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Digital instruction or the digitalization of instruction in modern ICT environment

Introduction

Latest research results and my experience as well underline that the disciplinary mission of digital instruction, in a stricter sense, digital pedagogy, is to reflect all challenges, tasks, and innovation options facing the digital citizens of today's continuously changing world. In addition to acquiring the so-called key qualifications, the five generations of the digital world should be familiar with all aspects of digital competence if they want to lead a successful and productive life.

Our digitalized world is based on the respective technological developments and the modernization of telecommunication and informatics systems. The related technological revolution and its chief manifestation, the emergence of information and communication technology impacted the social, economic, and cultural sphere. Based upon my more than two decades of personal and professional experience as a researcher and university instructor I view the concept of Information and Communication Technology as a sum of devices, technologies, organizational activities, and innovative processes facilitating efficient processing, flow, storing, coding and transmission of information and the implementation of problem and obstacle free communication. While a standard definition is not at hand, most people are familiar with the basic outlines of information and communication technology.

My research efforts performed in the past years have identified several domestic and international solutions for the direct or indirect application of ICT (Information and Communication Technologies) in the teaching and learning process thereby promoting the development of digital competences. Due to background support provided by web 2.0 and e-Learning 2.0, researchers (Piet Kommers, Pedro Isaías, Morten Flate Paulsen, Miguel Baptista Nunes) have developed several new, frequently mobile ICT-based approaches significantly altering the given learning environment. Such achievements anticipate the extent and necessity of the application of modern pedagogical methods.

The everyday use of new technologies, especially mobile ICT devices have played a significant role in the specialization stage of teacher training programs. Vocational training is a promising field for our research efforts as it not only provides a sound theoretical base, but the inquiries into the concept of Opening up Education can provide an overall structure for applied research in Hungary as well. Consequently, we can rely on a BYOD research program carried out in the education sphere without any direct special material or infrastructure-related requirements.

Information and communication technology tends to have an increasing impact in the education process and the respective learning environment. Accordingly utilizing the means of telecommunication various forms of e-Learning have emerged.

My treatise discusses the role and application options of ICT-based systems and the increasing role of digitalization. My hypothesis is supported by the results of an empirical research effort as well.

Theoretical considerations

In today's information based society due to the increased value of information, info-communication technology and techniques the concept of the digital gap is being reinterpreted. Accordingly, it not

only indicates the capability of device use, but the extent of information flow and information transmission. Consequently, while access to digital devices was an important indicator of digital literacy, it has become the marker of obstacle free information flow and the extent of support provided to the communication process. To define it more appropriately, digital literacy implying the ability of controlling and using of more and more ubiquitous informatics devices is considered a basic necessity. This key competence is not only expected in the labour market, but is an essential requirement of everyday life as well. Accordingly, nowadays virtually every second person possesses or has access to mobile communication devices and the Internet. The penetration of such digital tools entails both a device and service as well. Likewise, two or three mobile telephones or subscriptions per person is an increasing worldwide tendency. The mobile telephones contributed to an unprecedented intensity of interaction (Gocsál, 2015). The Web 2.0 reflects a new participatory culture in which the user is not in a position of a passive observer or reader of web-based content, but he or she can shape such content in an interactive manner. (Szűts, 2014). Therefore, in addition to the consumption of content its enhancement, creation and sharing become applicable. (Dragon 2008). The aforementioned developments taking place in virtual and digitalized space without spatial and temporal restrictions facilitate the extension of the learning environment for digital knowledge acquisition. Thus the learning space is converted into a total panoramic 360° area providing openness, and the options of reflection, problem solving thinking and mobile learning. (Benedek, 2013). The National Curriculum determines the essential components of informatics competence as our digital framework systems addressing student needs are based on the internationally accepted digcomp 2.1 recommendations, the digcomp.edu standards are geared at teachers, and the digcomp.org framework is applicable to the institutions of the educational sphere. Vocational education is in a special position as it is considered an important area for technical and technological innovation, while it is expected to provide effective answers to the high technology challenges of the Industry 4.0 phenomenon. (Karlovit, 2012).

Internet-based communication conquers physical distance as all essential information is only a click away and access into the virtual space is free of any temporal or spatial restrictions. In the network-based learning process supported by social media and Web 2.0 services the user takes the role of the creator, editor, or sharer of content. Consequently, traditional institutions have to be ready to meet these challenges.

In the context of the information-based society the main features of knowledge undergo a fundamental change as it becomes more practical, multimedia-oriented and transdisciplinary. A shift can be observed in the knowledge acquisition patterns as lifelong learning becomes dominant blurring the previous modern age-inspired dividing line or border between children's and adults' learning while formal and traditional educational institutions give way to open learning environments. Formal and traditional knowledge transmission becomes obsolete as presenters will rely on multimedia-based presentations. One of the essential requirements of modern and effective instruction is the inclusion of digital content as texts are enhanced by videos, animations, and e-Books. Such developments and trends lay the foundation of e-Learning-based virtual learning environments along with facilitating the implementation of massive open on-line courses in institutions committed to quality education.

Methodological digitalization

The changes brought on by ICT use in the pedagogical profession inspired several researchers and authors including myself.

In addition to the role changes the generational differences appear significant. The well-known terminology developed by Prensky distinguishes two groups, young people born into the world of modern devices known as digital natives and pedagogues not fully familiar with the use of digital technology, or digital immigrants. (Prensky, 2001).

Instructors of teacher training programs are often wondering what kind of skills should be developed in our fast changing world in order to enable prospective teachers to use devices effectively in the future. (Benedek, Molnár, 2013)

Elemér Hankiss attributes the uncertainty of teacher roles to the “shop window aspect” of teachers’ lives. While society expects pedagogues to transmit and inculcate a system of norms, the abundance of information and the impersonal network-based communication frustrates adherence and adjustment to the given norms.

The integration of ICT into teacher training programs is an urgent and well-known task. Device and technology oriented training schemes emphasizing traditional teaching functions and roles cannot prepare teachers to meet the requirements of the experience-based learning approach.

The concept of Flipped Classroom is one such solution in which students prepare at home and apply the theoretical knowledge in specific practice-oriented lessons. (Márta Hunya: Modern School 2015/1)

In the following section we introduce a few publications both by Hungarian and international researchers concerning the challenges of the teacher training process.

The volume titled Best practices in the scientific workshops of teacher training edited by Krisztina Károly and István Perjés contains several relevant essays. Victor Bakos writes about computer assisted Geometry instruction, Attila Buhály discusses the digitalization of instruction in his treatise titled “Seminar 2.0”, Zsuzsa Gonda surveys digital texts found in the National Curriculum, in the classroom and in the teacher training process, while Mária Laczkó explores the perspective of literature and grammar teaching in her article titled “Digital world, digitalized teacher of Hungarian language and literature” (Károly - Perjés, 2015).

The connection between vocational teacher training and ICT is characterised by unique features. In our study we rely on some of these research results.

The establishment and introduction of a comprehensive and complex definition of the term “competence” was the driving force behind the publication of a thorough comparative analysis of vocational training and vocational teacher training programs titled Competence oriented modular vocational teacher training. The 222-page volume includes 22 project case studies with several references to the ICT and other competences of vocational teachers. Section 4.5.3 of the summary study describes the ICT competence circle and analyses such concepts as media competence and e-Tutor competence. (Kadocsa - Varga, 2007).

Digitalized and digital systems in education

The electronic educational framework systems are one of the main components of digital systems. Educational framework systems entail integrated electronic learning environments incorporating selected Web. 2.0 internet-based services according to unique pedagogical considerations. Their primary goal is the promotion of blended learning, or the combination of the traditional and the virtual learning environment, in other words the enhancement or augmentation of the former with the latter. (Námesztovszki, 2013). The functions of integrated electronic learning framework systems cover the following areas:

- The provision, transmission, and processing of educational materials
 - file sharing
 - referencing external content
 - concept repositories
 - html based subject contents.

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- Communication
 - messages
 - chat
 - forum/news forum
 - voting
 - Monitoring and evaluation
 - tests
 - questionnaires
 - attendance sheet
 - task assignment, uploading, and evaluation surfaces.
 - Monitoring user activity: the time and type of activities carried out within the framework system can be checked via the logged files (Tóth-Lévai, 2011).

The best known educational framework systems (Moodle, Coospace, Ilias, Coedu, edX, Coursera, Sakai, Blackboard) all feature the above functions. The respective differences are based on the advanced status, display, usability, and the open or closed source code of the given system.

The so called en-learning or “entertainment-embedded learning” method utilizes audio-visually oriented multimedia devices in helping students to acquire “traditional” knowledge in the field of law, public administration, technology etc., while equipping learners with a cultural and general educational background required by their chosen profession. The en-learning approach utilizing the latest research results of modern pedagogical theory is based on the recognition that the integration of electronic device supported traditional instruction methods (oral presentation and explanation) into an entertaining context multiplies the efficiency of the learning effort. Consequently, student attention can be maintained without decline if a lecture is dynamic and includes either musical or visual components while promoting emotional identification with the given topic, along with facilitating increased participation and the recalling of the acquired information. The en-learning is a pedagogical program assigning priority to strengthening student motivation via making the student interested in the learning process. In order to make the student a “stakeholder” the structure and delivery of the given lesson must be interesting and attention grabbing at the same time. Furthermore, the student’s capability to process information acquired via the textbook and the given presentations should be boosted as well. Thus while knowledge acquisition and processing is self-directed as students must fulfil the given task by themselves, all digital and personal assistance should be provided as well. (Verebics, 2013).

In the following section utilizing our own experiences we introduce a few practical educational methodology solutions, which can make the work of teachers easier. There are several web 2.0-based options (learningapps.org, kahoot.it, quizizz, quizfaber, mindomo, mindmister, sli.do, socrative, mentimeter, plickers,) facilitating interactive task solution efforts.

Student feedback

In addition to the theoretical aspects my research program includes an empirical segment. Consequently, I would like to share my experiences related to a course titled Modern technologies in education. The course is in the mandatory part of the study schedule of our students enrolled in vocational teacher training programs and is taught in the first semester of the given academic year. The aim of the course was the familiarization of students with the device systems of digital pedagogy, the application of multimedia-based auxiliary materials, the use of Web 2.0-based ICT services, the basic principles and forms of electronic communication and the role of ICT competence. Additional objectives include providing basic digital skills facilitating the completion of the other requirements of

the program. The overall goal of the course is to introduce and briefly characterise the latest achievements in the field of information and communication technology and the respective options of adaptation into the teaching and learning processes, with special attention to the interactive systems, and network-based and mobile solutions. This practice-oriented course enables students to test the abovementioned digital and Web 2.0 systems and integrate them into their own pedagogical environment along with sharing the respective practical experiences.

In the fall 2018 semester 80 students submitted a class project including the compilation of a professional concept repository, a knowledge map, along with an interactive electronic test. The assignments had to be uploaded to the Moodle system. The next picture shows the evaluation surface of the system.

PONTOZÓI JELENTÉS

Oldal: 1 2 (Következő)

Korszerű technológiák az ...						
A szakmai munkához ...	E-jelenléti ív	Korszerű technológiák az ...	Ismeretterkép (1), VAGY ...	Hallgatói tesztsor - Nem ...	Mintateszt	Σ
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-	-	0,00	-	-	-	-
-	-	-	-	-	-	-
-	-	0,00	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
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Figure 1. – The evaluation surface of students in the Moodle system, author's own screenshot

Students became familiar with several interactive Web 2.0 services including:

- kahoot
- redmenta
- google drive
- quizziz
- learningapps
- socrative
- ripet
- mentimeter
- quizfaber
- kvizpart
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The above programs and services were introduced in detail in the form of lectures and students could select one program for solving their assignments.

Having analysed the 80 replies with descriptive statistical methods we summed up the results both in diagram and textual form. In the following segment we introduce only our more interesting and informative findings.

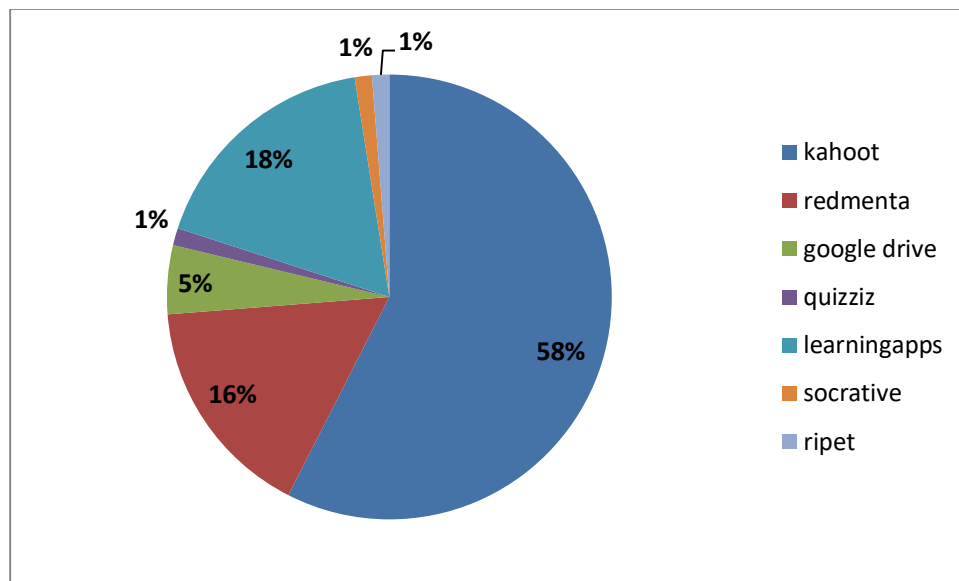


Figure 2. The distribution of the types of interactive student assignments to be used in pedagogical practice, source: author's own image

It can be concluded that most students relied on the Swedish kahoot digital quiz preparation program, followed by the learningapps used by 18% and the redmenta with a 16% user figure. Furthermore, 5% of the sample used the google drive for preparing their assignment.

Summary

Utilizing the domestic and international trends along with almost 20 years of experience as a teacher and instructor in higher education while taking empirical feedback received from students into consideration, I explored the application of the device system of digital culture via interactive methodology and technology. As the instructor of the course titled Modern technologies in education I introduced several Web 2.0-based interactive schemes to students involved in vocational training programs. Furthermore, students were given an opportunity to test these approaches in vocational training schools as well. Current research results underline that students both at the university and secondary school level welcomed this option (Benedek, 2019; Orosz; 2018).

Our mid and long-term goals include the extension and intensification of ICT-based methodological renewal supported by digital pedagogy and ICT-assisted digital skill development efforts. We expect that the application of best practices and methods will result in the increase of student satisfaction and improved academic performance.

An analysis of today's learning environments from an instruction technology angle coupled with an inquiry into the ways of learning and the respective learning devices in the digital world reveals that an ideally equipped classroom meeting the requirements of the 21st century should have the following instruction and information technology tools:

- desktop or laptop suitable for running multimedia software
- web camera
- microphone, sound system

- smartboard
- voting system
- document camera
- digital slate
- interactive table
- digital camera
- digital video camera
- mobile phone
- scanner
- printer
- projector
- wireless applications
- simulation systems
- class sound system
- e-book reader
- tablet
- wide bandwidth-based data transmission system suitable for communication and information search on Internet [5].

The mere availability of the abovementioned equipment does not guarantee the effectiveness of the teaching and learning process as the given educational environment and instruction technology background must be coupled with modern and adequate instruction methods and work formats.

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References

- Bacsa-Bán Anetta (2014): Mérnökstanárok a pedagóguspályán (Engineer teachers and the education process), In: Ósz Rita (szerk.) Empirikus kutatások a szakképzésben és a felsőoktatás-pedagógiában. Székesfehérvár: DSGI, pp. 41-52. (Kutatási füzetek; 12.)
- Benedek András - Molnár György (2015): A műszaki és humán szakterület szakmai pedagógusképzésének és képzők hálózatának fejlesztése (Development of vocational training programs in technology and humanities and the network of trainers), In: Horváth H. Attila, Jakab György (szerk.) A tanárképzés jövőjéről. Budapest: Oktatáskutató és Fejlesztő Intézet (OFI), 2015. pp. 97-105.

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- Benedek András (2008): A Tét és a technológiai fejlődés összefüggései (Correlation between lifelong learning and technological development), In: Benedek András (szerk.) Tanulás életem át (Tét) Magyarországon. Budapest: Tempus Közalapítvány, pp. 105-125
 - Benedek András (2019): Tanterv-tananyagegység-mikrotartalom online környezetben (Curriculum-subject unit-microcontent in on-line environments),: MTA-BME Nyitott Tananyagfejlesztési Kutatócsoport Közlemények, 7. sz. 2019/1. pp. 1-31. (ISSN:2498-8820)
 - Buda András (2012): Mérnök tanárok az információs társadalomban (Engineer teachers in the information society), In: Tóth Péter, Duchon Jenő (szerk.) Kutatások és innovatív megoldások a szakképzésben és a szakmai tanárképzésben : II. Trefort Ágoston Szakmai Tanárképzési Konferencia. Budapest: Óbudai Egyetem, pp. 162-169.
 - Buda András (2015): IKT és szemléltetés (ICT and illustration), In: Birta-Székely Noémi (szerk.) Tudás-Tanulás-Szabadság Neveléstudományi Konferencia. Kolozsvár: Babes-Bolyai Tudományegyetem Pedagógia és Alkalmazott Didaktika Intézet; Doceo Egyesület, pp. 64-65.
 - Dr Benedek András - Szabóné Dr. Berki Éva (2011): Szakmai tanárképzés-tradíciók és új késztetések (Vocational teacher training-traditions and new demands), In: Hrubos Ildikó, Pfister Éva (szerk.) Szakmai tanárképzés: múlt - jelen - jövő. Budapest: Aula; BCE, 2011. pp. 18-27. (NFKK Füzetek; 7.)
 - Feketéné Szakos Éva (2014): Innovatív irányok az ezredforduló utáni andragógiában (Innovative trends in andragogy in the post-millennium period). Eötvös József Könyvkiadó, Budapest
 - Forgó Sándor (2017): A közösségi-médiapedagógia, újmédia rendszer és a közösségi média (Community media pedagogy, new media system and community media)
 - Gocsál Ákos (2015). Ikt-használat a szakiskolában (ICT use in vocational training schools), In: Daruka Magdolna (szerk.) A tanári szerep változásának háttértényezői a szakképzésben. Budapest: Budapesti Corvinus Egyetem, pp. 128-149.
 - Holik Ildikó (2015): Szakmai tanárok módszertani repertoárja (Methodological repertoire of vocational teachers), In: Tóth Péter, Maior Enikő, Pogátsnik Monika (szerk.) Tanári és tanulói kompetenciák az empirikus kutatások fókuszában. Nagyvárad, Románia, Budapest, Óbudai Egyetem Trefort Ágoston Mérnökpedagógiai Központ, pp. 35-54.
 - Kálmán Anikó (2013): A felnőttképzők minősítési rendszerének fejlesztése WBA modell segítségével (The development of the qualification system of adult education professionals by the WBA model), In: Tóth Péter, Ósz Rita, Hajnal Andrea (szerk.) Új kihívások a felsőoktatásban és a pedagógusképzésben: III. Trefort Ágoston Szakmai Tanárképzési Konferencia. Budapest, Óbudai Egyetem Trefort Ágoston Mérnökpedagógiai Központ, pp. 245-260.
 - Karlovitz János Tibor (2012): Nevelési célok, nevelési értékek iskolai pedagógiai programokban (Educational objectives, educational values in the pedagogical programs of schools), In: Buda András, Kiss Endre (szerk.) Interdiszciplináris pedagógia és a felsőoktatás alakváltozásai: a VII. Kiss Árpád Emlékkonferencia előadásainak szerkesztett változata. Debrecen: Debreceni Egyetem Neveléstudományok Intézete, pp. 35-44.
 - Kollarics Tímea - Lükő István (2014): Fejezetek a szakmai tanárszakok módszertanából:: módszertani jegyzet a szakmai pedagógusképzéshez (Chapters from the methodology of vocational training programs-methodological observations), In: Lükő István, Kollarics Tímea, Fejezetek a szakmai tanárszakok módszertanából: módszertani jegyzet a szakmai pedagógusképzéshez. Sopron: Nyugat-magyarországi Egyetem Kiadó, pp. 1-138.
 - Mészáros Attila (2014): A felsőoktatás humán erőforrás kutatásához alkalmazható HS mérőrendszer bemutatása (Introducing the HS measuring system for researching human resources in the higher education sphere), In: Mészáros Attila (szerk.) A felsőoktatás

tudományos, módszertani és munkaerőpiaci kihívásai a XXI. században. Győr: Széchenyi István Egyetem, pp. 20-30.

- Molnár György (2015): A korszerű IKT alkalmazásának mutatói a szakmai tanárképzésben (Indicators of the application of modern ICT devices in vocational teacher training programs), In: Bacsa-Bán Anetta (szerk.) Mérnök-tanár: tradíció és modernitás: A 45 éves tanárképzés jubileumára. Dunaújváros: DUF Press, pp. 140-151.
- Molnár, György (2016): Innovatív technológiai megoldások alkalmazása a tanárképzésben (Innovative technological solutions in teacher training), TANULMÁNYOK: A MAGYAR NYELV, IRODALOM ÉS HUNGAROLÓGIAI KUTATÁSOK INTÉZETÉNEK KIADVÁNYA 2016 : 1. pp. 107-120., 14 p.
- Orosz, Beáta (2018): Digitális tanulói tartalomfejlesztés a tananyagfejlesztésben, mint az informális közösségépítés egyik új lehetősége (Digital educational material development by learners as a new option for informal community building), In: Fodorné, Tóth Krisztina (szerk.) A felsőoktatási lifelong learning társadalmi és gazdasági haszna: kutatás – fejlesztés – innováció : SOCIAL AND ECONOMIC BENEFITS OF UNIVERSITY LIFELONG LEARNING: RESEARCH – DEVELOPMENT AND INNOVATION, Debrecen, Magyarország: MELLearn Felsőoktatási Hálózat az életen át tartó tanulásért Egyesület, (2018) pp. 393-402. , 10 p.
- Sass Judit, Bodnár Éva (2014): Kihívások: Változó tanulók - változó módszerek – változó tanárszerepek (Challenges: changing students – changing methods – changing teacher roles), In: Tóth Péter, Ósz Rita, Várszegi Ágnes (szerk.) Pedagógusképzés - személyiségformálás, érték közvetítés, értékteremtés, Budapest, pp. 183-196.
- Simonics István (2011): Problémák és megoldások a Mentortanár képzésben (Problems and solutions in mentor teacher training), In: Tóth Péter, Duchon Jenő (szerk.) Empirikus kutatások a szakképzésben és a szakmai tanárképzésben: Budapest: Paper problémák. 6
- Szűts Zoltán (2012): A Web 2.0 kommunikációelméleti kérdései (Communication theory aspects of Web 2.0), Jel-Kép: Kommunikáció, közvélemény, média (1-4) pp. http://communicatio.hu/jelkep/2012/1_4/szuts_zoltan.htm
- Szűts Zoltán (2018): Online: Az internetes kommunikáció és média története, elmélete és jelenségei (The history, theoretical background, and main aspects of Internet-based communication and media), Budapest, Magyarország: Wolters Kluwer, ISBN: 9789632957784, pp 15-25.