E-Learning and STEM Education
Scientific Editor Eugenia Smyrnova-Trybulska
"E-Learning", 11, Katowice-Cieszyn 2019, pp. 277-294

TRAINING FOR FUTURE PRIMARY SCHOOL TEACHERS IN USING SERVICE H5P TEACHING MATHEMATICS

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Abstract: *The article is devoted to a research of the problem of the training for future primary school teachers in using information technology (IT) in teaching mathematics, in particular, in the aspect of the use of various online resources and online services for teachers. The necessity of using IT in mathematics lessons is substantiated based on peculiarities of the development of digital generation children's cognitive processes. The advantages and disadvantages of using services such as Learning Apps, Plickers and H5P to create interactive exercises, have been revealed. The results of IT introduction in the training for future primary school teachers were analyzed. The technology of teaching future primary school teachers to create interactive math exercises with the help of the online service H5P have been developed and implemented in the process of methodological training at the South Ukrainian National Pedagogical University named after K. Ushynsky and Izmail State University of Humanities.*

Keywords: information technologies, gadgets, digital generation, cognitive processes, training for future primary school teachers, interactive exercises, Learning Apps, Plickers та H5P.

INTRODUCTION

Given the high intensity of information flow and communication in the online environment, their impact on a child's mental development and personality formation cannot be underestimated. Every year, scientists are getting more and more information proving that infocommunication technologies not only complement and extend a child's life, but also affect the entire structure of their activity, both offline and online (Soldatova, G., 2018). The overuse of IT as a tool of daily living has led to a recent increase in the list of common skills that modern people should have. Today's updated list of key competences for lifelong learning includes digital competence (proposal for council recommendation on key competence for lifelong learning, 2019), which emphasizes confident, critical and responsible use and engagement with digital technologies for learning, professional activity and participation in the life of society. It is likely that with the development of the latestIT and their introduction into the public sphere of the country, the requirements for citizen's digital competence will increase. This is one of the most important reasons for reforming the elementary level of education, in particular, the use of modern IT by the teacher when teaching mathematics to primary school children.

1. PREREQUISITES OF USING INFORMATION TECHNOLOGIES IN MATHEMATICS LESSONS IN PRIMARY SCHOOL

1.1 The impact of IT on the development of the cognitive processes of primary school children – representatives of digital generation

Contemporary primary school children are representatives of digital generation called "digital native" or "net generation", they freely operate gadgets by finding the content on the Internet. However, scientists have not yet given an unambiguous answer to the question "Do gadgets have a positive or negative impact on a child's development?" Although, at the beginning of the 21st century, IT was considered as a barrier to children's mental development since the use of gadgets limits children's communication with peers and adults (Armstrong, Casement, 2000), their use is detrimental to children's health, in particular they influence the eyesight. Therefore, IT has a negative impact on the child's social, emotional, and physical development. It should be noted that these factors are still relevant, in particular the involvement of parents in the virtual environment further encourages them to involve children early in operating gadgets to watch miles of movies, to play games on the phone or tablet PC. Thus, modern children much less communicate with their parents, much less play with each other, being babies they already live in two worlds – real and virtual. Competing with the real world, the virtual world is increasingly attracted to the child with high levels of stimulation, a dynamic picture, and we have numerous examples when children even meeting each other do not want to interrupt their activity in the virtual environment. The culture of communication with adults and peers is gradually disappearing, and children are increasingly "communicating" with the gadget, which is essentially a communication on their own. Definitely, it is detrimental to the personal development of the child and to the formation of positive traits. Children do not have the tools to resolve conflicts with others, and they try to resolve all issues by force.

These problems have been still present, and scientists need to decide how to correct them, because it is obvious that the modern development of mankind is impossible without IT technologies. Therefore, scientists have tried to debunk the myth of IT as a barrier to cognitive development (Yelland, 2011), (Plowman, McPake, 2013), and find that the proper use of IT is a valid tool for improving child's development and is not a barrier to mental development. Angela M. Fish and colleagues have shown that children using home digital devices have a higher level of cognitive development than children without a computer at home (Fish, McCarrick, & Partridge, 2008). Gary Small and Gigi Vorgan emphasize that children who are attached to a computer have higher IQs and better cognitive abilities than their peers who do not use computers (Small, G., Vorgan G., 2008). Similar results were obtained by another group of researchers – Jackson, Witt, Games, etc., who have shown that children who use the Internet have higher academic performance than children who do not use the Internet (Jackson, Witt, Games, Fitzgerald, von Eye, Zhao, 2012).

So, today, there are two "camps": representatives of the former – those who believe that IT has a positive impact on the development of higher mental functions (e.g. Small and Vorgan) and use IT in educating primary school children, representatives of the second – those who for some reason do not use IT and believe that modern gadgets have a bad impact on children's development, such as Spitzer (Spitzer, 2014). However, the results of most studies demonstrate that the positive impact of digital technologies on the modern schoolchild prevails over the negative one.

The peculiarities of cognitive processes of digital children are the predominance of visual thinking, clip thinking, linguistic minimalism, rapid fatigue and loss of concentration, impaired auditory memory and overwhelming visual memory (Skvortsova, Britskan, 2019). The research by leading scientists DeBell and Chapman confirms the positive impact of digital technologies on the development of visual intelligence: the ability to simultaneously control multiple visual stimuli, visualization of spatial relationships (DeBell, Chapman, 2006), image recognition, development of visual memory (Van Deventer, White, 2002, White), metacognitive planning processes, search strategies and information appraisal (Tarpley, 2001).

According to scientists, technological development has directly affected the educational system in the way that the object of pedagogical influence is a new type of pupils, namely digital children. In fact, educational changes are driven by the striking gap between traditional teaching methods and the needs of the modern generation (Bennett, and Maton, 2010). Indeed, teachers of modern children are mostly non-digital generation members who are poorly aware of online services for creating educational and gaming content, or are unable to use modern gadgets in lessons. However, this situation has gradually improved with the arrival of young teachers – recent graduates of universities.

1.2 Diagnosing the state of future primary school teachers' readiness for the use of IT in mathematics lessons

The research and experimental work was carried out on the basis of South Ukrainian National Pedagogical University named after K. D. Ushynky and Izmail State University of Humanities. The pilot questionnaire covered 100 undergraduate students of specialty "Primary education".

In order to diagnose basic knowledge and the attitude of primary school teachers to the introduction of IT in mathematics lessons in primary school, we have developed a questionnaire with different types of questions. The questions of the elaborated questionnaire concerned both general data about the respondents and certain practical skills.

One of the questions asked students to rate their IT skills on a five-point scale. As a result of the questionnaire analysis, we found that all (100%) students own computers and have experience in using information technology in their educational activities. All students rated their IT skills as 5 points (100%); 100 students answered that they are able to work with email as 5 points (100%). Work with the file system was evaluated by 95 respondents as 5 points (95%), 5 students as 4 (5%). Work in a Microsoft Word text editor was rated by 92 students (92%) as 5 points, 8 students (8%) as 4 points. Regarding the ability to make presentations, we received the following distribution of students: 5 points – 88 learners (88%), 4 points –10 (10%), 3 points – 2 (2%). According to the development of the ability to process graphic image, we obtained the following data: 5 points – 90 students (90%), 4 – 6 students (6%), 3 – 4 (4%); ability to calculate using electronic spreadsheets: 5 points – 74 students (74%), 4 – 12 (12%), 3 – 14 (14%); ability to install necessary software: 5 points – 25 students (25%), 4 – 45 (45%), 3 – 28 (28%), 2 – 2 (2%); blogging skills: 5 points – 50 students (50%), 4 – 30 (30%), 3 – 17 (17%), 2 – 3 (3%). Students' self-assessment of their ability to work in professional online networks was rated as follows: 5 points – 20 students (20%), 4 – 36 (36%), 3 – 27 (27%), 2 – 10 (10%) and 1 – 7 (7 %); the ability to create websites was rated as 5 points by 12 students (12%), 4 – 10 (10%), 3 – 65 (65%), 2 – 3 (3%) and as 1 point – 10 (10%). The results of the study are presented in Figure 1. Analyzing the answers to this questionnaire, we can conclude that the students have basic knowledge and IT skills gained during their schooling and higher education.

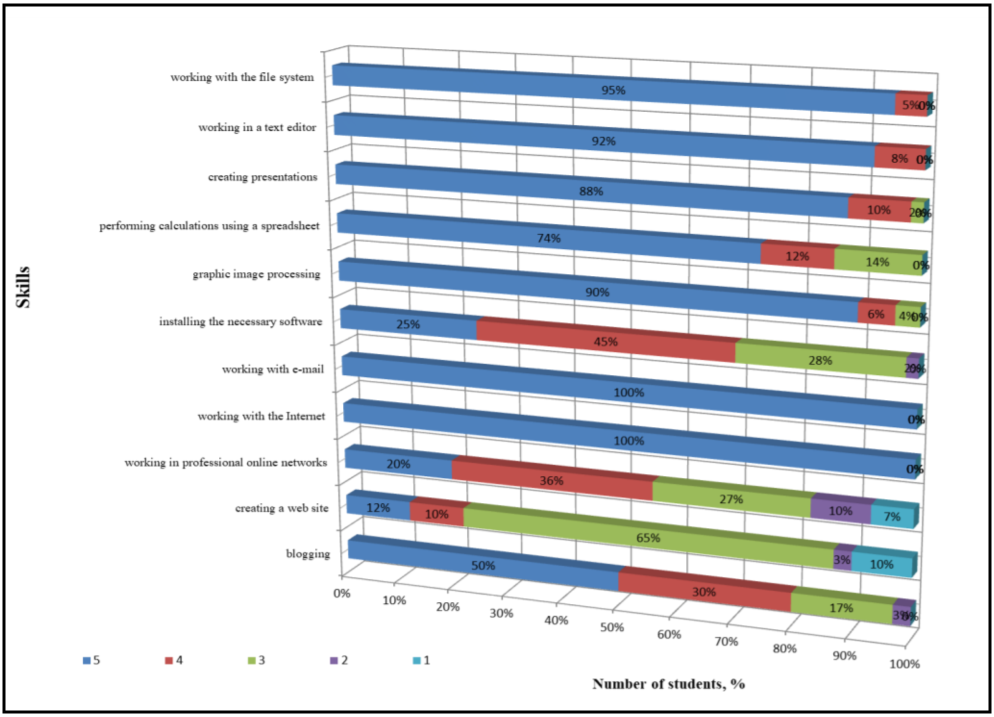

Figure. 1. Students' self-assessing of the level of IT proficiency
Source: own work

Comparing the studies of 2018 (Skvortsova, Britskan) and 2019 (Table 1), we can conclude that in 2019 students had more profound knowledge and more practical IT skills. We can justify this phenomenon by the fact that the younger the researcher, the more experience in IT he has.

It should be noted that prior to the experiment, students had experience of using multimedia presentations at lectures on "Methods of teaching mathematics", used information from web-pages, social networks, etc., in order to master this discipline.

At the beginning of the experiment, students were asked to answer an open-ended question, "What publicly accessible Web resources do you use?" in order to determine which IT tools they consider appropriate in primary school mathematics teaching. Future teachers have listed the following resources: https://skvor.info/, https://www.youtube.com, http://ru.osvita.ua/, https://learningapps.org/ etc. Unfortunately, this list is limited enough for the professional activity of a modern specialist.

The next question was aimed at future teachers' understanding of the necessity to use IT in teaching modern primary school children. Thus, 100% of students think it is necessary to use educational games, 97% – multimedia presentations, 98% – interactive exercises, 85% – educational videos and audio recordings, 83% – educational programs, 75% – tests and quizzes. Also, 100% of students agree that it is appropriate to use gadgets in teaching mathematics to primary school children. Therefore, most students agree that it is necessary to introduce IT in the education of modern children.

100% of the respondents answered to the question "Do you have experience in the H5P service?" "no", but all of them expressed their willingness to participate in interactive exercises using the H5P service.

Thus, the results of our study show that students have basic knowledge, abilities and skills of using IT and willingness to improve them, in particular, to learn how to create interactive exercises using the H5P service.

Table 1.

Comparative characteristics of 2018 and 2019 students' self-assessment of IT proficiency levels

	5 points			4 points			3 points			2 points			1 point		
	2018	2019		2018	2019		2018	2019		2018	2019		2018	2019	
blogging	5%	50%	+45	20%	30%	+10	46%	17%	-29	25%	3%	-22	4%	0%	-4
creating a web site	2%	12%	+10	8%	10%	+2	48%	65%	+17	17%	3%	-14	25%	10%	-15
working in professional online networks	4%	20%	+16	26%	36%	+10	37%	27%	-10	20%	10%	-10	13%	7%	-6
working with the Internet	100%	100%	0	0%	0%	0	0%	0%	0	0%	0%	0	0%	0%	0
working with e-mail	98%	100%	+2	2%	0%	-2	0%	0%	0	0%	0%	0	0%	0%	0
installing the necessary software	10%	25%	+15	32%	45%	+13	45%	28%	-17	13%	2%	-11	0%	0%	0
graphic image processing	22%	90%	+68	48%	6%	-42	28%	4%	-24	2%	0%	-2	0%	0%	0
performing calculations using a spreadsheet	21%	74%	+53	40%	12%	-28	39%	14%	-25	0%	0%	0	0%	0%	0
creating presentations	50%	88%	+38	49%	10%	-39	1%	2%	+1	0%	0%	0	0%	0%	0
working in a text editor	77%	92%	+15	22%	8%	-14	1%	0%	-1	0%	0%	0	0%	0%	0
working with the file system	70%	95%	+25	23%	5%	-18	7%	0%	-7	0%	0%	0	0%	0%	0

Source: own work

2. TRAINING FUTURE PRIMARY SCHOOL TEACHERS FOR USING INFORMATION TECHNOLOGIES IN MATHEMATICS LESSONS

2.1 The problem of selecting online services for creating interactive math exercises for primary school children: setting the criteria

Any teacher understands that it is impossible to give a modern lesson without using IT. But today there is another problem – the problem of choosing online services to create interactive exercises. It is well-known that there are now a small number of different services for teachers that offer different designs for creating tasks and their own bank of interactive exercises. What should a teacher do?

First of all, a highly qualified specialist should be aware of the new developments in IT that can be implemented in the educational process. We should note that there is no universal service that can be used for a long time. Since modern children are rapidly losing interest in certain tasks created on one service, the teacher needs to use the tasks created on different services and their combination to activate learners' cognitive interest.

Based on the study of the features of some services, we can assure that no matter how many opportunities and functions a certain service has, not all the tasks of the elementary mathematics teacher's educational set can be displayed on online services. Most teachers solve this problem by modifying the task to a specific service platform. Or vice versa, when one task from a textbook can be accomplished using different platforms.

In view of this, there is a need to set requirements for the selection of online services with the help of which you can create interactive exercises in mathematics, control and monitor the process of mastering a particular provision of the program. Having studied the features of the work of Web 2.0 services: Learning Apps, Plickers and H5P, we distunguished three groups of requirements: 1 – requirements for creating interactive exercises; II – requirements for controlling over their performance and monitoring pupils' performance; III – requirements for organizing work with the class (Skvortsova, Britskan, 2019).

The first group includes: 1) the opportunity to create exercises in all sections of elementary mathematics. Learning Apps and H5P allow the teacher to work with all sections of the elementary mathematics course – enumerating non-negative integers and regular proper fractions, arithmetic operations of addition, subtraction, multiplication and division with integers, quantities, plot-based mathematic tasks as well as algebraic and geometric propedeutics. Plickers somewhat restrict the teacher, but allows him to work with arithmetics. 2) the availability of sufficient number of platforms for a variety of interactive exercises. Learning Apps includes 17 platforms and 5 tools; Plickers service offers only 2 task designs; H5P allows the teacher to create interactive content for 42 different designs. 3) the possibility of vivid design of interactive exercises by using pictures, graphs, diagrams, audio and video materials, etc. Learning Apps and H5P allow the teacher to use texts, a variety of images, audio and video. Plickers can use text material and images. 4) the presence of animations, dynamism and special effects in interactive exercises. Learning Apps and H5P have a high level of dynamism and special effects when creating interactive exercises, and Plickers allows the teacher to use GIFs. 5) the ability to create differentiated exercises by difficulty levels. We can say that all the three services allow the teacher to create differentiated exercises by difficulty level, but exercises created with Learning Apps and H5P may be more diverse and not similar, and exercises created on Plickers may be different in complexity, but will look typically, since it has a limited number of platforms. 6) the opportunity to give a series of interactive exercises according to the level of progress, where the pupil sees how many exercises he needs to perform in order to move to the level above. With all the three services, the teacher can create a series of interactive exercises. 7) a clear and simple algorithm for performing interactive exercises. Analyzing the algorithms for creating interactive exercises on the three services, we can say that each service offers its own unique algorithm, which is different from other services. In our opinion, it takes less time to learn the Learning Apps algorithm, despite the fact that it has more platforms. The advantage of this service for teachers of Ukraine is that it is translated into Ukrainian. And Plickers and H5P services are in English. The algorithm for creating interactive exercises on the Plickers service is comparatively easier than on the H5P service. This can be explained by the number of platforms. But it should be noted that the Plickers service has a specific algorithm for live broadcasting, which also needs to be mastered by the teacher.

The second group of requirements is connected with the third group of requirements, namely: 1) the ability to create a virtual class: a selection of exercises or series of exercises to the specified lesson and the corresponding class. Learning Apps and Plickers allow the teacher to work with a virtual class. 2) availability of a bank of interactive exercises that can be used at any time without creating your bank. Learning Apps and H5P contain their own interactive content that can be used in one's concrete activity. But Learning Apps allows any exercise in the collection to be customized. Unfortunately, it does not have this function. Plickers does not have its own collection of exercises. 3) an opportunity to use interactive exercises offline. This benefit is provided to the teachers who work on Learning Apps. 4) the teacher's ability to further work with the results. Learning Apps and Plickers' users can work with the assessment results.

Therefore, the H5P service meets most of the requirements for selecting online services that can be used to create interactive math exercises, to control and monitor pupils' learning process as it has many advantages over other online services.

2.2 Theoretical and practical principles of creating interactive math exercises using the online H5P service

One of the ways of integrating IT in teaching mathematics to primary school children is to use the Web 2.0 free resources for the teacher: wikis (websites), social networks, podcasts, and virtual worlds. The scholar Howe J. distinguishes four types of processes in Web 2.0: 1. sharing user-provided content; 2. the evolution of community-developed tags and organization schemes for a large set of user-generated content; 3. elaboration of content collections by the users' community; 4. object search, trends, and app reviews (Howe, 2006). We emphasize that Web 2.0 enables teachers not only to create their own educational and game content, but also to share it on the Internet, as well as to enjoy the achievements of their colleagues. Let us consider the H5P service in details.

H5P is a plugin for existing editing systems that allows the system to create interactive content: interactive videos, presentations, games, quizzes, flash cards, posters, collages, charts etc. H5P is an English language service, so users need to be fluent in English or work with a Google Chrome browser that offers instant webpage translation to create tasks.

To create H5P interactive content, the user must follow the steps below: visit https://h5p.org, create a free account and connect their account to their email in case of password recovery. Having logged on, the user immediately finds the menu of the site – a list of hyperlinks to its sections: Examples & downloads, Documentation, Goals & roadmap, Forum, My account. To see and view the tasks created with H5P, you should choose Examples & downloads, where the user immediately finds the types of content that he or she can work with. H5P offers users the following content types: Accordion, Agamotto, Arithmetic Quiz, Audio Recorder, Chart, Collage, Column, Dialogs Cards, Dictation, Documentation Tool, Drag and Drop, Drag the Words, Essay, Fill in the Blanks, Find Multiple Hotspots , Find Hotspot, Flashcards, Guess the Answer, Iframe Embedder, Image Hotspots, Image Juxtaposition, Image Pairing, Image Sequencing, Image Slider, Impressive Presentation, Mark the Words, Memory Game, Multiple Choice, Personality Quiz, Questionnaire, Quiz (Question Set), Single Choice Set, Speake the Words, Speake the Words Set, Summary, Timeline, True / False Question, Virtual Tour, Interactive Video, Course Presentation, Branching Scenario, Advanced fill the blanks. Selecting the type of content you want, you can look at specific tasks.

Accordion Content provides an opportunity to display the learning material as a plan to follow. This platform will be useful for those teaching mathematics to primary school children, as digital children are known to better perceive new material through visual channels of perception. And as Rickers emphasized, it is advisable to present educational information in graphic and, if possible, electronic forms. For example, in form 2, we can offer the following scheme for consolidating pupils' knowledge of units of measurement (Figure 2).

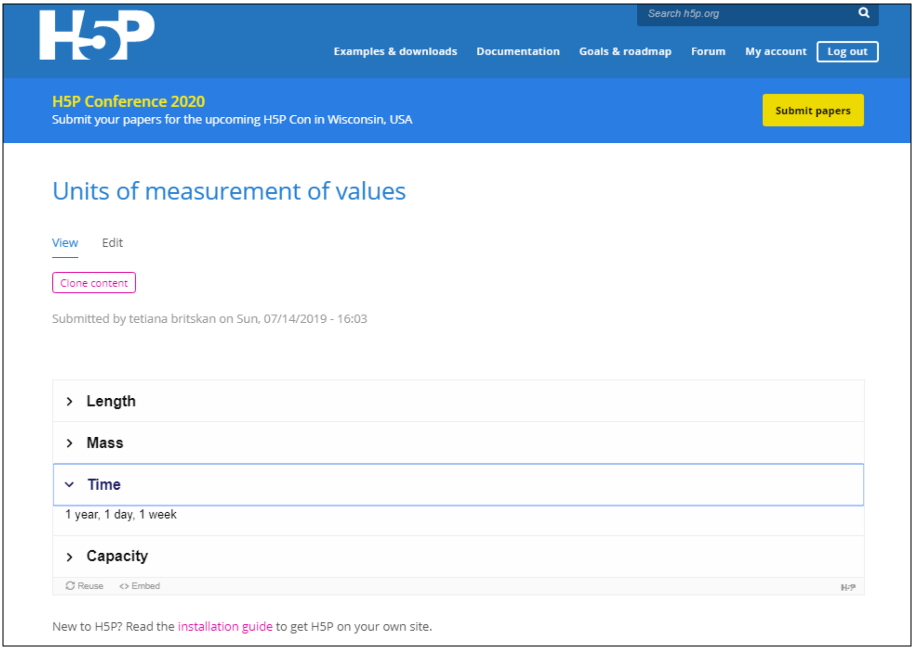

Figure. 2. Task created with help of Accordion Content
Source: own work based on https://h5p.org service

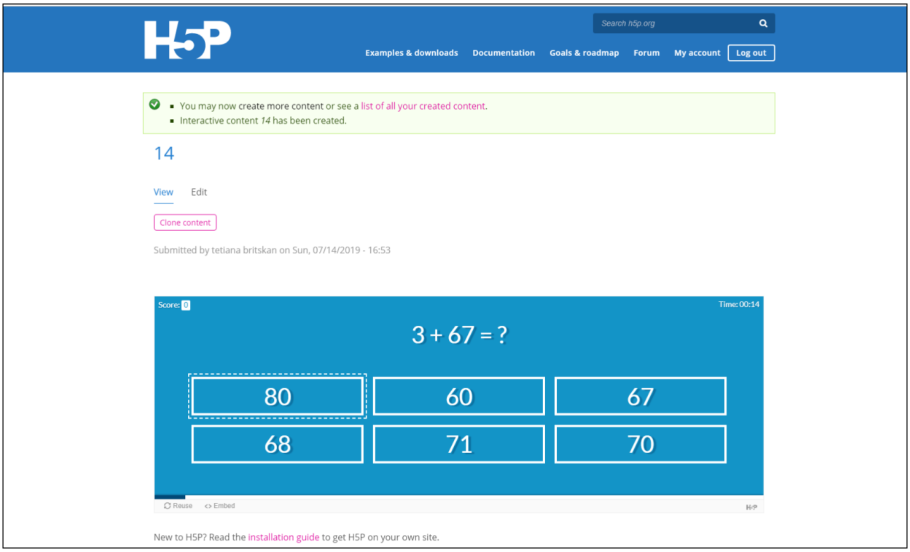

Figure. 3. Arithmetic Quiz
Source: own work based on https://h5p.org service

Agamotto Content allows the teacher to create a series of interactive images for analyzing and learning the sequence. Explanatory material can also be written to each image.

The H5P service independently creates arithmetic quizzes within the first hundred, the teacher only needs to choose the number of indices (max – 20) and arithmetic actions (addition, subtraction, multiplication and division) (Figure 3). This is very convenient, but the service does not take into account the following features: we work with numbers (single digits, double digits), with / without crossing the decades, table or extra-table cases. In our opinion, it is advisable to use Arithmetic Quiz to consolidate computing skills.

The H5P service enables the teacher to create interactive videos that make primary school children get interested to study. To do this, the teacher may upload his video or link to the video. The next step is to create an interactive task at any time interval of the video. To do this, one should select the function "add interactivity" and from the list of known platforms select the necessary one. For example, to illustrate the situation of a maths problem, we found a video about the main character of the task, raccoon, and the way he eats cherries (Figure 4). Primary school children are happy to watch the main character, and then they will need to solve and enter the answer in the box. If the pupil gave the correct answer to the question, then he can move on to the following tasks. We should note that within the same video, many interactive exercises of different types can be created, which will not allow pupils to get used to the tasks of only one type.

While performing interactive tasks, H5P monitors their correctness and captures both intermediate and final points.

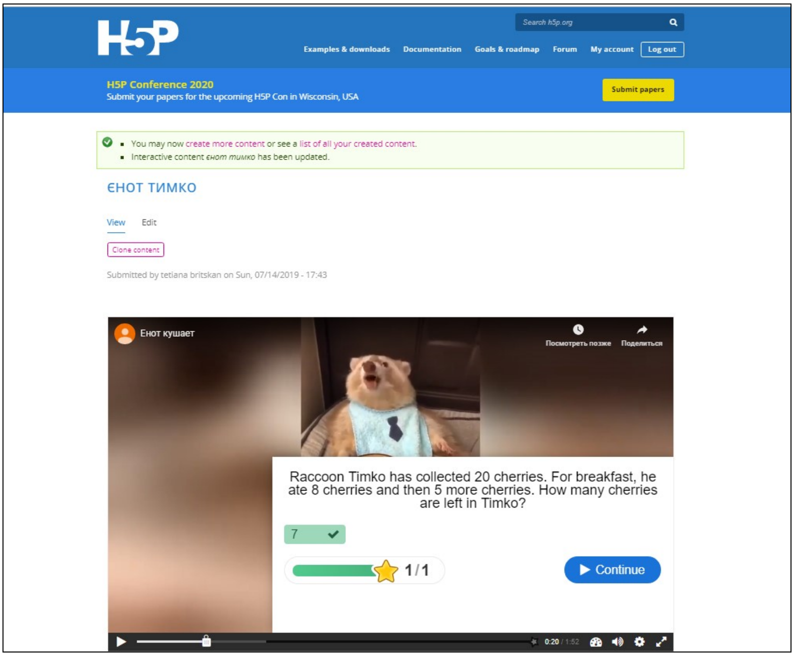

Figure. 4. Interactive Video

Source: own work based on https://h5p.org service

We should note that H5P users can create interactive content for WordPress, Moodle, or Drupal by adding the H5P plugin, or integrate it via LTI with Canvas, Brightspace, Blackboard, and many other VLEs that support LTI integration.

2.2 Approaches to teaching future primary school teachers to create interactive content with H5P

The purpose of the pilot study is training future primary school teachers to create interactive mathematics content using H5P.2.2.

The experimental study was conducted at the Universities of Ukraine – South Ukrainian National Pedagogical University named after K. D. Ushynsky and Izmail State University of Humanities over one academic year. The experiment was attended by students of the 1-3 years, specialty 013 “Primary education”. The experimental study was carried out within the course ‘Methods of teaching mathematics” at the expense of hours allotted for independent (self-guided) work – 72 hours. Altogether, 100 students participated in the study, 50 of them were in the experimental group (Izmail State University of Humanities) and 50 students were in the control group (South Ukrainian National Pedagogical University named after K. D. Ushynsky).

The students of the experimental group were specifically trained to work with the H5P service to use it when preparing tasks for primary school children. The students of the control group had to independently study the possibilities of the service and to formulate tasks for the pupils.

In the experimental group, training to work with the service for creating interactive content included several stages.

In the first stage of the study, students of the specialty 013 "Primary Education" were shown ready-made interactive content created on this service. The purpose of this phase was future teachers'mastering of the work with the content in the role of users and evaluating the performance of tasks by other students of their own group.

It should be noted that when studying the questions from the course "Methods of teaching mathematics in primary school", the attention was paid to how different educational materials can be presented in the form of interactive content. Therefore, while performing the tasks, students paid attention to such methodological aspects as: 1) the topic of the mathematics course which the task was created for; 2) the purpose of the task – the achievement of which program results the task is aimed at; 3) what stage of the learning cognition organization the task can be used at (consolidation of basic knowledge, obtaining new knowledge or learning a new mode of action, formation of abilities or skills, control and evaluation of learning outcomes); 4) opportunities to improve the task.

Thus, in the first stage, students gained experience in both the role of the task performer and the situation of observing the work of other performers and analyzing the completed tasks from a methodological point of view.

The second stage of the study involved acquainting prospective teachers with the H5P service and the algorithm of working with it. In order to learn the possibilities of this service, some lectures for the students of the experimental group were read on the topics: "Possibilities of the H5P service" and "Creating interactive mathematics content for primary school children using H5P". It should be noted that the creation of interactive content in mathematics has its own peculiarities, in particular the formulation of interactive tasks and their answers. For example, it is advisable to select Drag and Drop, Fill in the Blanks, Image Sequencing, Image Juxtaposition platforms to create interactive tasks on the topic of enumerating non-negative integers and regular proper fractions; arithmetic material and values – True / False, Quiz, Fill in the Blanks, Accordion; plot-based mathematical problems – Interactive Video, Course Presentation, Drag the words; algebraic and geometric propedeutics – Image Juxtaposition, True / False, Quiz, Fill in the Blanks.

In view of the above said, we have developed an algorithm for creating interactive content using H5P: 1) selecting a task from a textbook or tutorial; 2) developing a methodology of work on the task in accordance with the studied methodological approaches; 3) choosing a suitable platform that provides a convenient task interface for pupils; 4) designing possible actions when completing the task; 5) developing an algorithm of the pupils' actions to accomplish the task; 6) drawing up instructions for pupils; 6) preparing instructions for pupils stating the form of control and time limits.

The aim of the third stage of the experimental work was to teach students to create interactive content. At lectures, practical and laboratory classes in the course of “Methods of teaching mathematics” students under the guidance of the teacher obtained methodical knowledge and skills, and during consultations for independent (self-guided) work – acquired the ability to create interactive content.

We should note that most students learned how to create interactive content using the H5P service, but many difficulties arose when working with the H5P English service.

In the fourth stage, students had to apply the obtained knowledge, abilities and skills of work with the H5P service while creating their own interactive mathematics content for 1-4 form pupils according to the workbooks by S. O. Skvortsova and O. V. Onopriienko (Skvortsova, Onopriienko, 2017).

To create interactive content in mathematics, topics of 1st and 2nd forms were offered, namely, “Subtracting digits of the second set of five”, “We measure masses of objects”, “Enumerating numbers of the first hundred”, “Problems of finding numbers by the sum of two numbers” etc. The created interactive tasks focused on the stages of learning cognition, such as the stage of skills’ formation and the stage of testing the formation of certain knowledge, ability or skill (Figure 5, 6).

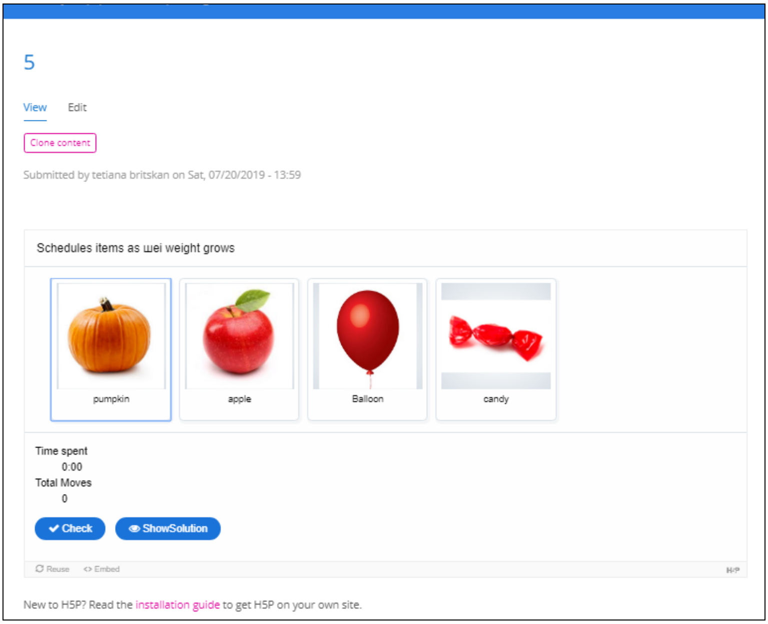

Figure 5. Interactive exercise of the student

Source: own work based on https://h5p.org service

Students' individual projects were assessed according to the following criteria: methodological, technical and aesthetic. Indicators of the methodological criterion were the correctness of the methodological development of the task, the completeness of adherence to the indicative basis of the action, the clarity of the task instructions for children, technological efficiency to perform actions with the elements of the task. The technical criterion was characterized by the following indicators: optimality of the choice of platform opportunities for accomplishing the task, correctness of the settings, dynamism. Indicators of the aesthetic criterion were: external attractiveness (brightness, funny character and modernity of the pictures, location on the plane of the task elements), adherence to the color scheme which causes positive emotions in children.

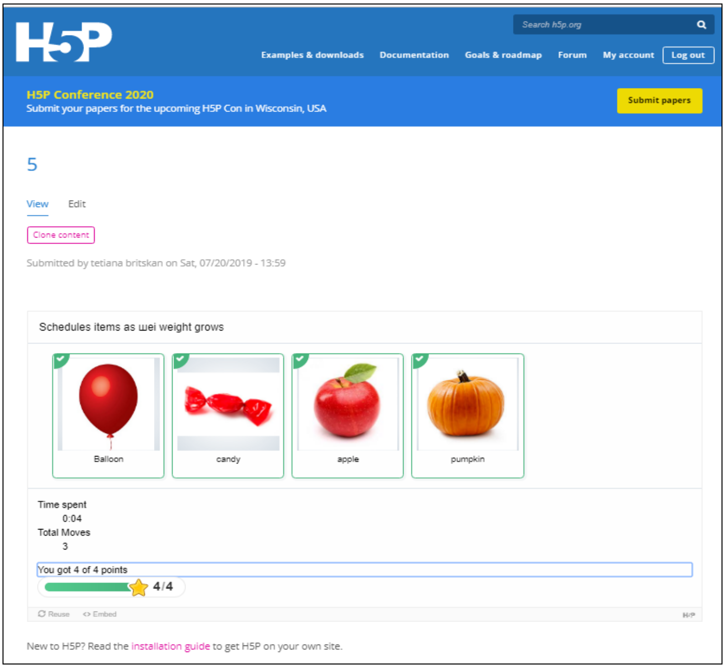

Figure 6. Interactive exercise creating with Image Sequencing
Source: own work based on https://h5p.org service

Identification of these indicators by methodological and technical criteria made it possible to characterize the levels of developing interactive content using H5P:

– low: fragmented knowledge and ability to create interactive tasks; the student can organize pupils' work on the service based on the ready-made interactive content, but has difficulties in controlling the progress of solving the interactive tasks and assessing pupils' learning achievements.

- medium: a student has some theoretical knowledge of the service and is able to create his own model exercise, but has difficulties in editing the service when creating his own interactive content.
- sufficient: the user knows the features of the service and is able to create standard tasks using images and has the knowledge and skills to adjust the service for pupils' work and assess their results.
- high level: students' knowledge is deep, solid and systemic; the student is able to create interactive content and edit their own tasks according to their needs, organize pupils' work with a series of learning tasks and can further assess pupils' educational achievements.

In the course of the pilot study, we used some elements of peer assessment, where students not only become observers of teacher's assessment of the results, but are involved in the use and development of the assessment criteria, in self-assessment and peer assessment, in reflection on their own learning progress, and in tracking their performance, as well as in the feedback analysis to make further changes to the learning process for improving their knowledge, skills and behavior (Morze, Vember, 2019).

Based on the assessment of individual projects completed by future primary school teachers, it can be stated that the vast majority of students (83%) have mastered the method of creating interactive content using the H5P service. 17% of the future teachers have acquired only the ability to use the H5P service to find ready-made interactive content. These results can be explained by the fact that H5P is quite difficult to operate because the service is in English. But if more time is spent exploring the features of this service in details, H5P will become a major help in the preparation of interactive content for teaching mathematics to primary school children.

CONCLUSION

Nowadays, giving mathematics lessons in primary school is impossible without the use of IT including online services. One of the services that allows teachers to create interactive content is H5P, useful for every teacher.

In the course of the experimental work the state of students' readiness for the use of IT in mathematics lessons in primary school was investigated and a comparative analysis of the results of years 2018 and 2019 was conducted. The students proved to have basic knowledge of IT, IT skills and abilities, and 100% of them demonstrated willingness to improve these skills, in particular, to learn how to create interactive content with H5P.

We have developed a technology for teaching students to create interactive content using H5P. As a result of the experimental learning, 83% of prospective primary school teachers have mastered the ability to create interactive mathematics content using H5P.

We see further research prospects in creating interactive mathematics content for primary school children; acquainting primary school teachers and students of the specialty 013 “Primary education” with other online resources and online mathematics services, such as Moodle, Google Forms, Webanketa, Online Test Pad, GoConqr, PlayBuzz, Baamboozle, Kahoot!, Triventy, Socrative, Quizalize, ProProfs, Purpose Games, Flippitty etc.

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Citation: Skvortsova, S., Onopriienko,O., Britskan, T. (2019) Training for Future Primary School Teachers in Using Service H5p Teaching Mathematics In E. Smyrnova-Trybulska (Ed.). *E-Learning and STEM Education*. "E-Learning", 11, (pp. 277-294). Katowice-Cieszyn: Studio NOA for University of Silesia 2019.