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THE ROLE OF DIGITAL COMPETENCES IN ELECTRONIC EDUCATION

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Abstract

The theoretical contribution to the use of modern information and communication technology in educational processes should be discussed critically. The multimedia learning materials and their use at different stages of the educational process in the context of their technical, educational, communicational and aesthetic quality have been reviewed from different perspective. There are many advantages in using multimedia learning materials in education but also disadvantages. Excesive use of electronic learning can lead to the possible unwanted situation in student personal development and upbringing goals may not be achieved. Since interactive multimedia learning materials are becoming more widely used in education they must be added into the teachers qualifications. Only competente teachers can use full potential of multimedia learning materials. How multimedia learning materials in all phases of education is used was tested on primary school teachers. Results are very useful for further teachers' education. The fear that educational process may loose some human quality is real.

INTRODUCTION

Modern education and upbringing extensively use term competences. The need was so great that it has to be institutionalized /**1**/. But the description of competences is not the same over different scientific fields. Even in education disciplines the term competence is not unambiguously defined therefore the need of interdisciplinary definition is in order. The competences are not uniform – at least competences of school, headmaster, teacher, and student can be distinguished. Despite terminological differences of students' competences they depend of overall development of personality on cognitive, emotional and psychomotor level. "*This starting point shows the direction of teachers' professional operation in acceptance of higher conception of teaching and learning and their competent practice*" (cognitive-constructivist model of teaching) /**2**/. From the teachers perspective competences can be explained as hypothetical psychological processes that involves cognitive, emotional, motivational, social and behavioral components that are acquired through process of learning /**3**/. Despite differences in interpretation of competences we can set some common findings about generic and specific competences independent from years of service or level of teaching. Specific competences are:

knowing the curriculum, expert knowledge of scientific discipline, learning, content of teaching and learning outcomes, and methodologies. Expert knowledge of scientific discipline is reflected in the cross-sectional competences. In the area of fine arts this can be intersection between modern artistic production and postmodern artistic curriculum. Competent teachers of fine arts are described by "The teacher is working with contemporary art in an equivalent position to the students. The teacher is not just an expert that understands the artistic work and its interpretation" /**4**/. TESE-II research defined competences as combination of knowledge, understanding, skills, abilities, and values /**5**/. But competences can be also combination of knowledge, assessment ability, communicational skills and learning skills. We must not forget digital competences since ICT becomes a part of our life and its application in education is necessity. "Digital competences are one of generic competences that individuals have to master in contemporary society" /**6**/. Digital competences cover social and natural sciences alike. They are seen as reliable and critical use of ICT on work, education, self-growth and cooperation in society /**7**/.

DIGITAL COMPETENCES OR E - COMPETENCES

It is an open debate should we use digital competences to denote e-competences or should we use them separately. Even if e-competences are used to denote just part of digital competences we still have problems with the term. But as long as we do not find better term we will define e-competences for the purpose of this article. E-competences are part of digital competences and they focus on special electronic concept of education and upbringing destined to constant changes and never ending evolution. Electronic school environment requires different, new, innovative types of teaching and learning. The aim of schools is to cherish its employees' skills for acquiring necessary e-competences. The institutional e-competences are defined as the policy of the university toward ICT in research and education. There is a strong bond between previous two e-competences (competences of teachers and institutional competences). Even on the primary school education we have to analyze those e-competences differently and the same strong bond between teachers and schools exist. Both types of e-competences reflect on the ability of successful use of ICT and e-learning materials in everyday pedagogical practice. Teachers need to know advantages and disadvantages of ICT and specific ethical rules in their use. Technological ethical code for teachers /**8**/ require three rules:

1. Teachers must to provide each student the same access to the technology
2. Teachers have to provide equivalent technological resources for each student
3. Teachers should use least restrictive way for the restriction of internet and software.

There is the law that grant students uncensored access to the information (CIPA – Child Internet Protection Act). Teachers should be thought during their study how to acquire necessary competences for independent and competent teaching. E-competences are vital part of required competences and need to be part of teachers' education and life long learning of teachers. With other words this means the acquaintance and application of ICT for teaching and teaching preparation.

INTERACTIVE E-LEARNING MATERIALS

Contemporary interactive e-learning materials and their competent application in education have significant role in modern learning paradigm. E-learning term is used for multiple types of modern ICT aided education. It consists of distance learning, computer aided learning, internet aided education, online education, and so on. "*In the searching for better efficiency of education the modern ICT role becomes hyper developed and absolute necessity.*" /**9**/. E-learning and e-learning materials were extensively developed in the last few years. But despite the fact that e-learning materials cover 100% of educational goals were not appropriate. Student got wrong impression of learning since all of the knowledge was available by mouse clicking. Versatility of screens, complete virtual-electronic educational goals and interactive e-learning materials leads away from real educational goals. With the excessive use of multimedia learning materials and virtual learning in the education the process of learning will become dehumanizing and non-pedagogic /**10**/. Teachers should gain adequate competences for effective and high quality use of multimedia learning materials during their study and lifelong learning process. Multimedia learning materials should be used as blended learning and not as substitute for traditional learning principles. This approach would deny the increasing concerns that multimedia learning materials could replace teacher-student communication. Many researchers have shown above any doubt that ICT increase effectiveness of educational processes /**11**/. Positive effect on success of students is therefore evident. But the questions remain how these effects were achieved and what was the price of achievement? On the other hand we still have no valid results how skills gained with ICT can be transferred to the environment without ICT. Questions do not stop here and major concern is also if there is a chance that individual learning with multimedia learning materials and ICT would displace healthy collective learning in the classrooms. Should this become the truth how could we achieve any upbringing and emotional goals, educational goals? It is evident and known to any educational specialist that today's curricula have redundancy and ballast content. With the re-

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quirement that multimedia learning materials cover study courses entirely this disadvantage is inherited in multimedia learning materials too. The question that arose in this point is: Could we provide enough functional knowledge with only one multimedia learning material? Is it possible to achieve successful learning and upbringing with mouse clicking only? Our opinion is opposite and feedback of the reviewers and application of multimedia learning materials in schools shows that teachers need to be active participants in the development, testing and introduction of multimedia learning materials.

Multimedia learning materials are part of social network system. Successful use of these materials requires technical resources, suitable content and pedagogical specifications. Final goal is the same as in the traditional approach and is simple – students should gain knowledge and competences. But high knowledge retention requires good pedagogical design of multimedia learning materials. Principles of logical division, good structure and systematic approach supported with facts and generalization are the keys of success of multimedia learning materials.

Contemporary available multimedia learning materials in Slovenian schools (primary, secondary, and vocational) distinguish themselves according to the content, intended audience, and quality. All should be didactically suitable for their intended purpose though. Contemporary didactical theory should be applied in the design of multimedia learning materials. Lower the level of education higher quality of learning materials should be (more strict didactical requirements should be obeyed). Quality parameters of multimedia learning materials are objective and subjective. Objective part of quality parameters consist of technical equipment and its didactical applicability. Subjective part of quality parameters consist of didactics and methodology and answer the question of suitability of equipment /**12**/. We have to know that high quality ICT do not guarantee successful e-

learning and intelligent support is vital for the success. Especially older students (vocational and high schools) show more inclination to self-learning then e-learning according to the research from European Centre for Development of Vocational Training /**13**/. From the presented facts and considerations we can deduce that perfection in the design of multimedia learning material in expert and didactical aspect is needed. Multimedia learning materials should therefore activate students but not scare them and should be versatile and appealing. Didactical structure of multimedia learning materials should inspire students and visualization should increase innovations of learners. Visual senses are preferred over vocal since kids first observe and identify before they can talk /**14**/. In the reality we see that quality of multimedia learning materials varies a lot.

METHODOLOGY

To gain the insight into the current state of usage of the multimedia learning materials at the level of elementary education we prepared the survey. The survey was performed on the sample of 211 teachers of elementary education in Slovenia.

We were focused on the following details:

- How familiar are the teacher with the multimedia learning materials at elementary education level.
- Stages of lessons in which multimedia learning materials are used.
- The methodology of usage of multimedia learning materials.
- Teachers' personal estimation of competency.

The analysis was made at the level of descriptive an inferenial statistics.

Teachers' acquaintance with the multimedia learning materials

The results presented in Table 1 represent the whole population (n=211) of teachers of the elementary schools that answered the questions in the survey.

Table 1: Teachers' acquaintance with the multimedia learning materials for the elementary education

How familiar are you with the e-learning materials for the elementary education?		
	f	f%

Familiar with most	52	24,6
Familiar with some	138	65,4
Weak	21	10,0

About the quarter of the population of the teachers are familiar with the most of multimedia learning materials for the elementary education. Most of them, about the two thirds, are familiar with some of them. The reason should be in the amount of the present multimedia learning materials which some of them are weakly presented from the side of developers or during the regular meetings in form of workshops or similar. Only about 10% of the teachers are not enough familiar with the multimedia learning materials.

The level of the familiarity with the multimedia learning materials for the elementary education is very similar concerning the teaching experi-

ence of the teachers. There is no statistically significant difference between novice or younger teachers and more experienced teachers (α=0,308). Only teachers of 20 or more years of experience are expressing slightly lower lever of familiarity with multimedia learning materials but the difference is still not statistically significant.

Multimedia learning materials used in different stages of the lesson

The results presented in Table 2 represent only teachers of the elementary educations who are using the multimedia learning materials in performing lessons (n=188).

Table 2: Stages in lesson in which learning materials are used

In which lesson stage you use the e-learning materials?	
Lesson stages	f%
Introduction/Motivation	29,4
Study	22,0
Practice	36,4
Evaluation	12,2

Among the teachers using the multimedia learning materials during the lesson the 36,4% are using them in the stage of practicing and about the 30% as introduction or for the motivational reasons. Less than a quarter are using

the multimedia learning materials in the stage of studying new facts. For the evaluation purposes the multimedia learning materials are only used in about 12% of cases.

E-learning materials usage

Table 3: The usage of e-learning materials

How do you use the e-learning materials?	
Usage types	f%
Individually for teachers 'preparation	36,8
(Exclusively during the lesson) Instead of traditional learning materials	31,7
Combining with traditional learning materials (blended learning)	31,5

Results show that different types of usage of e-learning materials are divided pretty evenly with a slight advantage to the teacher's preparation stage. But generally this result is very good example or even proof of versatility of the multimedia learning materials. Consequently in the process of preparation of the

multimedia learning materials expected type of usage should be considered carefully.

Teachers' personal estimation of competency

The results presented in Table 4 represent only teachers of the elementary educations who are using the multimedia learning materials in performing lessons (n=188).

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Table 4: Estimation of personal competency for using the multimedia learning materials during the lesson

Estimate your personal competency for using the e-learning materials during the lesson.		
	f	f%
Enough competent	79	42,0
Partially competent	100	53,2
Not enough competent	9	4,8

More than a half (53,2%) of the teachers taking the survey estimate their competency for using the e-learning materials during the lesson as partially competent or satisfying. About 42% are estimating their competency as competent enough and not more than 4,8% of teachers estimating themselves as not competent enough. This may be considered as satisfying result. Higher level of confidence in estimating their competency for using the e-learning materials during the lesson was discovered by the younger generation of teachers. More than 70% of them estimate they are "enough competent". The level of competency estimation lowers towards more experienced teachers. This brings the conclusion that the younger generations of teacher are more experienced in using multimedia learning materials. The higher level of competency estimation than by younger generations of teachers was consequently discovered in the categories of partial or not competent level. In both cases estimation level is higher than by the generations of teachers of less than 5 years of experience. The difference between the generations are statistically significant ($\alpha=0,009$). This fact can lead us to the conclusion that younger generations become sufficiently familiar with the multimedia learning materials during their study and consequently express higher level of estimated competency.

CONCLUSION

The e-competent teacher is required for appropriate application of multimedia learning materials. The term e-competency consists of knowledge, skills, and appropriate attitude. Therefore the didactic skills, suitable expertise in application of authoring tools, communication skills and assessment abilities are crucial. The e-competent teacher will be able to take more advantages of multimedia learning materials and apply them in any lesson stage. He or she will also be able to combine them with traditional didactical approaches and motivate the students to use multimedia learning materials autonomously. Combination of traditional didactical approaches and multimedia learning materials is still a kind of state of the art direction in didactics. The tutor aided multimedia learning environments are good example for this approach. In such environments the tutor's role is to stimulate students for interactive communication. Interactivity provides the feeling of social presence and prevents isolation due to the lack of direct interpersonal contact /**15**/. To take the advantage of the tutor aided multimedia learning environments highly skilled tutors are required. The latest researches show that highly skilled tutors positively influence the quality and success of entire multimedia learning process /**16**/. The same principles of appropriate trained teaching personnel should be considered regardless to the level of education. This can also be the level of elementary education where the results of our survey show some positive results. The teachers who are accustomed with the multimedia learning materials provide the solid foundation to future successful application of multimedia learning materials. The process can be further improved by the including teachers into the development process of new multimedia learning materials. In most cases the multimedia learning materials are used in the lesson for practicing or as motivation. In just about the quarter of cases they are used in the stage of studying facts. The reasons for using of multimedia learning materials for studying facts may be either inexperienced teachers or didactically inappropriate multimedia learning materials. Some results in our survey have shown that we should focus to the lack of teachers' experience. . More than a half (53%) of the population of teachers is estimating their competences as partially competent in

application of multimedia learning materials during the classroom lessons. Gladly less than 5% of teachers estimate their competencies as not good enough.

Analysis of methods how multimedia learning materials are used during the lesson show that the individual preparation is the most often used (36,8%). Despite that proportion of the other methods of usage are relatively close (about 31,5%) greater portion of the teachers that use multimedia learning material for preparation may indicate certain level of inexperience to use them in lesson directly. Modern multimedia learning materials are not only the opportunity for the teachers. They are also teachers' obligation to apply them competently. Regarding the level of education and specific study fields the reasonable implementation is required. Regardless of the large amount of present multimedia learning materials not all meet the didactical or technical quality requirements. Problem is even worst in the aesthetical aspect of quality. Even in such cases the e-competent teacher will be able to use the corresponding teaching approach and distinguish the appropriate quality. The aesthetics of multimedia learning materials becomes increasingly important. Not only for better acceptance of multimedia learning materials by the learners but for the higher amount of knowledge delivered to the learners. Finally the e-competent teacher will always be aware of the multimedia learning materials limitations. Especially regarding the risk of transferring too much education into virtual environments.

Bilješke

/1/ Europa parliament. (2005). Key competences for life-long learning (slv: Ključne sposobnosti za vseživljenjsko učenje. Prevzeto 28. April 2010 iz European parliament: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P6-TA-2006-0365+0+DOC+PDF+V0//SL

/2/ Herzog, J., Ivanuš-Grmek, M., Čagran, B. (2012). Views of mentors on elementary Education student Teaching. Croatian Journal of Education. Vol: 14 (1/2012),pp. 29-48.

/3/ Weinert, F. E. (2001). Vergleichende Leistungsmessung in Schulen – eine umstrittene Selbstverständlichkeit, in:Weinert, F. E. (Hrsg.): Leistungsmessungen in Schulen. Weinheim und Basel, S. 17-31. Retrieved 5.january 2012 from http://www.kompas.bayern.de/userfiles/infokompetenz.pdf

/4/ Zupancic, T. (2007). Methode des kunstpädagogischen Konzepts in: Buchkühle, C. P., Kettel, J., Urlaß, M. (Eds.). (2007). Horizonte. Internationale Kunstpädagogik. Oberhausen: Atena Verlag. pp.175-193.

/5/ Gonzales, J., & Wagenaar, R. (2005). Universities' contribution to Bologna process. Project Socrates.

/6/ Krašna, M. Bratina T. (2010). Universal Digital Competences. Central European Conference on Information and Intelligent Systems, CECIIS. Retrieved January 16 from http://www.ceciis.foi.hr/app/index.php/ceciis/2010/paper/view/349/134

/7/ Ala-Mutka, K., Punie. Y., Redecker, C. (2008) EiD (Electronic Identification). [Online]. Retrieved January 17 2012 from http://ftp.jrc.es/EURdoc/JRC48708.TN.pdf

/8/ Barcalow, T., Creech, M., Gerrietts, G., Marassa, M., Sallas, P., Sierra-Perry, M., Weinert, B. (2001). Code of Technology Ethics for Educators. A Project for the University of Illinois, Champaign/Urbana EPS 304/399. Retrieved 12. January 2012 from http://lrs.ed.uiuc.edu/students/bweinert/304code.pdf

/9/ Duh, M., Krašna M. (2009). Estetika e-gradiv. V: (Orel. M. ur.). Nova vizija tehnologij prihodnosti (str. 332-338). Ljubljana InfoKomTeh.

/10/ Duh, M., Krašna M. (2010). Interactive e-learning materials: how to prepare and use it properly. V: Čičin-Šajn M et all. (ed.) Computers in Education. Rijeka MIPRO.

/11/ Beers, P.J., Boshuizen, H. P. A., Kirschner P. A., Gijselaers, W.Westendorp, J. (2006). Cognitive load measurements and stimulated recall interviews for studying the effects of information and communications technology. Education Tech Research Dev (2008) 56:309-328. Retrieved 8.january 2012 from http://arno.unimaas.nl/show.cgi?fid=19142

/12/ Duh, M., Krašna M. (2009). Estetika e-gradiv. V: (Orel. M. ur.). Nova vizija tehnologij prihodnosti (str. 332-338). Ljubljana InfoKomTeh.

/13/ Aimard, V., Mc Cullough, C. (2006). E-Learning in Europe: How do trainers, teachers and learners rate e-learning? Retrieved December 11 2011 from

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http://cms.eun.org/shared/data/pdf/report_survey_t
eachers_and_learners_and_elearning_final.pdf

/14/ Berger, J. (2008). Načini gledanja. Ljublajna, Zavod Emanat.

/15/ Wheeler, S. (2005). Creating Social Presence in Digital Learning Environments: A Presence of Mind? Retrieved 9 November 2011 from http://videolinq.tafe.net/learning2005/papers/wheeler.pdf

/16/ Smith, C. T.(2005). Fifty-One Competencies for Online Instruction. The Journal of Educators Online, Volume 2, Number 2, July 2005 16. Retrieved 18 November 2011 from http://www.thejeo.com/Ted%20Smith%20Final.pdf#search=%fifty-one%20competencies%20online%20instruction%smith%22

Literatura

1. Berović, M. (2010). Virtualni nastavnik u realnoj učionici. V: Čičin-Šajn M et all. (ed.) Computers in Education. Rijeka MIPRO, Croatian Society.

2. Dirk Schneckenberg, D., Wildt, J. (2006). Understanding the concept of eCompetence for academic staff. Center for Research on Higher Education and Faculty Development University of Dortmund. Retrieved 8.january 2012 from http://www.ecompetence.info/uploads/media/ch3.pdf

3. Mirković, M. (2010). Nastavne metode u informatici/računalstvu. V: Čičin-Šajn M et all. (ed.) Computers in Education. Rijeka MIPRO, Croatian Society.

ULOGA DIGITALNIH KOMPETENCIJA U ELEKTRONSKOJ NASTAVI

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Sažetak

Teorijski doprinos za korištenje suvremene informacijske i komunikacijske tehnologije (IKT) u obrazovnim procesima treba kritički ocijeniti. Multimedijski materijali za učenje i njihovo korištenje u različitim fazama odgojno-obrazovnog procesa u kontekstu njihovih tehničkih, obrazovnih, komunikacijskih i estetskih kvaliteta provjerili smo iz različitih perspektiva. Postoje mnoge prednosti u korištenju multimedijskih obrazovnih materijala u obrazovanju, ali tu su i nedostaci. Pretjerivanje u korištenju elektroničkog učenja može dovesti do mogućih neželjenih situacija u studentskom razvoju i odgojnih ciljeva nije moguće postići. Budući da se interaktivni multimedijski materijali široko koriste u obrazovanju moraju ta biti znanja dodana u studijske programe budućih učitelja. Samo kompetentni nastavnici mogu koristiti puni potencijal multimedijskih obrazovnih materijala. Kako se multimedijskih materijala koristi za učenje u svim fazama obrazovanja testirali smo na većoj populaciji učitelja razredne nastave. Rezultati su vrlo korisne za daljnje obrazovanje nastavnika. Utvrdili smo, da pretjeranom primjenom IKT obrazovni proces može izgubiti neke opće ljudske kvalitete.