INFO-1041
Primljeno/Received: 2008-03-24

UDK: 37: 681.3:007
Original Scientific Paper / Izvorni znanstveni rad

THE COMPUTER AS A MODERN FORM OF COMMUNICATION IN THE EDUCATIONAL PROCESS FROM THE TEACHERS` POINT OF VIEW

KOMPJUTER KAO MODERAN OBLIK KOMUNIKACIJE U PROCESU EDUKACIJE SA ASPEKTA UČITELJA

*Mateja Ploj Virtič, Mateja Pšunder**

Faculty of Natural Sciences and Mathematics, University of Maribor, Maribor, Slovenia, Faculty of Arts, University of Maribor, Maribor, Slovenia*

Prirodoslovno-matematički fakultet, Sveučilište u Mariboru, Maribor, Slovenija, Fakultet za umjetnost, Sveučilište u Mariboru, Maribor, Slovenija

Abstract

Effective integration of information and communication technology (ICT) into the teaching process is becoming an indispensable part of an effective educational process. In this study, the research was conducted at reprezentative sample of teachers teaching Design and technology in primary school in Slovenia on the use of the computer and the applicability of individual forms of e-learning in class and reported on the actual use of the computer in their classroom. The basic finding of the study is that teachers do use computers in class and that they are inclined towards using different forms of e-learning. Their position regarding the use of the computer in class is positive, with the exception of the attitude towards the knowledge and experiences acquired during their undergraduate study. Such information indicates that in the future, special attention must be given to the training of teachers for the use of the computer already during undergraduate study.

Sažetak

Efektivna integracija informacijskih i komunikacijskih tehnologija (IKT) u nastavi postaje nezamjenljiv dio učinkovitog edukacijskog procesa. U radu je provedeno istraživanje na reprezentativnom uzorku učitelja tehnike i tehnologije u osnovnoj školi u Sloveniji o okolnostima korištenja kompjutera i o primjenjivosti pojedinih oblika e-učenja u razredu, a istodobno i o stvarnom korištenju kompjutera u njihovom razredu.

Osnovni nalaz ove studije je, da nastavnici upotrebljavaju kompjutere u razredu i da su skloni različitim oblicima korištenja e-učenja. Njihovi stavovi prema upotrebi kompjutera i e-učenja u razredu su pozitivani. Pojedinačni različiti stavovi su u korelaciji s prethodnim stečenim znanjima, nastavničkom iskustvu i stečenim znanjima tijekom studija.Rezultati pokazuju da treba u budućnosti veću pažnju usmjeriti na bazično obrazovanje nastavnika za primjenu kompjutera u studijskim programima na dodiplomskim studijima.

1. Introduction

The teaching methods and styles in the educational process changed through history and have always aimed at higher quality. In the last 15 years, computer use increased reflecting itself of course also in the field of education. Initially, computers were used only to prepare different documents or for simple programming, while with the emergence of the internet, the applicability of the computer affected all areas of life.

In the field of education, the computer provides a broad range of applicability. In addition to its educational function, it also enables communication on various levels and thus the use of the term information and communication technology (ICT).

The use of ICT in education can be divided into /**1**/:

1. the use of ICT as object of study. It refers to learning about ICT. Mostly organised in a specific course. Education prepares students for the use of ICT in education, future occupation and their daily life;
2. the use of ICT as an 'assisting tool'. ICT is used as a tool, for example while making assignments, collecting data and documentation, communicating and conducting research. Typically, ICT is used independently from the subject matter;
3. the use of ICT as a medium for teaching and learning. This refers to ICT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. It appears in many different forms, such as drill

and practice exercises, in simulations and educational networks;
4. and the use of ICT as a tool for organisation and management in schools.

This article focuses on the 2nd and 3rd manner of using ICT that are most often used by teachers.

Despite their belief that ICT is a useful tool, some teachers still do not use it, as they believe that they are not competent to use ICT. In the past, teachers did not engage with ICT during their study as often as the teachers studying today and as a result, the already employed teachers often believe that they are not competent enough to use a computer in their classroom. Their knowledge on the use of ICT therefore largely depends on themselves, their interest and most commonly their self-education in this field.

The revolution of ICT is a major challenge for teachers' professional development. Teachers not only have to become familiar with ICT but also need to acquire the pedagogical expertise needed for fruitfully working with new technology-based learning environments /**2**/.

Teachers need to plan thoughtfully before they start ICT integration into a curriculum. For instance, they have to choose the correct ICT tools for particular learning objectives or contexts, modify existing resources or develop new learning environments to engage specific groups of learners /**3**/.

Numerous researches conducted in the last years have studied the use of ICT in education (Loveless, Bitner, Chen and others). They have predominantly shown that the decisive factor for a successful implementation of ICT into education is the teacher (Bitner, Chen and Romano). This is a logical consequence of the fact that it is the teacher who directly performs the teaching process and at the same time the one who uses ICT. There are numerous factors influencing the teacher's use of ICT. According to some authors (Ertmer, Windschitl and Watson), the most important factor is the teacher's belief in the transformative nature of new technologies.

Hermans & Tondeur /**4**/ claim that among the factors influencing the use of ICT in class, the most important is the impact of computer experience, general computer attitudes and gender and only second is a positive effect of constructivist beliefs. Their research has also shown that traditional beliefs have a negative impact on classroom use of computers.

From the Perceptual Control Theory (PCT) perspective, three conditions are necessary for teachers to use technology /**5**/:

1. The teacher must believe that technology can more effectively meet a higher-level goal than what has been used;
2. The teacher must believe that using technology will not cause disturbances to other higher-level goals that the he or she thinks are more important than the one being maintained;
3. The teacher must believe that he or she has or will have sufficient ability and resources to use technology.

The factor that we see as strongly related to the use of ICT in education is the field of teaching. Due to specific differences of individual subject areas, the use of ICT strongly differs among teachers of different subjects. We are not trying to say that the use of computers in social sciences is less appropriate than in natural sciences but merely wish to point out the obvious difference. In teaching natural sciences, it is necessary to highlight teachers of technical subjects. In primary schools, these teachers are often also administrators of computers, computer systems and computer classrooms. It is precisely their knowledge about computers and their applicability that should be the decisive factor for the use of ICT in teaching technical subjects.

In order to understand modern technologies and the consequences of their use, the knowledge of design and technology is essential for all wishing to stay abreast with the times. This relates to all areas of life, from medicine, pharmacy and economy to conventional natural sciences, such as mechanical engineering, electrical engineering and chemical technology.

The pupils are met with design and technology in the 4th and 5th grade studying Natural Sciences and Design, while Design and Technology (D&T) is part of the 6th, 7th and 8th grade curriculum. In secondary education, subjects with technological contents are present only in vocational and professional education, while none are taught in general secondary schools.

Design and Technology is a subject taught in primary school providing technical education and enthusiasm for further education in the technical field. The use of modelling in ICT enables very graphic simulations and depictions of real, simple and complex technical procedures that can otherwise be conducted only in laboratories. The use of ICT thus efficiently facilitates and gives variety to classes, while the cost factor is also not to be neglected especially due to high costs of laboratory equipment. In order to increase the interest of the young population in technical occupations, we need to put special emphasis on teachers teaching D&T.

Conceptual learning is intensively being implemented into teaching programmes of natural

sciences and design, with its guiding principle being to experience or to get to know the effects of a scientific and technical law before giving it theoretical and mathematical attention. Different models, animations, simulations and other ICT elements are an ideal tool to attain these aims.

The development of ICT thus provides ample opportunity for further development of didactics and teaching methodology and the use of appropriate methods, as it successfully motivates pupils, requires active participation and the interconnection of different fields of knowledge, while at the same time constantly acquiring new ones. ICT opens new ways of teaching while acting as a means of motivation. The latter is especially important if we consider the importance of pupil motivation for successful education and their readiness to solve even the more complex problems. We of course need to be careful and use it only when this is sensible and when it guarantees optimum pedagogic, professional, technical and educational boundary conditions. ICT must therefore be considered as one of the potentials of learning strategies of a higher quality essentially influencing traditional work methods and contents.

With regard to these facts, one might conclude that D&T teachers in schools are among the most competent for the use of the computer in class, while usually also the school's computer administrators. Furthermore, we must also not neglect the nature of the subject that D&T teachers teach, as due to its specifics, it often requires the use of the computer in class. We believe that these are only a few facts that might influence the fact why D&T teachers use the computer in class more often than other teachers might, so it would be good to know their viewpoints on the use of the computer in class and their actual use of this tool in the educational process. We decided to pay special attention to this point in this study. The study is interesting especially as it considers the fact that the beliefs regarding the use of the computer and its actual implementation in the educational process might essentially vary among teachers of different subjects. The so far conducted research has namely not paid special attention to this fact.

2. The Empirical Research

2.1. Research Problem

Based on the facts that we stated in the first part of this article, we concluded that D&T teachers are one of the principal subjects to facilitate the use of the computer in class or should at least be such a factor. We therefore decided to research their opinions on the circumstances regarding the use of the computer in class and the actual use of the computer in class. Specifically, the study attempted to answer these questions:

- What do D&T teachers think about the circumstances for the use of the computer in class?
- What is the applicability of individual forms of e-learning in class according to D&T teachers?
- How much is the computer actually used in class according to D&T teachers?

2.2. Method

Participants

The participants in this study were 67 teachers teaching D&T at primary schools in Slovenia. It needs to be stressed that Slovenian primary schools usually have only one teacher of Design and Technology.

The sample of teachers was approximately equally divided by age (32.8% up to 40 years of age, 32.8% from 40 – 45 years of age and 34.3% above the age of 45) and period of employment (50.7% up to 20 and 49.3% more than 20 years). With regard to the location of the school, the sample covered teachers at rural schools (47.8%), followed by teachers at urban schools (34.3%) and teachers at suburban schools (17.9%). Just under two thirds of teachers (59.7%) have a higher education diploma and just over one third (40.3%) have completed post secondary education.

Data Collection

Data was collected using anonymous questionnaires that were developed by the author and co-author to be used in this study. The authors submitted the questionnaire to the National Education Institute that sent the questionnaires to D&T teachers who in turn filled them in and returned them by email.

The questionnaire consisted of two sections. The respondents were first asked to provide some general information (the teacher's age, period of employment, school location, level of education). In the second part of the questionnaire, a number of questions about the teacher's beliefs regarding the circumstances of using the computer in class, applicability of individual forms of e-learning in class and about the actual use of computers in the teaching process were observed.

2.3. Results

Opinion of the Teachers Regarding the Circumstances of Using the Computer in Class

We were initially interested in the viewpoints of Design and Technology teachers regarding the

circumstances of using the computer in class. We were interested if they see the circumstances as supporting or hindering the use of the computer in class. We were interested in what the teachers think about the following circumstances that might be more or less favourable for the use of the computer in class:

- opinion of the teachers regarding the circumstances of using the computer in class,
- opinion of the teachers regarding the necessity of additional education for the use of the computer in class,
- opinion of the teachers regarding the sufficiency of practical education for the use of the computer in class during study,
- opinion of the teachers regarding the inclination of the school's management towards the use of the computer in class and
- opinion of the teachers regarding the interest of pupils in the use of the computer in class.

These circumstances are probably the key factors influencing the use of the computer in class that we discussed in more detail in the Introduction. The teachers used a five-stage scale to express their opinion on whether the circumstances for the use of the computer in class are favourable or not. Statements relating to individual circumstances were appointed numeric values from 1 – I completely disagree to 5 – I completely agree. The more the teachers agreed with individual statements, the more they believe the circumstances to be favourable for the use of the computer in class. Their answers are presented in Table 1.

Table I: Mean of Rating Scores[a], Standard Deviations and Rank Orders[b] of teachers reporting on the circumstances regarding the use of the computer in class

Circumstances regarding the use of the computer in class	Mean	SD	Rank order
Use of the computer in class in necessary.	4.52	0.73	1-2
Pupils are interested in the use of the computer in class.	4.52	0.68	1-2
Additional education of teachers for the use of the computer in class is necessary.	4.19	0.78	3
The school's management facilitates the use of the computer in class.	4.12	1.00	4
The study of design contains sufficient practical training regarding the use of the computer in class[c].	1.48	0.66	5

[a]A higher score indicates that teachers see an individual circumstance as more favourable for the use of the computer in class (1 = is not favourable for the use, 5 = is very favourable for the use)

[b]A lower rank indicates that teachers see an individual circumstance as more favourable for the use of the computer in class (1 = most favourable, 5 = least favourable).

[c]This question was answered only by teachers taking their undergraduate study at the Faculty of Education or after 2006 at the Faculty of Natural Sciences and Mathematics (n=59). In 2006, the Faculty of Education was divided into three faculties, one of them being the Faculty of Natural Sciences and Mathematics.

As evident from the table, the average response of teachers regarding four of the statements was positive, indicating their conviction that the teachers see the majority of the circumstances as being favourable for the use of the computer in class. There was only one of the statements that received a negative attitude, i.e. the statement that the study of design at the Faculty of Education (today's Faculty of Natural Sciences and Mathematics) provided sufficient training regarding the use of the computer in class. The opinions of the teachers regarding this statement show a decisive negative contrast in relation to all other statements (x =1.48, there are more than 4 other statements).

The undergraduate study of D&T at the Faculty of Education (today's Faculty of Natural Sciences and Mathematics) in Maribor includes a special course in Multimedia that is supposed to provide certain knowledge and experiences for the use of the computer in class. With regard to the considerable dissent to the statement, we might conclude that the students did not obtain the desired knowledge

and experiences regarding the use of the computer in class within the scope neither of the mentioned subject nor any other subject (e.g. didactics of individual subjects). These answers however do not indicate the simple conclusion that the teachers do not have the knowledge to use the computer in class, as there is always the possibility that they have obtained this knowledge through self-education or through other forms of education. This was not the subject of our study but this is indicated by the positive attitude of the teachers towards the statement that additional education of teachers regarding the use of the computer in class is important (x=4.19). Their answers indicate that the teachers are open to further education, as they see it as important and necessary.

Table 1 also shows that the teachers were most inclined towards two of the statements, i.e. that the use of the computer in class is necessary and that pupils are interested in using the computer in class. The teachers were equally positive about both statements (x=4.52). In the Introduction, we quoted authors (Ertmer, Windschitl and Watson) that stress the teacher or his beliefs about the transformative nature of new technologies as being the most important factor for the use of ICT. The answers provided by the teachers in this study indicate that they see the use of the computer in class as necessary, showing their inclination towards the use of the computer in class. Concluding from the stated studies, this is undoubtedly a good starting point for the actual use of the computer in class. Such insights are encouraging and we may hope that D&T teachers and their beliefs on the positive circumstances for the use of the computer in class might have a beneficial effect also on teachers of other subjects or subject areas.

The very positive viewpoint expressed by the teachers regarding the statement about pupil motivation for the use of the computer in class is also encouraging and advantageous for the use of the computer in class. Active participation of pupils in activities that they like reduces discipline problems. In engaging in such activities, pupils namely do not have time to engage in less productive actions. As pointed out by many authors (Jones, Pšunder and Stronge), it is possible to reduce the majority of discipline problems in the classroom with effective teaching. At the same time, the active participation of pupils in learning activities contributes to them having a better understanding of the subject matter and finding it easier to remember.The fourth position regarding the favourability of individual circumstances regarding the use of the computer in class was taken by the statement regarding the inclination of the school's management towards the use of the computer in class. We regard such answers as satisfactory, but are however convinced that the school's management might do even more in this field. The school's management is namely that subject which has an important impact on whether the school as an institution and its employees will be inclined towards novelties arising from the continual development and resulting changes and whether these novelties will be implemented in school work or whether the practice will hinder them. We therefore believe that it is essential for the school's management to first be aware of the importance of the use of the computer in class, to use computers themselves and at the same time stimulate their colleagues to do the same. We would especially like to stress that it is the school's management that provides the material conditions for the use of the computer.

Opinion of the Teachers Regarding the Applicability of Individual Forms of E-Learning in Class

In the second part of the study, we were interested in which forms of e-learning the teachers see as being the most applicable for use in the educational process. The teachers expressed their opinion on individual forms of e-learning on a five-stage scale. Statements relating to the applicability of individual forms of e-learning were appointed numeric values from 1 – I completely disagree to 5 – I completely agree. The more that the teachers agreed with an individual statement, the more they are convinced about the applicability of an individual form of e-learning in the educational process. We must however not ignore the fact that teachers answered with regard to the specifics of their subject, i.e. D&T which probably differs from other subjects. Their answers are presented in Table 2.

Table 2 shows that the teachers expressed a positive viewpoint about the majority of forms of e-learning with regard to their applicability in the educational process. The mean rating of online seminars indicates a neutral viewpoint regarding their applicability in the educational process (x=3.00), while the applicability of blogs received a negative viewpoint (x=2.63).

The opinions of teachers regarding the applicability of different forms of e-learning in the educational process are very pleasing. Their answers might allow us to conclude that they are open to different possibilities of using the computer in class. The diverse use of individual forms of e-learning is of course necessary, so as to allow the teacher to prepare an interesting and attractive class. The prevalence of individual forms of e-learning in class

Table II: Mean of Rating Scores[a], Standard Deviations and Rank Orders[b] of teachers reporting on the applicability of individual forms of e-learning.

Forms of e-learning	Mean	SD	Rank order
Simulations	4.33	0.93	1
Interactive exercises	4.03	0.92	2
E-material	3.96	0.89	3
Educational portals	3.37	0.95	4
Forum	3.21	1.16	5
Online seminars	3.00	1.03	6
Blog	2.63	1.08	7

[a]A higher score indicates that teachers see an individual form of e-learning as more applicable in the educational process (1 = not applicable at all, 5 = very applicable).
[b]A lower rank indicates that teachers see an individual form of e-learning as more applicable in the educational process (1 = most applicable, 7 = least applicable).

might result in the pupils quickly growing weary of the use of the computer in class.

Table 2 indicates that teachers see simulations as the most applicable form of e-learning in the educational process (x=4.33). Such answers probably relate to the specifics of the subject that D&T teachers teach. There are numerous specific programmes available for the field of design and technology, facilitating simulations that might otherwise be difficult or even impossible to witness in the natural environment (e.g. simulation of operation of an individual machine). From this point of view, the computer in D&T classes seems a necessary and indispensible part of a quality educational process as indicated by the answers provided by the teachers.

The teachers are a little less (but still substantially) inclined towards interactive exercises (x=4.03) and e-material (x=3.96) that they have classified as the second and third most applicable form. Educational portals were classified as fourth (x=3.37) and forums as fifth (x=3.21).

The Use of the Computer among D&T Teachers

In the third part of our study, we focused on the actual use of the computer among D&T teachers. The first question asked within the framework of this part of the questions was whether they used the computer in class. All but one (98.5%) answered that they used the computer in class. The teacher answering that he or she does not use the computer is aged between 35 and 40, has 20 years of service, works at a rural school and has completed post secondary education.

The next question related to the type of software that the teachers use in the implementation of the educational process. The Ministry of Education and Sports suggested CiciCad as the only software for technical drawing in Slovene and the high percentage (97%) of teachers using this software was thus expected. The second place was awarded to Edison (23.9%). An approximately same percentage of teachers (22.4%) stated that they use also other software in class: AutoCad, SolidWorks, Catia, Proengineer and WinMeh.

The teachers were also asked about why they use the computer in technical subjects. Their answers are presented in Table 3.

Table III: The purpose of using the computer in the educational process

The purpose of using the computer	f	f%
Support in class	58	86.6
Simulations of more complex technical systems	52	77.6
Independent acquisition of knowledge and information	48	71.6
Practical part	19	28.4
Homework	5	7.5
Other	3	4.5

It is evident from the table that the majority of the teachers (86.6%) use the computer as support in class, i.e. the use of ICT as an assisting tool as defined in the Introduction as the 2nd manner of using the computer according to Plomp /**6**/. A somewhat smaller number of teachers (but still a substantial percentage) use the computer for simulations of more complex technical systems (77.6%). We anticipated such results and they are probably closely connected to the specifics of D&T that we covered in more detail in the introductory part of this article. It is recalled that teachers indicated simulations as being the most applicable form of e-learning.

Teachers rather often use the computer for independent acquisition of information and knowledge (71.6%). Such answers indicate that for D&T teachers, the computer represents an important source of knowledge and information. Such acquisition of knowledge and information is fast and enables access to different types of information while at the same time requires the teacher to display critical reflection regarding the suitability and adequacy of the acquired information. One of the characteristics of acquiring information over the internet is also that the quantity of information does not represent any problems; it is more how to choose the right and useful ones.

Something less than one third of the teachers (28.4%) said that they use the computer in the practical part and only 7.5% of teachers that they use the computer also for homework. Such answers are somewhat expected, as teachers cannot expect all pupils to have a computer to do their homework. On the other hand, we cannot ignore the fact that numerous schools have modern computer classrooms but the question remains to what extent the pupils are able to use these classrooms outside classes. Some of the teachers (4.5%) stated that they use the computer also for other purposes, i.e. planning and technical drawing.

The Use of Educational Portals among D&T Teachers

The last set of questions in the questionnaire related to the use of educational portals among D&T teachers. We were first interested in whether teachers even use educational portals or how often they use them. The teachers answered this question by choosing answers among the provided possibilities.

The majority of the teachers (92.5%) stated that they use educational portals. Among the teachers answering that they do not use educational portals, 4 of the teachers were over the age of 40. Such answers might relate to the fact that the older generation in general has more difficulties adapting to new computer technologies than the younger one, as these see computer technology as an intrinsic part of their lives. It is also interesting that all teachers who do not use educational portals have concluded a non-teaching field of study, four of them have completed higher education and only one has a university degree.

The majority of the teachers (50.7%) stated that they use the educational portals a few times a month; these are followed by teachers who use these portals several times a week (28.4%). Only 10.4% of teachers said that they use the portals less than once a month and only 3% of teachers use these portals every day. It is recalled that teachers positioned educational portals as fourth regarding the applicability of forms of e-learning in the educational process.

We were further interested which educational portals the teachers use most often. Their answers are presented in Table 4.

Table IV: Educational portals used by the teachers

Educational portals	f	f%
Moodle	22	32.8
School portal[a]	21	31.3
Učiteljska.net exchange of material[b]	33	49.3
Portal of the National Education Institute	42	62.7
Svarog.org[d]	11	16.4
Other	8	11.9

[a] Educational portal provided by individual schools
[b] Website enabling communication among teachers and the exchange of different materials
[c] Educational portal maintained by the National Education Institute
[d] Website enabling the exchange of professional literature for teachers

It is evident from the table that teachers use rather different portals. Most commonly, this is the portal of the National Education Institute (62.7%), followed by the učiteljska.net exchange of material portal (49.3%), Moodle (32.8%), the school portal (31.3%) and Svarog.org (16.4%). Apart from the provided portals, teachers (11.9%) stated also other portals: Virtual school, Rokus, CPI, TZS, praktik.si. All the stated portals enable the exchange of material for educational purposes.

3. Conclusion

The present study was conducted with the aim to see what D&T teachers think about the circumstances regarding the use of the computer and the applicability of individual forms of e-learning in class and to examine how the computer is actually used in class.

One of the fundamental findings of this study is that the viewpoints of teachers regarding the circumstances of using the computer in class are positive, with the exception of the knowledge and experiences acquired during undergraduate study. Such results indicate that in the future, education of especially D&T teachers regarding the use of the computer in class will have to provide more practical training and more knowledge for the actual use of the computer in class.

The study further showed that teachers see various forms of e-learning as being applicable. The most applicable form of e-learning are simulations, while applicability is recognised also to other forms of e-learning. Such information is encouraging, as the inclination towards individual forms of e-learning represents also a potentially better starting point for the actual use of these forms in practice.

The last but not the least important finding of this study is that almost all D&T teachers stated that they use the computer in class. Such information shows that it is not justifiable to regard all teachers in the same way with regard to the use of the computer in class. There might be substantial differences among them and they should receive more attention in future studies. This study has shown that D&T teachers represent a good model regarding the use of the computer in the educational process and we can only hope that teachers of other subjects will follow.

References

/1/ Plomp T., Brummelhuis A. C. A., Rapmund R.: Teaching and learning for the future, *Report of the Committee on MultiMedia in Teacher Training (COMMITT)*, Den Haag: SDU, 1996.

/2/ Hakkarainen K., Muukonen H., Lipponen L. et al.: Teachers' Information and Communication Technology (ICT) Skills and Practices of Using ICT, *Journal of Technology and Teacher Education*, Association for the Advancement of Computing in Education (AACE), jun 2001.

/3/ Wang Q.: A generic model for guiding the integration of ICT into teaching and learning, *Innovations in Education and Teaching International,* Vol. 45, No. 4, November 2008, 411–419.

/4/ Hermans R., Tondeur J., van Braak J. et al.: The impact of primary school teachers' educational beliefs on the classroom use of computers, *Computers & Education* 51 (2008) 1499–1509.

/5/ Zhao Y., Cziko G. A.: Teacher adoption of technology: A perceptual control theory perspective, *Journal of Technology and Teacher Education*, 2001, 9, 5–30.

/6/ Ibidem /1/

Literature

1. Loveless A., Dore B.: ICT in the primary school. Learning and teaching with ICT. Buckingham: Open University Press, 2002.
2. Dinevski D., Plenković M.: Modern university and e-learning. *Media, culture and public relations*, 2002, 1, 2, str. 137-146.
3. Bitner N., Bitner J.: Integrating technology into the classroom: Eight keys to success, *Journal of Technology and Teacher Education,* 2002, 10, 95–100.
4. Chen C. H.: Why Do Teachers Not Practice What They Believe Regarding Technology Integration, *The Journal of Educational Research*, 2008, Vol. 102, No. 1, 65 – 75.
5. Van Braak J., Tondeur J., Valcke M.: Explaining different types of computer use among primary school teachers, *European Journal of Psychology of Education*, 2004, 19(4), 407–422.
6. Romano M. T.: Empowering teachers with technology, Lanham, MD: Scarecrow, 2003.
7. Kučiš V., Plenković M.,: Translatologija i komunikologija u funkciji obrazovanja. V: Nadrljanski, Đorđei(ur.). Druga međunarodna naučno-stručna konferencija "Informatika, obrazovna tehnologija i novi mediji u obrazovanju", Sombor, april 2005. *Zbornik radova*, (Biblioteka Posebna izdanja, knj. 102, knj. 103). Sombor: Univerzitet u Novom Sadu, Učiteljski fakultet: University of Novi Sad, Teacher Education Faculty, 2005, str. 89-97.
8. Ertmer P. A.: Teacher pedagogical beliefs: The final frontier in our quest for technology integration?, *Educational Technology Research and Development*, 2005, 53(4), 25 – 39.
9. Windschitl M., Sahl K.: Tracing teachers´use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture, *American Educational Research Journal*, 2002, 39, 165 – 205.
10. Watson D.: Understanding the relationship between ICT and education means exploring innovation and change, *Education and Information Technologies*, 2006, 11 (3-4), 199 – 216.
11. Jones V. F., & Jones S. J.: Comprehensive classroom management: Creating communities of support and solving problems. Boston: Allyn and Bacon, 2006.
12. Pšunder, M.: Disciplina v sodobni šoli, ZRSŠ, Ljubljana, 2004.
13. Dinevski D., Ojsteršek M., Plenković M.,: Information technology platform for e-learning implementation. V: Plenković, Juraj (ur.). The 10th International Scientific Conference, Opatija, 28th-30th June 2003. *Društvo i tehnologija 2003 : (printed as manuscript)*. Rijeka: Sveučilište, Građevinski fakultet; Zagreb: Hrvatsko komunikološko društvo, 2003, str. 148-158.
14. Stronge, J. H.: Qualities of effective teachers. Alexandria, VA: Association for Supervision and Curriculum Development, 2008.