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Faculty of Natural Sciences
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Collaborating Networks in the Cloud Supported by Experience-Oriented Devices

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Abstract

The prevalence of the Internet and the proliferation of digital devices have impacted all aspects of life including the labour market and the educational system. However, not only the processes change, but the required competences are transformed as well. Therefore both students and teachers have to adapt to the respective changes. In the era of digital paradigm shift the success and effectiveness of the education effort depend on teachers' ability to meet the demands of the information-based society and being knowledgeable and capable of applying the network- based instruction methods. While previous educational theories were not suitable to describe the digital lesson or learning process, the latest trend, connectivism, integrates those features that are applicable to the current teaching and learning effort. Furthermore, it facilitates collaboration, known as interactive social activity aimed at building knowledge for the purpose of solving a given problem. While the Web 2.0 and cloud-based solutions support new options of collaboration, there are differences regarding the popularity and penetration of such devices. Our study introduces the most important and informative results of related programs promoting the activization of students, and the basic features of selected applications facilitating the realization of the three main goals of web 2.0-based systems, sharing, collaboration and the formation of on-line communities.

Keywords

Collaboration. ICT, BYOD. Web 2.0. Cloud-Based Services

THE TRANSFORMATION OF THE EDUCATION SYSTEM

The growing prevalence of the Internet and the increasing popularity of mobile communication technologies have impacted all aspects of life (Prensky, 2001; Molnár, 2013) including the labour market and the educational system (López-Pérez et al, 2011). Such changes are determined by economic and technological factors (Benedek, 2016; Beetham - Sharpe, 2013). Consequently, active members of society have to be equipped with new skills and aptitudes meeting the requirements of the information-based society. In an increasingly

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network-oriented world high level digital competences (Berki, 2019) become indispensable along with professionalism, cooperation (Schrauf, 2019), problem solving skills, and digital security and well-being implying the ability of critical thinking and the knowledge related to the production and processing of electronic content (Roschelle & Teasley, 1995) (Dillenbourg, 1996) (Molnár, 2013).

Due to the digital paradigm change the technological achievements are becoming integrated in the education process (Simonics, 2016). Thus the learning habits are changing as multimodality, intensifying use of technology, the formation of individual learning paths and the need for instant feedback becomes the norm (Sass - Bodnár, 2017). These changes have imposed an added burden on the teaching profession as educators not only have to keep up with the quickly changing educational materials, but are compelled to meet the demands of the information-based society. Furthermore, it is the teachers' responsibility to help students to acquire such professional and modern, up-to-date knowledge enabling them to adapt to the respective changes (Köpeczi-Bócz, 2007). The effectiveness and success of the education process depends on personal circumstances (Gogh-Kovari, 2019) as all actors in the education sphere are required to possess an user-level proficiency of ICT devices, and content-related requirements have to be fulfilled implying the accessibility of appropriate, sufficient and good quality digital educational materials (Török, 2014). In order to fulfil these conditions adequate, technology-based teaching methods, including collaboration are indispensable (Jambor, 2019).

THE THEORETICAL BACKGROUND OF COLLABORATION

Since the middle of the 20th century several learning theories have emerged (Virág, 2013). While each of them contain features that can be relevant to the current teaching and learning process, none of them can fully describe the characteristics of learning in the digital age. Behaviourism emphasizes the importance of reinforcement in boosting the motivation and commitment of the learner, while cognitivism implies an active, consciously designed learning process. Furthermore, constructivism prioritises the learner's personality and interests. Connectivism (Siemens, 2005), unlike, the previous trends, is organically connected to digitalized learning. The term "trend" in this case is a more than a mere coincidence, since professional debates have taken place until the present day concerning whether connectivism is a learning theory or simply a pedagogical perspective (Kurzweil, 2006). No matter which category the given approach belongs to, it takes the phenomenon of information explosion to consideration along with the need to explore the authenticity of information sources. It considers learning as a process embedded into a different activity and emphasizes the network-based aspect and possibility of information exchange via various devices. Accordingly, knowledge can be described as a network, while learning implies a network arrangement activity resulting from interaction with one's environment (Rainie, 2012).

Such a learning theory model can provide an adequate basis for collaboration. The concept of collaboration originates in the 1990s (Hunya, 2008), from the launching of the CSILE project (Computer Supported International Learning Environment) (Francisti & Balogh, 2019), implying a knowledge construction process aimed at solving a given problem or performing a specific task. Accordingly, the determination of the objectives was up to the learners, who had to continuously adapt to the actual circumstances, and assignments

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leading to a greater identification with the respective problem or task. Obviously the fulfilment of the given objectives requires the presence and help of the teacher. The specific output of collaborative learning will be the new material, approach (Silverman, 2005), methodology, or solution elaborated jointly or via a shared effort of the learning community.engaged in fulfilling the given task (Daradoumis, 2006). The resulting knowledge has a social aspect leading to the concept of collaborative knowledge construction implying that knowledge is formed as a result of interaction, shared understanding and interpretation (Stahl, 2006) (Scardamalia - Bereiter, 1994). According to a study by Strijbos, Martens and associates, intragroup interaction has two basic principles. The principle of mutual dependence shows as to what extent the academic progress of individual students depends on the effort of other group members (a high rate indicates the growth of group cohesion). Individual accountability represents the responsibility of the specific students regarding the given work phases and its correlation with the overall group performance (Gunawardena, 1997). During online collaboration the teacher plays the role of a tutor, monitors and supports the individual and group activity, offers constructive criticism, and provides positive reinforcement while maintaining and increasing the motivation of the learner (Kovari, 2019). The resulting networked individualism gives rise to persons and learners capable of navigating in networks and attaining greater freedom during the learning process. Such a situation provides an opportunity for the formation of individual learning paths supported by the availability of a wide selection of devices implying a new type of help in task solution (Farkas, 2018).

APPLICATIONS AND PROGRAMS FACILITATING COLLABORATION

Micro-research concerning Web 2.0 applications supporting collaboration

Digital web 2.0 and cloud-based solutions facilitate collaboration whose effectiveness has been discussed in several publications. Below we introduce those research results which can be optimally applied during student and teacher interaction. It can hardly be disputed that the globalization of knowledge production led to such a high amount of information, which cannot be handled effectively without digital devices or data bases. Web 2.0 users are not primarily involved in the creation of content, rather they contribute to the formation of an information system in which content can be shaped continuously. Furthermore, working on and sharing their tasks in one location, both learner and teacher are integral parts of such systems. Tags editable freely by the participants help the categorization of information. Tags are crucial components of the system as not only they provide information about the scope of interest of the users, but function as markers of a connection network formed between the respective individuals. Another tendency is the increased importance and value of situation and experience-based learning, along with the personalization of information acquisition (Cress – Kimmerle, 2008). The transformation of the previously one-directional communication into a bi-directional process resulted in the formation and proliferation of a written and at the same time readable web culture (Hargreaves,2015). Personalized learning environments (Attwell, 2007) enable users to meet the requirements of the information society along with the development of self-regulated learning strategies. Consequently, instead of assuming the passive role of the receiver, students become creative participants in the learning process (Blees- Rittberger, 2009). These tendencies clearly delineate the three pillars of Web 2.0 educational systems:

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sharing, collaboration, and formation of on-line communities. Our empirical research explored, how familiar members of the education profession are with the most frequently applied programs designed to boost the activity level of the learner. Below we introduce the responses related to three applications assuring the efficiency and success of the learning process. These applications can be simultaneously used both by teacher and learner and many students can have access to them free of charge. As Diagram 1 indicates the most frequently used or most popular program is the Kahoot which was applied by 74,4% of the respondents, that is 174 out of 234, while 11 persons (4,7% of the sample) regularly rely on it on a daily basis. Two respondents have even delivered training to or assisted their colleagues in using this application. This quiz program is suitable for assessing the knowledge of students either as a warm-up or closure of the lesson in a competitive, game-like atmosphere via assigning points based upon the speed of answering the given questions. Another popular application as shown in Diagram 2 is the Mentimeter tested by 109 people, that is 46,6% of the respondents. Moreover, 32,1% or 75 respondents have heard about it, or saw other pedagogues using it. 50 respondents or 21,4% of the sample haven't heard about it, and there were no participants who would use it regularly on a daily basis or helped colleagues regarding its use. While the Mentimeter is capable of displaying responses in real time and compose word clouds or diagrams, this function is hidden. in order to avoid influencing the testing process in any way. The third application we focused on was the Socrative on-line questionnaire providing feedback in real time as well. The system is capable of providing brief explanations to the questions which include multiple choice, true or false, or short answers. The application can be used by groups as the progress of a team is shown by virtual figures thereby providing a gaming or competitive atmosphere in a community context. Despite such advantages this application is not widely used. Diagram 3 reveals that 206 respondents, that is 88% of the sample, haven't tried it and only 3%, that is, 7 persons have registered and attempted to use the program.

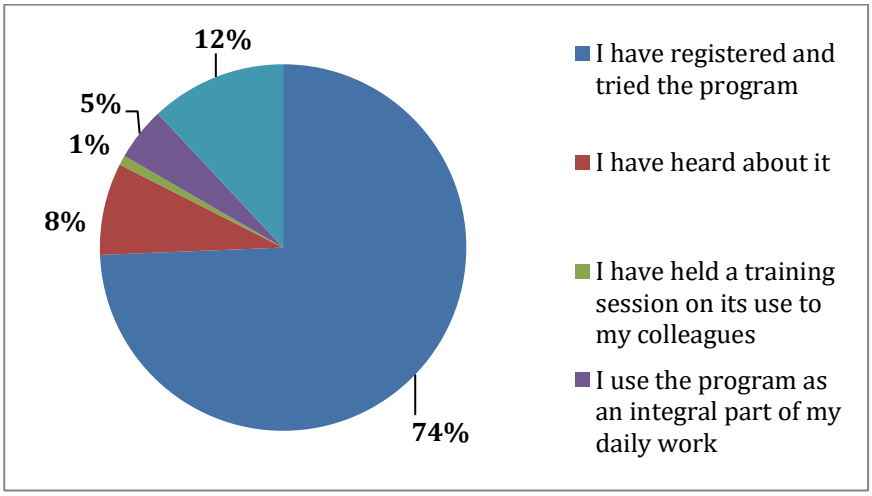

Diagram 1: Familiarity with applications supporting the learning process - Kahoot (author's own compilation).

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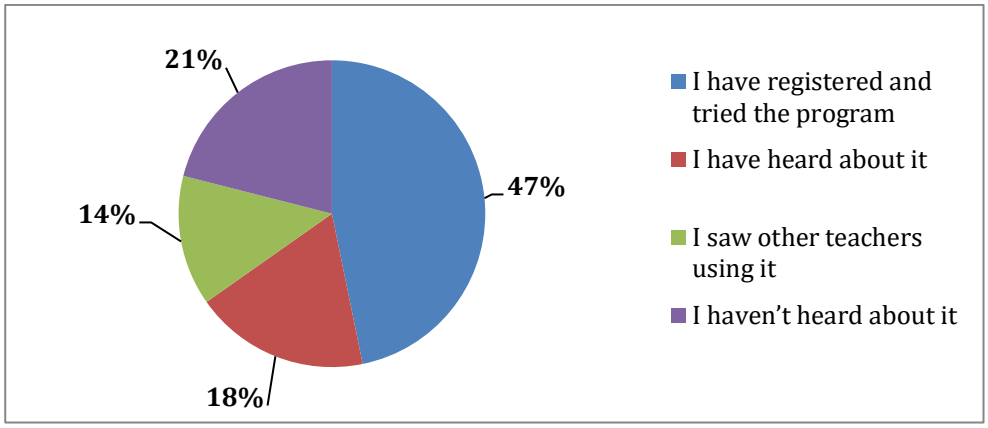

Diagram 2: Familiarity with applications supporting the learning process - Mentimeter (author's own compilation).

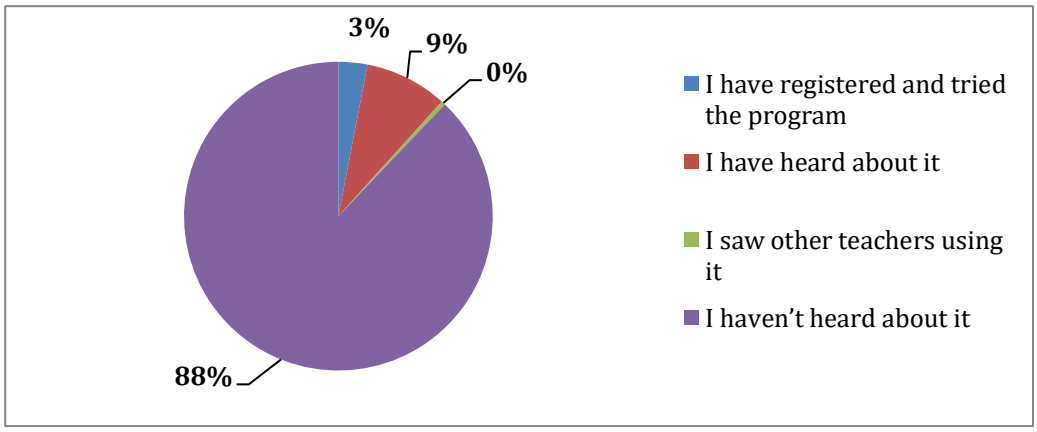

Diagram 3: Familiarity with applications supporting the learning process - Socrative (author's own compilation).

Below we introduce further applications reflecting the three basic principles of the Web 2.0 learning effort, namely sharing, collaboration, and community formation.

Additional cloud-based applications utilizing the user's own device

Symballo

During the informatics classes of the current academic year I relied on the Symballo system. The Symballo is an Internet-based bookmark collection or a website collecting links (Picture 1). A website can be included via the administration surface and can be marked by small icons, subtitles, or placed on a grid.

Advantages:

- the given website can be viewed without registration,
- spares the work of either dictating or writing numerous links on the board,
- separate webpages can be established with DNS control.

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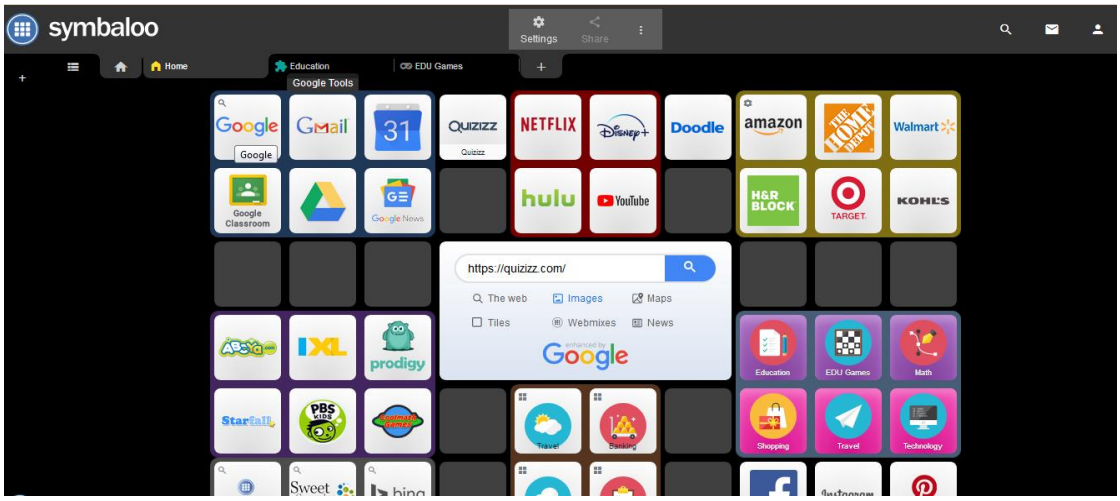

Picture 1: Symballo, author's own screenshot.

Google Classroom

The Google Classroom is an LMS scheme similar to the Moodle system (Balogh & Kucharik, 2019). It is primarily used for giving and collecting in-class assignments and homework during Informatics lessons. Students entering the system with their g-mail address access the shared course wall. Depending on the given setting the teacher or even students can place educational materials, links, YouTube videos, or Google Drive files on the wall (Picture 2). We can create locations where students can place their work even according to a set calendar schedule. The uploaded works can be evaluated and the given points will appear on the students' surface as well.

Advantages:

- there is no need for a separate server
- it is integrated with the own application of the Google (Drive, Forms, etc.)
- it can be integrated with more and more applications, i.e Quizziz.

Picture 2: The surface of the Google Classroom, author's own screenshot

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Description of a lesson

I attempted to use the most approaches possible. One class was started with frontal instruction as I demonstrated the setting options of the WORD paragraphs. Accordingly, I projected my screen on the students' machines by the help of the Veyon, marked the most important information by the ZoomIt, then span the WheelDecide, and I picked the student. I asked the student to repeat and explain the given settings and options, (to me and the class) which were projected on the board. I paid special attention to errors and inaccuracies during the discussion of the oral report, for which I assigned a red mark or 1 point as indicated in the ClassDojo. After that the students completed a new Quizziz test whose link was found in the Classroom. The test included 10 questions and the answers were projected on the board. This way the group or the students could monitor their progress and could see the rate of right and wrong answers even in case of real conditions. If someone achieved 100% on the test, the given reward was indicated in the ClassDojo. In the next segment of the class we applied the previously learned theories. Accordingly, I uploaded the tasks in the Classroom and the relevant source files could be downloaded from the Classroom as well. The completed assignments had to be uploaded into the Classroom. In the closing segment I span the Wheel of Fortune of the WheelDecide and picked a student whose work was projected on to the screen while the class discussed the appropriate solutions. Finally, I assigned the homework, which had to be solved and uploaded into the Classroom or could be done in form of a test on the Quizziz. I uploaded my evaluations of the students' in-class work as besides the numerical marks I included textual explanations as well. The Classroom also provided a summary table, which provided significant help during the determination of the students' monthly marks. In the following section we introduce a developmental scheme optimal for the easy to learn mobile telephone-based applications enabling the teacher to create a program facilitating and monitoring the acquisition of educational materials. What's more, the previously described quiz production programs can be programmed further and games can be developed as well.

Quickapp application builder for Android operation systems

The use of the web-based Quickapp service is free of charge. During registration a Google e-mail address is needed and the system is ready for use. Later the program can be accessed by a Facebook identifier as well

Picture 6: Quickapp, author's own screenshot.

Our first application can be prepared after clicking on the "Create new game" icon (Picture 6) as shown above.

The completed application can be modified by a click on the small pencil icon. The existing applications can be edited, deleted, duplicated, or hidden by the points at the end of the row (Picture 7).

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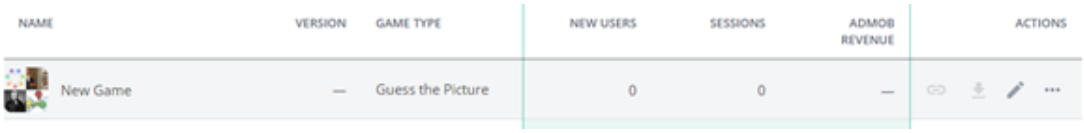
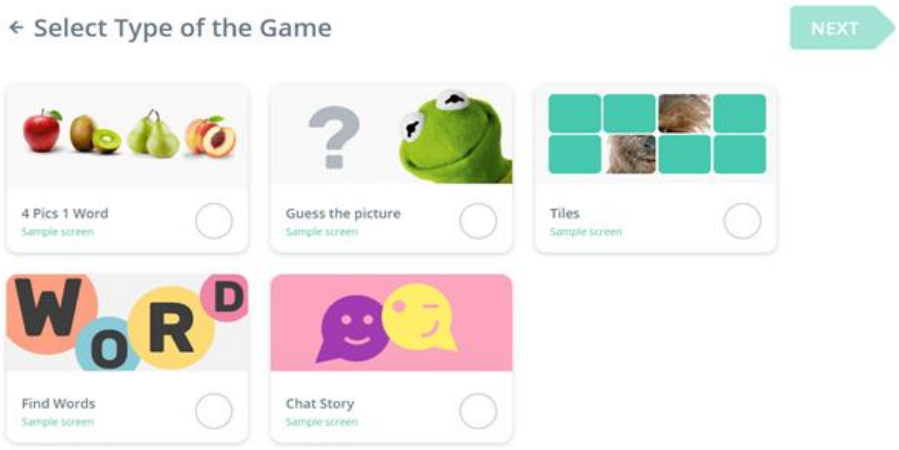


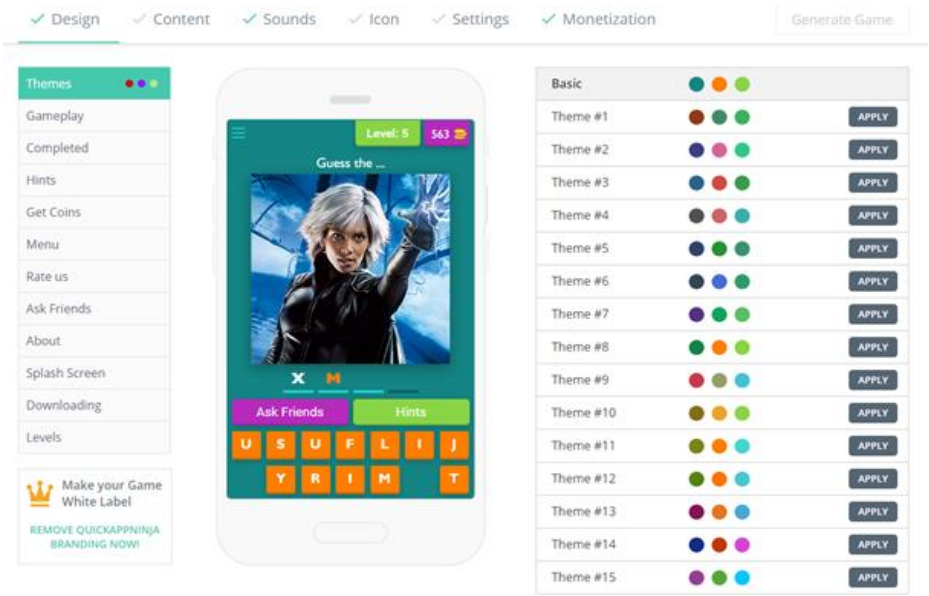
Picture 7: Options provided by the Quickapp, author's own screenshot.

Building a new game program:



Picture 8: Task selection options, author's own screenshot

Clicking on the above images, the type of the game can be selected (Picture 8). The respective game types can include a "4 pictures 1 word" format, general word or image search as the tiles have to be turned so that the player can find the given words or expressions. The application can be edited after clicking on the "Next" button.



Picture 9: The design surface of the application, author's own screenshot.

The display or look of the game can be adjusted at the design page (Picture 9). Accordingly, all aspects of the game including theme, topic, game surface, colour of the buttons can be modified. Frequently, only the matching of colour schemes is required. In

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order for the text to follow the Hungarian punctuation we can select the language of the game on the ”Content” page.

The size of the pictures or images uploaded via dragging can range between 400x400 and 600x600 pixels. The length of each question is 25 letters and the ANSWER cannot contain more than 14 letters. Only the following symbols can be used in the QUESTION field: letters from A to Z, or a-z, digits from 0-9, full stop (.), comma (,), hyphen (-), question mark (?), colon (:), semicolon (;), star (*). The questions indicate what information the players have to find, among them the “name of a famous person,” or “the capital of a country.” We can create games with at least 48 levels. New questions are automatically presented, as we only have to provide additional content.

SUMMARY

Our essay described how the educational system changes due to the prevalence of the achievements of modern technology and their integration in a school environment. While becoming familiar with and learning to use ICT devices can take up a substantial amount of time for pedagogues, we believe it is important to get to know such systems as they enable learners to become more efficient in acquiring competences required by the changes of the labour market. Consequently, the application of ICT devices and the accompanying teaching and learning methodology should not be viewed as a burden imposed by the information society, but as a new option to create a fully student-centred learning process (Balogh, 2006) (Horvath-Sudar, 2018) (Horvath, 2019). This would also mean the elimination of previous spatial and temporal obstacles and potential infrastructural problems hindering the efficiency of teaching and learning. Virtually all students have mobile communication devices with a tremendous potential for learning both in the classroom and at home. Teachers should be encouraged to use such devices in order to increase student motivation and boost participation or activity levels. We introduced a selection of applications successfully used in the education process. Accordingly we can establish a virtual classroom with the Goggle Classroom integrating the Google Forms capable of monitoring the acquisition level of theoretical knowledge. The Quizziz provides an ideal solution to control the fulfilment of home assignments not necessarily in real time. The Symballo can help in the collection or relevant webpages and the Doodle program can be used to schedule the given tasks. The digitalized teacher can choose from several options and can expand their arsenal with applications designed on one’s own mobile phone. All the above mentioned options are connected with modern mobile communication devices leading to interactive, attention-evoking collaboration (Katona-Kővári, 2018a; 2018b) and experience oriented learning. Our experiences confirm that the abovementioned approaches will help in the maximisation of benefits and achieving the level of efficiency recognized by educational researchers. Additionally, such solutions will be instrumental in preparing our students to meet the challenges and perform tasks imposed by the labour market of the future.

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