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APPLICATION OPTIONS OF MODERN ICT-BASED INTERACTIVE COMPONENTS IN OUR DIGITALIZED, COLLABORATIVE AND CLOUD-BASED METHODOLOGICAL AND TECHNOLOGY-ORIENTED LEARNING ENVIRONMENTS

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1. The main features of digitalized learning environments

The digital transformation has impacted the education sphere. According to the Digicomp, the European framework system of digitally competent educational organisations, the impact of digital learning technologies on educational innovation requires educational organisations to prepare for such changes. Consequently, the respective design efforts should focus on three dimensions: the pedagogical, technological, and organisational level. The primary objective of the DigCompOrg is to promote self-reflection and self-evaluation related to the respective teaching, assessment, and learning activities.

In order to promote the comprehension of the organisational dimension several scenarios were prepared within project work programs. The given scenarios focused on typical teaching and learning contexts of digitalized schools of the future, entailing natural science, social science instruction, traditional and laboratory environments, and extracurricular activities. The main emphasis was not on accuracy, but the image-oriented demonstration of the correlations between the given contexts.

The description of the digital school includes general (infrastructure, network connections, tools, software, pedagogy etc.) requirements and indicators, along with defining the process of digital transformation and determining the internal policies and procedures and the managerial context via the utilization of experiences provided by pilot projects.

The Digital Schools pilot program was launched in 2017 as the first step of digital pedagogy development schemes. The respective developments were implemented according to the recommendations of the Digital Education Strategy and met the requirements of the governmental draft concerning the approval of such strategy (Racskó, 2017).

Prior to carrying out the digital developments specified by the Strategy a Digital Demonstration School project was launched with the current participation of 10-12 public education institutions in the coordination of the IVSZ. The project was based on the cooperation of the governmental, civic, and business sphere and facilitated the design, formation, and fine tuning of the technological, human resource-related and pedagogical conditions of prospective digital improvements (Hülber 2017, Benedek,

2016). One of the pressing problems of today is assuring the security of network communication via smart devices. (Szűts, 2018). Since this tasks implies an ever increasing challenge it is important to establish and maintain a protocol supporting the educational use of digital devices in a communication context utilized by learners. (Holik-Sanda, 2018).

2. The current role of digital competence systems

The formation of DigComp framework systems capable of identifying, assessing, and evaluating digital competences was justified by the key role of digital technologies in the national economy, especially in the fields of innovation, economic growth, and job creation.

On the individual level, digital competence is one of the eight competences required for lifelong learning (LLL) as specified by European Union guidelines.

Apart from the recognition of the need for digital competences there was no consensus or agreement on what competences would be included in the digital competence criteria of the people of the European Union.

The experts of the Joint Research Centre (JRC), the science and knowledge hub of the European Commission, have focused on the elaboration of framework systems describing digital competence in addition to other schemes.

The digital competences of European citizens, or in other words citizenship related digital competences (European Digital Competence Framework for Citizens) were developed in order to bridge the gap between education and the labour market.

The development of the European digital competence system started in 2005. The first version (DigComp 1.0) was published in 2013. The second (DigComp 2.0) was issued in 2016, and the latest (DigComp 2.1) was released in 2017.

The concept of informatics literacy or proficiency emphasizes the access to information and the evaluation and ethical use of the acquired information. Media literacy implies the knowledge and understanding of the operation of media, the evaluation of the given functions, and the ability of reasonable expression of the self. The Media and Information Proficiency Curriculum and Competence Framework System prepared for teachers facilitates the realization of both abovementioned objectives. The framework system provides a diverse interpretation of both media and informatics literacy along with emphasizing the development of research-oriented skills and the productive use of media and various information channels according to the given form and technology.

The correlation between these two converging areas results in media and information literacy. Presently there are two interpretations of this concept. Certain researchers consider information or informatics literacy a more comprehensive discipline urging a broader approach, while others believe that information-related literacy should be allocated into the category of media literacy. At any rate it must be pointed out that a research group commissioned by the UNESCO identified several correlations and differences between media and other information channels.

3. A brief description of digital and collaborative device systems and their practical application

In the following section we introduce a selection of web 2.0 based digital device systems that can be effectively used in education.

Learningapps (https://learningapps.org)

The LearningApps.org is a result of a joint research and development project of the Pedagogical College of Bern, the University of Mainz, and the College of Zittau/Görlitz. It is a web surface suitable for the preparation of interactive educational support materials. After registration users can create or share applications or learning cubes via the use of templates or patterns.

The "learning cubes" are basically the given tasks that can be created by the users after filling the task templates or moulds with content. At the same time there is the option of selecting from the learning cubes created by the other users and the given learning cubes can be converted or transformed upon demand.

The webpage is easy to use and facilitates differentiated task assignment. Students can be invited into a virtual class where the learning cubes can be shared and completed. The given tasks presented by the learning cubes can be solved on an interactive board frontally or on the students' own devices independently. The program allows students to practice at home as well. Since the completed learning cubes are not considered self-contained, closed teaching units they have to be embedded or integrated into a proper learning environment. Thus a given type of learning cube can be used with other subjects in a variety of ways.

The program includes a multiplayer mode and users can create a collection of tasks (Matrix). When preparing the collection, one's own exercises and those created by others can be used along with the option of including references. Such data can be integrated into our blog or website as in case of any other application.

The most frequent assignment types include matching, arranging concepts into categories, establishing the chronological order or timeline, crossword puzzle, word search, and filling gaps in a text.

Plickers (https://www.plickers.com)

The Plickers provides a voting system via a mobile telephone or any smart device including a camera operated by the teacher.

The use of Plickers greatly simplifies immediate evaluation. Teachers need only a mobile device and students use a printed white sheet identifiable by a pictogram. When answering the teacher's questions, they raise the sheet and turn it toward him. Depending on the given answer the pictogram can be turned in 4 directions (A, B, C, or D). One disadvantage is that it can only be used in case of multiple choice tests.

The temporary break in connection and the resulting inability to reach the Internet is a frequent problem in schools. The AR-based Plickers offers a solution via turning the classroom into an interactive location without students using their phones or requiring Internet connection.

In order to test the system, it is enough to register at the website and after establishing one or more classes and potentially entering the names of students the application can be downloaded on to a smart phone. Having printed the answer sheets the system is ready for testing. It is easy to use as the teacher asks a question with four potential answer options. In response each student raises their answer card turned to

display the letter representing the appropriate answer. After starting the application, a camera records the answers and the teacher can see each student's replies. At the same time the results along with their distribution are available at the Plickers website. Thus the respective answers can be projected for the whole class to see, and exporting options are available as well.

Menti (https://www.mentimeter.com; https://www.menti.com)

The Mentimeter is a presentation software enabling students to answer questions via the help of a code. The method does not require any instalment or adjustment as students can use their own laptops, tablets, or smart phones. The respective results can be shown in real time, but it is possible to hide them until everyone finishes answering. Furthermore, there is no need for documentation or additional administration as the results are automatically saved by the webpage and they can be downloaded later as well.

The software helps the teacher in making the lessons interactive via surveying the opinions of students regarding a given question or issue. Moreover, it can also be used as a formative evaluation device. Another option is establishing a ranking order among the members of the class if they identify themselves by name before answering. Additionally, the system is suitable for preparing a traditional presentation and can help in the compilation of interactive word clouds too.

Sli.do

In 2013 a great application, the sli. do was introduced. This web-based application gives a voice to your audience by enabling presenters and program organisers to involve the viewers in the communication process.

Such an improvement helped to bridge the gap between the presenter and the questions or comments of the respective audience.

The interactive aspects are already available with the basic services, which are accessible at no cost. While a minimal level English language proficiency is required for the operation, today's Internet users can easily find their way on this surface.

To put it shortly the operation enables the user to visit the sli. do, website either by smart phone, tablet, or laptop. After identifying the pre-determined topic or event by a code, questions can be asked or comments can be made. Other users can vote on the previous comments indicating that they are interested in the given topic.

4. Empirical micro-research

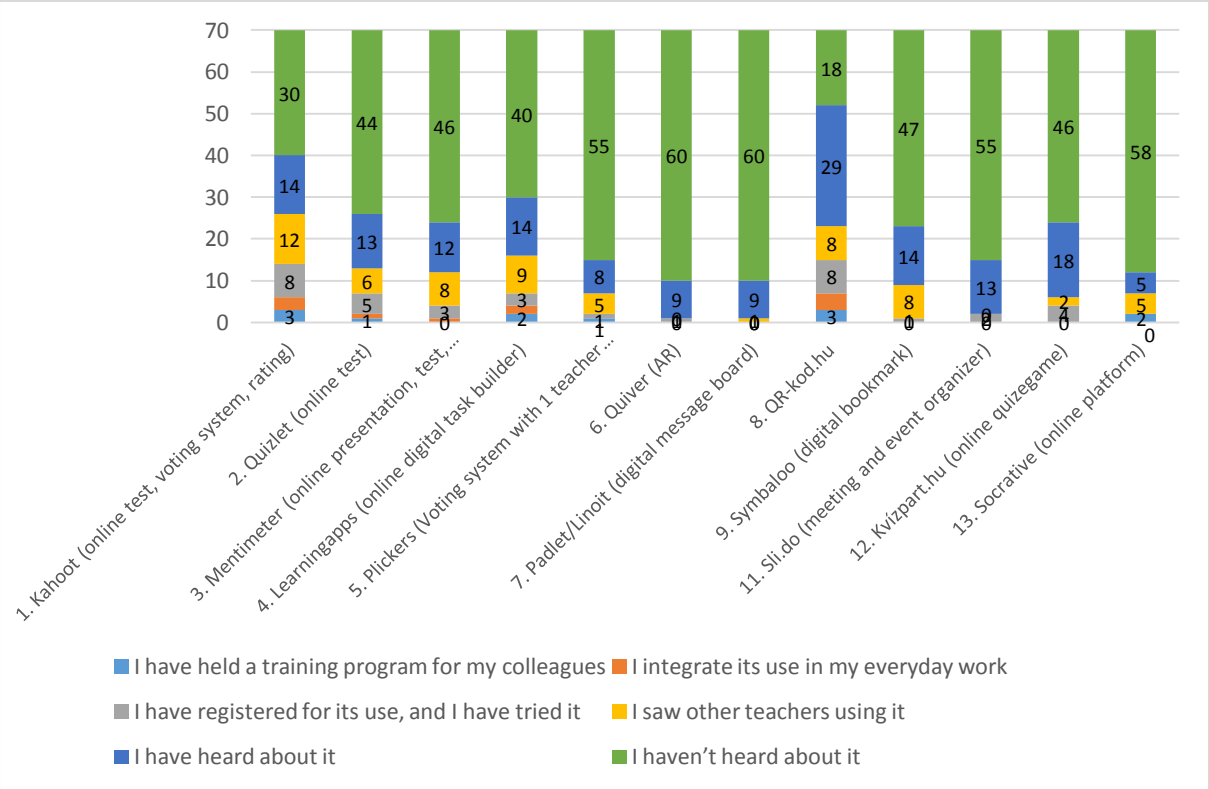
In the autumn of 2019 our students enrolled in teacher training programs and mostly employed in vocational training institutions completed a questionnaire concerning their digitalization-related needs. The random and simple sampling process resulted in 70 valid responses. The aim of the research program was to identify which modern Web 2.0 digital devices are used by the students. The questionnaire utilizing a survey search engine was available on-line at:

https://forms.gle/nSm2t2GLGayVUFL48. The results of the cross-section analysis using simple descriptive statistics were described by diagrams. Our theoretical hypothesis is supported by the listing of the top 10 educational devices and their description in 2019:

1. YouTube – video sharing platform
2. PowerPoint – presentation software

3. Google Docs/Drive – cloud-based administrative packaging and storing device
4. Word – word processing software
5. Zoom – videoconference support device
6. Google Search – web search engine
7. Kahoot – feedback device for classrooms
8. Google Forms – survey device
9. Padlet – on-line board (for collaboration)
10. Excel – table management application

In the following section we only demonstrate the results, which are congruent and compatible with the above list via graphics. Diagram 1 contains a summary of information related to all applications. It reveals that the two most well-known applications are the Kahoot and the QR code, while the least known ones include the Quiver, Linoit, and Socrative.

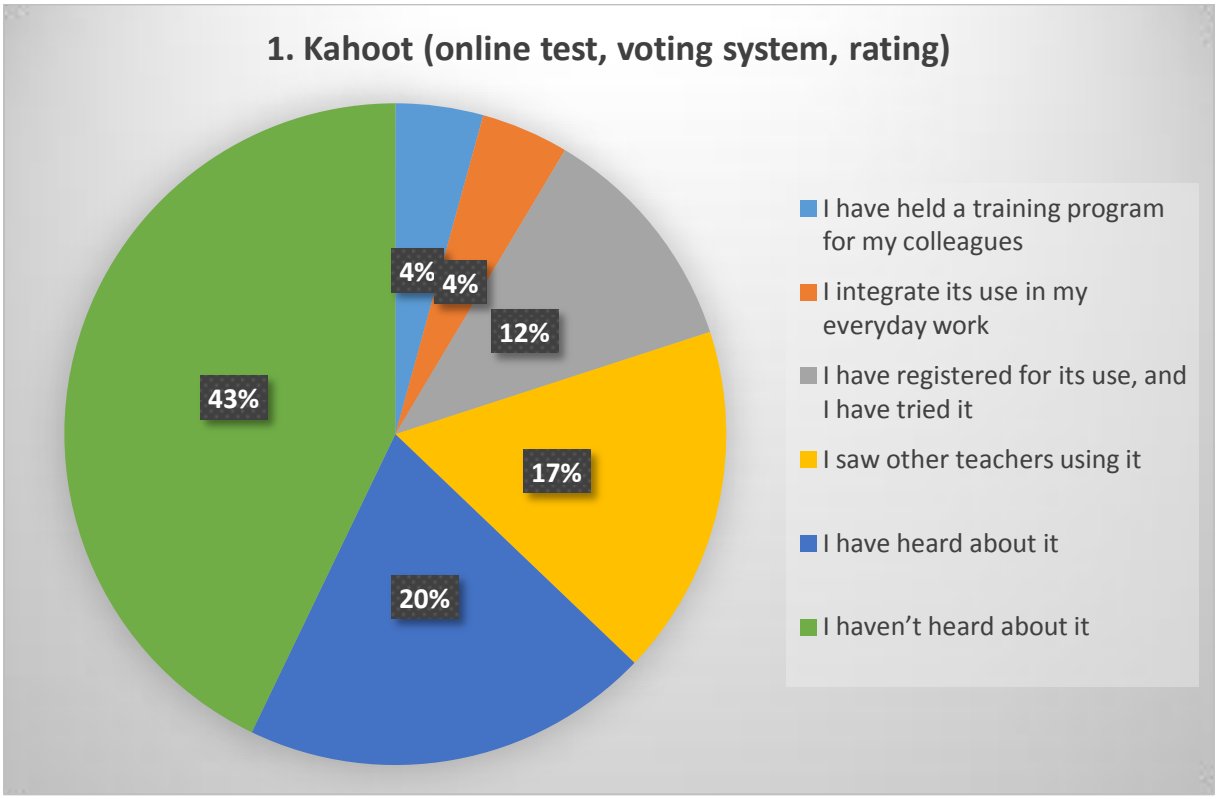


Source: Own figure

Figure 1. Frequency distribution of answers to questions related to all applications

The next figure includes the answers pertaining to the Kahoot quiz engine. It reveals that 20% have heard about it, while 43% are unfamiliar with the application.The table below summarizes the statistical parametres of the six potential answers ranging from" 1 "= I haven't heard about to "6"= I have held a training program for my colleagues. The figure also reveals that the expected dispersion value is represented by the I have heard about it category.

value	2,271428571
standard error	0,1725721
median	2
mode	1
dispersion	1,443841781
sample variance	2,084679089
kurtosis	0,136830584
skew	0,993648594
domain	5
minimum	1
maximum	6
sum	159
quantity	70



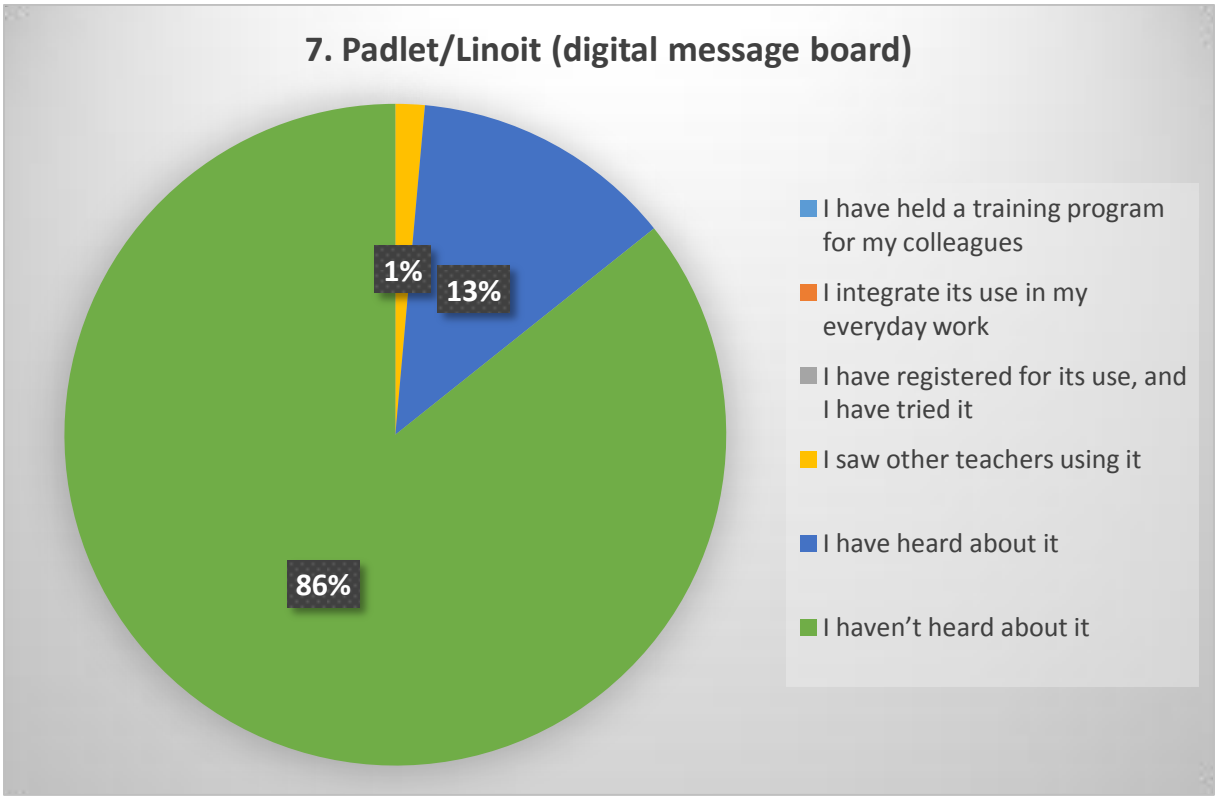
Source: Own figure expected value, standard error, median value, mode, dispersion, sample variance, kurtosis, skew, domain, sum, quantity

Figure 2. Frequency distribution of answers to a question related to the Kahoot application (on-line test, voting system, evaluation...)

The next figure describes the distribution of answers related to the Linoit digital message surface. 13% of those surveyed have heard about it, while 86% haven't heard about the application at all. The table below summarizes the statistical parametres of the six potential answers ranging from" 1 "= I haven't heard about to "6"= I have held a

training program for my colleagues. The table also reveals that the expected dispersion value is represented by the I haven't heard about it category.

value	1,157142857
standard error	0,048307651
median	1
mode	1
dispersion	0,404170802
sample variance	0,163354037
kurtosis	6,411043273
skew	2,579345367
domain	2
minimum	1
maximum	3
sum	81
quantity	70



Source: Own figure

Figure 3. Frequency distribution of answers to a question related to the Linoit application (digital message board)

5. Summary

Based upon domestic and international tendencies and on an almost two decades long teaching and higher education experience and empirical research results we highlighted the potential means of utilizing digital processes in today's educational environments.

The research effort has yielded valuable results and encourages our students working as in-service teachers in vocational training institutions to continue their inquiries. The students' responses basically reflected the tendencies indicated by professional research. Thus it was concluded that digitalization has permeated the educational system and students can reasonably expect the application of such technological achievements on a daily basis. The abovementioned modern interactive digital methodological solutions can help to introduce a learner-centred teaching approach taking students' needs into consideration while strengthening motivation. The application of such methodology will make the learning process more experience-oriented and effective along with increasing student enthusiasm. All in all, we can conclude that students enrolled in teacher training programs at our institution are open to the application of digital methodologies and the teacher training curricula of the digital age should include the respective courses. Student feedback supports the need for digitalization-based pedagogical practices including my own course focusing on modern methodological devices and technologies.

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