General-cultural (development of the personal and social culture of the teacher),
- Professional (acquisition of knowledge and development of skills closely related to a specific profession),

- Pedagogical-psychological (development of competencies related to the teacher's pedagogical work and building of basic knowledge in psychology),
- Didactical-methodical (development of competencies for an effective realisation of the teaching process, i.e. For specific ways of organizing teaching and learning activities) and
- Technical-technological and we might add informational (development of teachers' IT and information literacy skills).

It should be emphasized that building competencies in the above areas at the realization of the basic teacher education and training at the university level, is however conducted unevenly. The main emphasis is on professional training, while some elements are almost or even completely ignored. This observation is confirmed by the results of the Pisa study from 2000, which point to the fundamental flaws in school culture of learning and teaching in the Republic of Croatia, which are insufficiently compensated by universities. Competencies that are now considered critical in school and university education (such as development of skills for independent learning, media competence, etc.) have a subordinate role, even more so true for the education of future teachers. Such a situation is not a Croatian specificity, similar deficits are also observed in many other countries around the world (Gehrmann, 2004).

It is necessary to make additional efforts in adjusting teachers to new and different pedagogical-psychological and technical-technological demands of teaching and learning. The importance of education and adjusting of teachers to new working conditions, i.e., developing new teaching competences, is reflected by the thinking: "If the first teacher of a child is badly trained, insufficiently educated and unmotivated, the foundation for further education will be unstable" (Delors et al., 1998, p.165).

Different forms of distance education have an increasingly important role in the educational context. Nowadays they are most commonly organized by the model of e-learning. E-learning, based on the use of the Internet, includes numerous examples of use of new ICT for learning purposes. It covers a wide range of possible applications of technology, from computer use in the classroom, through virtual classes, online curriculums and virtual learning communities to various possibilities of self-education (Bindé, 2007). Virtual schools play today an important educational role, for example in the United States. They do not have the limitations associated with previously determined time and place of learning. Due to their advantages, they started to spread rapidly, especially at the level of secondary and higher education as well as adult education (Blaylock and Newman, 2005). In the long term, some experts believe that open education and distance education could completely replace the school. However, although various e-learning models are rapidly evolving around the world, it is fact a that they are still in their building phase and there are many open questions and a variety of more or less successful solutions when it comes, for example, to the organization of teaching in online contexts (Anderson, 2006), online modelling (Salmon and Giles, 2006), the implementation of online assessment (Elissavet and Economides, 2003; NCES, 2005; Rister, 2006), etc.

Nichols (2003) points out that only pedagogical progress in combination with progress in access to modern technology will ensure long-term rationality for the implementation of e-learning, which can make learning more convenient (or even possible at all) to many students.

All interested parties may participate in a variety of e-learning curriculums that train users for the use of information. On the other hand, participants in these programs are predominantly referred to the Internet as the main medium of learning and are expected to cope with the abundance of available information sources (Špiranec, 2003). Children who use the Internet, sometimes at a very advanced level, rarely learn this through formal school teaching and learning, but through the independent use of the Internet outside of school or with friends (Jagić and Vrkić Dimić, 2010). Computer and Internet activities have thus become a daily experience of children and young people. However, as all

Applied Innovations and Technologies
ISSN: 1804-4999

children do not play and do not interact in virtual spaces, the school has an important role in the development of these virtual competences (Holm Sørensen, 2003).

Although various studies and strategies of organizations such as the EU, UN or UNESCO show that the success in the 21st century in the field of education, economy and even political power will largely depend exactly on the ability to find and use information, the focus in Europe is however put on developing technologic infrastructure and computer skills as a primary area of activity (Špiranec, 2003). Such efforts are visible in the introduction of computer technology in educational institutions and by encouraging teachers and other school staff to engage in ECDL programs (European Computer Driving Licence).

ECDL is an internationally recognized certificate of computer literacy. In 2003, HIZ (Croatian Information Technology Association) signed an agreement with the European Computer Driving Licence Foundation from Dublin on the introduction of ECDL in the Republic of Croatia and thus gained the right to establish authorised centres for computer training. A participant confirms obtained knowledge and developed skills through ECDL in seven areas: basic information technologies, the use of the computer and management of files, word processing, spread-sheet calculations, databases, presentations, information and communications. A worldwide recognized certificate is issued after the exams are passed. The objective of the ECDL program is the expansion of computer literacy as a basic precondition of each country and its citizens for the entry into the information society (Frković, 2003). Although these are significant and necessary initiatives, they alone are not sufficient (Špiranec, 2003). In the context of school education and its adaptation to the changes brought by the information age, it is necessary to change and update the curriculums, but also to make changes in the use of different teaching methods, changes in teaching and learning. Modern education is turning to the model of active learning based on real-world information resources. Teachers must know how to use modern computer technology, but it is also essential to be information literate. Changes in curriculums and methodical ways of action must involve all levels of education. It is especially important that such transformations also spread to university curriculums for the education of future teachers (Hoić-Božić, 2003).

In a study conducted in 2004, the European Training Foundation - ETF, pointed out that in the Republic of Croatia, the development of ICT using skills is not part of the curriculum for future teachers, and are only partially represented in the professional development of teachers (Kralj, 2006). The education of future teachers with the use of modern technology would ensure their willingness to use it in teaching and learning as well their personal professional permanent improvement. The development of modern didactic materials and software, content-wise and methodically customized to individual student's age, is also essential. These teaching materials should be made available to schools, so they can be suitable and easy to use in the classroom. By analysing the readiness of the Croatian education system for e-learning, Kralj (2006) concludes that of all people involved in education, students who accept well and quickly acquire the skills necessary for such a way of learning, are actually the most ready. They are followed by teachers, and the last are the school leaders and administrative staff who are the least ready for these changes in the education system, which means that the changes should be introduced from above and from beneath at the same time.

What is the situation in developed countries regarding the use of ICT in learning and teaching and the training of future teachers for integration of technology in education? Technology in education is only as good as is the teacher's ability to use it in order to make teaching more effective. Therefore, new teachers coming from faculties should have the knowledge and the skills which will enable them to successfully integrate technology into their daily work. In practice, it often happens that these young teachers, who are trained for an effective use of technology, are placed in schools with lack of systematic resources required to support the effective use of computer technology in teaching and learning. The result of this situation is great frustration of teachers, especially at the

beginning of their teaching career (Valdez et al., 2004). It was also found that teachers who were trained during their study to use the technology yet often fail to introduce it into their teaching, although the necessary material and human resources exist (e.g., appropriate technology and computer technology maintenance and servicing experts). One of the main reasons is that the most technology training at the faculty is primarily related to teaching about the technology, rather than technology-based teaching (Harland, 2001). The use of technology throughout the curriculum for the preparation of future teachers is resulting in a wider understanding of ICT, where the technology is closely linked to learning rather than training. Because such an approach to training of future teachers is still relatively rare, teachers are finding it hard to transfer technological competences in their professional development (Harland, 2001).

Difficulties in the use of computer technology in educational teaching and learning are found around the world. These two causes are standing out as the most important: inadequate training of future teachers for a productive use of ICT in learning and teaching and the lack of adequate human and material support to teachers in the application of computer technology within schools.

Methodology of empirical research

Goal, tasks, variables and research

The goal of the empirical research on samples of high school students and teachers was to determine their awareness of school and extracurricular (outside of the schools) opportunities for computer training, attendance of training and readiness and motives for involvement/non-involvement in the said training. Differences in the samples of respondents - high school students and teachers (differences within individual samples of respondents based on some of their socio-demographic characteristics) were determined based on the monitored independent variables. The differences between the sample of surveyed high school students and the sample of high school teachers in awareness, opportunities, readiness and motives for involvement in computer training (differences between individual samples of respondents) were also examined.

Based on the pre-specified goal, we singled out the following tasks:

1. To establish opportunities for computer training of high school students and teachers inside and outside schools (formal and non-formal forms of computer education and training) and awareness of students and teachers about them;
2. To identify involvement of high school students and teachers in various forms of computer training;
3. To examine the readiness of high school students and teachers to participate in computer training and their motives;
4. To identify and analyse statistically significant differences within both observed samples of respondents (separately for the sample of high school students and separately for the sample of high school teachers) based on the observed independent variables (listed below) and
5. To identify and analyse statistically significant differences between the observed samples of respondents (between the sample of high school students and high school teachers).

Since the two observed samples of respondents on which the study was conducted are different according to their characteristics, the independent variables observed for the sample of students and teachers were also somewhat different.

The independent variables, observed on the sample of *high school students*, were:

- The type of the high school attended by the student: categorized into gymnasium-type general education high schools, oriented gymnasiums (e.g. Language-oriented

Applied Innovations and Technologies
ISSN: 1804-4999

gymnasium, science and mathematics gymnasium, etc.), four-year vocational high schools and three-year vocational high schools (vocational schools of the industrial-crafts type);

- Grade attended by the student (1st, 2nd, 3rd or 4th grade of high school);
- Sex of the student;
- School success at the end of the previous school year;
- The socioeconomic status level;
- Possession of personal computer and internet connection in the student's household;
- Self-estimated level of knowledge and skills necessary to work on the computer/note: in previous empirical researches, self-estimation turned out to be a credible technique for assessing the development of own computer knowledge and skills, i.e. When such collected data are compared with objective indicators measured by systematic observation or testing of computer terminology and computer functions knowledge, they are not significantly different among themselves (Demunter, 2006);
- involvement in various forms of computer training (inside and outside of school).

The independent variables, observed on a sample of high school teachers, were:

- The age of the teacher;
- Sex of the teacher;
- The socioeconomic status level;
- Possession of personal computer and internet connection in the teacher's household;
- Self-estimated level of knowledge and skills necessary to work on the computer;
- Involvement in various forms of computer training (aimed at teachers - ECDL and/or broader public).

When analysing the collected research data, the independent variable observed in both samples of respondents - involvement in various forms of computer training (both inside and outside of school), was also treated as a dependent variable, i.e., the effect of other independent variables on it was established.

Research Hypothesis

There are significant differences between high school students and their teachers when it comes to opportunities and ways of computer training, attending of computer training and readiness and motives for involvement / non-involvement in computer training. In this paper, we assumed that high school students, in relation to teachers, have more opportunities for computer training and that their motives for participation in computer training are significantly different from the motives of teachers. It is assumed that the indicated differences are favourable for high school students, compared to high school teachers.

Instrument of research, population and samples of respondents

Surveys were used within the empirical research, in order to collect data from high school students and their teachers. The surveys for students and teachers were originally constructed for the purpose of collecting data for this research.

High school students and high school teachers are the target populations this research was aimed to examine. The research was conducted on samples of high school students and teachers in nine high schools in the cities Zadar, Pag and Biograd na moru in the Republic of Croatia. The high schools in which the data were collected were: Vladimir Nazor Gymnasium, Franjo Petrić Gymnasium, Medical School Ante Kuzmanić, Hotel and Hospitality Management School, Maritime School, Technical School, Crafts School Gojko

Matulina, Agriculture School Stanko Ožanić, Bartul Kašić High School and Biograd na Moru High School.

Samples of students and teachers are formed randomly. Yet when the sampling was conducted, attention was paid that the ratios within the students sample, which relate to the type of school, sex and class, correspond as much as possible to the proportions of these "subpopulations" within the population of high school students. The sample of high school students consisted thus of an approximately equal number of male (52%) and female students (48%), and students of all four grades of high schools (1, 2, 3 and 4) were surveyed. Regarding the variable - type of high school: students from gymnasiums (general and oriented gymnasium programs) and vocational high schools (four-year and three-year programs) were included in the research. The number of vocational high school students was somewhat higher (58%) than the number of gymnasium students (42%), which roughly corresponds to the actual situation in the population of high school students. A total of 601 high school students were surveyed.

The sample of high school teachers was also formed randomly. The research included all teachers working in high schools where the research was conducted, and who were willing to participate. When it comes to age of the surveyed teachers, a normal distribution was obtained in the sample, where the largest number of teachers is in the middle age category: 36% of teachers between 40 and 49 years, followed by equally represented teachers between 30 and 39 years (25%) and between 50 and 59 years (26%). The smallest number of surveyed high school teachers was in the border age categories: young teachers up to 29 years of age accounted for about 8% of the sample, while older teachers aged 60 or more were represented in about 5%. With regards to the subject/s taught by the teacher, a little less than 8% of the teachers in the sample consisted of IT teachers (who were in a separate category due to the subject matter of the research), and there were also teachers of natural sciences subjects and mathematics (around 15%), teachers of various vocational subjects (around 26%) and teachers of social sciences and humanities group of subjects (around 51%). Subjects from the socio-humanistic field were most represented in the curriculums of high schools and are found in all schools in which the research was conducted (which is not the case, for example, with vocational subjects), so their greater representation in relation to teachers from other teaching areas is not surprising. A possible cause for the relatively small number of surveyed teachers from natural sciences and mathematics is the fact that one teacher often teaches several related subjects in one school (e.g., mathematics and physics, chemistry and biology), but also the case when a teacher, who teaches informatics/computer science is also teaching mathematics or statistics at the same time (in this case, the teacher is classified in the group of informatics teachers). An additional possible reason of the smaller number of surveyed teachers from the natural sciences and mathematics field is in practice often situation that teachers from that field, who are often in demand in schools, teach in different schools (when this research was conducted, in many cases the teachers refused to take the survey, clarifying this with the fact that they had already taken the survey at another high school in which the same survey was conducted). In total, 129 high school teachers were surveyed.

Processing of data

The basic indicators of descriptive statistics (frequencies, percentages, cumulative percentages, ranks), which formed the basis for a further statistical processing of data (means, standard deviations) and for the statistical analysis of interference, were calculated with the quantitative analysis of the collected survey data. The statistical significance of the correlation of independent and dependent variables, on a probability level of 95% or 99%, was calculated by χ^2 tests. They were also used for the determination of the significance of identified differences between the data collected on samples of high school students and teachers.

Applied Innovations and Technologies
ISSN: 1804-4999

Analysis and interpretation of research results

Awareness about the opportunities to develop computer knowledge and skills, and attendance of Computer Training

Descriptive and interferential statistical procedures were used to verify the existing opportunities and possibilities, followed by a verification of the involvement of high school students and teachers in computer training.

Students

All surveyed students have had informatics as a mandatory subject in their high school education. Although schools have different names for the subject informatics (informatics, computer science, programming), it is implemented as a mandatory subject for all students in the first grade of high school.

When we speak of informatics as a non-mandatory school subject, whether it is an elective subject, an additional subject, leisure activities, etc. (Table 1), about 26% of students declared that their schools have such a program; even 46% mentioned a lack of such a program, while the rest of 28% of students declared that they do not know whether their school provides the possibility of non-mandatory informatics. It is important to note that in all high schools, where the research was conducted, students have the possibility to attend non-mandatory informatics class (in different organizational forms), however, as is evident from the collected data, only 26% of the students are familiar with this possibility.

TABLE 1. INFORMATICS AS A NON-MANDATORY SUBJECT IN HIGH SCHOOLS - AWARENESS OF STUDENTS

	f	%	∑%
YES	156	25.96	25.96
NO	277	46.09	72.05
I DON'T KNOW	168	27.95	100.00

Further statistical analysis of the collected data, conducted by χ^2 test, showed that none of the observed independent variables has any significant impact on the awareness of students about the existence of non-mandatory informatics in their schools. The open question of reason for such poor information of students remains, and should be answered in the future.

TABLE 2. INVOLVEMENT IN NON-MANDATORY INFORMATICS CLASSES - STUDENTS

	f	%	∑%
YES	47	30.13	30.13
NO	109	69.87	100.00

The question about the involvement in non-mandatory informatics classes in schools was answered only by those students who have previously responded that their school provides the possibility to attend non-mandatory informatics classes. Of 156 students who confirmed the existence of non-mandatory informatics as a subject in their school, only 30% participate in this form of classes (i.e., only 5% of all surveyed students) (Table 2). The reasons for such a poor response of students to participation in non-mandatory informatics can be sought in the previously shown information which indicates that

students are very poorly informed about the existence of such curriculums in their schools.

Of all observed independent variables, two were pointed out as statistically significant, when it comes to students' involvement in non-mandatory informatics in high schools; *class* (χ^2=13.094; df=6; p<0.05) and *type of high school* (χ^2=13.109; df=3; p<0.01). Younger students are significantly more involved in such subjects as compared to their older colleagues (1st grade: 51%; 4th grade: 13%). This means that non-mandatory informatics is attended most frequently by 1st grade high school students, in parallel to mandatory informatics class. Third grade high school students are least involved in non-mandatory informatics in schools (about 9%), which can be explained by a significant proportion of students enrolled in three-year high schools in the surveyed sample of high school students (who generally show the least interest for computers and various computer related activities). This is confirmed by the data on the type of high school as a statistically significant independent variable: none of the three-year vocational high school students, who were aware of the existence of non-mandatory informatics in their schools, was involved. Among the students who respond affirmatively regarding the existence of non-mandatory informatics as a subject in school, the four-year vocational high school students (about 39%) and gymnasium students (35%) were most commonly involved in this subject.

TABLE 3. ORGANIZATION OF COMPUTER TRAINING IN THE PLACE OF EDUCATION/RESIDENCE - AWARENESS OF STUDENTS

	f	%	∑%
YES	215	35.77	35.77
NO	210	34.94	70.72
I DON'T KNOW	176	29.29	100.00

Students were also asked to indicate whether computer training is organized in their place of education or residence (Table 3). Their affirmative and negative answers were approximately equal (36% - YES, 35% - NO). Yet about 29% of the students are not aware of such a possibility. Due to the fact that computer training is at least occasionally organized in all cities where the surveyed students go to school, we can conclude that students are also generally very poorly informed in this respect (although slightly better than in the case of non-mandatory informatics in their schools).

In the case of awareness about computer trainings outside of the school, several independent variables were significant. With regards to the *type of high school* attended by the students (χ^2=36.321; df=6; p<0.01) it was found that students from gymnasiums were better informed than students of vocational high schools (three and four year). When the variable of *possession of personal computer* is taken into account (χ^2=13.390; df=4; p<0.01), the best informed students are those with a networked personal computer (40%), followed by students with personal computer without Internet access (27%), while the students without personal computers are least informed (20%).

The assumption that owning a personal computer, especially one connected to the Internet, is generally increasing the students' interest in computer activities, and thus the awareness about them, therefore seems logical. Considering the existing access to the Internet, students with a networked personal computer have also greater opportunities to obtain information. Considering the *self-assessment of student's computer knowledge and skills*

Applied Innovations and Technologies
ISSN: 1804-4999

(χ^2=16.740; df=8; p<0.05), it was found that students, who assess their computer knowledge and skills higher, are significantly better informed about extracurricular computer trainings, and students, who indicated a lack of required knowledge and skills necessary to work on a computer, are least informed. So, a better awareness of extracurricular opportunities of computer training is associated with higher estimated levels of computer knowledge and skills. We can assume that this is partly because students who attend computer trainings assess their computer knowledge and skills higher and generally due to their higher interest in computers, and for the possibilities of computer training.

Involvement of students in non-mandatory informatics in schools (χ^2=8.998; df=2; p<0.05) also influences the awareness of the existence of extracurricular computer training or other forms of computer training: it is interesting that students who are not involved in non-mandatory informatics classes in schools are better informed about extracurricular computer training (43%), compared to their colleagues who are involved in non-mandatory informatics in school (23%), of which 49% believe that there is no additional extracurricular computer training (the above percentages do not apply to all surveyed students, but only to those who answered the question regarding the existence of non-mandatory informatics in their schools affirmatively). It seems that the students who attend non-mandatory informatics in schools do not seek further information on other possibilities of computer training.

TABLE 4. ATTENDANCE OF COMPUTER TRAINING OUTSIDE OF THE SCHOOL - STUDENTS

	f	%	∑%
YES	43	7.16	7.16
NO	557	92.68	99.84

Table 4 shows that only 7% of the total number of students attend or have attended some form of computer training outside of the school. The reasons for such poor student involvement in this kind of computer training are in their poor awareness, but also in the shown readiness of students for computer training (which will be shown in the analysis below). These data are even more interesting when compared to the data on pointing out the most important ways of acquiring computer knowledge and skills (Jagić and Vrkić Dimić, 2010). Of 43 students involved in computer training outside of the school (Table 4), only 4 point it out as having the most important role in the acquisition of knowledge and skills necessary to work on the computer (Jagić and Vrkić Dimić, 2010). With respect to the presented data, the question of quality of such training is raised.

Of all observed independent variables only *assessment of knowledge and skills necessary to work with a computer* turned out to be significant for involvement of students in computer training outside of school, although it only exceeded the statistical margin of safety (χ^2=9.707; df=4; p<0.05): students, who assessed their computer knowledge and skills higher, were significantly more involved in additional computer training outside of school, compared to students who estimated their computer knowledge and skills to be lower.

Teachers

Teachers were also asked to state whether computer training is organized in place of their work or residence. Questions of awareness of the existence of organized training for teachers (ECDL programs) and training for the general public were separated.

TABLE 5. ORGANIZATION OF COMPUTER TRAINING IN THE PLACE OF RESIDENCE/WORK - AWARENESS OF TEACHERS

	TRAINING FOR TEACHERS - ECDL		TRAINING FOR THE GENERAL PUBLIC	
	f	%	*f*	%
YES	76	58.92	100	77.52
NO	25	19.38	6	4.65
I DON'T KNOW	28	21.71	23	17.83

Table 5 shows that about 59% of teachers are aware of the fact that a computer training course for teachers is available in the place of their work or residence, while about 78% of them know that there is training aimed to the general public. About 19% of teachers declared that there is no computer training for teachers in places of their work or residence, while little less than 5% of them says that there is no training aimed to the broader public. A large percentage of teachers (around 20%) say that they don't know whether there is any kind of computer training at the place of their work or residence.

These data reflect an alarming level of teachers' ignorance or lack of interest in computer training, since in every city in which teachers work, computer training for the general public is organized at least occasionally. The data are even more alarming when it comes to training intended for teachers, because computer training for teachers is available in the Republic of Croatia. It is organized based on expressed interest of high school teachers and is funded by the competent Ministry. It is the previously mentioned ECDL program, and the school staff is encouraged, through the leadership of the school, to get involved. It should be noted that the above programs, except in organizational terms (organization of teacher composed homogenous groups for computer training), are not specifically adapted for the teachers, i.e. the activities of teaching and learning (which is reflecting their biggest flaw), but the same ECDL programs are also periodically organized for numerous other public and state employees (public and state administration).

Independent variables were found to be statistically insignificant, even when it comes to awareness of teachers about the opportunities of computer training for them, or about organization of computer trainings for the general public. So, as with the students, we believe that further studies should determine the reasons for such poor awareness of teachers about the possibilities of computer training.

TABLE 6. ATTENDANCE OF COMPUTER TRAINING - TEACHERS

	TRAINING FOR TEACHERS - ECDL		TRAINING FOR THE GENERAL PUBLIC	
	f	%	*f*	%
YES	42	54.55	28	27.72
NO	35	45.45	73	72.28

Teachers who responded affirmatively to the question regarding the availability of computer training in places of their work or residence had to specify whether they were involved in such forms of computer training (Table 6). Of the total number of teachers who were informed about the availability of such training, almost 55% of them attended computer training intended for teachers (i.e. about 33% of all surveyed teachers), while training of the general public was attended by a smaller part of teachers, around 28% (i.e. about 22% of all surveyed teachers). A smaller number of teachers involved in computer training for the public, in relation to the number of teachers involved in ECDL programs, should not be surprising because public computer trainings require significant financial

Applied Innovations and Technologies
ISSN: 1804-4999

investments of teachers (taking into account the unenviable material position of teachers in Croatia, this ratio seems logical).

Attending computer training for teachers (χ^2=12.274; df=3; p<0.01) and computer training for the general public (χ^2=11.692; df=3; p<0.01) was statistically significantly associated with *self-assessment of knowledge and computer skills*: in both cases, teachers who attended computer training were assessing their computer knowledge as being high, compared to teachers who did not attend the mentioned forms of computer training. A correlation between *attendance of computer training for teachers and computer training for the general public* (χ^2=4.415; df=1; p<0.05) was also found: teachers who were or still attend computer training for teachers are more likely to attend computer training for the general public, just as those involved in training for the general public more often respond that they were attending computer training intended for teachers.
Teachers were also asked if they are encouraged by their school colleagues, primarily the principal, pedagogue and other teachers, to participate in computer training.

TABLE 7. ENCOURAGING TEACHERS TO GET INVOLVED IN COMPUTER TRAINING BY THEIR SCHOOL COLLEAGUES

	f	%	∑%
YES	83	64.34	64.34
NO	45	34.88	99.23

Table 7 shows that this kind of stimulation is present with teachers in 64% of cases. Independent variables did not show a statistically significant connection with the encouragement of teachers to get involved in computer training by their school colleagues.

Readiness and motives for involvement in computer training

The readiness of students and teachers to engage in computer training, if such training was offered to them, was examined. Individual motives for involvement or non-involvement in computer training were isolated. Thus, students and teachers were offered two positive motives each. One of them is a general motive and related to the fact that computers are ubiquitous, and even unavoidable in the lives of people today - "Yes, it is always good to learn something new about working with a computer" and the other is aimed at easier and more creative education and/or work: students - "Yes, I could use that for easier employment or further education"; teachers - "Yes, I could use that for an easier and more creative performance on the job". In addition to the positive ones, two negative motives were also offered: one related to the assessment of the sufficiency of individual computer knowledge and skills - "No, I have enough knowledge and skills in working with a computer" and the other, which in addition to the high assessment of own computer knowledge and skills also includes a kind of distrust towards the usefulness and the possibilities of computer training - "No, I would not learn anything that I already don't know." Respondents were also offered one motive that relates to the lack of interest for computers in general ("No, I'm not interested in computers"). The response frequency of both groups of respondents is shown in Table 8 below.

As is evident from the presented data (Table 8), most students and teachers showed a readiness to engage in computer training, regardless of the type of motive (because they think it's always good to learn something new about working with a computer, or believe that such training will be beneficial in their current or future work and/or education). However, compared to students, a larger number of teachers indicate the readiness for

training (a total 88% of the teachers: 69% of the students). These differences were tested with the χ^2 test and the results indicate a statistically significant difference.

TABLE 8. READINESS AND MOTIVES FOR INVOLVEMENT / NON-INVOLVEMENT IN COMPUTER TRAINING - STUDENTS AND TEACHERS

	STUDENTS		TEACHERS	
	f	%	*f*	%
Yes, it is always good to learn something new about working with a computer	212	35.28	79	61.24
Yes, I could use that for easier employment or further education / for an easier and more creative performance on the job	202	33.61	35	27.13
No, I have enough knowledge and skills in working with a computer	101	16.81	9	6.98
No, I would not learn anything that I already don't know	34	5.66	2	1.55
No, I'm not interested in computers	52	8.65	4	3.10
χ2=34.05, df=4, χg2=9.49, p<0.05				

It may also be noted that students and teachers differ in their reported motives for involvement in computer training: while students equally demonstrate the readiness for computer training because it is always good to learn something new about working with a computer (35%) and because that knowledge and skills could be used for employment and/or further education (34%), teachers are more than twice as likely to show readiness for computer training because they find it is always good to learn something new about computers (61%), compared to the motive associated with easier and more creative work performance (27%). It can be concluded that, although the majority of teachers believe that nowadays it is important to know how to work on the computer and therefore engage in computer training, yet only a small portion consider that their computer knowledge and skills are primarily focused on the improvement and enrichment of the teaching practice.

As we can see, compared to their teachers (12%), students more than twice as often (31%) show no desire to be involved in computer training for all the above reasons.

Students

Further implementation of χ^2 tests showed a statistically significant association of many independent variables with the readiness and motives of students for involvement in computer training. Regarding the *type of high school* (χ^2=25.030; df=12; p<0.05) it was found that gymnasium students more often than students of vocational high schools declare they readiness to engage in computer training, because it is always good to learn something new about computers and because they believe that computer knowledge and skills could be useful in further education or easier employment. Students of vocational high schools, particularly three-year vocational schools, significantly more often than other students respond that they are not interested in computer training, because they are generally not interested in computers. The *school success* variable (χ^2=32.726; df=16; p<0.01) showed that with greater success in school, students more often express a readiness to engage in computer training (for both of the above reasons), and as a school success is lower, they often respond that they do not want to participate in training (for all the above reasons).

Applied Innovations and Technologies
ISSN: 1804-4999

Sex of students was also a significant independent variable (χ^2=27.532; df=4; p<0.01)*:* 42% of female students, compared to 26% of mail students, respond that additional computer knowledge and skills could be useful in easier employment or further education. Mail students (almost 30%) twice as often as female students (15%) declare their non-readiness to participate in computer training, because they believe they already possess enough computer knowledge and skills and that they would not learn anything new about computers during training. This information is consistent with the results of significant differences between male and female students with respect to self-assessed levels of computer knowledge and skills: compared to the female students, male students estimate their computer knowledge and skills significantly higher (Jagić and Vrkić Dimić, 2010).

SES of students shows significant correlation with their readiness to engage in additional computer training (χ^2=26.324; df=16; p<0.05): although the majority of students, regardless of SES, express readiness for computer training, it was found that the frequency of students' readiness to engage in computer training increases with the increasing of SES levels and vice versa. These results were expected, as additional computer training also requires significant financial resources. Regarding *existence of computers in the student's household* (χ^2=29.517; df=8; p<0.01), it was shown that students, who have a personal computer (networked or not) generally show a greater readiness to engage in computer training (for both reasons mentioned above), compared to students without personal computers, who often declare that they do not want to participate in computer training (for all the reasons mentioned above).

Students' self-assessment of computer knowledge and skills is correlated with the expression of readiness of students to engage in computer training (χ^2=114.505; df=16; p<0.01): as the assessed students' level of computer knowledge and skills is higher, the students show a higher readiness to engage in computer training because it is always good to learn something new about working with a computer, but there is also an increase in frequency of student responses that they do not wish to participate in computer training because they believe they would not learn anything new about computers that don't already know.

Teachers

Teachers among themselves differ significantly in the readiness for involvement in computer training with regard to *sex* (χ^2=11.998; df=4; p<0.05): male respondents (80%), compared to their female colleagues (92%), declare generally less often their readiness to engage in training, and 20% declare that they do not need to be involved in computer training, which applies to only 8% of female teachers. Teachers' *self-assessment of computer knowledge and skills* (χ^2=22.728; df=12; p<0.05) is also a significant independent variable: although the vast majority of teachers shows a readiness to engage in computer training, regardless of their motives, teachers which assess their computer knowledge and skills as basic or advanced are however more prone to it, while teachers without computer knowledge and skills in relation to other teachers, are more likely to declare their lack of interest in computers and therefore do not wish to engage in computer training. This is a worrying fact which indicates that those teachers who are in most need of such training are not willing to get involved.

Conclusion

After considering the results of the empirical research, we will look at the initial hypothesis. We assumed in it a significant advantage of high school students in relation to teachers when it comes to opportunities, awareness and involvement in computer training and readiness and motives for computer training. Based on the results of research we determine that the initial hypothesis is partially confirmed, and that the image of computer training of high school students and teachers depicted here by the shown results are far more complex than those referred to by the initial assumption. Therefore, we form the following conclusions:

Opportunities for computer training of high school students are far wider compared to computer training of their teachers. There is primarily a difference within the formal education levels: all high school students attend informatics in the first grade of high school. Also, earlier in elementary school they had the opportunity to engage in computer training as part of elective subjects (in the four-year period from 5th to 8th grade) and later in high school, they were provided with computer training as a non-mandatory informatics subject. Their teachers (mostly) had no opportunity to gain skills for working with a computer during their primary and secondary education (such school curriculums did not exist in the past). As shown in the theoretical part of the work, computer training is not conducted in an appropriate manner or is even completely ignored during university education of teachers. Therefore for many teachers-practitioners additional forms of computer training, whether intended for teachers (ECDL) or the public, are the only formal/non-formal form of the computer training.

When it comes to the awareness of high school students and teachers about the possibilities of additional computer training inside and outside the school, the empirical data showed an alarming level of non-awareness in both cases. Particularly worrying and surprising is the lack of student awareness about the possibilities of attending non-mandatory informatics in their schools (only 26% of all students are aware with this possibility), as well as the alarming level of high school teachers' lack of awareness on the possibilities of computer training for teachers (41% of teachers responded that there are no or that they are not aware of ECDL programs for teachers). Both students and teachers are somewhat better informed about computer training intended for the general public, however insufficient in this case as well. The task to examine the reasons of such poor awareness of computer training, especially within schools, remains for the future. At the same time, the observed independent variables did not show a statistical significance level, except for the awareness of high school students about the possibilities of extracurricular computer training outside of the school. Compared to students in vocational high schools, gymnasium students, students with networked personal computer and students who assess their computer knowledge and skills higher are significantly better informed about such training. It is interesting to see that high school students who are involved in non-mandatory informatics in their schools show less awareness about the possibilities of computer training outside of the school than students who are not included in such non-mandatory school subjects, but are aware that they exist.

Only 5% of the surveyed students were involved in non-mandatory informatics in their schools, and only slightly more of them (7%) participated in some form of computer training outside of the school. Teachers lead significantly in additional non-mandatory computer training: 33% of them attended ECDL programs, and 22% attended computer training aimed to the public. Although these are significant differences in favour of the teachers, it should also be noted that in the case of attending computer training, high school students are still in significant advantage in relation to their teachers, as attending any of the non-mandatory forms of computer training for students *always* represents additional training (all students attend mandatory informatics in the first grade of high school), while for many teachers this is the *only* possibility of computer training (due to absence of such curriculums during their formal education). So, despite a significantly more frequent involvement of teachers in additional computer training in relation to

Applied Innovations and Technologies
ISSN: 1804-4999

students, we can still say that the number of teachers trained to work with a computer is insufficient. Considering the impact of observed independent variables, it was found that students who assess their computer knowledge and skills higher (or they assess them higher because of the training) were significantly more often involved in computer training outside of the school, which also applies to teachers in both observed forms of computer training (ECDL programs and public computer trainings). It is interesting that teachers who participate in one of the two observed forms of computer training are also significantly more often involved in another form of training. This information may indicate the existence of a certain inclination of a group of teachers towards computer training in general, but it can also be interpreted such that the teachers feel the need for further training even after attending computer training. A possible cause for this phenomenon could be inadequacy of the existing computer training with regard to the specifics of the teaching profession, and consequently the specific ways of using ICT in the process of teaching and learning. Additional research should be conducted to determine the needs of teachers for computer training, whose attendance would result in good and creative use of ICT in class, learning and teaching.

Both students and teachers show for the most part a readiness to engage in computer training (if it was offered to them). At the same time teachers (88%) are in a statistically significant advantage compared to students (69%). There is also a significant difference between students and teachers in the expressed motives: while students express positive motives for involvement in computer training because it is always good to learn something new about working with a computer (35%) and computer knowledge could help them in education or employment (34%), teachers more than twice as often associate the built computer knowledge and skills with the general usefulness of computer knowledge (61%), than with easier and more creative performance on the job (27%). This is an alarming fact which speaks in favour of the statement that a good use of ICT is still not part of wide school practice of teaching and learning and that teachers are not aware of its teaching perspective.

Many observed independent variables were statistically significant with the surveyed students: while gymnasium students are more likely to engage in computer training because they think that it is always good to learn something new about computers or because they think that computer knowledge will be useful in further education and/or employment, students of vocational high schools (especially three-year high schools) in general significantly more often respond that they are not willing to engage in computer training because they are not interested in computers. The readiness to engage in training generally grows with higher school success, while lower school success increases the frequency of negative responses. While the female students (42%) significantly more often than male students (26%) reply that they are willing to engage in computer training because they think such knowledge is useful in education or employment, male students (30%) state their unwillingness to engage in computer training twice as often as female students (15%) because they think they have sufficient computer knowledge and skills, or they think that they would not learn anything new in present computer trainings. A mutually proportional relationship was found between the readiness to attend computer training and SES: with an increasing level of SES, the readiness to engage in computer training grows and vice versa. Students who own a personal computer (with or without an Internet connection) generally show a greater readiness to computer training compared to students without personal computers, who significantly more often say they do not want to participate in computer training. When it comes to self-assessment of computer knowledge and skills, we can see that students who assess their computer knowledge and skills as being higher, more often declare their readiness for computer training because it is always good to learn something new about computers, but the frequency of negative motives related to a kind of disbelief in the usefulness of computer trainings also increases, where they find that they would not learn anything they do not already know. In their readiness for computer training, teachers differ according to sex: women (92%) show an overall greater readiness to engage in computer training compared to their male

colleagues (80%). Ultimately, a causal relationship between the readiness for computer training and self-assessed computer knowledge and skills was observed: teachers who assess their computer knowledge and skills as basic or advanced are generally more inclined to training, while teachers without developed computer knowledge and skills significantly more often than others respond that they do not want to participate in computer training because they are not interested in computers. This last information is particularly alarming because it shows an aversion towards computer training particularly of those teachers which need such training the most.

The task of designing computer training, which would enable true transformation of the existing practices of teaching and learning, remains for the future. We hope that the data we obtained in this research will, at least partly, be used for this purpose.

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