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Diplomová práce

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The Use of ICT in Teacher's Practice

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Vedoucí práce: Mgr. Ondřej Duda

I declare that I have prepared the diploma thesis on the topic The use of ICT in teacher's practice independently and that I have used only the sources listed in the list of used literature.

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In Olomouc 20. 6. 2022 Bc. Petr Klumpar

I would like to thank Mgr. Ondřej Duda for professional guidance, willingness and help in processing this diploma thesis.

Abstract

This diploma thesis deals with the use of ICT in teacher's practice. The research examines the use of ICT in the practice of lower secondary school teachers in the Czech Republic. This thesis analyzes usage of specific mobile applications, software and websites, and compares their usage in practice according to the length of practice, age of the respondents and participation in the additional education of pedagogical workers. Research sample consists of eighty respondents. The research has quantitative character and questionnaire method was used. By processing the research, I concluded, that the vast majority of the respondents uses ICT in practice.

Contents

Introduction

People nowadays come in contact with technology from an early age to late old age. Information and communication technology (Henceforth ICT) is undergoing continuous development and implementation, whether in the field of business or daily activities. Technology has undergone tremendous development over past decades and undoubtedly became a part of everyday life.

ICT offers wide range of possibilities and solutions, therefore implementation to and connection with education appears as a logical consequence. As ICT overtime became standard in schools and the demand on teachers and their skills in the effective usage of ICT in the teaching process have risen, and for some of them became a difficult challenge.

The diploma thesis deals with the topic ICT in teacher's practice. The main motivation for choosing the topic ICT in teacher's practice were lessons of Mgr. Ondřej Duda that were part of the subject Information technology for English teachers on the Pedagogical faculty of Palacky University in Olomouc as well as observations and conversations with teachers struggling to use some of the more advanced ICT tools during author's teaching practice.

There are various didactic applications or resources and services on the Internet which can be used by teachers. In my opinion, not all teachers are competent enough to make effective use of the wide range of possibilities that ICT offers. This was most evident during the coronavirus crisis, when teachers had to start teaching online and to involve ICT in teaching to a greater extent.

As mentioned above, there are various mobile applications, software and websites that can be used in teaching practice but not all of them are suitable or effective enough for teaching on the lower secondary school. Among other things, this thesis also contains a short list of suitable mobile applications, software and websites that could be used for enrichment and effective teaching.

I.THEORETICAL PART

1 Introduction to ICT

1.1 Definition of ICT

For the purpose of this diploma thesis, it is necessary to define what ICT represents. There seems to be no universal definition to be applied when describing ICT. However, according to Khan et al. (2015), ICT represents technologies that provide access to information through communication. Khan et al. (2015) suggests that the title ICT serves as an umbrella term for any device or software used for communication. In the same context, Badura (2018) states that ICT is one of society's fastest expanding sectors. It does not contain only computers and hardware, but also the programs and software that tell the device how to deal with the data.

According to Zounek a Šeďová (2009), ICT includes means of modern didactic audiovisual technology and digital technologies based on computers, as well as telecommunication services. This allows its users maximum access to information and further work with this information, as well as communication in various ways.

Chráska (2004) looks at the ICT from different angle and states that it doesn't always have to be just information technology. The term ICT also encompasses different ways of working with information, examples are book printing, book writing, radio, radio broadcast, television broadcast, business information systems and services or various information systems, publishing and more.

Based on the understanding of the definition it may be deduced that mobile phones, radios, televisions, computers as well as software, mobile applications or social networks with the needs for their operation such as the Internet and wireless networks or satellites included are considered to be ICT.

1.2 Brief history of ICT development

The development and history of ICT dates to 3000 BC., when the Chinese Emperor Fouhi discovered the binary system. Scottish mathematician John Napier played an important role when he published his tables of logarithms in 1614. The American inventor Herman Hollerith used a counting machine to count the population in 1890, which used punched tape

for bulk data processing. These served as a basic means of communication with the computer. In the 19th century, the English mathematician Charles Babbage, who according to Kříž (2011) is now regarded as the real father of the computer, proposed how to build the first programmable computer. Gradually, people realized that the computer could make work and other things easier, so investments in this area began at the end of the 19th century. Kindergarten children or elementary school students still come across a simple tool, such as a ball counter.

Computers have gone through many evolutions that are divided into five generations. These generations differ mainly in terms of performance, dimensions and the technologies that are used. In Generation Zero, electromechanical computers used relays as the basic component, and the speed of the computer was very slow. These machines were mainly used as calculators or as encryption or decryption machines. IBM (International Business Machines) financially contributed projects related to Generation Zero Computing (O'Regan, 2012).

First–generation computers, which were very primitive, had their own program encoded in a special machine code and stored on removable media. Only one program was loaded into memory at a time, and it was not possible to interact with the computer until it was finished. For this reason, it was difficult to program such a machine. According to Beal (2010), the second generation was influenced by the invention of semiconductors. Tubes that were used in the Generation Zero were replaced with diodes and transistors, perforated labels were replaced by magnetic tapes and discs. The first programming languages such as FORTRAN or COBOL appeared, and computers no longer had their own programming language. These computers were called mainframes because they took up all the space back then. Computers could be better utilized in this generation not only for calculations, but also for civil traffic management (Marshall, 2017).

In the third generation of computers, integrated circuits containing large numbers of transistors appeared. The new feature in this generation was a significant reduction in the device, as well as the discovery of multitasking (the operating system could perform several tasks at once). The more modern programming language Pascal was used (Marshall, 2017).

The fourth generation is characterized by microprocessors and personal computers. The circuits were significantly smaller and more powerful than those of the third generation. Reliability and storage capacity have also been increased. In 1981, IBM released a personal computer called the IBM PC, which ushered in the era of Microsoft's simple DOS (Disk Operating System) operating systems. Microsoft also tried to create a graphical user interface. Software development has undergone major changes. Gradually, the number of operating systems increased, such as MAC OS, Windows 3.11 or Linux. Also, during this generation, the Internet was born. The fourth generation, which has been the generation of tremendous advances for personal computers, continues to this day (O'Regan, 2012).

The fifth generation is still the future. Based on the assumptions of the 1980s, a new computer architecture using artificial intelligence was to emerge after 1990. This technology should be able to solve problems, but also find solutions with algorithms. However, this generation still exists only in theoretical models or the initial stages of research (Kovář, 2004).

1.3 Concepts of ICT in education

In the literature focusing on the topic of the link between ICT and education, four main teaching concepts often appear in this context (Mann, 2007).

Computer Assisted Instruction (CAI) is historically the first concept that attempts to describe the use of modern technology in the classroom. This concept is as well found under the name "Computer Aided Instructions" used in American English (Mann, 2007). The teaching concept was created in the early 1960s and was based on the individualization of education. This individualization was achieved by a student working on a computer. The computer or the didactic program fulfilled the role of the teacher and offered the student a simple overview of the subject, the possibility of its practice and simplified feedback. This concept currently has its pros and cons. Verma (2016) sees the main advantages in the individualization of the student work and in the possibility of choosing the frequency of the feedback, which can take place during the exercise as well as at the beginning or at the end. He also mentions the possibility of interaction depending on the student's ability (the difficulty of the exercise can decrease if you fail or vice versa). Disadvantages include

excessive stereotyping, which can lead to boredom and subsequent inactivity in learners, a tendency to "learn by doing" (a tendency to memorize knowledge, not to understand the content of the material), and potentially high cost of the education associated use of technology.

Computer Managed Learning (CML) has emerged as a new concept from the CAI concept and because of that, there are many similarities. The fundamental difference is the ability to store data about the student and their performance. In this way the teacher has a tool to improve the learning process and thus receive clear feedback of individual or class performance. Another fundamental difference in this concept is the ability to use the didactic programs not only for electronic use, but also for printed materials and tests. However, it is still a concept that focuses on the knowledge acquired by students, not the learning process and student skill development (Zounek & Šeďová, 2009).

Computer Assisted Learning (CAL) is probably the most well–known concept used in practice nowadays. It was created in the late 70s and 80s of the last century. A novelty in this concept over the previous two is the shift of attention to acquired knowledge. It no longer focuses solely on the acquired knowledge, but on the learning process itself (Steinberg, 1991). Zounek (2006) sees the greatest benefits of this concept in the development of students' skills, such as problem solving or stimulation in creative work.

The new and most recent concept is Web–Based Learning (WBL), which emerged in the early 1990s due to the proliferation and accessibility of the internet connection. This concept is based on the possibility for students to use the Internet to acquire knowledge, but also to present it and give feedback to the teacher. Websites play several fundamental and important roles in education. They are source of information for teachers and students, they can be means of communication supporting, among other things, collaborative teaching, and they can be carriers of teaching material (Zounek 2006).

2 ICT in education

Combination of ICT and education has become a standard at primary schools, secondary schools as well as at universities nowadays where it fulfills the role of support of teaching and teachers and provides a content of teaching itself. Some of the ICT tools, for instance softwares created for education, communicate information for the learners, lead their autonomous work and concurrently provide feedback (Klement, Dostál & Bártek, 2017).

If the ever–evolving world of technology is taken into account, it may be expected that the needs and extent of incorporating ICT tools to education will continue to grow (Klement, Dostál & Bártek, 2017). To support this theory, Klement, Dostál & Bártek (2017) also state that some of the present educational theories do not meet the current requirements and trends of modern education and they provide an example: „*It is possible to illustrate the situation on an example of implementation of interactive boards into teaching which started a broad both expert and lay discussion in 2008 about possibilities of employment of these ICT tools in the teaching. Schools were massively equipped with those devices, and teachers were creating corresponding teaching materials for them. Despite the fact that this ICT tool is indisputably contributive for the teaching and a number of schools successfully employs it, it starts to be replaced by a new type of touch device – tablet. "*

We are now living in an era of incredible technical advancement. We can all agree that these changes have an immediate impact on us. The growth of technology impacts everyone differently depending on how often they interact with these devices. However, technological advancement has the biggest influence on the so–called "network generation," who already considers technology to be a regular part of its everyday life. Education is one of the areas of human existence that has been most impacted by technological advancements (Brdička, 2010).

2.1 Types of ICT used in schools

2.1.1 Interactive whiteboard

Utilization of interactive whiteboards (Henceforth IWB) in education is becoming a part of almost every school. The use of these IWBs dates back to 90s of 20th century but at that time the technology was due to its high price unaffordable for most of the schools.

Despite the fact the availability of these IWBs has changed over time, it is still possible to find schools that have not implemented the technology into the process of education (Dostál, 2009a).

IWB is an electronical device that has been developed specially for educational purposes. For successful operation the connection with computer and data projector is used in most cases. The board itself serves as a controller similar to computer mouse or notebook touchpad. Along with that, the IWB also serves as a projection screen collecting transmitted image from the data projector. Therefore, IWB allows users to control the computer as well as running programs and on top of that to observe real time changes on the screen. IWB is controlled with the assistance of specially designed pen (stylus), pointer or with the use of fingers (Bourbour 2020).

Two types of IWBs are used in schools. First type is IWB with front projection, where, as the title suggests, the data projector is placed in front of the IWB. This type of IWB brings significant disadvantages. Due to the placement of the data projector shadows of the person operating the IWB are projected and thus covering parts of the projection screen. Also due to the same problem – data projector placement, the projector is prone to possible mechanical damages. However, the manufacturers are constantly developing new possible preventions and so these types of IWBs can be found in the vast majority of schools. Second type is IWB with rear projection with data projector placed behind the board. This solution eliminates problems with shadow projection. A major disadvantage of this design is the slightly higher price and larger dimensions, which can lead to problems with direct wall mounting. (Dostál, 2009b).

2.1.2 Tablets

Growing popularity of mobile devices among the general public has also manifested itself over time in education, and with tablet's potential for a new tool used for interactive teaching, the tablet has begun to be integrated alongside other ICT tools already used in the educational process (Oliemat, Ihmeideh & Alkhawaldeh,2018).

According to Miriam webster dictionary (© 2022) is the device defined as below: *„Tablet or tablet computer: a mobile computing device that has a flat, rectangular form like that of a magazine or pad of paper, that is usually controlled by means of a touch screen,*

and that is typically used for accessing the Internet, watching videos, playing games, reading electronic books, etc."

According to Černý (2015) is the tablet one of the essential gadgets that radically enriches didactic technologies, changing the way a teacher not only works directly in the classroom, but also connects with students, educates himself, or prepares. This adjustment may be regarded as a paradigm shift, but it is more of a step towards making the educational experience more interactive.

It is a device that a large number of pupils and teachers themselves use in their free time or for self–education. This reduces the barrier between the school environment and the outside world and opens space for greater integration of formal and non–formal education. Many activities, if well thought out, explained and included, can help in better learning as well as in motivating pupils to learn. The tablets may be linked to a variety of devices. These linkages provide a variety of intriguing insights and, like any sophisticated technologies (for example big data processing, artificial intelligence, or augmented reality) have the potential to transform schools and as well tablets themselves. Tablets most certainly do not represent the last stage in the development of didactic technologies (Černý, 2015).

2.1.3 Smartphones

Smartphones as seen today are powerful portable microcomputers with a number of instructional features and applications. The cost of smartphones, considering the variety of functions smartphones offer, has significantly decreased over last decade making them more accessible for everyone. These devices have the ability to support multitasking for example through accessing course material, communicating with or between teachers and peers or conducting research anytime, anywhere, as well as to expand opportunities for cooperation between teachers and students through a number of unique features from mobility to applications, games or collaborative contextual environments (Motiwalla, 2007; Patten, Sanchez, & Tangney, 2006)

Ways of incorporating smart phones into the curriculum might be as diverse as the phones themselves. For example, when studying ecosystems, students might explore and interact with them using their smartphones. Students can document the ecosystem on site with a built–in camera and report about key traits they have observed via voice or written

message. All of the collected data can be then sent to a teacher via e–mail for evaluation (Clyde, 2004).

2.2 Advantages and disadvantages of ICT in education

Opinions regarding this topic among public scientific representatives of education can be divided into two groups of teachers. The first group – teachers enthusiastic about teaching with the help of ICT tools who support and pursue implementation of ICT into schools at fast pace. The second group – teachers who argue with the importance of the human role in the educational process and assume that the implementation of ICT in the process will suppress this role, which could possibly have the effect of disrupting pupils' education. However, both of these views represent the two groups at opposite poles of the imaginary line of opinion and so neither of these views should be considered ideal (Klement, Dostál & Bártek, 2017).

From a general point of view, among various authors, opinions are mostly of a positive nature. For example, Talebian, Mohammadi & Rezvanfar (2014) state that *„ICT now permeates the education environments and underpins the very success of 21st century education. ICT also adds value to the process of learning and to the organization and management of learning institutions. Technologies are a driving force behind much of the development and innovation in both developed and developing countries*. *“*

The exchange of information in the ICT world knows no borders and much can still be done to realize the full potential of adding ICT as a second source of instruction in traditional classroom settings, especially considering the fact that an increase in the integration of ICT in the educational process is inevitable over time. ICT paves the way for acquiring additional educational materials for study, research, entertainment, and development across borders, thus its importance cannot be over emphasized (Ciroma, 2014).

A large number of publications and research are dealing with ICT in the educational process, however, vast majority of them mostly focus on the positive contribution of ICT to education and the negatives are not given as much space or are omitted.

2.2.1 Advantages

According to Mohanty (2011), Kubrický (2011) and Zounek & Šedová (2009) the most frequently mentioned benefits of ICT in education are:

General benefits

- The whole school becomes more efficient.
- There are more options in communication – email, discussion groups and chat rooms.
- The regular use of ICT in various subjects of the curriculum can have a beneficial motivating effect on students and their learning.

Benefits for teachers

- Sharing resources, expertise and advice is thanks to ICT easier.
- There is more freedom in terms of when and where tasks are completed.
- There are improvements in ICT literacy skills, confidence, and enthusiasm.
- It is easier to plan and prepare lessons as well as to design materials.
- It provides access to current student and school information anytime, anywhere.
- It improves the professional image projected onto colleagues.
- Students tend to be more focused on the task and express more positive emotions when using the computer rather than when given other tasks.
- There are more interactive lessons thanks to available technology.
- The use of computers during class motivates students to continue learning outside of class.

Benefits to students

- It improves curriculum quality by enhancement of collaboration among teachers on resource preparation and planning.
- It personalizes education for every student based on the analysis of their strengths, weaknesses and overall performance.
- It improves pastoral care and behaviour management through better tracking of students.
- It supports comprehension.
- There is better development of writing skills, fluency, originality, and elaboration.

- There is higher self–responsibility for learning with encouragement of independence.
- It develops higher–level learning styles.
- Using educational technology in school, according to students, made them more driven to study, and have higher self–confidence and self–esteem.
- There are more possibilities to work on tasks with individuals from outside of or inside the institution.

2.2.2 Disadvantages

Despite the fact that the advantages far outweigh the disadvantages, the other side of the coin must also be taken into account, especially when it comes to education (Zounek & Šedová, 2009).

The biggest disadvantage of ICT in general is the relatively rapid, progressive development. In order to establish adequate competences of future teachers, teaching content must be greatly reinvented year after year, according to new trends and predicting future advances. In other words, frequent changes require the ability of an individual to adapt to new things in a short period of time. In this regard, a relatively wide range of variables, such as the age group of teachers or their motivation to learn new things, should be taken into account as a factor that may influence the progress of the implementation of new technologies. It is vital to ensure regular and up–to–date training in this area at all levels of education of new but also existing teachers (Kubrický, 2011; Zounek & Šedová, 2009).

The overuse of modern technology in education can lead to decrease in face–to–face interaction, which can result into multiple addictions such as addictions on social networks or computer games. Negative socialization manifestations such as aggression, pathological manifestations behaviour and so on can occur in the individual. Even for these reasons, some teachers avoid ICT, which can lead to a variety of problems. In this context, the term "digital divide" can be heard in professional jargon. This phrase refers to the distinction between people who have access to and use ICT to their advantage and others who do not have access to or cannot fully utilize current technology due to their disability. Manifestations of the digital divide may thus be seen in the individual's (non)competitiveness in the job market,

communication with the environment, participation in the advantages that ICT offers, and so on (Kubrický, 2011; Zounek & Šedová, 2009).

2.3 E – learning

The use of electronic media, educational technology and ICT in education is known as E–learning (Adina et al., 2015). E–learning, according to Oxford Dictionaries (2010), is described as learning that takes place through electronic means, most commonly the Internet. E–learning encompasses a wide range of media that deliver text, audio, images, animation, and streaming video, as well as technology applications and processes like audio or video tape, satellite television, C–ROM, and computer–based learning, as well as local intranet/extranet and web–based learning (Adina et al., 2015). E–learning, in general, is a form of learning that employs contemporary information and communication technology to transfer learning content, connect with participants, and manage the learning process (Maněna et al., 2015).

E–learning may be thought of as computer–assisted learning as well as pedagogy for student–centered and collaborative learning. Early advances in E–learning concentrated on computer–assisted learning, in which some or all of the learning information is given digitally. The pedagogical feature of E–learning has lately gained prominence. E–learning encompasses all types of computer–assisted learning and instruction. Whether networked or not, information and communication technologies serve as specific media for implementing the learning process (Jethro, Grace & Thomas, 2012).

The integration of E–learning into teaching has its advantages and disadvantages. Kopecký (2006) divides them on the basis of research surveys.

Advantages:

- Unlimited access to information – E–learning provides local and temporal access to information. As a result, students may learn from anywhere and at any time. However, technology limits access to information (Internet connection, computer speed, E–learning server load),
- Teaching efficiency – according to the author, the effectiveness of E–learning teaching is at least comparable to full–time teaching,

- Timeliness of information and the possibility of their innovation with immediate impact – E–learning allows fast updating knowledge while also upgrading scientific fields. As a result, there is no need to disseminate creative educational materials, which waste time and money,
- Multimedia and its influence on perception and storage of information – E–learning incorporates a variety of multimedia features, allowing students to obtain knowledge in a more sensory manner. Memorization of the curriculum requires balanced sensory awareness, with sight dominating,
- Interactivity – the author considers the multimedia text to be interactive, which means that conversation occurs between the learner and the text. It is necessary for this communication to be two–way,
- Sophisticated verification – texts for E–learning should allow quality assurance of learned information, particularly through various sorts of examinations or open activities,
- Costs vs. income – in the short term, E–learning is both financially and time –consuming, particularly in terms of developing instructional materials and multimedia. However, E–learning is economically worthwhile in the long term,
- Individual pace of self–study – individual self–study is carried out by E–learning participants. However, if the learner lacks proper discipline, it might be a disadvantage.

Disadvantages:

- Dependence on technology – when adopting online education, a computer must be linked to the Internet or Intranet, as well as be equipped with the essential software,
- Standardization – insufficient standardization of E–learning technologies and educational content,
- Unsuitability for certain students – learning with electronic media might be difficult for some students. These pupils require a paper copy of the material for taking notes or highlighting,

- Challenging content creation – creating quality E–learning content is financially, time and methodically demanding. Authors of such content should be methodically trained,
- Unsuitability for some areas of education – E–learning is only suitable for some areas of education. According to the author, it is not appropriate for skill training.

E–learning cannot be restricted to the practical difficulties of incorporating current technologies into various types of education. It should become an essential component of not just lifelong learning, but also didactics in its broadest meaning. The use of ICT should progressively become a common component of teaching and learning, with its usage based not only on the ability to grasp technology, but also on the ability to apply it pedagogically appropriately. This requires all educational actors to be knowledgeable in these areas, including the benefits and drawbacks of teaching and learning using new technologies. (Zounek, 2009).

2.3.1 M–learning

In connection with E–learning, it is possible to come across the term M–learning, which is an abbreviation for mobile learning (Oxford Dictionaries, 2010). Herrington et al. (2009) defines M–learning as any form of learning that takes place with the support or through mobile devices. However, these devices may not always be mobile phones. M–learning includes all devices that do not have a physical connection to the network and lead to learning. An example of such device is a tablet, laptop or even MP3 player (Zormanová, 2012).

M–learning is a logical progression from E–learning. It has the ability to expand when, where, and how children study and perform in many areas of their lives. One of the primary advantages of M–learning is its ability to increase student productivity by making information and learning available at any time and from any location. It allows learners to participate in learning activities without the usual place and time constraints. Mobile technologies provide more accessible and widely available learning than traditional E–learning environments. M–learning improves performance by providing easy access to information, which can have an immediate influence on students' performance in a learning

environment, facilitating their education. M–learning accommodates various learning requirements, and it is great for allowing students to learn at their own pace. M–learning improves two–way engagement by facilitating direct connection between students and teachers, allowing timid or reluctant students to communicate more freely than in classrooms. Furthermore, teachers that teach big groups can employ direct engagement to provide individualized education to all pupils. M–learning also assists students who are experiencing financial, family, or health issues in transitioning to university programs. M–learning is self –motivated and self–disciplined, it allows study without wasting time, wherever and at any time (Sarrab, Elgamel & Aldabbas, 2012).

In the context of M–learning, Lorenz (2010) presents several characteristics focused on positives:

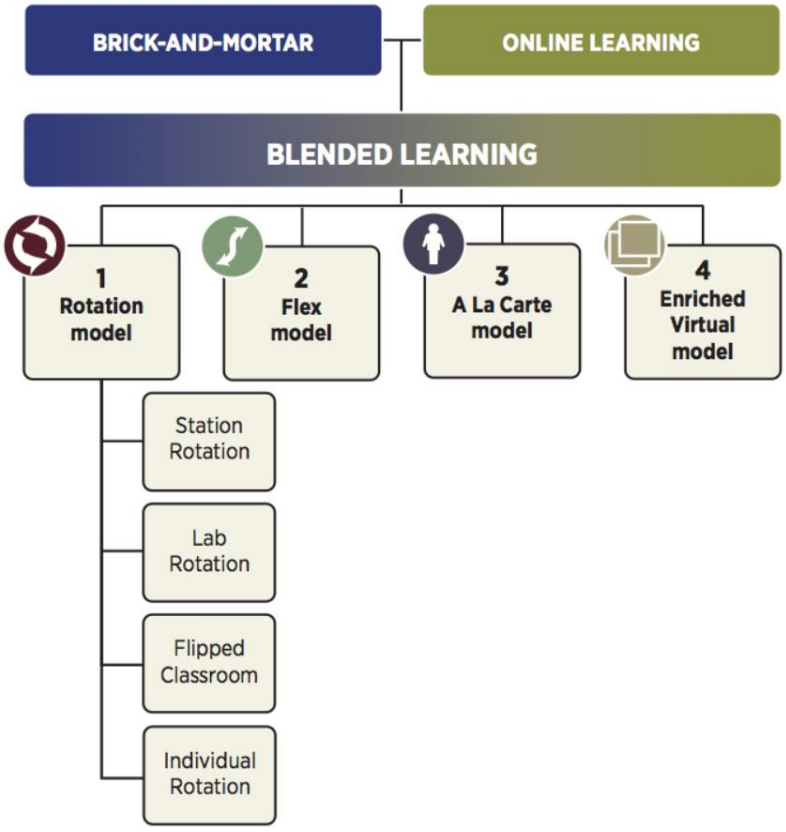
- Prosocial – by focusing on the social environment of students, it mediates the possibility of using already existing relationships to interconnect in real time and helps to create social relationships within the group,
- Authentic and meaningful – it gives context and meaning to activities by focusing on the real problem environment,
- Unlimited – it offers a large number of paths that lead to problem solving due to placement in a wide information space,
- Internally motivating – thanks to the use of popular technologies and tasks focused on the context of the real world, student's engagement increases,
- Interlaced with feedback – it is interlaced with feedback based on own activities performed in a virtual environment, from the teacher and group members.

Lorenz (2010) also states that the right notion of M–learning instruction results in a shift in the student's approach to education. This change comes from a strong desire to learn. He as well highlights the importance of informal education (unplanned, in leisure time, self–education), in which the producer of educational activities creates the environment for spontaneous information sharing among students. The combination of excitement for school and learning leads to changes in the establishment of student social groupings.

2.3.2 Blended learning

The term blended learning is understood nowadays as the connection of forms and methods of regular (face–to–face) teaching with E–learning, M–learning or elements of distance education. It is therefore a link between regular teaching and online teaching, where electronic resources and tools are integrated into teaching. The main goal of blended learning is to make full use of digital technologies in combination with traditional methods used in regular teaching. The combination allows all participants of the learning process (teachers and students) to take advantage of wide range of suitable and functional solutions that can be adapted to different teaching styles of teachers and different learning styles of students, therefore making the output of the teaching as well as learning process more effective (Zounek et al., 2016).

According to Horn & Staker (2014) can be blended learning divided into different models based on the combination of forms of teaching:



Picture 1 - Blended learning models (Source https://www.christenseninstitute.org/blended-learning-definitions-and-models/)

1. Rotation model – It is a course or subject in which students rotate between learning modalities, from which is at least one of the modalities online learning, on a set schedule or at the discretion of teachers. Other modalities may include activities such as small–group or full–class lesson, group projects, one–to–one lessons, and pencil –and–paper assignments. Apart from any homework, the students mainly learn on the presence campus. The rotation model is further divided into four types:

    a) Station rotation

       Students work according to a set schedule and rotate between individual learning stations. The station rotation model is set to a contained classroom or a group of classrooms. All stations need to be included to the rotation.

    b) Lab rotation

       The online part of the course or subject takes place in a computer lab where the online learning station is set. Students rotate between a computer lab and a normal classroom.

    c) Individual rotation

       In this type of rotation model has each student individualized plan set by a teacher or an algorithm. The rotation between different stations and modalities persists, though, students do not necessarily cycle every available modality or station.

    d) Flipped classroom

       A course or subject in which students participate in off–site online learning instead of traditional homework, and then attend face–to–face classes for teacher –led practice or projects. The primary delivery of content and instruction is online.

2. Flex model – Parts of teaching take place in school in a form of face–to–face teaching, for example a seminar or a lecture. The core of the flex model revolves around online teaching and the teacher serves as a flexible support, either online or in person.

3. Enriched virtual model – This model is based mostly on online teaching. At the beginning of the course is required a face–to–face meeting with teacher which serves as an „enrichment". All duties are finished online afterwards.

Lopes & Soares (2018) further describe the fourth model:

4. A la Carte model – The A La Carte model (Self–Blend model) allows students to attend one or more courses online with an online instructor of record while continuing to take other face–to–face courses, which typically provides students with additional scheduling freedom.

3 ICT and teachers in Czech schools

3.1 Digital education strategy until 2020

On 12th of November 2014 a document named The Digital Education Strategy until 2020 was approved by Government Resolution No. 927/2014. The document focuses on setting processes and creating appropriate conditions that lead to goals, methods and forms of education corresponding to the current state of knowledge, social life requirements and the labor market influenced by the development of digital technologies and the information society. The document also aims to initiate changes in methods, forms and in goals of education (Ministerstvo Školství, Mládeže a Tělovýchovy, © 2022).

Three priority aims of the strategy according to Ministerstvo Školství, Mládeže a Tělovýchovy (© 2022) are:

- To support the development of students' computational thinking,
- To improve pupils' competences in working with information and digital technologies,
- To enable the use of new methods and ways of learning thanks to digital technologies.

The aims are organized to directions of intervention:

- Non–discriminatory access to digital educational resources,
- Ensuring conditions for the development of digital competencies and computational thinking of pupils and teachers,
- Ensure the construction and renewal of educational infrastructure,
- Support for innovative practices, monitoring, evaluation and dissemination of their results,
- Ensuring a system supporting the development of schools in the areas of integration of digital technologies into teaching and school life,
- Increase public understanding of the goals and processes of integrating technology into education.

If digital literacy is to develop in students, it is essential that teachers have at least the same ICT competences as students and are able to develop these competences in students. In this context the digital education strategy until 2020 intends to establish a standard of teacher skills and competences for the application of digital technologies. To achieve this standard, technology must be integrated into undergraduate teacher education, as well as the offer and availability of additional education of pedagogical workers or instructional resources expanded (Ministerstvo Školství Mládeže a Tělovýchovy, 2014).

3.2 Educational policy strategy of the Czech Republic 2030+

The 2030+ strategy according to Ministerstvo Školství, Mládeže a Tělovýchovy (© 2022) is a critical document for the development of the Czech Republic's educational system in the years 2020-2030+. The goal is to modernize the Czech education system in the areas of regional education, leisure and non-formal education, and lifelong learning, preparing it for new challenges while also addressing persistent difficulties in Czech education. Its goals include, among other things, modernizing, equipping, and rationally managing schools, introducing new technology, and supporting innovation. Furthermore, new methods of student preparation and assessment will be introduced for students to gain information, skills, and attitudes that may be applied in both personal and professional life.

Teachers' support is required to change the content of education and the overall quality of education. The teacher's involvement in the advancement of digital education is crucial. The emphasis will be on developing teachers' digital capabilities, both during pre-graduate training and later in their education. Mentoring and sharing best practices in incorporating digital tools into education are also required. Activities that increase teachers' abilities to work with a range of digital learning materials, plan and implement the use of digital technologies at various stages of the learning process, work responsibly with digital content, and create and develop students' digital competences will be supported (Fryč et al., 2020).

Fryč et al. (2020) further state that student or teacher faces digital exclusion if he or she lacks appropriate digital abilities, access to digital tools, or an Internet connection. The education system's goal is to bridge the digital divide between students and teachers by

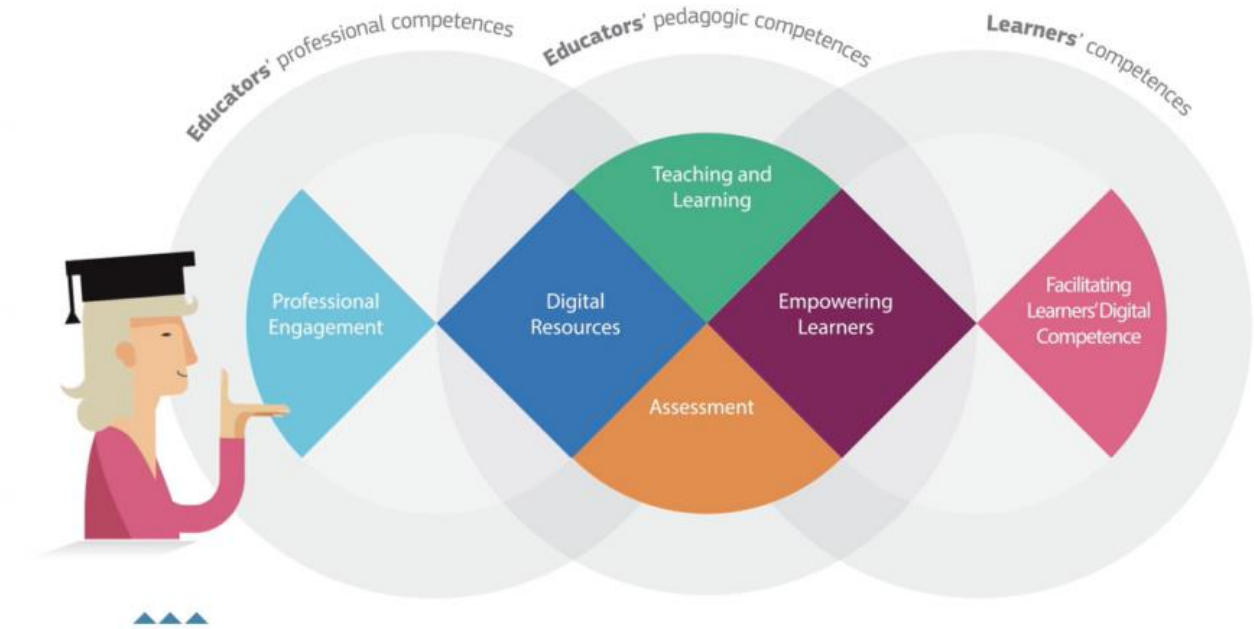
promoting non-discriminatory access to high quality education and providing conditions that lead to a growth in their digital skills both inside and outside of school. If digital tools are made available and used appropriately in all schools, they can make a substantial contribution to decreasing educational inequities.

3.3 Digital competences

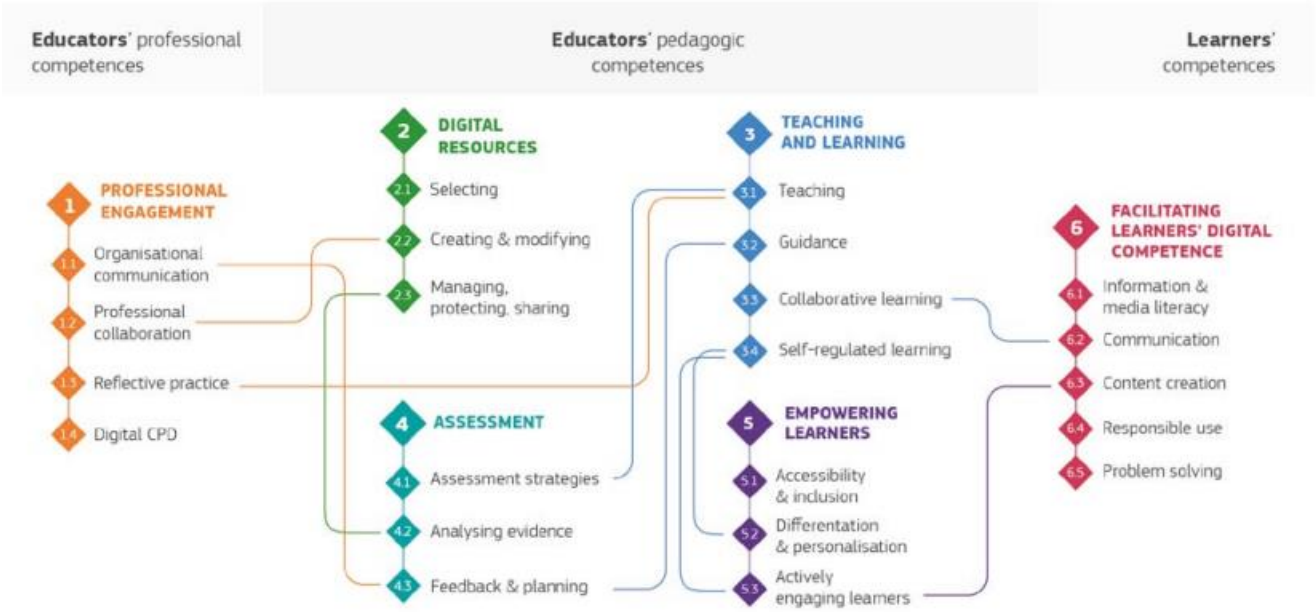
The following chapter is taken from European framework for the Digital Competence of Educators (DigCompEdu) by Redecker (2017).

Digital competences have recently been a frequently discussed topic in pedagogy. Most European countries are changing educational documents based on the achievement of the necessary digital competences of pupils. However, this logically creates a need for teachers who lead pupils to acquire these competences to be equipped with the appropriate competences in this area. Adequate digital competence of teachers is also necessary not only to improve teaching, but also for their professional interactions with colleagues, students, parents, and other stakeholders, for their individual professional development, community well–being and continuous innovation in organization and in the teaching profession.

DigCompEdu aims to describe educator specific digital competences and organizes them into six areas (picture 2) and twenty–two elementary competences as in picture 3.



Picture 2 – Areas of competences according to DigCompEdu (Source https://data.europa.eu/doi/10.2760/159770)



Picture 3 – Division of competences (Source https://data.europa.eu/doi/10.2760/159770)

1. Area of Professional Engagement is divided into four competences:
    a) Organizational communication – To use technology for communication with students and parents and collaborate to further develop and improve communication strategies,
    b) Professional collaboration – To use digital technologies in order to connect with other educators, and to innovate pedagogical practices through collaboration, exchange of knowledge and experience,
    c) Reflective practice – To reflect and critically evaluate and actively develop own digital teaching practice and the practice of educational community individually and together,
    d) Digital continuous professional development.
2. Digital Resources area contains three competences:
    a) Selecting – To identify, evaluate and select digital resources for teaching as well as learning. When selecting digital resources and planning their use, consider the specific learning objective, context, pedagogical approach and student group,
    b) Creating and modifying – To modify and develop resources with open license or other resources with permission made for this purpose as well as to produce or help with production of unique educational resources while considering specific learning objectives context, pedagogical approaches, and student group, especially in the process of designing or planning to use digital resources,
    c) Managing, protecting, sharing – To ensure availability of organised digital content to students, parents, and other teachers. To make sensitive digital content effectively protected. To apply privacy and copyright rules in correct way. To understand the employment and creation of open licenses and open instructional resources, as well as their correct attribution.

Educators are currently confronted with variety of digital educational resources that can be used for teaching. One of the key skills that every educator must develop is to adapt to this diversity, effectively identifying the resources that the best fit their learning goals, student group and teaching style while structuring the variety of materials, making

connections, modifying as well as adding and developing resources to support their teaching. Educators must simultaneously be aware of using and managing digital content with responsibility. When using, modifying, and sharing different resources, copyright rules must be respected and protection of sensitive content or data, such as student grades or digital exams, must be secured.

3. Teaching and learning area are divided into four competences:
    a) Teaching – To enhance the efficacy of the teaching intervention, plan and incorporate digital devices and resources into the teaching process. Manage and arrange digital teaching techniques appropriately. Experiment with and create new formats and teaching approaches for educational purposes,
    b) Guidance – To use digital technologies and services to improve interaction with learners, both individually and collectively, both inside and outside of the learning session. To make advantage of digital technology to provide fast and targeted advise and help. To test and create new forms and formats for providing guidance and help,
    c) Collaborative learning – To develop and improve learner cooperation via the use of digital technology. To empower students to use digital technology in collaborative assignments to improve communication, cooperation, and collaborative knowledge development,
    d) Self–regulated learning – To use digital technology to facilitate self–regulated learning, for example to allow learners to plan, monitor, and reflect on their own learning, offer proof of progress, exchange ideas, and come up with innovative solutions.

In a variety of ways, digital technology may enhance and improve teaching and learning practices. However, regardless of the pedagogical style or approach used, the educator's distinctive digital competency rests in skillfully coordinating the use of digital technology in the many phases and contexts of the learning process.

4. Assessment area deals with three competences:
    a) Assessment strategies – To employ digital technology for corrective feedback. To broaden the range and applicability of assessment forms and methodologies,
    b) Analyzing evidence – In order to inform teaching and learning, develop, choose, critically analyze, and interpret digital data on learner activity, performance, and progress,
    c) Feedback and planning – To give learners focused and timely feedback using digital technology. Based on the evidence generated by the digital technologies used, adapt teaching strategies, and provide targeted support. To assist learners and parents in comprehending and applying the evidence supplied by digital technology for decision–making.

Thanks to digital technologies, existing assessment strategies can be improved, and new evaluation strategies can also emerge.

5. Empowering Learners area contains three competences as bellow:
    a) Accessibility and inclusion – To guarantee that all learners, including those with special needs, have equal access to educational materials and activities. To acknowledge and react to learners' (digital) expectations, skills, uses, and misunderstandings, as well as environmental, physical, or cognitive limits to their use of digital technology,
    b) Differentiation and personalization – To employ digital technology to meet the unique learning requirements of learners by allowing them to grow at different levels and speeds, as well as to pursue personalized learning pathways and objectives,
    c) Actively engaging learners – To employ digital technology to encourage students' active and creative involvement with a subject. To incorporate digital technologies into pedagogical strategies that promote learners' cross –disciplinary skills, deep thinking, and creative expression. To expose learners to new, real–world settings for learning that include them in hands

–on activities, scientific study or difficult problem solving, or to improve learners' active participation in complex subject subjects in other ways.

6. Facilitating learners ‘digital competence area contains the last five competences:
    a) Information and media literacy – To be incorporating learning activities, assignments, and assessments that require learners to communicate information needs such as finding information and resources in digital environments, organizing, processing, analyzing, and interpreting information as well as comparing and critically evaluating the credibility and reliability of information and its sources,
    b) Communication – To integrate learning activities, assignments, and assessments that require learners to utilize digital technology in effective and responsible way for communication, collaboration, and civic involvement,
    c) Content creation – To include learning activities, assignments, and assessments that demand learners to express themselves digitally, as well as edit and produce digital content in a variety of forms. To teach students about copyright and licensing as they pertain to digital content, as well as how to cite sources and acknowledge licenses,
    d) Responsible use – To take precautions to guarantee learners' physical, psychological, and social well–being when utilizing digital technology. To provide students with the knowledge and skills needed to manage risks and utilize digital technology with safety and responsibility,
    e) Problem solving – To implement learning activities, assignments, and assessments that encourage learners to recognize and solve technical problems, as well as creatively apply technology knowledge to new contexts.

3.4 Additional Education of Pedagogical Workers

According to Tužilová (2016), the aim of Additional Education of Pedagogical Workers (henceforth AEPW) is professional development of Czech teachers. It is a systematic and coordinated procedure that begins with undergraduate education and

continues throughout the educational worker's career. AEPW is a component of lifelong learning in the Czech Republic and the emphasis of teacher professional development.

At the same time, educators have both the right and the responsibility to engage in AEPW, which serves two primary functions – standardization and development. This signifies that AEPW guarantees that the present education system's quality and level are preserved while also serving as a tool to encourage its development and innovation. The new demands require not just excellent training in teacher education institutions, but also further education and certification acquisition or development not only in the area, but also in methodology, didactics, pedagogy, psychology, and specialized activities such as working with ICT. The necessity for more pedagogical worker education derives from the rising complexity of teaching job. It promotes teachers' career freedom and gives them room for professional development. The integrity of the additional education system is also required for sustaining and enhancing the status of the teacher profession. It may also contribute to an improvement in teachers' perceptions of the teaching profession (Lazarová, 2006).

Individual types of further education are defined by the Decree on AEPW. These are:

- study to meet qualification requirements,
- study to meet other qualifications,
- study to deepen professional qualifications.

Further education of pedagogical staff can take place only through accredited educational programs in accredited educational institutions. The Ministry of Education, Youth and Sports also accredits individual educational institutions for this purpose (Tužilová, 2016).

II. RESEARCH PART

4 Methodology of the research

4.1 Aim of the research

The main aim of this research was to map the use of ICT in the practice of lower secondary school teachers in the Czech Republic.

The partial aims were to find out which specific mobile applications, software and websites this research sample uses in practice and to briefly describe them. Another partial aim was to find out what they most often use mobile applications, software and websites in lesson for.

4.2 Research questions

- What is the percentage of use of ICT in practice?
- What is the percentage of specific ICT used in practice and what does the given sample use this ICT for?
- What is the percentage of usage of mobile applications, software and websites in practice and what are they used for in lesson?
- What is the dependence of participation on ICT training in additional education of pedagogical workers and the use of ICT in practice?
- What is the percentage of opinion on the effectiveness of the use of ICT in practice?
- How do respondents evaluate their ability to use ICT in practice?
- What is the percentage comparison of ICT use in practice depending on the length of practice?
- What is the percentage comparison of ICT use in practice depending on the age of the respondents?
- What is the percentage comparison of ICT use in practice depending on participation in additional education of pedagogical workers?

4.3 Characteristics of the research method

For the processing of the research in this diploma thesis was chosen the method of quantitative research by the method of questioning, the technique of questionnaire (Appendix 1). The data were processed in order to meet the set aims and to answer research questions. The questionnaire consisted of twenty–three questions and was completely anonymous and was divided into three parts – General information part, ICT focused part and Final part which consisted of three questions (participation in additional education of pedagogical workers, effectivity of ICT in practice and ability to use ICT in practice). The questionnaire was posted to the Facebook groups uniting communities of teachers – Učitelé+ and Učitelé učitelům.

The questionnaire was created using the Google Forms internet service. The resulting answers were then processed using a Google Sheets and Microsoft Office Excel spreadsheet, and charts were created using this data to present final results.

4.4 Characteristics of the research sample

The research sample contained 80 respondents. From the chart 1 can we see that more than a half of the respondents (72,6 %) consists of teachers that are aged between 25 and 44 years. The least represented category are teachers under 25 years of age (5 %).

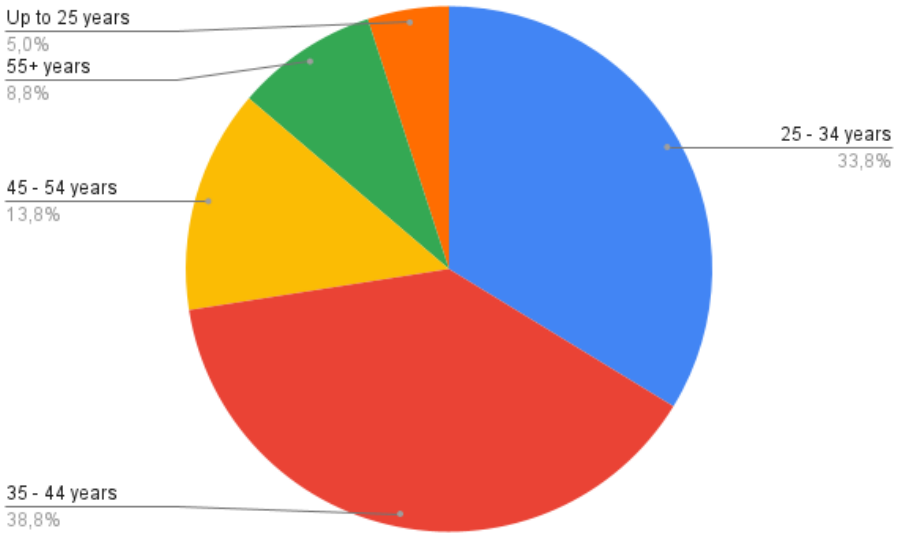


Chart 1 – Age category

The length of practice of individual respondents we can see in Chart 2. Almost half of the respondents (47,6 %) have more than 10 years of practice. More than a third of respondents have less than 5 years of practice.

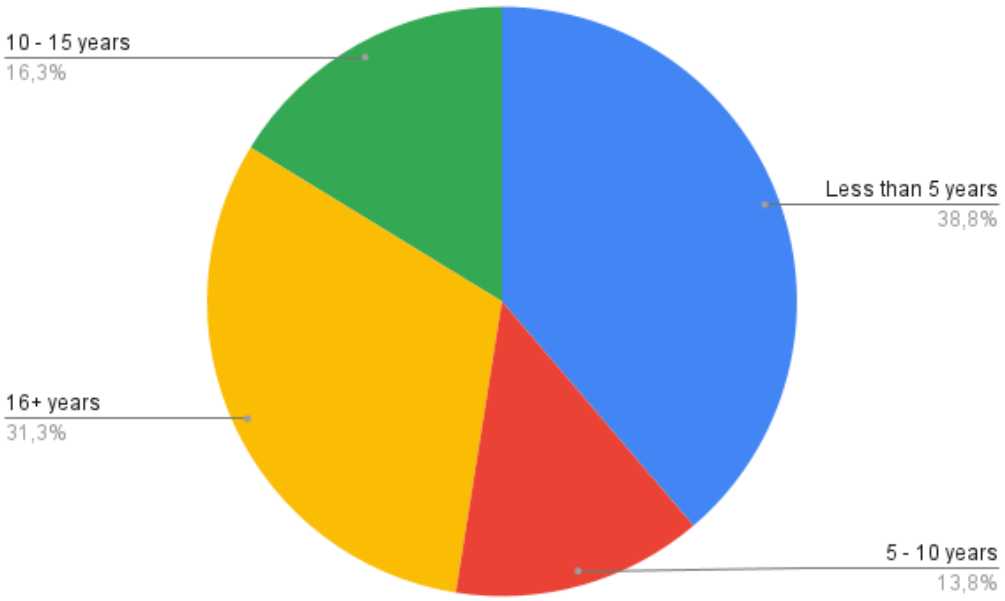


Chart 2 – Length of practice

From the Chart 3 can be seen that the vast majority of them (98,7 %) teaches on the lower secondary school. The rest (1,3 %) chose 8 years gymnázium as an answer. Option number three – 6 years gymnázium was presented as an option in this question as well but none of the respondents selected it.

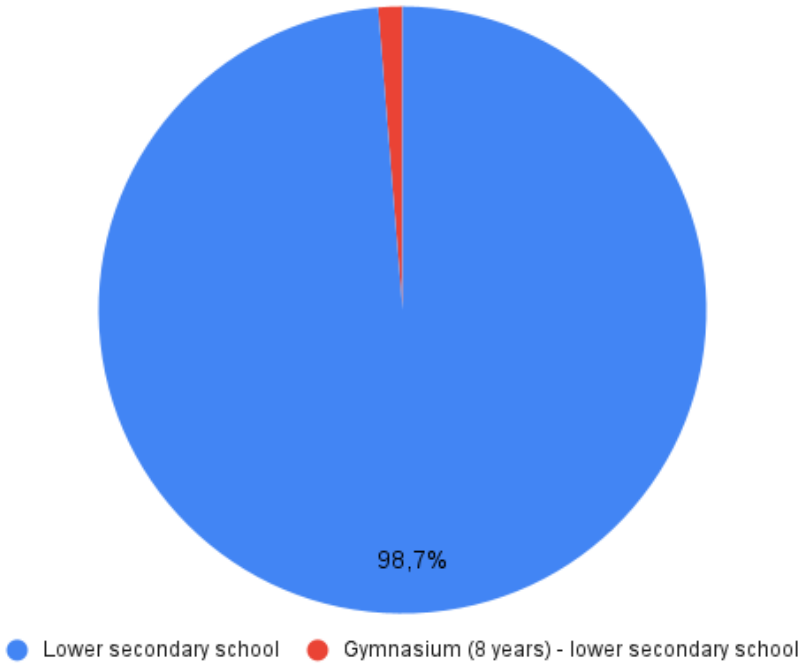


Chart 3 – Type of school

Another research sample distribution was according to the subject. The respondents could select two subjects. Chart 4 shows the results. The most often selected subject (33 times) was foreign language in general followed by second most often selected mathematics (28 times).

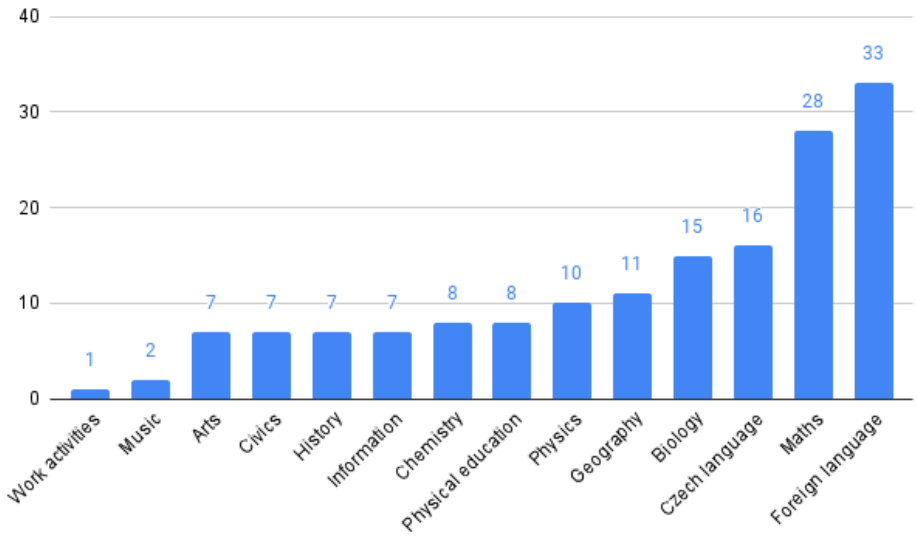


Chart 4 – Subjects

5 Results of the research

5.1 Results and data interpretation

The following charts show the summary results of the survey.

In the question number five, were the respondents asked whether they use ICT in practice or not. The question had only Yes or No option. Chart 5 shows that majority of the respondents (98,8 %) responded in a positive manner and were further redirected to the ICT part of the questionnaire.

Only one respondent chose the second option. The respondent that answered in a negative manner was redirected to question determining the reason behind the decision of not using ICT during the teaching practice. The options that could be selected were as below:

1. It does not make sense to use ICT in my practice.
2. The school I am teaching in does not have adequate equipment.
3. I do not possess adequate skills.
4. Use of ICT in practice delays me.

The respondent selected option number two and was further redirected to the final section of the questionnaire.

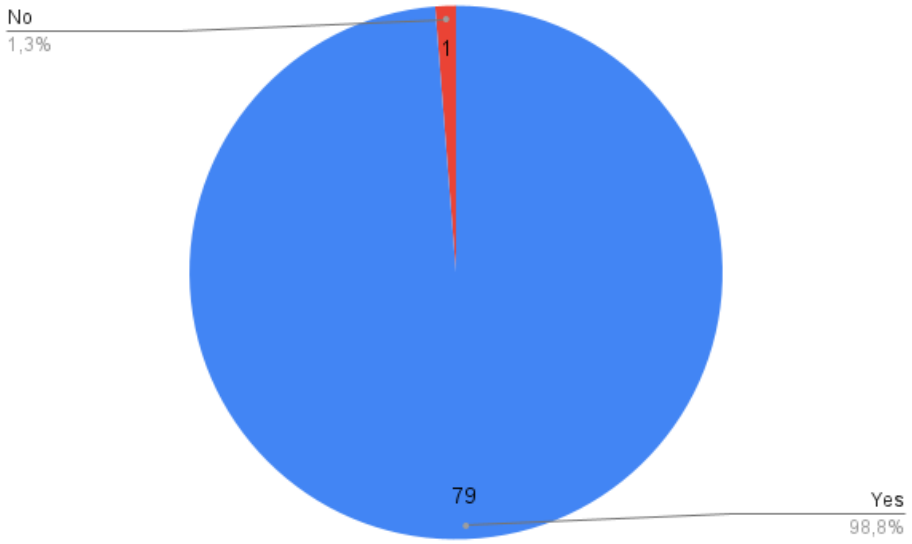


Chart 5 – Use of ICT in practice

Question number six concerned the specific ICT most often used by respondents in practice (Chart 6). The most selected answer was notebook / computer (45,6 %), followed by interactive whiteboard (31,7 %). The least selected answer was smartphone (1,3 %).

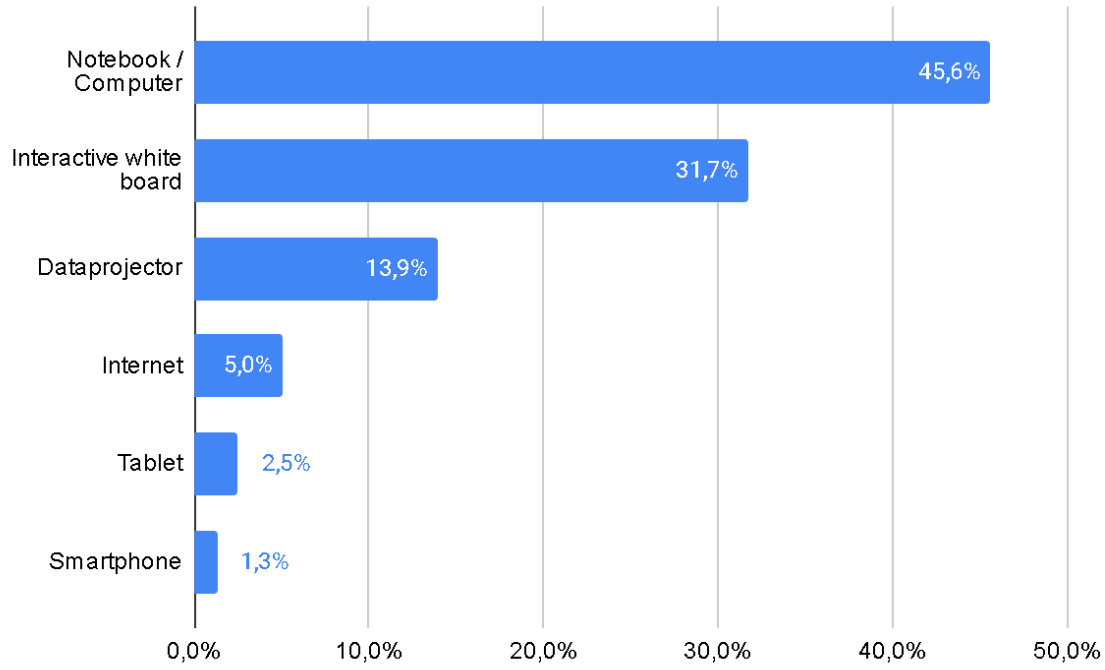


Chart 6 – Specific ICT

In the next question the respondents were asked for what they most often use the ICT. As in Chart 7, more than a half of the respondents (54,4 %) uses the ICT for teaching. Almost the same percentage of respondents stated that they most often use ICT to search for teaching materials (22,8 %) and to produce teaching materials (20,3 %). The least represented answer were cloud services (2,5 %).

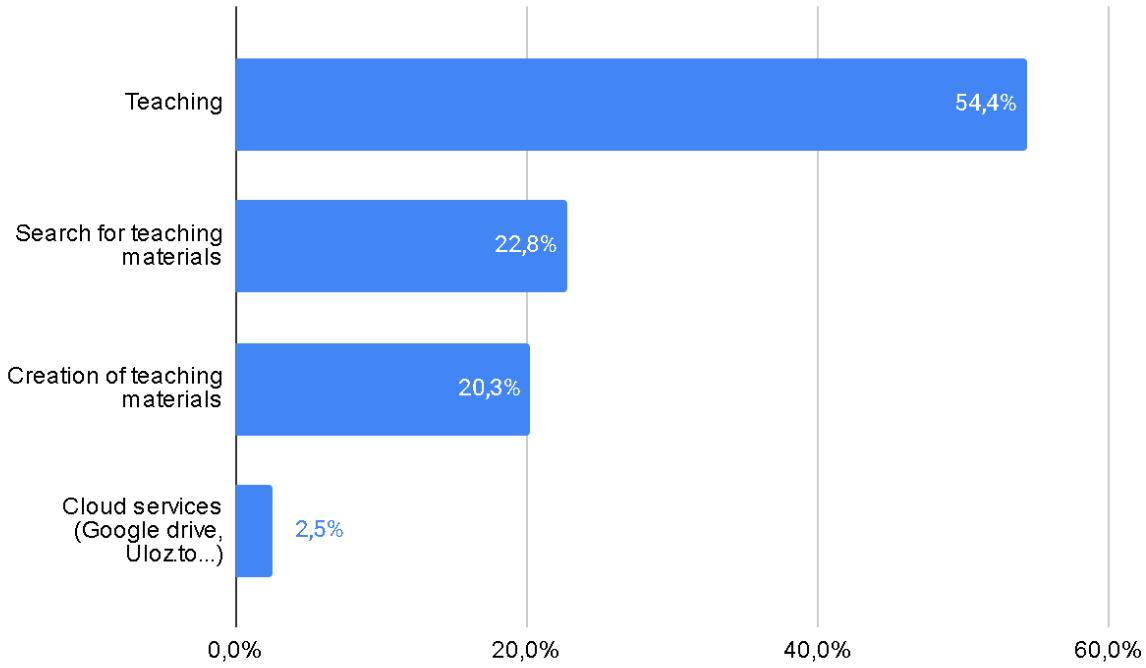


Chart 7 – Use of ICT in practice

Following question aimed to determine whether the respondents use mobile applications, software and websites in their practice or not. Chart 8 shows that the vast majority of them (96,2 %) uses mobile applications, software or websites in practice. Only three respondents (3,8 %) do not use mobile applications, software or websites in the practice. This question excluded respondents that do not use mobile applications, software or websites but use ICT in practice. Those, who selected no as an answer, were redirected to the final section of the questionnaire.

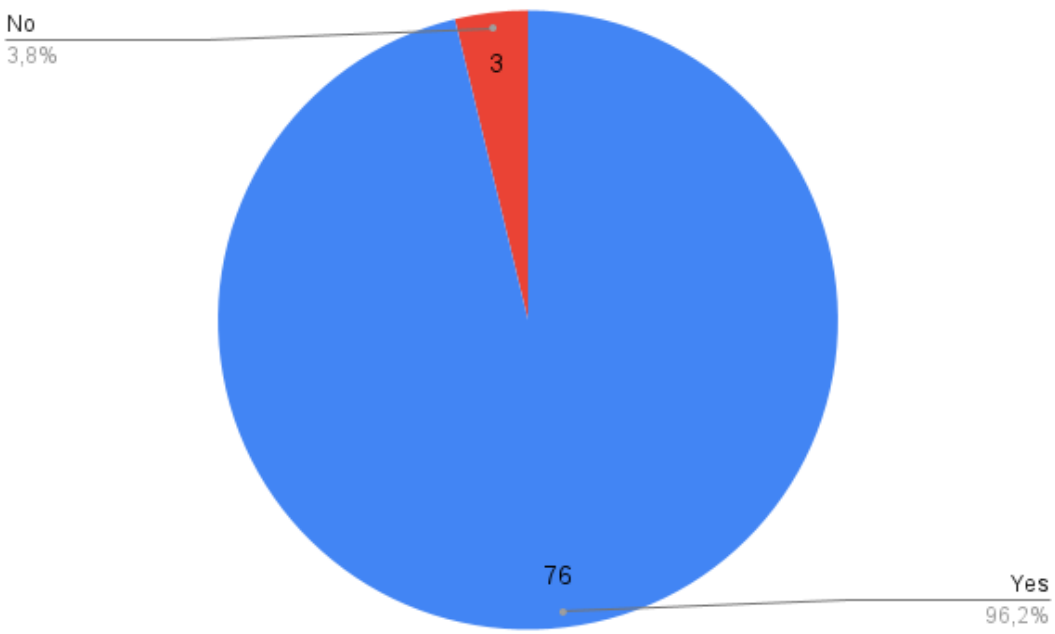


Chart 8 – Use of applications, software and websites in practice

Question number nine was focused on the use of mobile applications in general. The respondents were asked for their use of these applications in practice. Chart 9 shows that more than a half of the respondents (56,6 %) stated that they do not use mobile applications in practice. If answered in a positive manner, the respondents were asked a set of two questions. First question was determining specific applications and second question was determining the usage of mobile applications in lessons.

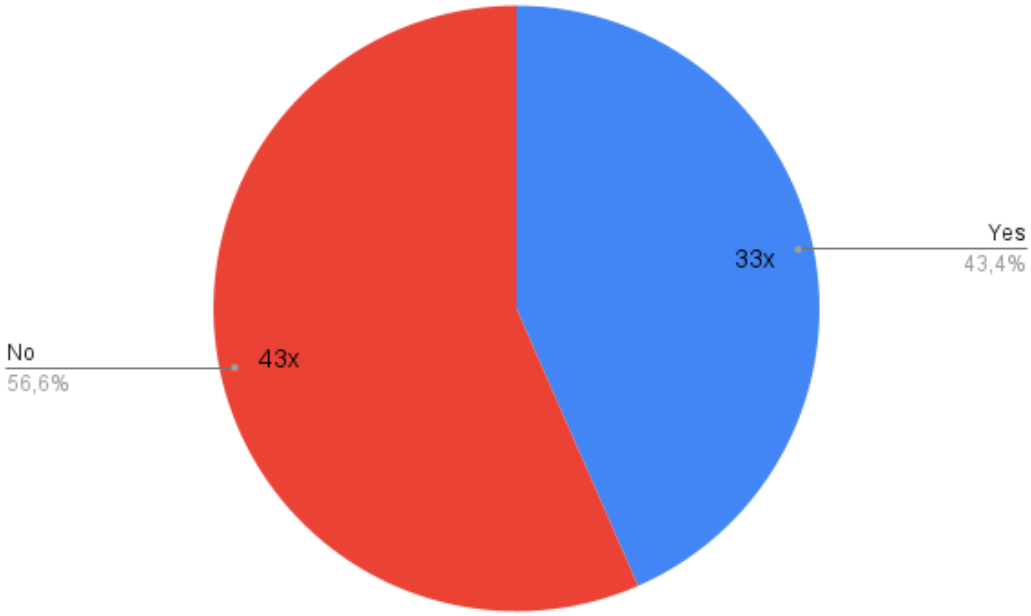


Chart 9 – Use of mobile applications in practice

In Chart 10 we can see that respondents stated (18 times) that they use the mobile applications the most often for repetition of previous curriculum. Second most often selected answer (8 times) was consolidation of a new curriculum.

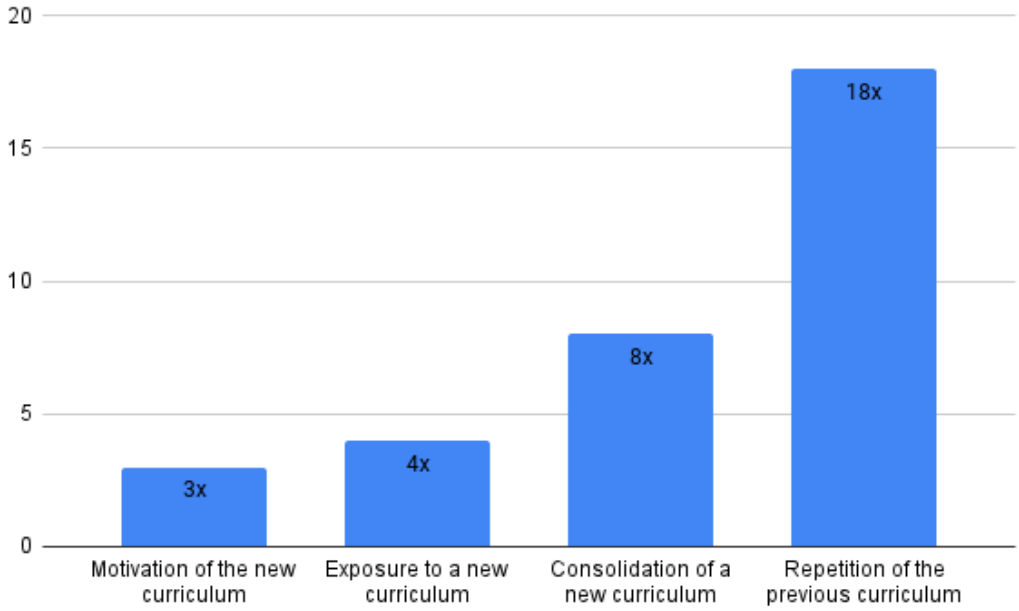


Chart 10 – Use of mobile applications in lesson

The questions dealing with the applications were followed by separate questions of the same nature, which focused on software and websites. At first determining whether the respondents use software or websites in practice. In both cases, if answered in a positive manner, two questions followed. First question was determining specific representatives and second question was determining the usage of software or websites in lessons.

Chart 11 shows that more than half of the respondents (53,9 %) uses software in practice. These respondents then most often use the software for an exposure to a new curriculum as seen in Chart 12. The second most used purpose of the software is for repetition of the previous curriculum.

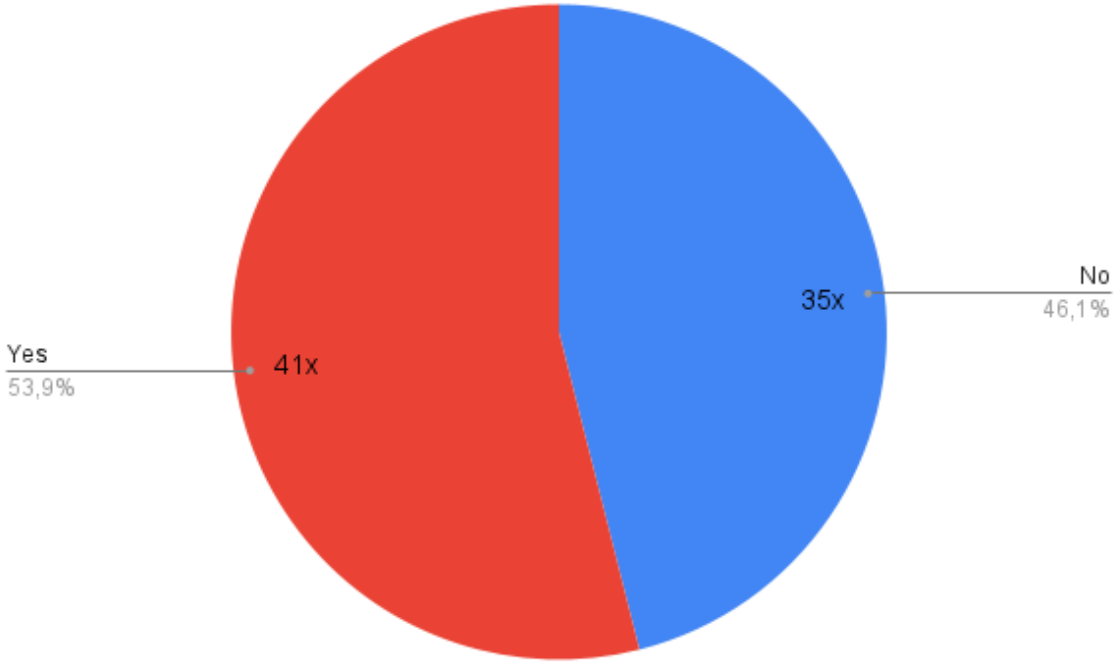


Chart 11 – Use of software in practice

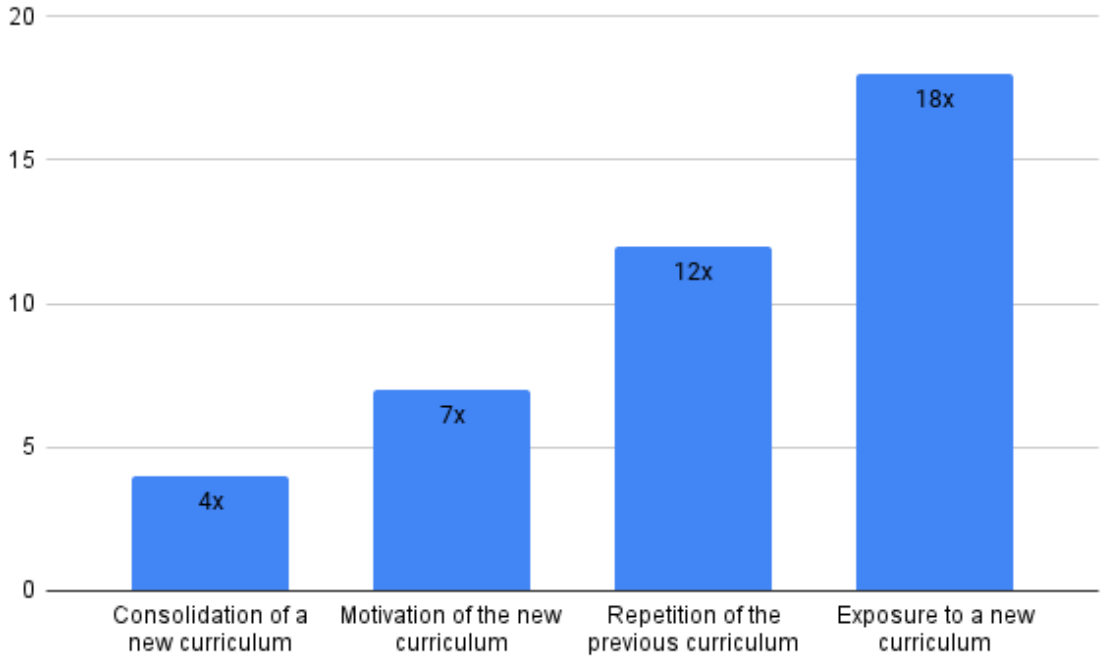


Chart 12 – Use of software in lesson

Following question, focused on websites, was answered by the vast majority of the respondents (97,4 %) positively as seen in Chart 13. Respondents stated (29 times) that they use the websites the most often for repetition of previous curriculum (Chart 14). Second most often selected answer (16 times) was exposure to a new curriculum followed closely by motivation of the new curriculum (15 times).

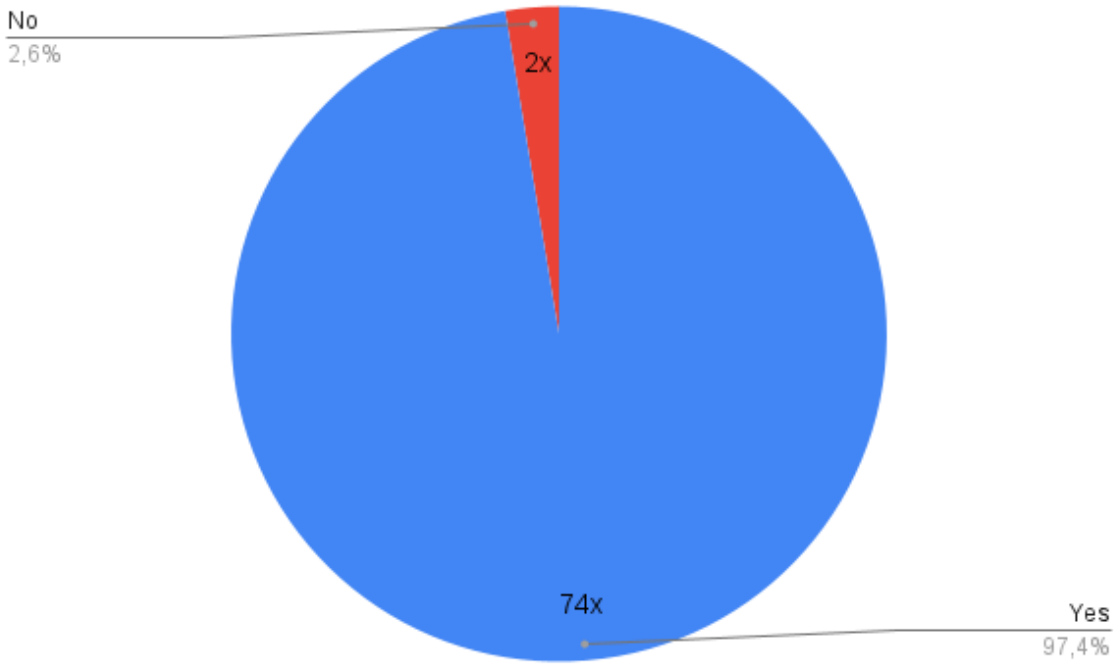


Chart 13 – Use of websites in practice

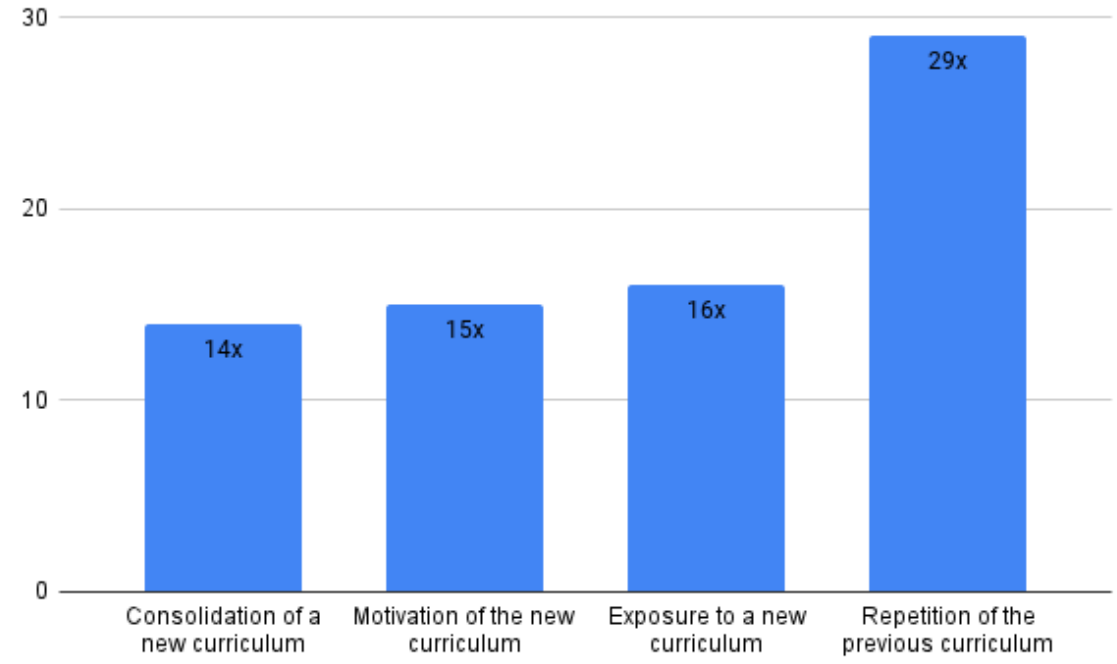


Chart 14 – Use of websites in lesson

The final part of the questionnaire was focused more generally on the respondents and their relationship to ICT and ICT–related topics. All the respondents were asked whether they participate in various seminars focused on ICT within the additional education of pedagogical workers. Four options were presented as seen in Chart 15. More than a third of the respondents (32,5 %) participate in seminars concerning ICT rarely. Almost the same amount (31,3 %) stated that they do not participate in these seminars. Almost a third of them (27,5 %) participate in the seminars regularly and 8,8 % of the respondents indicates that their ICT skills are sufficient enough and do not have to participate.

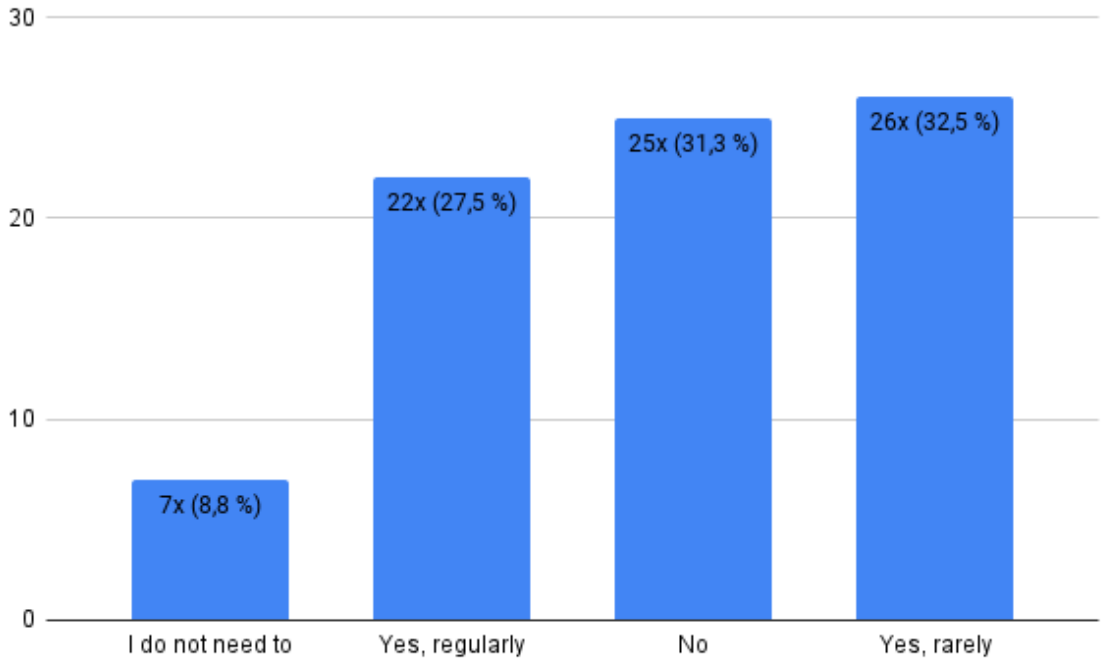


Chart 15 – Participation in additional education of pedagogical workers

Next question was aimed to determine the opinion of the respondents concerning the effectivity of ICT use in practice. As seen in Chart 16, half of the respondents think that the use of ICT in practice is very effective. Almost half of them considers ICT rather effective. Only 1,3 % find use of ICT rather ineffective. Fourth option was part of the question but none of the respondents find ICT use in practice very ineffective.

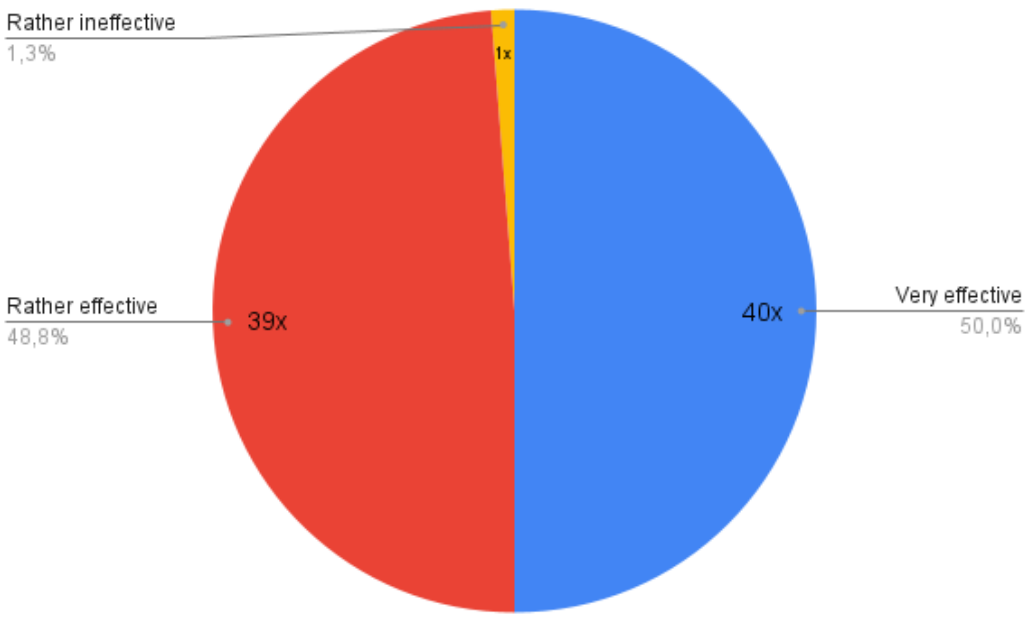


Chart 16 – Effectivity of ICT in practice

Last question of the questionnaire was focused on evaluating the respondents' ICT skills based on their opinion. The resulting data shows that the average value of their skill in ICT is 7,9 out of 10. The most often selected values were numbers 7 and 8. In the Chart 17 the number 1 represents the lowest value, and the number 10 represents the highest value.

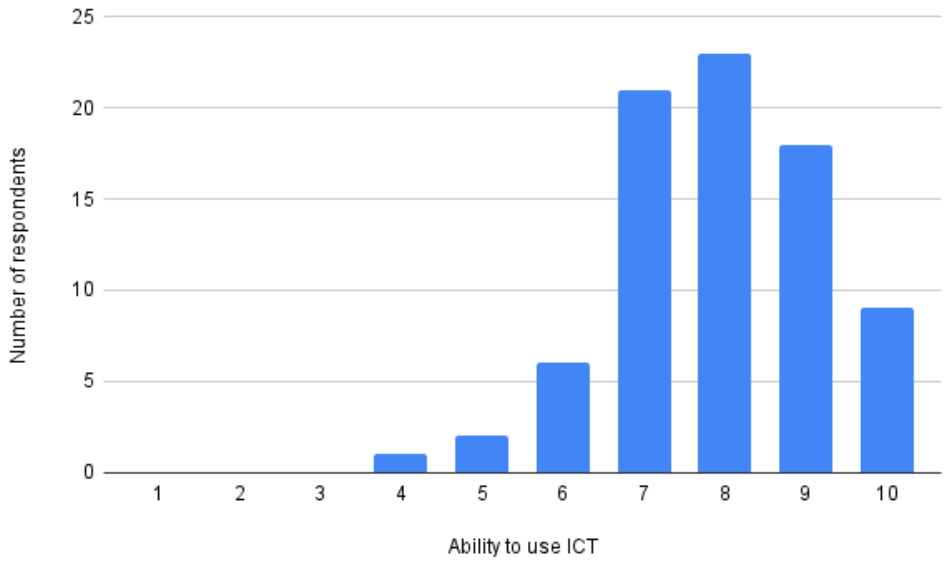


Chart 17 – Ability to use ICT in practice

In the Chart 18 we can see comparison of mobile applications use in practice depending on the age of the respondents. The highest proportion (80 %) of positive answers was in the age group 45–54 years. Almost identical results in the frequency of negative responses (more than 60 %) were achieved in the age groups up to 25 years, 25–34 years and 55+ years.

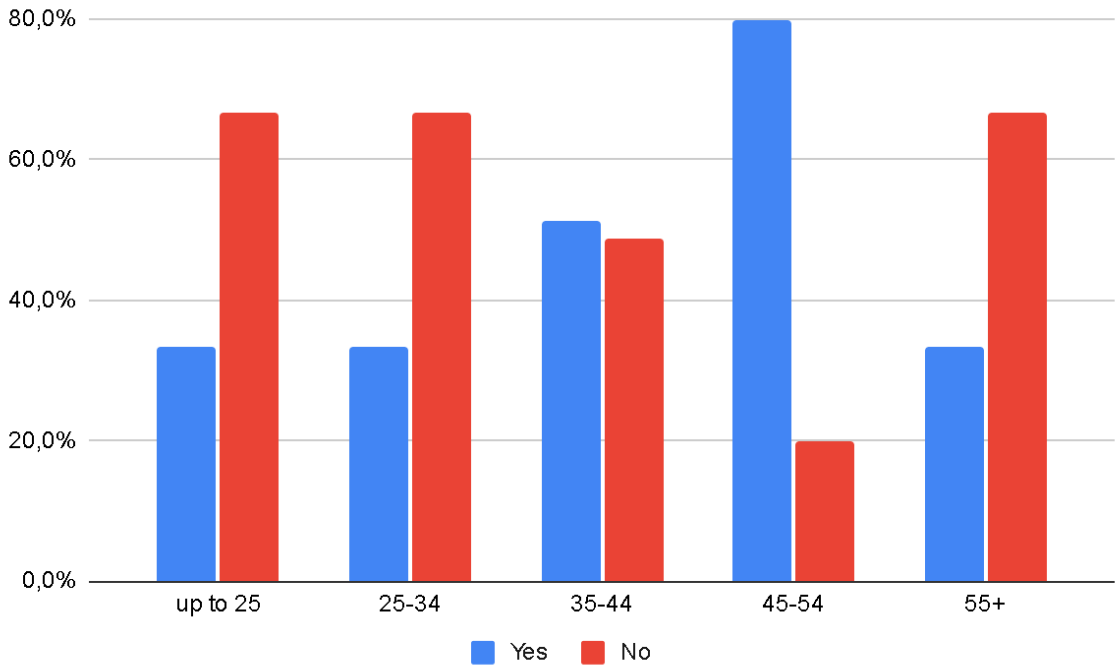


Chart 18 – Comparison of mobile applications use in practice depending on the age of the respondents

Chart 19 describes comparison of websites use in practice depending on the age of the respondents. All respondents from all categories, except categories 35–44 years, answered that they use websites in their practice. In the age group 35–44 years only two respondents answered that they do not use the websites in practice.

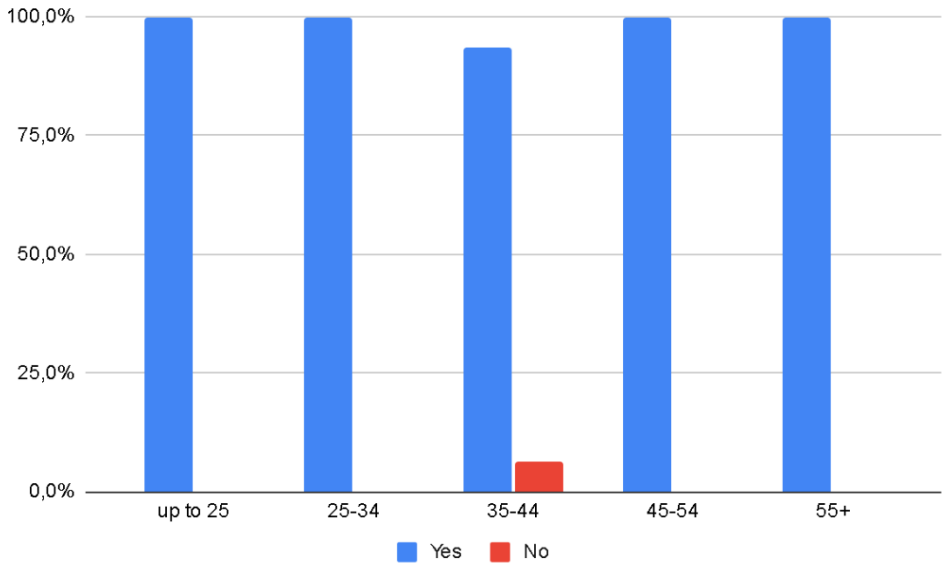


Chart 19 – Comparison of websites use in practice depending on the age of the respondents

Comparison of software use in practice depending on the age of the respondents can be seen in the Chart 20. Everyone in the group up to 25 answered this question in the negative manner. The highest proportion of positive answers (more than 60 %) was in the age group of 45–54 years. In the age group of 55+ the proportion of positive and negative responses was the same.

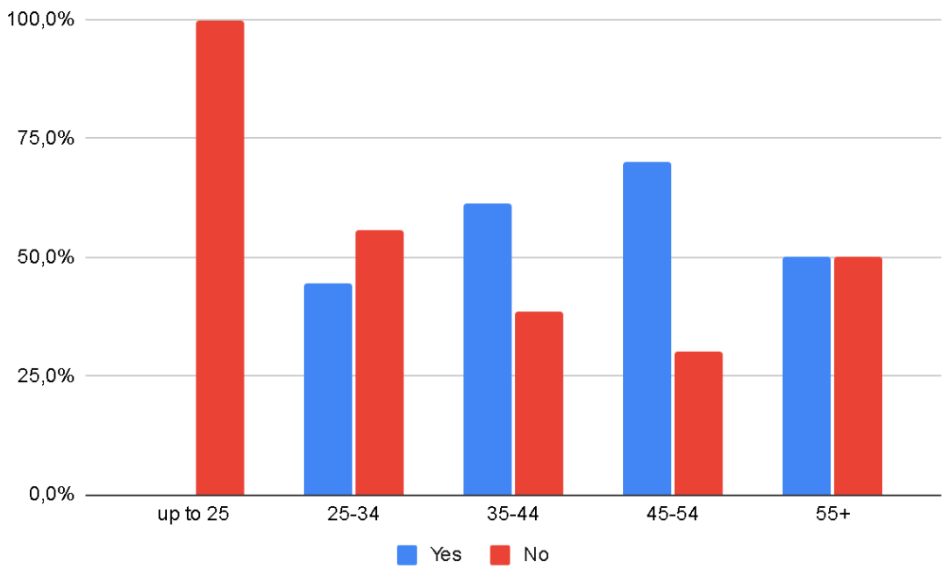


Chart 20 – Comparison of software use in practice depending on the age of the respondents

The most common answer to question about using mobile applications in the practice depending on the length of practice of the respondents was in a negative manner in the groups less than 5 years, 5 – 10 years and 16+ years of the practice (Chart 21). The only group that answered in a positive manner was the age group 10 – 15 years.

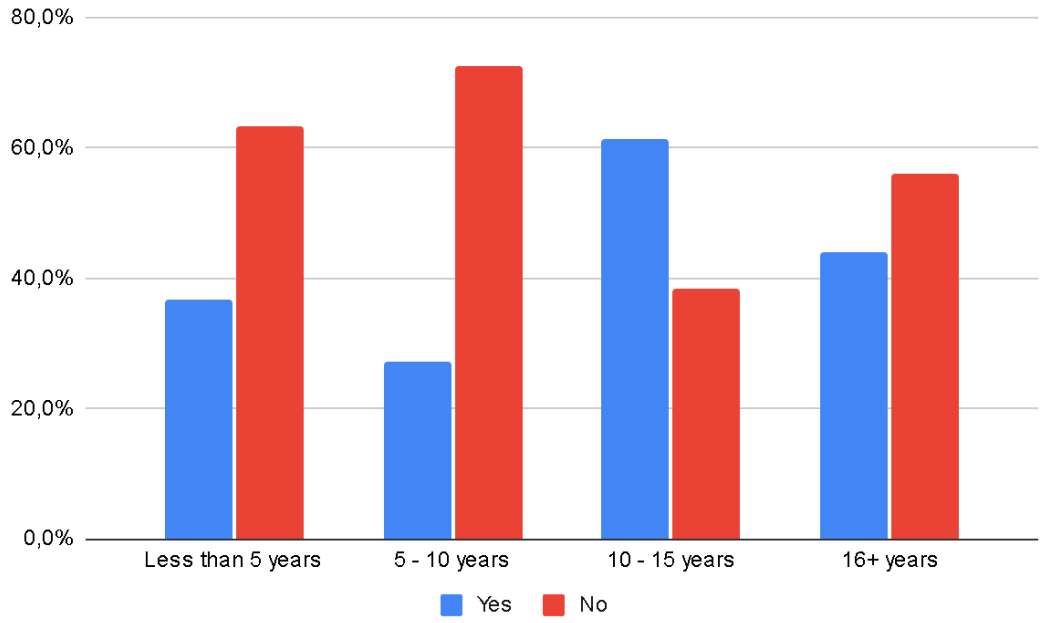


Chart 21 – Comparison of mobile applications use in practice depending on the length of practice

Chart 22 compares websites use in practice depending on the length of practice of the respondents. The chart shows that all of the respondents who teach for less than five years and 10 – 15 years answered in a positive manner. The other groups answered mostly in a positive manner.

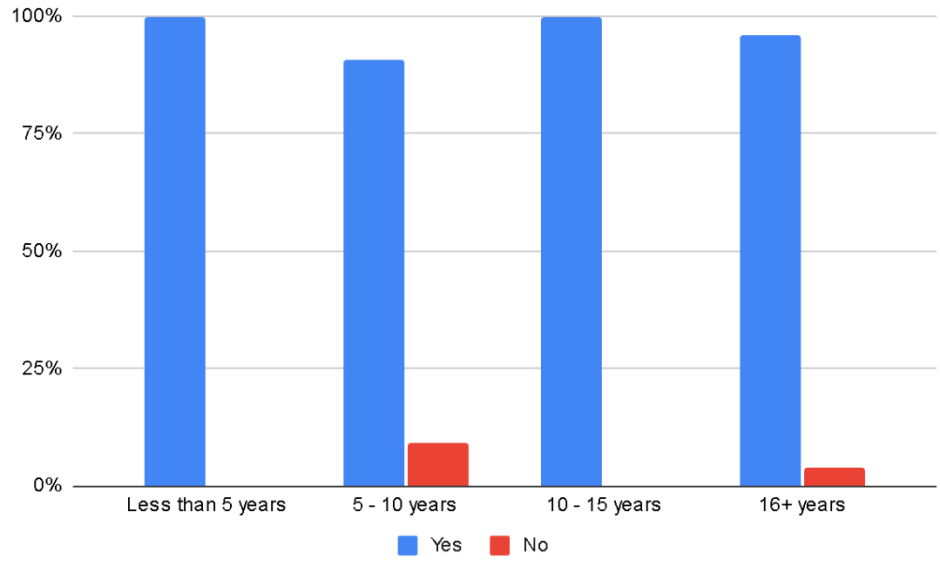


Chart 22 – Comparison of websites use in practice depending on the length of practice

In the Chart 23 can be seen comparison of software use in practice depending on the length of practice of the respondents. The software is mostly used by the 10–15 year and 16+ age groups (60 % or more). The only group that responded more often in a negative manner (60 %) was the group which has less than 5 years of practice.

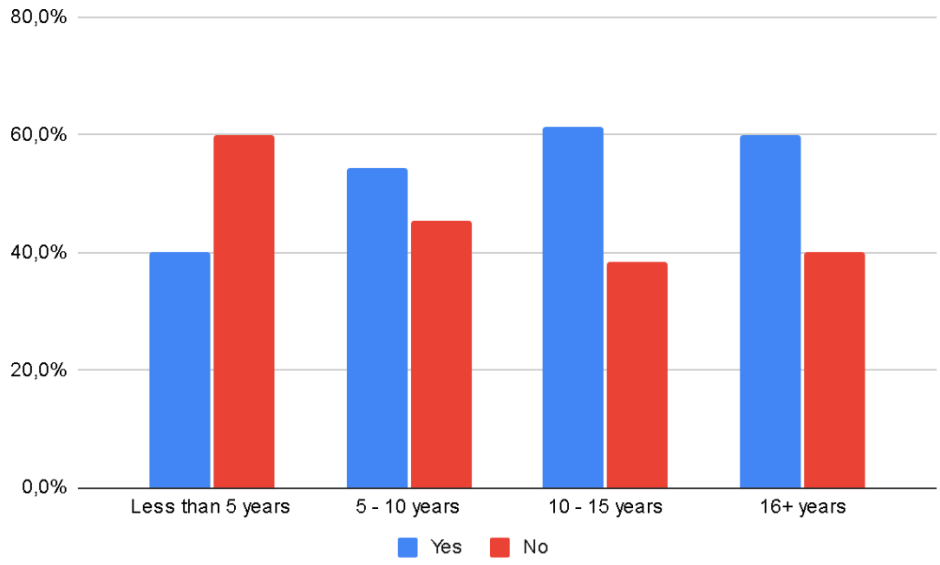


Chart 23 – Comparison of software use in practice depending on the length of practice

Comparison of mobile applications use in practice depending on the participation in the additional education of pedagogical workers is described in the Chart 24. In the chart can we see that significant number of the respondents who participate in an additional education of pedagogical workers rarely answered that they do not use mobile applications in practice (more than 75 %). On the other hand, more than 50 % of respondents, that stated that they do not need to participate in additional education of pedagogical workers, uses mobile applications in practice.

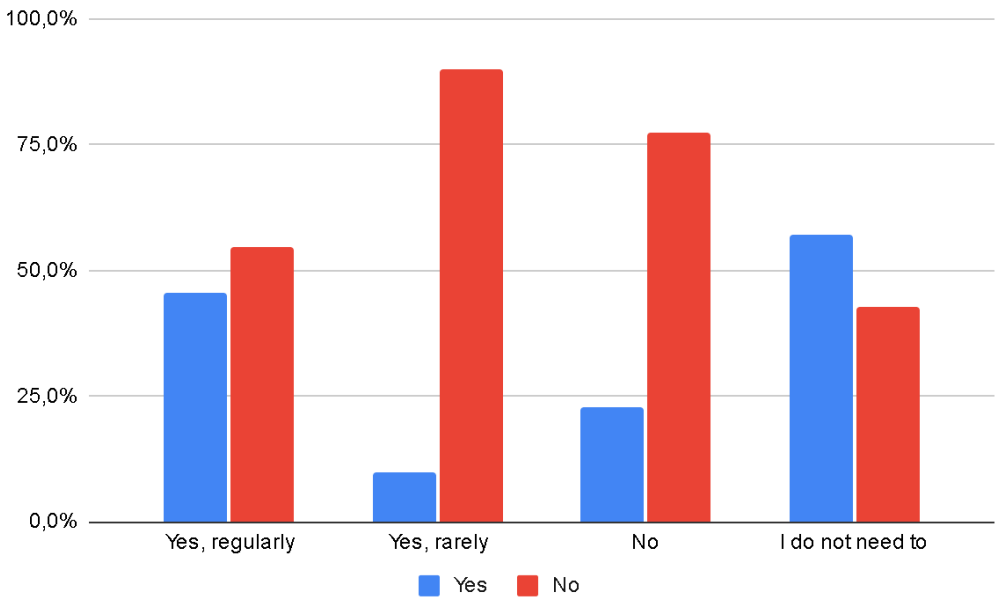


Chart 24 – Comparison of mobile applications use in practice depending on the participation in the additional education of pedagogical workers

Almost all respondents, who answered to the question concerning additional education of pedagogical workers, answered that they use the websites in practice (Chart 25). Only less than 10 % of the respondents from the group who answered “Yes, rarely” or “No” do not use websites in practice.

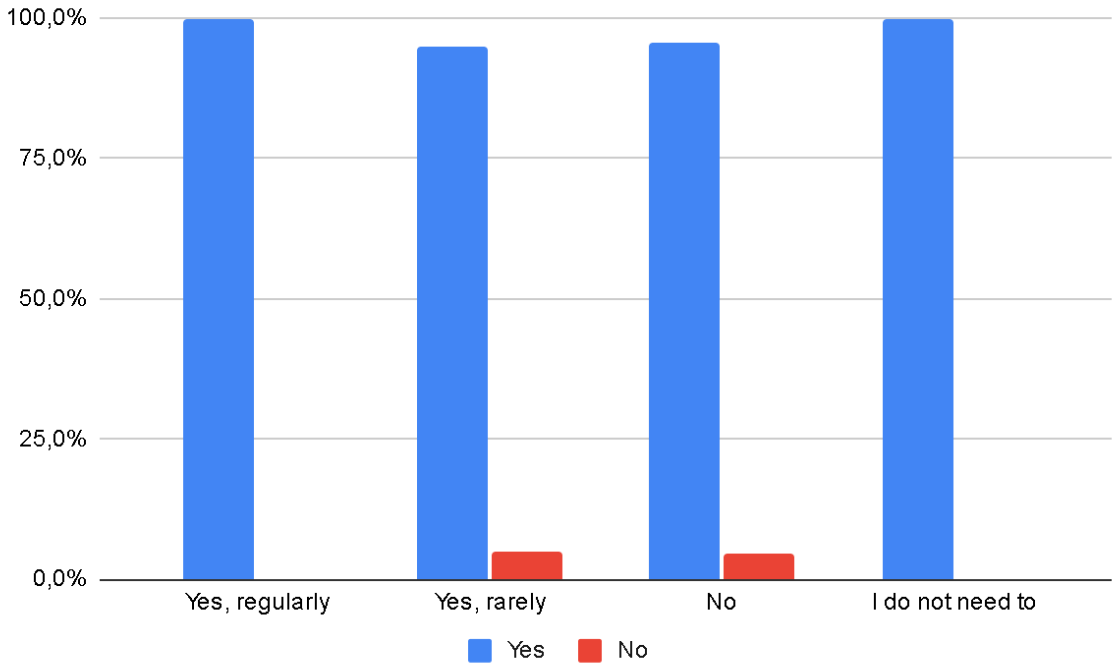


Chart 25 – Comparison of websites use in practice depending on the participation in the additional education of pedagogical workers

Chart 26 describes comparison of software use in practice depending on the participation in the additional education of pedagogical workers. The only group which answered mostly in a negative manner (more than 50 %) was the group that stated that they regularly participate in additional education of pedagogical workers. The highest proportion of positive responses was in the group that participate in additional education of pedagogical workers rarely.

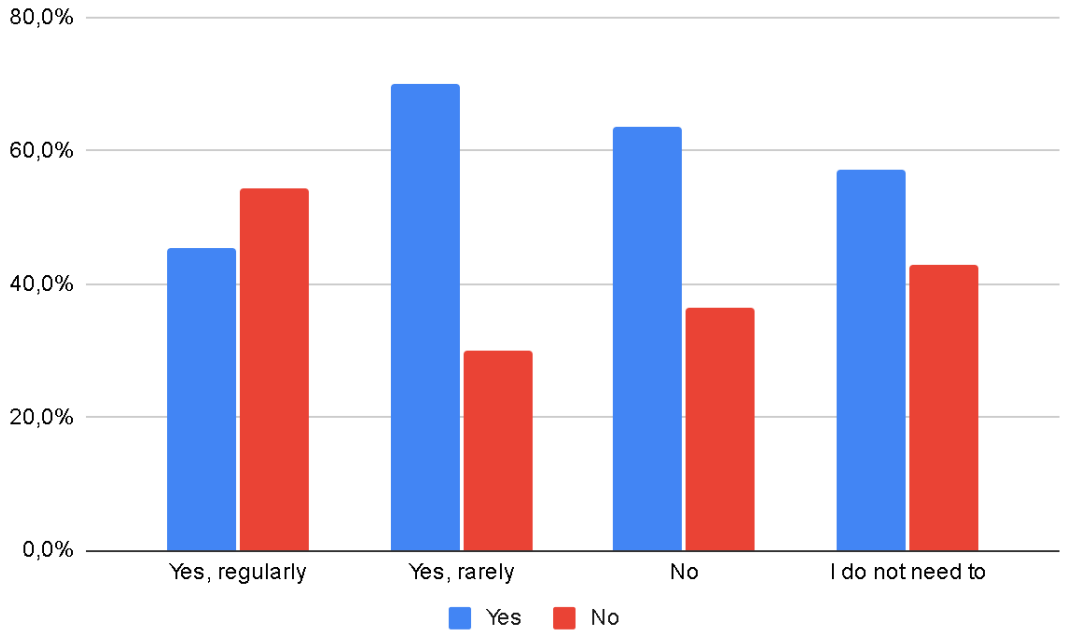


Chart 26 – Comparison of software use in practice depending on the participation in the additional education of pedagogical workers

5.2 Analysis of mobile applications, software, and websites

The part of the questionnaire dealing with ICT aimed to find out what specific applications, software and websites the respondents use in practice. All categories are analyzed further below. The introduction describes the most common representatives of each category. For a better idea of the most frequently used mobile applications, software and websites representatives were selected for this purpose. The representatives appeared at least three times in the answers. The remaining representatives appeared in the responses, except for a few cases, only once. A short description is given in each category for these representatives. The author assumes that these categories are often interconnected nowadays, and it is possible to come across a situation where, for example, a website function is available in the form of an application or software.

5.2.1 Mobile applications

The first most frequently mentioned application was Kahoot!. Kahoot! was mentioned by 14 respondents. It is a learning platform that allows its users to create, share

and play game–based learning exercises or quizzes. Kahoot! is free and available through browser or in a form of mobile application that supports both major mobile phone platforms iOS and Android. It is possible to subscribe to premium option Kahoot!+ through either annual ($36) or monthly ($5) payment. Premium version offers access to additional learning applications, ready–to–use content by verified creators organized by topics and added every month as well as removes ads (Kahoot, © 2022).

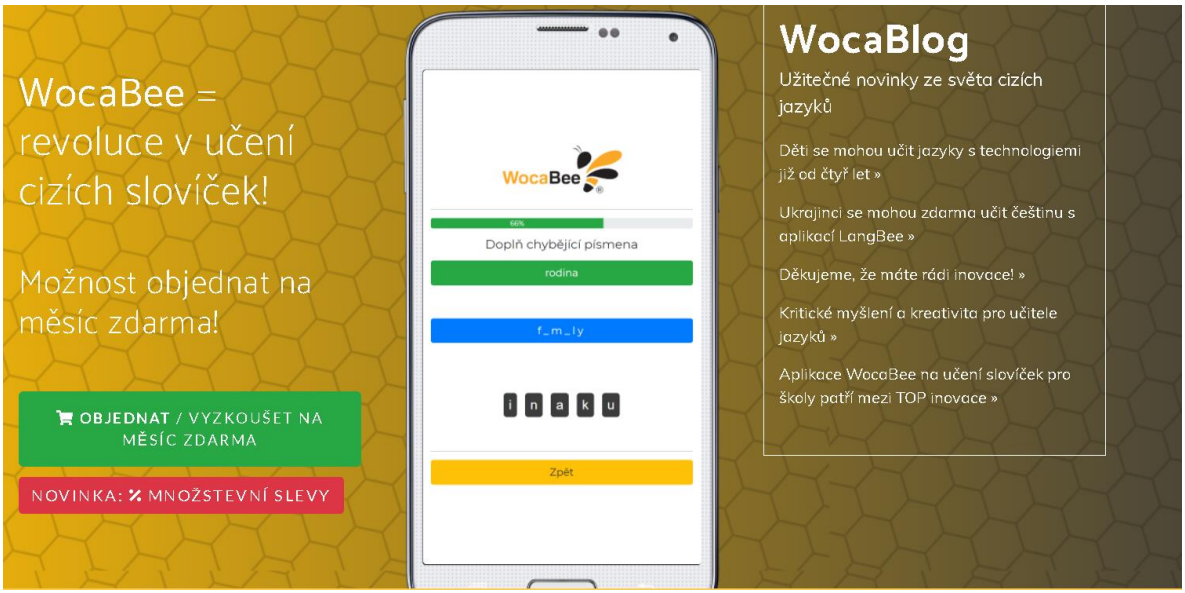
Second most frequently mentioned application was Quizlet. Quizlet was mentioned by 6 respondents. It is a free digital flashcard learning tool that allows its users to create personalized flash cards or to use flash cards made by other users. Quizlet can be accessed through a web browser or an application that supports both major mobile phone platforms iOS and Android. The users need to register first to use Quizlet. For $35.99 a year, Quizlet has a premium option Quizlet Plus that offers expert explanations, advanced creation toolkit, built–in learning assistant and removes advertisements (Quizlet, © 2022).

Third most frequently mentioned application was Photomath. Photomath was mentioned by 4 respondents. It is an application that can be used to calculate all types of common mathematical operations. The solution can be viewed in the individual steps explained in detail. The application also serves as good feedback, if an error occurs in the student's calculation, the application will explain where the error occurs. Mobile application supports both major mobile phone platforms iOS and Android and is free. Photomath also have a premium option Photomath Plus that offers extra “how and why” tips and customization of visual aids. Subscription costs are $9.99 / month or $4.99 / month when subscribed for a year (Photomath, © 2022).

Wocabee is a vocabulary learning application focused on fourteen different languages. It assists students with vocabulary instruction. The teacher manages the class and adds a package of new vocabulary to the classroom at least once a week. Students practice them at home in the form of various games, for example by assigning, combining words with pictures, translating and so on. The teacher then sees who and how the task was completed (Wocabee, © 2022).

- Availability: Mobile application (iOS, Android), Laptop / PC, Tablet

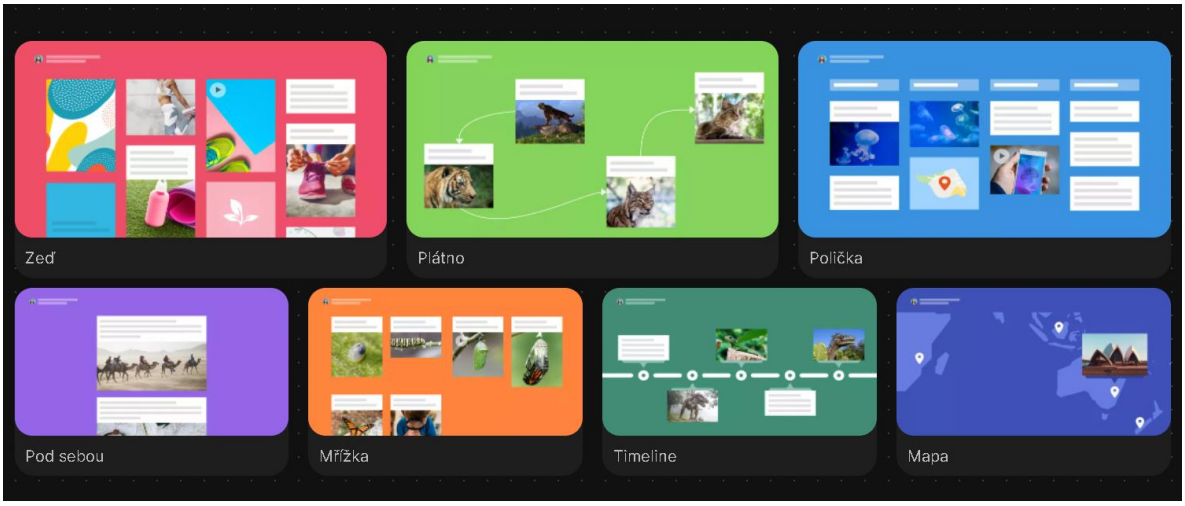
- Subscription: Free teacher access, fee of 0.90 € per student a month depending on the length of subscription
- Registration: Needed



Picture 4 – Wocabee app shown on smartphone (Source https://www.wocabee.app)

Padlet is a virtual whiteboard platform that works on a principle of notice–board. The basic function is to preselect the style in which the work is done, it can be a wall (brick arrangement of content), canvas (various links or division of content), shelf (arrangement of content into columns), grid (arrangement of content into boxes in rows), below each other (vertical content arrangement), conversation (chat communication), map (adding content to points on the map), and timeline (placing content to the horizontal line) enriched with features known from social networks such as likes or commentary posts (Padlet, © 2022).

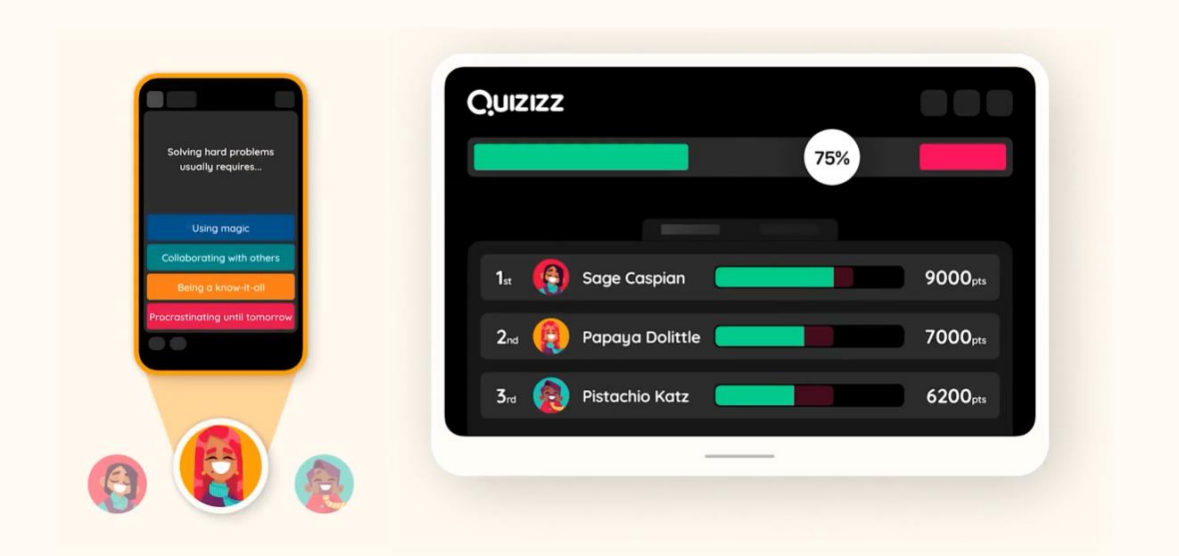
- Availability: Mobile application (iOS, Android), browser
- Subscription: Free – limited number of padlets, Premium – from 4,99 € / month to $5000+ / year for 100+ teachers
- Registration: Needed



Picture 5 – Padlet UI (Source https://padlet.com)

Quizizz is a learning platform, similar to Kahoot or Quizzlet. It allows users to create online quizzes. The database already contains shared public quizzes created by teachers, students or other users. These quizzes can be used by the teachers in the same form or adapted for their own needs. Students log in to the test using generated code and the teacher monitors their activity. Teacher can see all the answers when the quiz is finished. The quiz can also be given as homework for several days. Quizizz has cross–platform interaction with Google apps environment (Quizizz, © 2022).

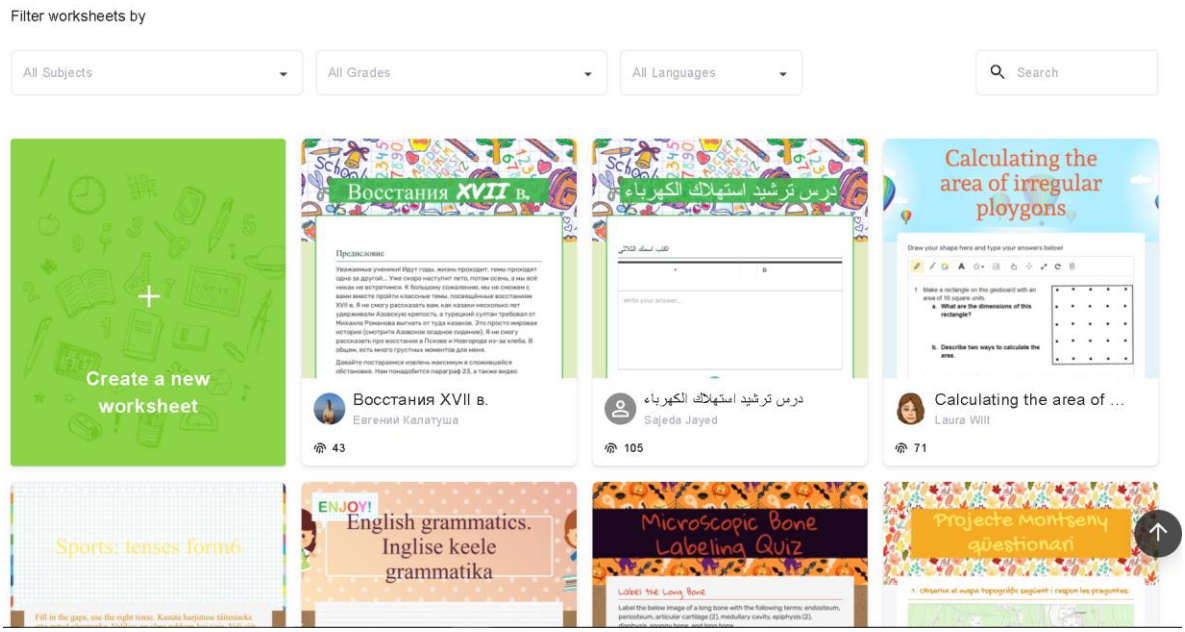
- Availability: Mobile application (iOS, Android), Laptop / PC, Tablet, browser
- Subscription: – Free trial version with limited functions, Premium version starting at $29 / month, host
- Registration: Needed



Picture 6 – Quizizz UI (Source https://quizizz.com/?fromBrowserLoad=true)

Wizer is an intuitive platform where you can create creative and graphically high–quality worksheets. There are two types of modes – teacher or student. Wizer offers publicly shared worksheets by other teachers or students. The worksheet can be downloaded to Worksheets library. Worksheets can be edited, copied, pasted, collected into folders and enriched with video, audio or pictures (Wizer, © 2022).

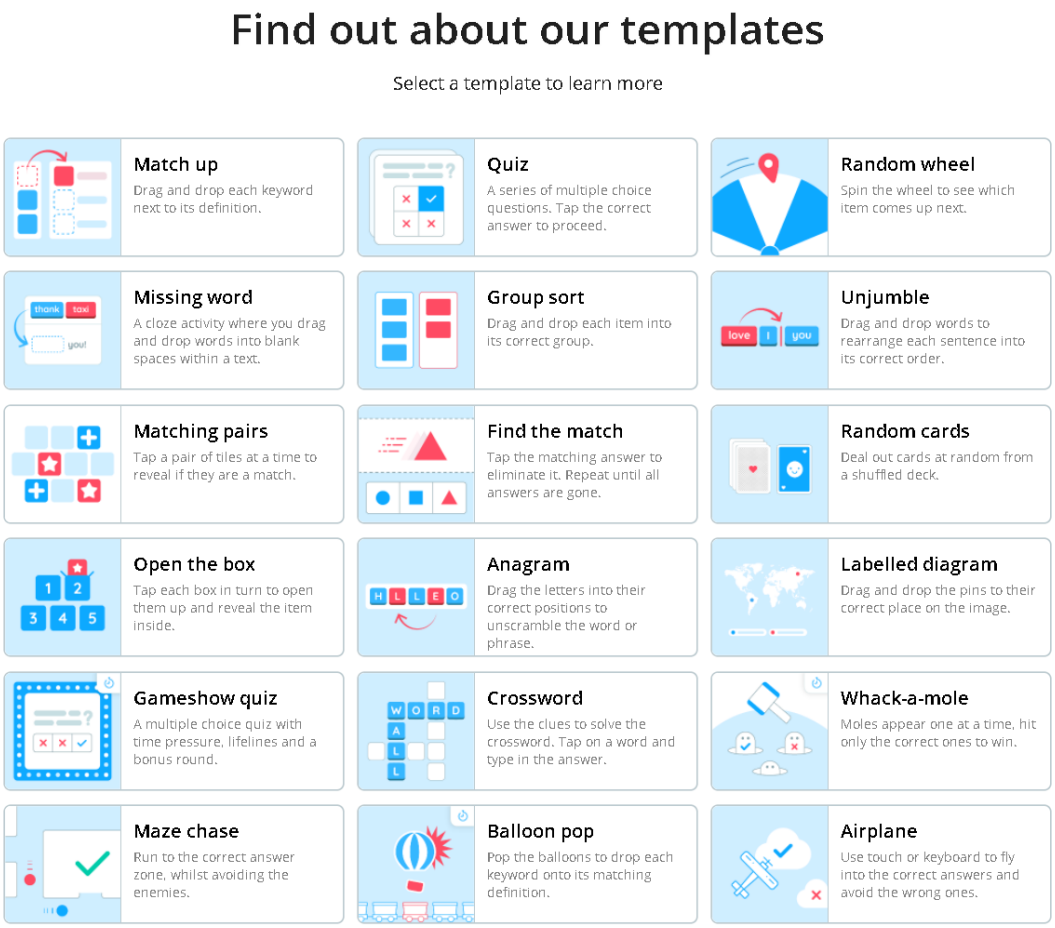
- Availability: Mobile application (iOS), Laptop / PC – google apps environment, browser
- Subscription: – Free lite version with limited functions, Premium $59.88 / year or $4.99 / month
- Registration: Needed



Picture 7 – Wizer creations (Source https://app.wizer.me)

Wordwall is a platform that offers the creation of learning materials in the form of a game that the user can use or create himself. Games, materials and activities are created based on templates with interactive elements. Once the game, material or activity is created, it is possible to use several variations that Wordwall offers such as quiz, match up, group sort, random wheel, random cards, labeled diagram, whack–a–mole, crossword and so on. The student can choose the variant that he enjoys the most (Wordwall, ©2022).

- Availability: Mobile application (iOS, Android), Laptop / PC, browser
- Subscription: – Free with limited number of games created, Standard $6 / month, Pro $9.00 / month
- Registration: Needed

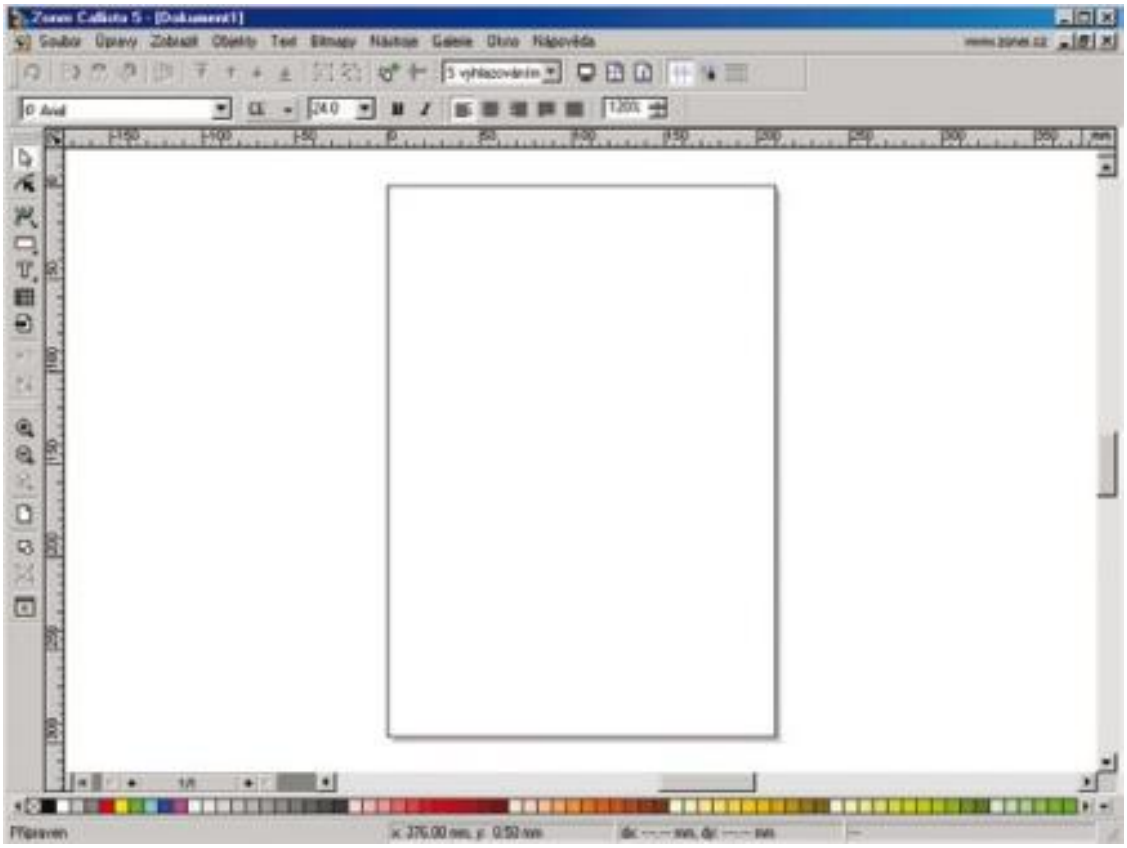


Picture 8 – Wordwall types of exercises (Source https://wordwall.net)

5.2.2 Software

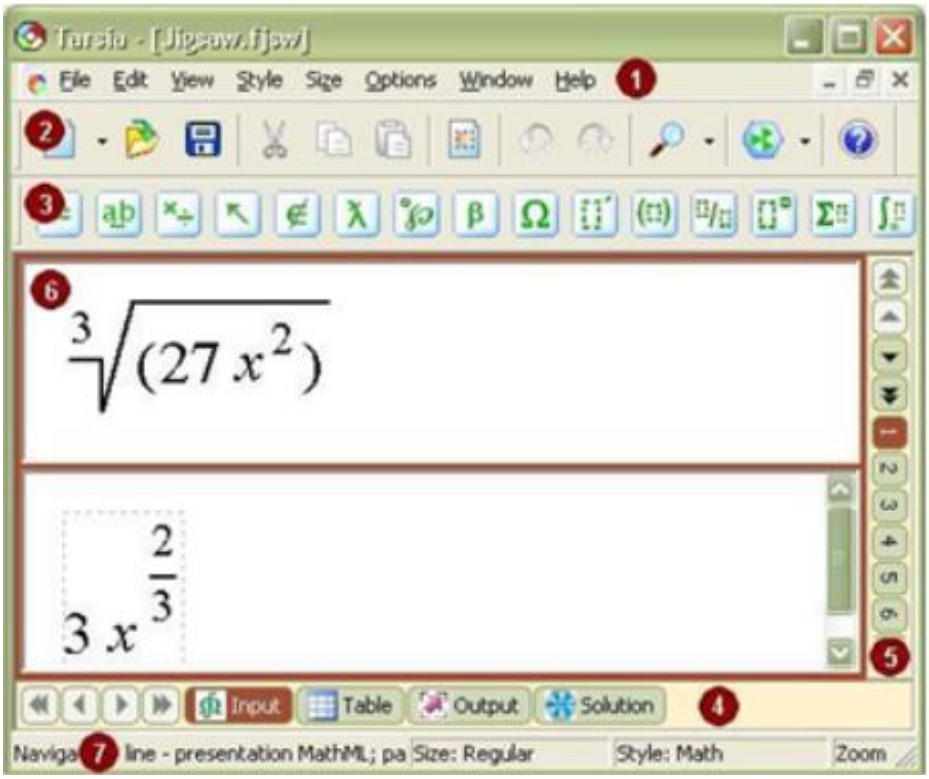
After a closer analysis of the specific most frequently used software, it was found that names of various applications or websites often appeared in answers. In several cases, it was not possible from the answer to determine, which specific software the given respondent uses due to a very general description such as “various”, “I don't know”, “ppt”, “educational software” or “Google environment”. Furthermore, instead of specific software, MS Office was most often mentioned. MS Office consists of several different software and cannot be taken into account when determining the specific most frequently used software. This suggests that the notion of "specific computer software" may have been misunderstood by respondents and that the data collected that are dealing with the specific software are not adequately relevant. The answers, where it was possible to determine which specific software it was, were further processed.

Zoner Callisto is a universal vector editor for creating graphically processed documents such as business cards, flyers, graphic price lists, letterheads, and more. The development of this software has been stopped for quite some time, and the company behind its creation focuses on the development of their new software instead – Zoner photo studio X. However, this software is still completely available for free on the manufacturer's website (Zoner Software, ©2022).



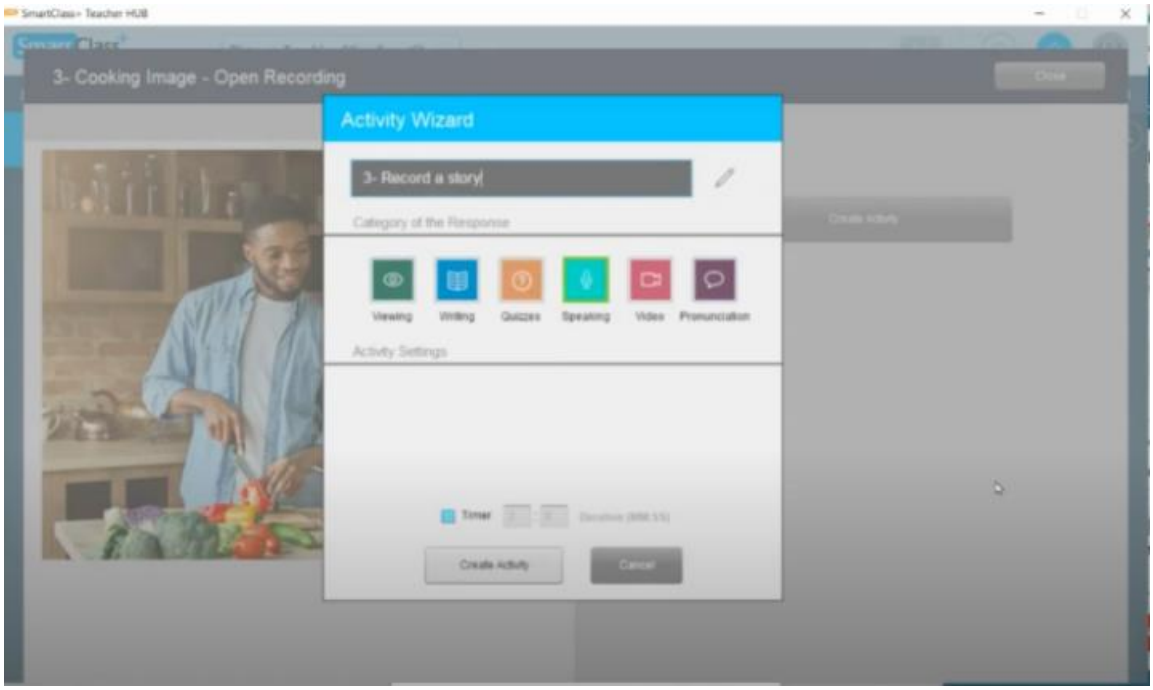
Picture 9 – Zoner Callisto UI (Source https://www.callisto.cz)

Formulator Tarsia, formerly known as Formulator Jigsaw, is an editor designed for math teachers who create activities in the form of puzzles or dominoes and so on. It includes a powerful equation editor to create the mathematical expressions for activities. An advanced text placement feature on the side of the form makes this tool irreplaceable software for quick activity creation. Tarsia Formulator became a powerful tool for learning activities because it supports activity templates. It provides teachers with simple support and opens up new perspectives for the development of their teaching activities. The software is free to download and to use (Hermitech Laboratory, © 2003–2022).



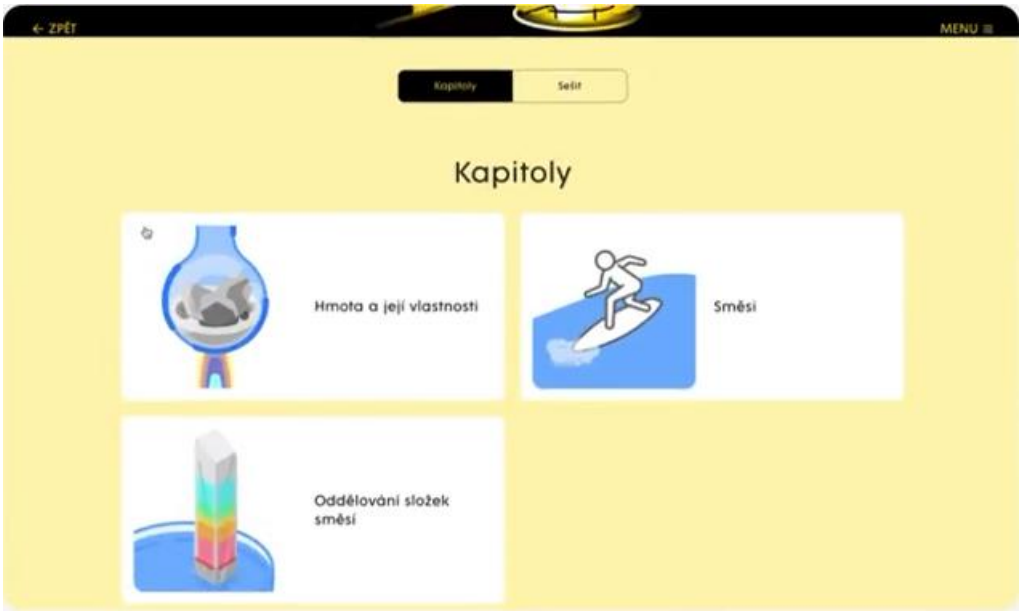
Picture 10 – Formulator Tarsia exercise example (Source www.mmlsoft.com/index.php/products/tarsia)

Robotel is a smartclass HUB created for language teachers. Robotel allows users to create various interactive activities, assign tasks or use various pre–prepared templates. Students can complete these tasks from anywhere thanks to the support of all available devices. Furthermore, it is possible to grade and evaluate these tasks both orally and in writing, all within one interface. It is a paid software that can be extended in one package with other products that this company offers. Prices start at 10 € (Robotel, © 2022).



Picture 11: Robotel exercise example (Source https://www.robotel.com)

Vividbooks are digital textbooks for interactive teaching of science subjects at Czech primary schools. Vividbooks offer teachers complete lesson preparation, methodology and workbooks. The material is presented to pupils visually, clearly and with examples from life, with an emphasis on pupil's critical thinking about the problems and learning to formulate their own opinions. Digital textbooks of physics and chemistry are currently available. Vividbooks also offer a mobile application. This software is available in a form of annual subscription (Vividbooks, © 2022).



Picture 12 – Vivid books exercise example (Source https://www.vividbooks.com)

5.2.3 Websites

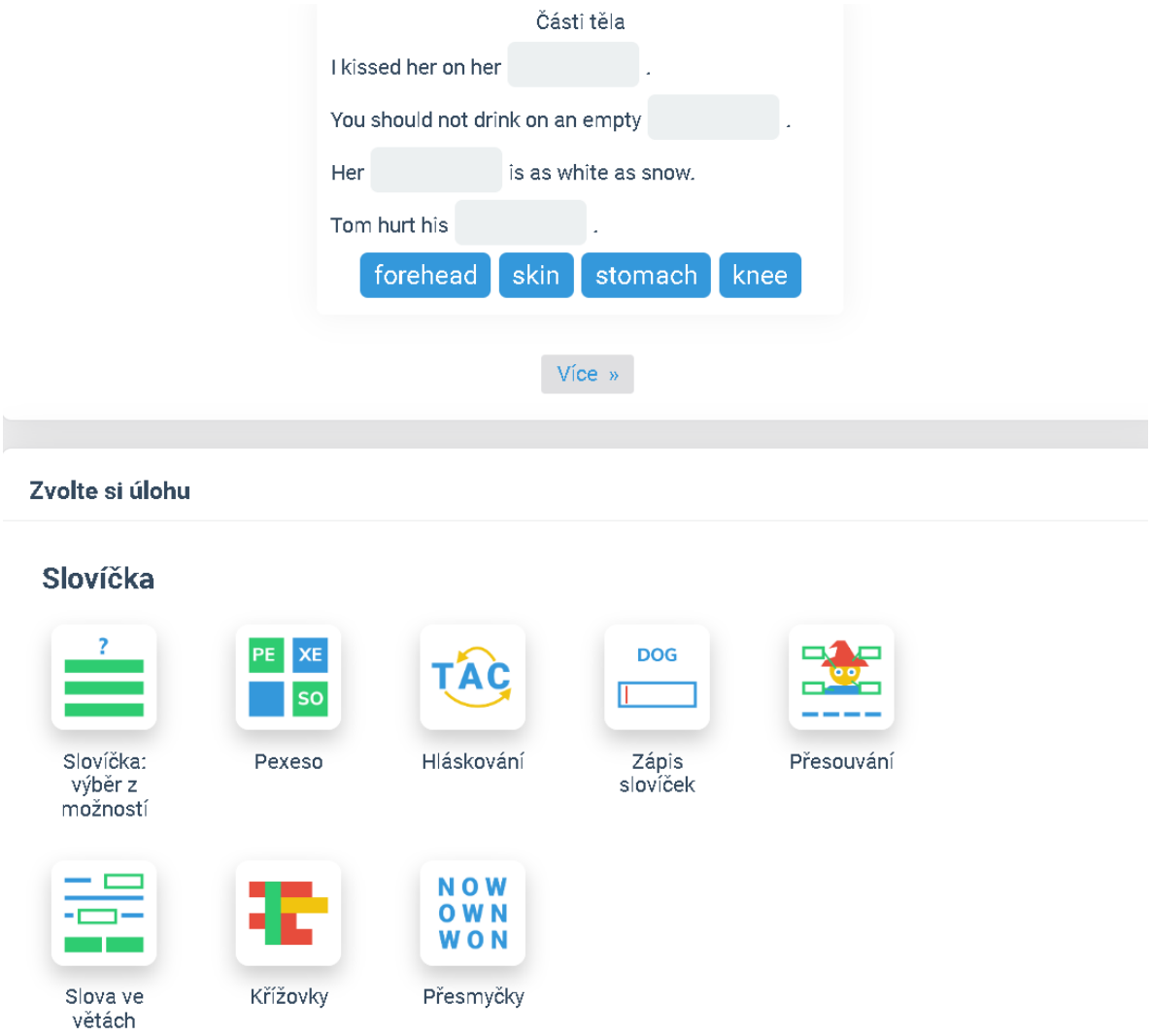
The first most frequently mentioned website was Youtube. Youtube was mentioned by 36 respondents. Youtube (© 2005 – 2022) is an online database of videos where users are allowed to upload content.

The second most frequently mentioned website was Liveworksheets mentioned by 21 respondents. This website allows users to transform traditional printable worksheets, interactive online exercises with autocorrection. Students can complete worksheets online and submit their answers to the teacher. Interactive worksheets make the most of new technologies applicable in education. Worksheets can include sounds, videos, drag–and–drop exercises, arrow matching, multiple choice, or speaking exercises. Many of the worksheets can also be downloaded in PDF (Portable Document Format) with a download limit of ten per day (Liveworksheets, © 2022)

The third most frequently mentioned website was Kahoot. It was mentioned by 11 respondents. Kahoot has already been described in the section dealing with mobile applications.

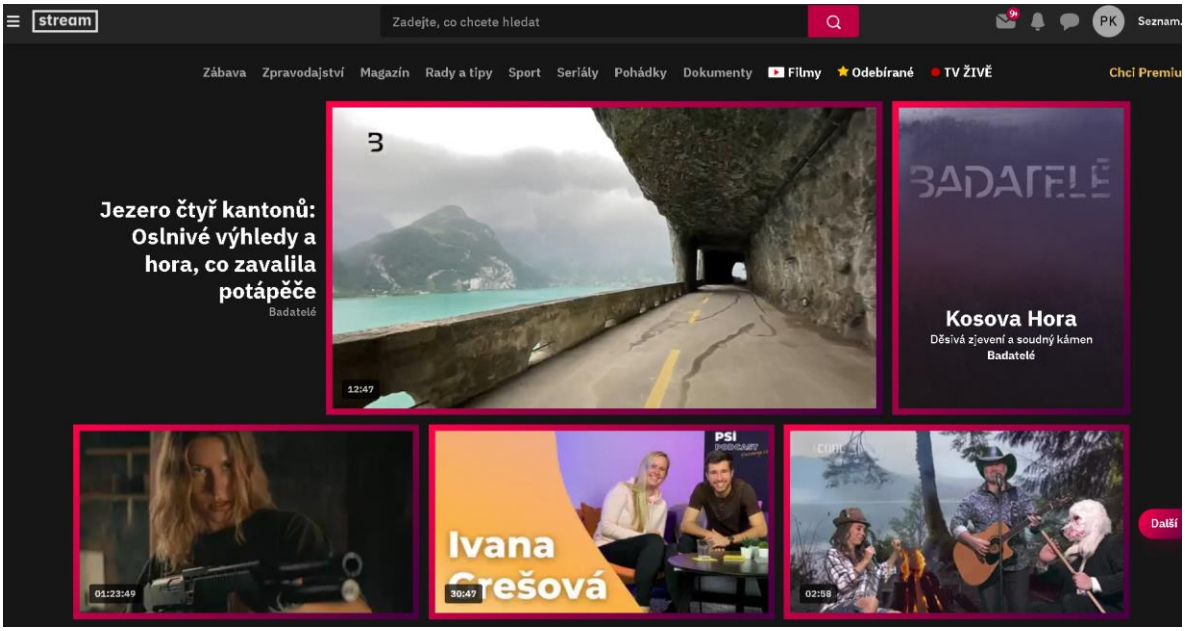
Umíme is a set of systems, which offers interactive exercises in the form of games, with an emphasis on game principles such as clear and achievable goals, immediate feedback

or imaginative assignments. This system is available in several subjects such as English language, mathematics, biology, chemistry, physics and more (Umíme, ©2022).



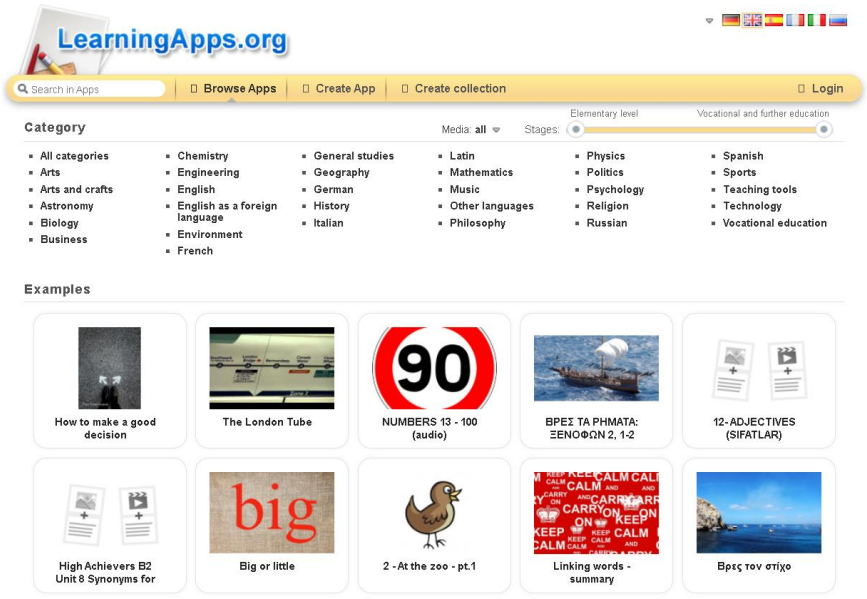
Picture 13 – Umíme exercise example (Source https://www.umimeto.org)

Stream.cz is a video portal full of hundreds of original shows, series and movies available online and offline. Stream.cz is a very similar platform to Youtube focused on the Czech market (Stream.cz, ©1996 – 2022).



Picture 14 – video portal Stream.cz (Source https://www.stream.cz)

LearningApps.org is a website that supports learning and teaching processes with short interactive multimedia exercises. Various templates (homework, multiple–choice tests and so on) are available. These exercises serve to practice and deepen skills (for example grammar in foreign language lessons). The website allows users to create or use exercises already created by other users (LearningApps, © 2022)



Picture 15 – Learning apps (source: https://learningapps.org)

6 Discussion

We can see from the results that the vast majority of respondents answered that they use ICT in practice (98,8 %). The only respondent (1,3 %) who answered that he does not use ICT in practice due to insufficient equipment of the school in which he teaches. Povalová (2021) also states in her research focused on the use of ICT in teaching that 96% of respondents use ICT in practice. The rest of the respondents do not use ICT in practice due to the lack of ICT equipment in their schools.

Results from this research showed that 45.6 % of respondents most often use Notebook / Computer in practice and 31,7 % use interactive whiteboard. According to the result of this research the least used ICT were smartphones (1,3 %) and tablets (2,5 %). Uluyol & Sahin (2014) state in their research that most teachers use a notebook / computer and interactive whiteboard in practice.

In the question where the respondents were asked for what they most often use the ICT, 54,4 % stated that they use the ICT for teaching. According to our respondents, the use of Cloud services (Google drive, Uloz.to ...) was the least represented (2,5 %). Similar results acquired Povalová (2021) in her research. Her respondents also stated that they use ICT mostly for teaching and smaller amount of the respondents stated that they use Cloud services.

Most respondents (96,2 %) stated that they use mobile applications, software and websites in practice. From those who answered in a positive manner 43,4 % use mobile applications, 53,9 % use software and 97,4 % use websites in practice. Fan et al. (2016) states that the vast majority of teachers use websites in practice. Mobile applications and websites are most often used for repetition of the previous curriculum and software is most often used for exposure to a new curriculum. On the other hand, the smallest amount of the respondents stated that they use mobile applications, software and websites for motivation of the new curriculum and consolidation of the new curriculum.

The first question from the final part of the questionnaire was determining the participation in additional education of pedagogical workers. Vast majority of respondents stated that they participate regularly (27,5 %), rarely (32,5 %) and that they do not participate

(31,3 %). Only 8,8 % stated that they do not need to participate in additional education of pedagogical workers. Similar results were achieved by Neumajer (2013). According to his results only 22 % of his respondents are interested in participating in seminars in the field of ICT.

The second question in the final part of the questionnaire was determining the opinion of the respondents on the effectivity of ICT use in practice. Almost all of the respondents answered that according to their opinion use of ICT in practice is very effective (50,0 %) or rather effective (48,8 %). Only one respondent (1,3 %) thinks that ICT use in practice is rather ineffective. According to Máliková, Jenisová & Balážová (2018) is the use of ICT in practice very effective.

The last question of the final part of the questionnaire was determining subjective evaluation of respondents' abilities in the use of ICT in practice. On the scale from 1 to 10 (1 being the lowest, 10 being the highest) respondents achieved average value of 7,9. From the results of the research by Hatlevik & Hatlevik (2018) teachers have a high opinion of their ability to use ICT in practice.

When comparing the use of mobile applications in practice depending on the age of the respondents, I found that the largest proportion of positive responses (80%) were in the age group 45–54 years. A larger ratio of negative answers to positive answers was found in groups up to 25 years, 25 – 34 years and 55+ years (more than 60 %). According to research by O'Bannon & Thomas (2014) people over the age of 50 do not use smartphones as much as people in younger age groups, so they do not use mobile applications as often in practice.

A comparison of the use of the websites in practice and the age of the respondents shows that only two respondents in the age group of 35–44 responded in negative manner. The rest of the respondents answered that they use websites in practice. Schofield & Davidson (2002) state that the vast majority of the teachers regardless of age uses internet.

Another comparison of software use in practice depending on the age of the respondents shows that all of the respondents in the age group up to 25 years stated that they do not use software in practice. Most of the respondents from age groups 35 – 44,

45 – 54 years answered in a positive manner. According to Mumtaz (2006) the majority of teachers older than 30 years uses software in practice.

When comparing the use of mobile applications depending on the length of the practice, I found that only respondents with 10–15 years of practice mostly answered in a positive manner. The rest of the respondents answered mostly in a negative manner most likely because according to Selwyn & Aagaard (2020) mobile phones are banned in most schools.

A comparison of websites use in practice depending on the length of practice shows that almost all of the respondents stated that they use websites in their practice. Only two respondents from the group of respondents that have 5 – 10 years of practice stated that they do not use websites in their practice and only one respondent from the group of respondents that have more than 16 years of practice stated that he does not use websites in the practice. Povalová (2021) found in her research that all of her respondents use websites in their practice.

Another comparison of software use in practice depending on the length of practice shows that except for the respondents with less than 5 years of practice majority of the respondents stated that they use software in practice. Bang & Luft (2014) found out that teachers with less than 5 years of practice do not use software in practice as often as teachers with more years of practice.

When comparing the use of mobile applications in practice depending on the participation in the additional education of pedagogical workers, I found that the only group that answered in a positive manner was the group that stated that they do not need to participate in the additional education of pedagogical workers. The groups that stated that they participate in the additional education of pedagogical workers regularly, rarely or not at all answered mostly in a negative manner.

A comparison of the use of websites in practice depending on the participation in the additional education of pedagogical workers shows that vast majority of the respondents stated that they use websites in practice. Only two respondents (one from the group that answered that they participate in the additional education of pedagogical workers rarely and

one from the group that answered that they do not participate in the additional education of pedagogical workers) answered in a negative manner. According to this research, we can state that there is no dependence on the use of websites and the participation in the additional education of the pedagogical workers.

The last comparison of software use in practice depending on the participation in the additional education of the pedagogical workers shows that only group that answered that they regularly participate in the additional education of the pedagogical workers mostly stated that they do not use software in practice. The vast majority of the respondents from the groups that answered “Yes, rarely”, “No” and “I do not need to” stated that they use software in practice.

Based on the results of the research and also according to Výroční zpráva České školní inspekce (2020) we can state that additional education of pedagogical workers in the field of ICT is not effective enough.

7 Conclusion

The main aim of this diploma thesis was to map the use of ICT in the practice of lower secondary school teachers in the Czech Republic. Partial aim was to find out which specific mobile applications, software and websites the research sample uses in practice and to briefly describe them. Another partial aim was to find out what the research sample most often use mobile applications, software and websites in lesson for. The research sample consisted of eighty Czech lower secondary school teachers.

It was found that 98,8 % of the respondents use ICT in practice. The most used ICT equipment was notebook / computer (45,6 %). The least used ICT equipment was smartphone (1,3 %). Respondents answered that they use ICT mostly for Teaching (54,4 %) and the least for cloud services (2,5 %).

96,2 % of the respondents stated that they use mobile applications, software and websites in practice. More than 50 % do not use mobile applications and software in practice. Vast majority of the respondents (97,4 %) uses websites in practice. Mobile applications and websites were mostly used for repetition of the previous curriculum and software was mostly used for exposure to a new curriculum.

The respondents participate in the additional education of pedagogical workers rarely (32,5 %) or not at all (31,3 %). Half of the respondents stated that the use of ICT in practice is according to their opinion effective. Only 1,3 % of the respondents stated that they find the use of ICT in practice rather ineffective. The average value of the respondent's ability to use ICT in practice is 7,9 out of 10.

In comparison of mobile applications, websites and software use in practice depending on the age of the respondents, majority of the respondents from the age group 45 – 54 years stated that they use mobile applications, websites, and software in practice. The majority of the respondents from the age group up to 25 years stated that they do not use mobile applications and software in practice.

In comparison of mobile applications, websites and software use in practice depending on the length of practice of the respondents, majority of the respondents from the group 10 – 15 years of practice stated that they use mobile applications, websites and

software in practice. The majority of the respondents from the group with less than 5 years of practice stated that they do not use mobile applications and software in practice.

In further analysis of data concerning participation in the additional education of pedagogical workers I found that connection with the use of mobile applications, websites and software and participation in the additional education of pedagogical workers is not significant.

This diploma thesis also contains a list of selected mobile applications, websites and software enriched with a brief description. In conclusion, all of the aims of the research have been fulfilled, and the research questions have been answered.

8 Summary

This diploma thesis deals with the usage of ICT in teacher's practice. The thesis consists of theoretical part and a research part. Theoretical part contains brief summary of the problematics concerning ICT. The information was gained from secondary literature sources.

The aim of the research was to map the use of ICT in the practice of lower secondary school teachers in the Czech Republic and to analyze the data. Acquired results are based on the quantitative research, questionnaire method was used. Questionnaire was divided into three parts. First part of the questionnaire contains general information, the second part is focused on ICT and the final part consisted of three questions (participation in additional education of pedagogical workers, effectivity of ICT in practice and ability to use ICT in practice.

Following results came from the answers. Vast majority of the respondents uses ICT in practice. They mostly use notebook / computer in practice, and they use it mostly for teaching. Almost all of the respondents answered that they use mobile applications, software or websites in practice. All of the respondents, except for one, find using ICT in practice very effective or rather effective.

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10 Appendixes

Appendix 1 – Questionnaire

Appendix 2 – List of abbreviations

Appendix 1 - Questionnaire

Dotazník pro učitele 2. stupně základní školy

Vážení budoucí kolegové,

Jaká je Vaše věková kategorie? *

- do 25 let
- 25 - 34 let
- 35 - 44 let
- 45 - 54 let
- 55+ let

Jaká je délka Vaší praxe? *

- Méně než 5 let
- 5 - 10 let
- 10 - 15 let
- 16+ let

Na jaké škole učíte? *

- 2. stupeň základní školy
- Osmileté gymnázium - nižší gymnázium
- Šestileté gymnázium (8. a 9. třída)
- Jiná...

Na jaké škole učíte? *

- ○ 2. stupeň základní školy
- ○ Osmileté gymnázium - nižší gymnázium
- ○ Šestileté gymnázium (8. a 9. třída)
- ○ Jiná...

Jaké předměty nejčastěji vyučujete? *

- ☐ Matematika
- ☐ Fyzika
- ☐ Dějepis
- ☐ Cizí jazyk (anglický, německý...)
- ☐ Český jazyk
- ☐ Hudební výchova
- ☐ Chemie
- ☐ Občanská výchova
- ☐ Přírodopis
- ☐ Tělesná výchova
- ☐ Výtvarná výchova
- ☐ Zeměpis
- ☐ Informatika
- ☐ Pracovní činnosti

Využíváte ve své práci informační a komunikační technologie? (Tablet, notebook, interaktivní tabule, internet...) *

- ○ Ano
- ○ Ne

Z jakého důvodu nevyužíváte ve své práci informační a komunikační technologie (ICT)?

- ☐ Využívání ICT v mé práci nemá smysl
- ☐ Naše škola není dostatečně vybavená ICT
- ☐ Nemám dostatečné dovednosti v práci s ICT
- ☐ Využívání ICT v mé práci mne zdržuje
- ☐ Jiná...

Které z následujících Informačních a komunikačních technologií nejčastěji používáte v rámci prezenční výuky?

- [ ] Notebook / Počítač
- [ ] Tablet
- [ ] Mobilní telefon (Smartphone)
- [ ] Interaktivní tabule
- [ ] Dataprojektor
- [ ] Internet

K čemu nejčastěji využíváte informační a komunikační technologie?

- [ ] Vyhledávání materiálů do výuky
- [ ] Realizace výuky
- [ ] Komunikace s rodiči nebo žáky
- [ ] Cloudové služby (Google drive, Uloz.to...)
- [ ] Tvorba materiálů do výuky
- [ ] Sebevzdělávání (workshopy, kurzy, webináře...)

Využíváte v rámci prezenční výuky různé mobilní aplikace, internetové stránky či počítačový software?

- ( ) Ano
- ( ) Ne

Využíváte v rámci prezenční výuky mobilní aplikace?

- Ano
- Ne

Které konkrétní mobilní aplikace používáte? *

Text stručné odpovědi

K čemu v rámci vyučovací hodiny nejčastěji používáte mobilní aplikace? *

	Opakování předch...	Motivace nového ...	Expozice novému ...	Fixace nového učiva
Mobilní aplikace				

Využíváte v rámci prezenční výuky Internetové stránky?

- Ano
- Ne

Které konkrétní Internetové stránky využíváte? *

Text stručné odpovědi

K čemu v rámci vyučovací hodiny nejčastěji používáte Internetové stránky? *

	Opakování předch...	Motivace nového ...	Expozice novému ...	Fixace nového učiva
Internetové stránky				

Využíváte v rámci prezenční výuky počítačový software?

- ◯ Ano
- ◯ Ne

Který konkrétní počítačový software využíváte? *

Text stručné odpovědi

K čemu v rámci vyučovací hodiny nejčastěji používáte software? *

	Opakování předch...	Motivace nového ...	Expozice novému ...	Fixace nového učiva
Software	◯	◯	◯	◯

Účastníte se školení v oblasti ICT v rámci DVPP (Další vzdělávání pedagogických pracovníků)? *

- ◯ Ano, pravidelně
- ◯ Ano, zřídka
- ◯ Ne, nepotřebuji
- ◯ Ne

Využití informačních a komunikačních technologií v rámci prezenční výuky považujete za: *

- ◯ Velice efektivní
- ◯ Spíše efektivní
- ◯ Spíše neefektivní
- ◯ Velice neefektivní

Na stupnici od 1 do 10 vyznačte jaké jsou Vaše dovednosti využívání ICT ve Vaší práci. *

	1	2	3	4	5	6	7	8	9	10	
Nedostačující	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Dostačující

Appendix 2 – List of abbreviations

AEPW – Additional Education of Pedagogical Workers

CAI – Computer Assisted Instruction

CAL – Computer Assisted Learning

CML – Computer Managed Learning

DidCompEdu – European framework for the Digital Competence of Educators

IBM – International Business Machines

ICT – Information and Communication Technology

IWB – Interactive Whiteboard

PDF – Portable Document Format

WBL – Web–Based Learning

Anotace

Jméno a příjmení:	Bc. Petr Klumpar
Katedra:	Ústav cizích jazyků
Vedoucí práce:	Mgr. Ondřej Duda
Rok obhajoby:	2022

Název práce:	The Use of ICT in Teacher's Practice
Anotace práce:	Diplomová práce se zabývá využitím ICT v učitelské praxi. Tato práce popisuje ICT z hlediska historického vývoje, vzdělávání a pojednává o propojení ICT s českým školstvím a učiteli. Zabývá se také různými koncepcemi zapojení ICT do vzdělávání a konkrétními typy ICT, které jsou ve školách využívány. Výzkum zkoumá využití ICT v praxi učitelů druhého stupně základních škol v České republice.
Klíčová slova:	ICT, informační technologie, vzdělávání, software, internetové stránky, mobilní aplikace, učitel, E–learning, M–learning, kompetence, digitální kompetence
Anotace v angličtině:	The diploma thesis deals with the use of ICT in teacher's practice. This thesis describes ICT in terms of historical development, education and discusses the connection between ICT and Czech education and teachers. It also deals with various concepts of ICT involvement in education and specific types of ICT that are used in schools. The research examines the use of ICT in the practice of lower secondary school teachers in the Czech Republic.
Klíčová slova v angličtině:	ICT, information technology, education, software, websites, mobile application, teacher, E–learning, M–learning, competences, digital competences
Přílohy vázané v práci:	Appendix 1 – Questionnaire Appendix 2 – List of abbreviations
Rozsah práce:	93 stran
Jazyk práce:	Angličtina