http://jates.org

Journal of Applied Technical and Educational Sciences jATES

ISSN 2560-5429

JATES Journal of Applied Technical and Educational Sciences

Digital education in digital cooperative environments

Beáta Orosz[a], Cintia Kovács[b], Dijana Karuović[c], György Molnár[d], Lenke Major[e], Vilmos Vass[f], Zoltán Szűts[g], Zsolt Námesztovszki[h]

[a]*Budapest University of Technology and Economics, Budapest, orosz@metakepzes.hu*

[b]*University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, kcintia91@gmail.com*

[c]*University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, aruena@tfzr.uns.ac.rs*

[d]*Budapest University of Technology and Economics, Budapest, molnar.gy@eik.bme.hu*

[e]*University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, major.lenke@magister.uns.ac.rs*

[f]*Budapest Metropolitan University, Budapest, vvass@metropolitan.hu*

[g]*Budapest University of Technology and Economics, Budapest, szuts.z@eik.bme.hu*

[h]*University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica, zsolt.namesztovszki@magister.uns.ac.rs*

Abstract

The globalizing world of international business, the mobility of workplaces and the accelerated technological development have made the educational sphere competitive as well. Consequently, educational institutions and the educational process itself have to come up with new methods to meet the respective challenges. Digitalization of education provides such an option as the education process serves as one of the foundations of the economic prosperity of any country. Our article focuses on the tendencies and phenomena generated by digitalization and introduce its immediate, practical impact on the teaching and learning process. We will emphasize such key competences, which are relevant and crucial for the support of digitalization in the 21st century.

Keywords: digital education, ICT-based environments, digital competences, teaching methods

1. Introduction and the relevant professional context

Digital transformation leads to two main issues, namely the ability of the education system to fulfil the emerging demands of the labour market and in return how the labour market can accommodate the altered social and economic needs. The main driving force behind the specific interactive and interdependent processes is the continuous development of information and communication technologies.

Accordingly, the activities facilitated by the digitalization process have become integral parts of everyday life in the information-based society. Therefore, as a result of the expanded and digitalized knowledge space information acquisition is not limited solely to schools.

Traditional learning environments have undergone a radical change and due to the increased availability of resources provided by the information-based society knowledge acquired in extracurricular frameworks either in one's leisure time or at home have gained increased significance (Balogh et.al., 2011). Students not only rely on theories and information based on their everyday experiences, but utilize up-to-date, authentic, and real life knowledge acquired from digital sources within the context of formal education (Gőgh, 2018). Hence students not only make a novel contribution to the educational process via the integration of a more and varied knowledge, but expect schools to provide educational materials that are similarly to those in the given individual's private knowledge space are dynamic, exciting, and current (Racskó 2017).

Nowadays information and communication devices have become indispensable to daily life coupled with the increasing medialization of learning and teaching via digital technology and the respective applications (Kis-Tóth–Lengyelné, 2012) The educational use of info-communication devices can be described as part of a process ranging from digitalized data recording, via the penetration of computers in the private sphere, the work and learning spaces, and everyday life until the emergence of the world wide web. It must be noted however, that some of these developments have reached the plateau of productivity, where further improvement is hard to achieve (Ujbanyi et al, 2017).

Daily use of digital media has shown a significant increase since 2008 while the number of mobile communication devices connected to the Internet grew as well. Such tendencies are reinforced by the example of the United States, a major point of reference regarding digitalization and the use of information and communication technology. Figure 1 shows that in 2008 the daily use of digital media was under 3 hours, out of which the use of mobile communication devices including laptop and smartphone amounted only to 20 minutes. Conversely in 2018 the daily use of digital media was over 6 hours, with 3,5 hours spent with mobile devices respectively.

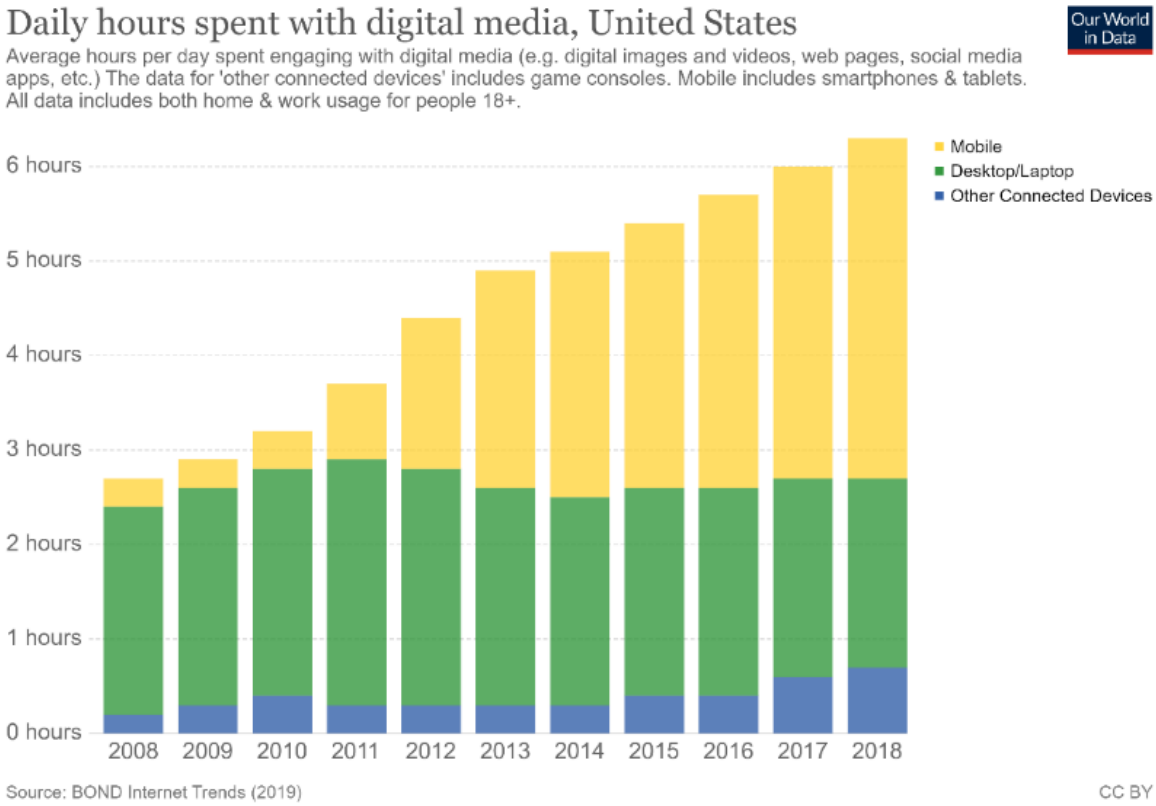

Fig. 1. Dialy hours spent with digital media, US
https://ourworldindata.org/rise-of-social-media

2. The role of competence-based instruction and digital competences

The emergence of digital media has divided the pedagogical profession into two groups techno-optimists and techno-pessimists demonstrating enthusiasm and reluctance or scepticism respectively. Furthermore, techno-optimists support the full digitalization of the education process via smart devices, electronic content and platforms eventually relegating the teacher into a programmer working with algorithms and smart devices. In their view printed books should be superseded by computer screens, student exercise books or notebooks would give way to tablets, writing would be replaced by fingers on the touch screen and individual learning routes along with student evaluations would be performed by non-empathic or indifferent artificial intelligence. Techno pessimists apart from the teacher's computer and projector and selected presentations refuse to admit digital technology and content into the classroom.

In a rapidly changing social and technological environment, increasingly competitive and highly interconnected world, under the umbrella of lifelong learning paradigm, each person will need a wide range of life skills and to develop them continually throughout life (Balogh et.al., 2012). Basically, life skills (Self-awareness. Empathy. Critical thinking. Creative thinking. Decision making. Problem Solving. Effective communication. Interpersonal relationship etc...) have increasing importance in education. 'Life skills are abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life'(Vivekanand, 2015). In fact, this above-mentioned process has prioritized values, strategies and aims in public education emphasizing lifelong learning, especially focusing on self-directed learning and learning skills and competences (Gőgh&Kővári, 2018). Starting with the definition of competence: 'the ability to do something well', parallel to the list of life skills, the work-related competencies are playing important role as well. Basically, work-related competencies (n62) are starting the structuralization process. They are defined as 'A cluster of related abilities, commitments, knowledge, and skills that enable a person (or an organization) to act effectively in a job or situation. Competence indicates sufficiency of knowledge and skills that enable someone to act in a wide variety of situations.' These structural elements (knowledge and skills and later attitudes) are overlapped in strengthening inter- and transdisciplinary approaches in education. In fact, there are several connections with life skills and work-oriented competency areas. Regarding this growing complexity, the DeSeCo project stated: 'A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context.' In this project, the experts emphasized the role of communication, especially, practical IT skills. European Council Recommendation on key competences for lifelong learning defined key competences as: 'Key competences are those which all individuals need for personal fulfilment and development, employability, social inclusion, sustainable lifestyle, successful life in peaceful societies, health-conscious life management and active citizenship.' The Recommendation indicated the growing importance of competency areas such as: Literacy competence, Multilingual competence, Mathematical competence and competence in science, technology and engineering, Digital competence, Personal, social and learning to learn competence, Citizenship competence, Entrepreneurship competence, Cultural awareness and expression competence. Turning to the Digital competence, the Recommendation defined this competency. (Council recommendation, 2018): 'Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for

learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.'

On the individual level digital competence is part of the 8 competences required for lifelong learning determined by the European Union. Apart from the recognition of the need for digital competence member states of the European Union have not clearly established which competences are included in the respective category. Experts of the Joint Research Center, the scientific hub of the European Commission focused on the elaboration of a framework system describing the digital competences of European citizens and developed other framework systems as well.

The digital competences of European citizens, currently known as Digital Competence Framework for Citizens were determined in order to bridge the gap between the education sphere and the expectations of the labour market. The development of the framework started in 2005, the first version (DigComp 1.0) was published in 2013, the second (DigComp 2.0) in 2016, while the latest version (DigComp 2.1) was released in 2017.

Parallel to the growing complexity and structuralization of the competency areas, there are two trends, which are relevant to this paper:

1. Complexity of the basic skills: (4 C): critical thinking, problem solving, information processing, creativity and innovation, communication and collaboration.
2. Growing role of transversal competencies in public education, this is the complex, networking, competency-based world, which is based on some transversal competency areas: Intercultural skills & global awareness, Flexibility & adaptability, Strategical & innovative thinking, Organization & time management, Decision making, Teamwork, Empathy / ability to build relationship, Problem solving, Learning orientation, Negotiation skills, Leadership, Collecting and processing information.

The transversal competences indicate clear direction on competency development to the experts, decision makers and practitioners. Namely increasing inter- and transdisciplinarity in the school systems. It is obvious, that the wide range elements of competency lists are

relevant to the experts and the decision makers, but it is not pragmatic to the practitioners. In order to solve this dichotomy (from theory to practice and from research to action), the very first point we have to focus on is the meanings and definitions of 'transversal'. According to the Cambridge English Dictionary and Math Open Reference, transversal - from the geometric point - is 'a line that crosses two other lines'. In order to understand the role and place of digital competence in this process of 'competency tsunami' and competency development, it is necessary to stress the dilemma, namely whether the development of digital competence is a subject-oriented or transversal approach? In fact, the traditional way of curriculum development is subject-based, but the abovementioned trends and processes require a growing transversal approach. In practice, on the one hand it means that systematic curriculum planning has to become a relevant component of digital competence related to the different subject areas. On the other hand, this process requires collaborative curriculum planning from the teachers.

3. The work context of teachers

As Kata (2006) asserts the preparation for classes and the management of the learning process are crucial aspects of any teacher's work. The main objective is to enable students to acquire new knowledge in the most effective way possible while meeting the requirements of the future and accommodating the respective continuous changes. The design of the learning process should include the determination of how much time should be spent on teaching the given learning unit along with selecting the specific teaching methods and technological approaches. Since in case of several subjects a textbook is not or at best partially available, the compilation of class or lecture materials, notes and assignments is a time and energy consuming process. Shared content development can provide an answer to this problem along with other advantages including professional development and improved academic performance for teachers and students alike. Below we provide a brief introduction of the given reasons and the respective consequences.

Research results have proven that reform measures and the resulting higher investments in the education sphere do not guarantee improved academic performance (Barber & Mourshed. 2007). The quality of the teacher and the teaching process is a much more significant factor (OECD 2005). The evaluation of the teaching activity is a multivariable process. Edmonds (1979) had established 5 key factors determining the efficiency of the teaching effort including appropriate classroom management, emphasis on the development of basic values, the provision of steady and safe educational environment, maintaining high expectations

towards student performance, and frequent evaluation of student progress. While such criteria have been considered valid until the present day, additional factors have been included. Accordingly, professional cooperation between teachers has crucial significance along with maintaining positive class atmosphere, promoting the greater involvement of parents, and assuring the optimal content of the education process (Scheerens 2004, Bander et. al. 2015).

Consequently, more and more schools emerge where the learning and professional development of teachers is a crucial component of the everyday operation and emphasis is placed on cooperation. In such stuck and moving schools (Rosenholtz 1985) the teaching staff is motivated to cooperate if such professional challenges occur, which an individual cannot meet on their own. While the most frequent difficulty is the use of digital devices, other problems include aggression and coping with or integrating students with special needs. If teachers possess appropriate digital skills, cooperation can take place without temporal or spatial restrictions (Tóth-Pjeczka 2016).

ICT devices help the identification of methods applicable in the given situations. Said devices and instruments have increasing significance in the education process and facilitate student-centred and technology-based teaching and learning (Hunya 2014). Teachers are expected to integrate and regularly use these devices in their work (Bartha & Sáfrányné 2018) and the domestic and international tendencies including such micro trends and models of school digitalization as the Flipped Classroom, BYOD theories, gamification and electronic learning environments have become more prevalent as well (Molnár 2018). Such developments pose a significant challenge for most pedagogues as they have to learn the use and operation of the given technology on their own.

Yet the type of co-operation is crucial as according to the TALIS (OECD 2009) co-operation restricted to exchange and coordination is considered only functional and sufficient for the operation of the given system, while the ideal form is professional collaboration promoting team teaching, mutual class visits, development-oriented feedback, and coordinated home assignments. Teachers involved in collaborative team efforts have a higher performance than those working alone. Thus cooperation can be considered as an efficiency factor and its success is based on the formation of professional capital (Hargreaves & Fullan 2015). Professional capital consists of a human component, namely the available features and attributes that can be improved in addition to the skills and competences. It also includes the social capital standing for the benefits of the given networking system, and is complemented by decision-based capital, that is, methods acquired from experienced colleagues, and coping

with the respective complex decision-making situations and solution options. In this vein professional capital is considered the sum of all advantages gained from professional collaboration. The resulting Professional Learning Communities (PLC) facilitate collaborative learning efforts. Accordingly, teachers work together continuously as partners in order to achieve a pedagogical objective. Thus their learning effort is motivated by helping the students, which means significant benefits for their own professional development as well. As a result of methodological cooperation the given methodological repertoire or arsenal expands along with that of self-esteem and confidence and the need for self-training and development (MacGilchrist – Myers – Reed 2004). Other advantages or benefits of teacher collaboration include setting examples for students, reduction of stress levels, avoiding teacher burn-out, and the feeling of being a member of a team (Tóth-Pjeczka 2016a).

The development and self-improvement of the members of the pedagogical profession assure the higher standards and appropriate quality of the education process, thus it has a positive impact on students as well (Cordingley et al 2003). As Köpeczi-Bócz (2006) asserts high standard instruction should be commensurate with the skills of students thereby facilitating the most optimal pace of development along with meeting professional standards and the latest scholarly requirements. Thus knowledge will always be up-to-date enabling both teachers and students to keep pace with the development of science. In sum there are four main components of high quality instruction, that is meeting the respective social and economic demands, equal access to reliable and identical standard knowledge, achieving satisfaction on the part of society, economy, and students, and facilitating the acquisition of knowledge considered useful by the given individual. As Benedek (2006) asserts the efficiency of information flow among students and teachers, in other words, the productivity or success of the teaching effort depends on 5 factors. The selection of facts and data and their conversion into information followed by the creation of knowledge belong to the field of cognitive psychology. Accurate presentation and coding of information facilitating the understanding of the given information is a task of pedagogy. Information technology focuses on the forwarding and transmission of information to the respective students. While errors can take place in any of these stages, and none of them work flawlessly on their own, the combined application of the various methods and increased use of ICT devices can make information transmission more effective. Naturally, the system includes factors that can frustrate the realization of the original objectives. These include distant hard to achieve, or too ambitious training objectives, the lack of regular and on-time feedback, inappropriate group

atmosphere, and non-student friendly learning schedules disregarding individual problems or circumstances, eventually resulting in attrition or dropping out. The self-feeding aspect of learning can counterbalance such setback factors. Accordingly, learning can be viewed as a cyclical process. Achievement can increase the enjoyment of learning, which can strengthen self-confidence leading to higher expectations towards the learning process. The subsequent increased motivation paves the way for improved performance and better academic results. The cyclical self-feeding aspect of learning is shown by Figure 2 (Zrinszky 1995).

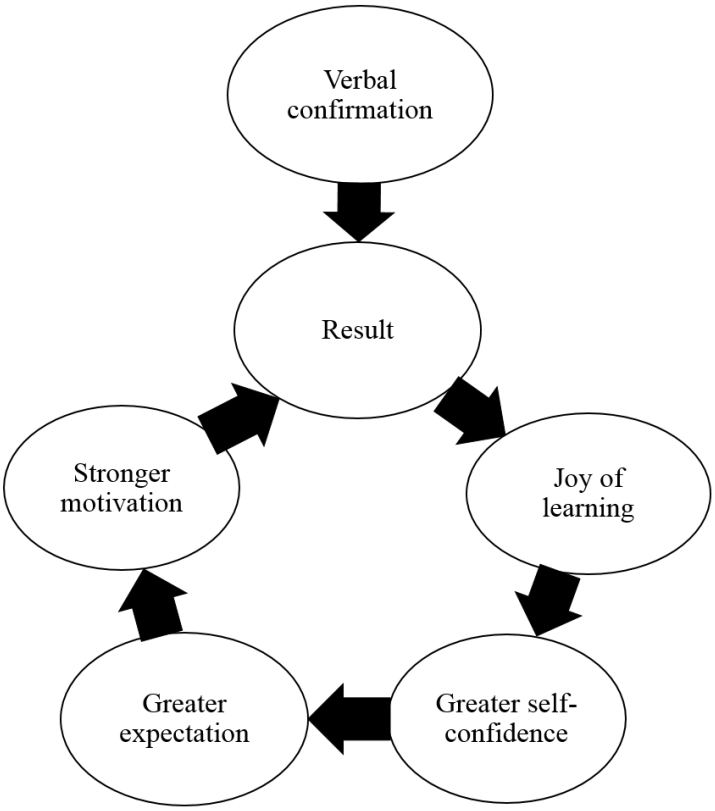

Fig. 2. The self-feeding aspect of the learning process

Zrinszky, L. (1995). *A scientific approach to adult education: Introduction to andragogy*

The figure illustrates that teachers can intervene in the learning process at several instances. One prerequisite of successful teaching is if pedagogues collaborate and work together in harmony. Reinforcement is important for all learners, and the experience-based knowledge acquisition leads to joyful learning and improved self-confidence. If students have greater expectations toward themselves and the learning process, their motivation can further increase and this will result in higher academic performance. Consequently, teachers see such developments as an incentive for additional effort, intensified professional growth, and continued successful collaboration.

4. Summary

We believe that the efficiency and appropriateness of the education process depends on the teacher's ability to recognize when should digital technology be used and when they can rely on traditional methods. Such competence should be the guiding approach not only in the present, but throughout the 21st century. The appearance of cinemas did not phase out the theatre, and after a beginning decline stage books have stabilized their position compared to the e-book reader. In our treatise we will provide a historical overview and in the theoretical segment we will rely on the achievements of cognitive psychology in exploring the positive and negative consequences of the use of digital technology. We think that info-communication devices are only means or tools and not the end or goal of the education process. Yet such tools can help to prepare the teacher generation of the future to meet the challenges posed by digital pedagogy and provide an effective answer as well.

References

Bander Katalin, et al. (2015): "Eredményesség az oktatásban. Dimenziók és megközelítések. Szerkesztette: Szemerszki Marianna." *Oktatáskutató és Fejlesztő Intézet*, Budapest 115.

Barber, M. és Mourshed, M. (2007): Mi áll a világ legsikeresebb iskolai rendszerei teljesítményének hátterében. *McKinsey & Company*, Chicago

Bartha, Z., & Sáfrányné Gubik, A. (2018). Oktatási kihívások a technikai forradalom tükrében. *ÉSZAK-MAGYARORSZÁGI STRATÉGIAI FÜZETEK*, 15(1), 15-29.

Benedek, A. (2006*). Szakképzés-pedagógia*. Typotex Kft.

Cordingley et al (2003). The impact of collaborative CPD on classroom teaching and learning. In: *Research Evidence in Education Library*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London. http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=133&language=en-US

Council recommendation (2018). *On key competences for lifelong learning*, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&from=EN

Edmonds, R. (1979). Effective schools for the urban poor. *Educational leadership*, 37(1), 15-24.

Gőgh, E., & Kővári, A. (2018). Examining the relationship between lifelong learning and language learning in a vocational training institution. *Journal of Applied Technical and Educational Sciences, 8*(1), 52-69.

Gőgh, E., & Kővári, A. (2018). Metacognition and Lifelong Learning. In *9th IEEE International Conference on Cognitive Infocommunications*, pp. 271–276.

Hargreaves, A., & Fullan, M. (2015). *Professional capital: Transformng teaching in every school*. Teachers College Press

Hunya, M. (2014). *A tanulás és a tanítás gyakorlatának innovációja: a kreatív osztályterem kialakításának kulcselemei Európában*. OFI.

Kata, J. (2006). A tanítási-tanulási folyamat mérnöki szemmel. *Szakképzés-pedagógia*, 49.

Kis-Tóth, L. & Lengyelné, Molnár T. (2012): Blended Learning in Practice: A Comparative Analysis. In: Open, University Malaysia (eds.) *ICI 2012 International Conference on Information: learning unlimited*, Kuala Lumpur, Malajzia: Open University Malaysia, 242-247.

Köpeczi-Bócz, T. (2006). Személyre szabott e-tanulási tananyagok és módszerek. *VI. Neveléstudományi Konferencia* „E-tanulás alapú kooperatív pedagógiai módszerek a tanulóközpontú tanítás szolgálatában" c. szekciójában elhangzott előadás. Budapest, 2006.

MacGilchrist, B., Reed, J., & Myers, K. (2004). *The intelligent school*. Sage.

Molnár, György. "Hozzájárulás a digitális pedagógia jelenéhez és jövőjéhez (eredmények és perspektívák)." *MTA-BME NYITOTT TANANYAGFEJLESZTÉS KUTATÓCSOPORT KÖZLEMÉNYEK IV* (2018).

Organisation for Economic Co-operation and Development, Santiago, P., & SourceOECD. (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Organisation for Economic Co-operation and Development

Racskó R.: Digitális átállás az oktatásban. Iskolakultúra, Veszprém, 2017.

Rosenholtz, S. J. (1985). Effective schools: Interpreting the evidence. *American journal of Education*, 93(3), 352-388

Scheerens, J. (2004). The meaning of school effectiveness. Presentation at the 2004 Summer School, December, 6

TALIS, OECD. (2009). *Teaching and Learning International Survey*. Paris: Organisation for Economic Cooperation and Development

Tóth-Pjeczka K. J. (2016a): *A tanári együttműködés gátjai és ösztönzői a jelenkori Magyarországon*, PTE BTK. Online: http://oktataskepzes.tka.hu/content/documents/Effect/SZAKDOLGOZAT_Toth_Pjeczka_kesz.pdf

Tóth-Pjeczka, Katalin (2016). Az együttműködéstől a kollaboratív tanulásig, *Digitális pedagógus és nemzedék konferencia 2016*: "Digitális lábnyomok – Digitális mérföldkövek". Budapest, Magyarország, 2016.11.26.

Ujbanyi T. et al (2017). ICT Based Interactive and Smart Technologies in Education - Teaching Difficulties. International Journal of Management and Applied Science, 3(10). 72-77.

Vivekanand Nalla (2015). "Life skills and soft skills make you smart life" Online: https://www.linkedin.com/pulse/life-skills-soft-makes-you-better-vivekanand-nalla-lion-2500

Zrinszky, L. (1995). *A felnőttképzés tudománya: bevezetés az andragógiába*. Okker Oktatási Iroda.

Zoltan Balogh (2012). Modeling of Control in Educational Process by LMS, DIVAI 2012: 9TH INTERNATIONAL SCIENTIFIC CONFERENCE ON DISTANCE LEARNING IN APPLIED INFORMATICS

Zoltan Balogh, Michal Munk, Milan Turcáni (2011). Analysis of Students' Behaviour in the Web-based Distance Learning Environment, Recent Researches in Circuits, Systems, Communications and Computers, pp 339-344

About Authors

Beáta Orosz is graduated from the Budapest University of Technology and Economics (BME) as a teacher of economics. Since 2017 she has been teaching at META - Don Bosco Vocational High School, and she has a part time job a II. Rákóczi Ferenc Economic Vocational High School, her main subjects are marketing and economics. She started to cooperate with the Open Content Development Research Group at the beginning of 2018. Now she is a PhD student at the Doctoral School of Business and Management, BME, her research topic is the economical aspects of educational use of ICT tools in VET.

Cintia Kovács was born in 1991, on June 16, in Serbia. She has a master's degree in education. In 2015 she was an instructor of the online course "Basics of Conscious and Safely Using Internet", and from 2016 she was an instructor on webuni.rs, too. Cintia is an active member and lecturer of the e-Region non-profit organization. Her main research area is the application of ICT technologies in education. Now, she is a PhD student at the Doctoral School of Educational Sciences "Eszterházy Károly University", Eger and assistant lecturer at the University of Novi Sad, Hungarian Language Teacher Training Faculty, Subotica. Besides this, she has a part-time job at the Subotica Tech - College of Applied Sciences as a lecturer.

Dijana Karuović is a PhD of science in IT area. She was born in Zrenjanin, Vojvodina Province, Serbia on March 14, 1978. She obtained her PhD in Technical sciences at University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, Serbia in 2010. Her major field of study is human-computer interaction in learning management system. Since November 2000, she is employed at the University of Novi Sad, Serbia, at Technical faculty "Mihajlo Pupin" in Zrenjanin as an associate professor.

György Molnár is an associate professor, electrical engineer, teacher of engineering, medical biologist engineer, pedagogue with special qualification examination in the field of public education manager, who works at Budapest University of Technology and Economics (BME), Faculty of Economic and Social Sciences, Department of Technical Education, and Budapest University of Technology Teacher Training Centre.

The graduation from BME as an electrical engineer in 2000 was followed by gaining a multidisciplinary university medical biologist engineer degree at BME. Followed by this, having entered the world of work as an engineer, he started new studies in the field of pedagogy as a teacher of engineering from 2001. From this time on, his academic studies and teaching activities have been carried out at the Department of Technical Education, successor of the ever-prestigious Institute of Pedagogy. He also applied for his doctoral PhD programme at this department, and finished that at the Eötvös Loránd University Doctoral School of Education. He has been teaching at the Department of Technical Education since 2001. He habilitated in 2018 on digital pedagogy. His fields of research include the basic aspects of ICT, the methodological and innovative issues of vocational teaching which have enabled him to research new, atypical and electronic teaching-learning paths.

Lenke Major was born in 1981 in Subotica, Serbia. She is an associate profesor (2019 February-) at the University of Novi Sad, Hungarian Language Teacher Training Faculty in Subotica. She has university degrees: Teacher (2000-2004), Librarian (2001-2005), Library

and Information Science (2005-2007) and Master Teacher (2007-2009). She received her PhD degree in 2017 at the University of Szeged, Graduate School of Educational Sciences. She teaches the following courses: Pedagogy, Educational Theory, Research Methodology. She is a member of the Hungarian Educational Research Association. Her research interests include pedagogy of sustainability, environmental education, information culture and mental health of educators.

Vilmos Vass is habilitated Associate Professor of Education Science and a teacher of Hungarian language and literature, history and pedagogy. He has been teaching in schools and universities for 37 years. He is a board member of several national and international associations. Between 2004 and 2010 he was a member of the EU Key Competences Cluster. In 2003 and 2007, he was the head of the revision on the National Core Curriculum and the Implementation Board. In 2004 he was the director of the Centre on the Curriculum Development He is member of the Editorial Board of 14 national and international journals. He now works at the Budapest Metropolitan University, Hungary. He is the author or co-author of nearly 200 Hungarian and English language publications, with a citation index of 163. His research areas and recent publications are on learning-centred curriculum theory, new meaning of learning and creative knowledge transfer.

Zoltán Szűts (1976) holds a PhD and is an Associate Professor at Budapest University of Technology and Economics in Hungary. He is a digital media and information society researcher. Studied at Eötvös Loránd University, Budapest, earned his PhD degree in literary science and habilitation is sociology. Author of the book Metaphors of the World Wide Web: An Introduction to the Art of New Media [in Hungarian] published with Osiris in 2013, and Online - History, theory and phenomena of infocommunication and media [in Hungarian], published with, Wolters Kluwer, Budapest, 2018, and numerous articles, including "An Iconic Turn in Art History – The Quest for Realistic and 3D visual Representation on the World Wide Web", in: Benedek András – Nyíri Kristóf (eds.) The Iconic Turn in Education, Peter Lang, Frankfurt am Main. 2012.

Zsolt Námesztovszki holds a PhD of science in IT area. He was born 1981 in Subotica, Serbia. He obtained his PhD in Technical sciences in 2013 at the University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Serbia (PhD thesis: Analysis of the Effects of Applying Educational Software Tools on Pupils' and Teachers' Motivation Level in Primary Schools). His major field of study is e-learning and IT in education. Since November

2006, he has been working as assistant professor at the University of Novi Sad, Serbia, at the University of Novi Sad, Hungarian Language Teacher Training Faculty in Subotica.