

Training of future primary school teacher for use digital educational resources in their professional activities

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Abstract. The article reveals the relevance of training future specialists in primary education to use digital educational resources in professional activities. After analysing the scientific works on this problem, the authors identified similar approaches to its solution in different countries and mostly low and medium levels of the pre-service primary school teachers' readiness to use digital educational resources in their professional activities. Based on the results of empirical research on the state of development of operational and activity and projective components of the readiness of prospective bachelors and masters of Primary Education to use digital educational resources in professional activities and the dynamics of this personal phenomenon under traditional conditions of higher education, the research methodology consisted in the gradual implementing the quasi-professional technology, the method of expert evaluation, and the further distribution of the respondents according to the levels of development of the readiness components: intuitive and receptive, reproductive, productive, and research and creative. The results of the study were subjected to the quantitative and qualitative analysis, as a result of which the authors concluded that within the current system of professional training of future primary school teachers the level of development of operational and activity and projective components of their readiness to use digital educational resources is insufficient. In addition, the authors found that among the methods and techniques of working with presentation slides, the reproductive patterns predominate: information method, structural and graphical techniques of information processing; respondents are not sufficiently oriented in the types of slides, as well as in software environments for designing the presentations. Prospective bachelors and masters are limited to the use of graphic and textual information in presentations; future specialists in primary education mainly use animation and creolisation of the text for their e-learning tools, and there are almost no infographics, interactive posters, educational comics, tasks on online learning platforms, etc.

Keywords: quality of education, vocational training, professional activity, professional readiness, primary school teacher, digital educational resources

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1. Introduction

Development and measurement of teachers' ability to use modern methods of information processing, their readiness to use digital educational resources in professional activities are an urgent issue, which is solved worldwide: UNESCO ICT Competency Framework for Teachers, ISTE National Educational Technology Standards for Teachers / Students, European Framework for the Digital Competence of Educators (DigCompEdu), etc. The regulations indicate the necessary skills of the teachers, which provide them with a sufficient level of ICT use for both personal development and preparing their students for life in the information society [9]. UNESCO has identified three levels of development of teachers' digital competence: understanding of ICT and integration of the technological competence into curricula; use of ICT to organize a quality educational process for students; acquisition of new knowledge and their production based on the use of ICT [11].

In Ukraine, the development of digital competence and literacy of teachers is also supported at the legislative level: the Law of Ukraine "On Higher Education", "Conceptual Principles of Pedagogical Education Development in Ukraine and its Integration into the European Educational Space", "Concept of Continuing Education Development", "Action Plan for the Creation and Implementation of E-Learning Content", "Regulations on E-Learning Resources", the State Program "Information and Communication Technologies in Education and Science", "Digital Agenda of Ukraine 2020", etc. The processes of digitalization of the pedagogical field in the national educational system are in a state of active development, which is currently significantly reflected in the training of prospective school teachers [10]. In accordance with the requirements of current regulations, in the conditions of development of the New Ukrainian School, the readiness of the future primary education specialist to carry out professional activity implies, in particular, the ability to apply technologies for creating and using digital educational resources. Therefore, an important direction in changing the key guidelines of primary school teacher training is a systematic study of the personal phenomena of pre-service teachers, one of which is their readiness to use digital educational resources in professional activities.

2. Literature review

Preparing future primary school teachers for the use of ICT, digital technologies, e-learning resources, e-learning tools is one of the urgent theoretical and practical issues, some aspects of which are currently covered in the publications by Al-Huneini, Walker and Badger [2], De Rossi and Restiglian [6], Durán Cuartero, Prendes Espinosa and Gutiérrez Porlán [8], Mochizuki et al. [17].

Most research raises partial questions about the use of interactive whiteboards [15], graphic organizers for electronic text, technologies of argumentative reading and writing [17], writing for studying [1], and online training of pre-service primary school teachers [24]. An important part of research [3, 6, 7, 20, 21, 28] is devoted to diagnosing the development of personal phenomena of future teachers (digital competence, digital (technological) literacy), their motivation to use different types of e-learning resources in personal practice, analysing the factors influencing the use ICT in primary school teacher training, etc.

The greatest among them in terms of diagnosing the personal phenomena of primary school teachers is currently the work of the Spanish scientists. Thus, while studying the digital skills of the Spanish primary school teachers, del Moral-Pérez, Villalustre-Martínez and del Rosario Neira-Piñero [7] used the practical task of creating a narrative, noting that digital storytelling can be an ideal practice for both professional development of primary school teachers' skills through the incorporation of technological resources for educational purposes and for diagnosing its formation. After analysing the digital narratives of a sufficient sample of primary school teachers, the researchers concluded that the digital competence of 78,7% of them was at a high level, while communicative and narrative competencies were much lower. It should be noted that the results of these investigations differ somewhat from the findings of other scientists.

Fernández-Cruz and Fernández-Díaz [11] noted that the skills and demands of modern pupils and students lacked the technological skills of their teachers and used a questionnaire to compare the digital competence of primary school and university teachers, who worked with the students of this specialty in Madrid. Researchers concluded that the university teachers generally had a higher level of competence, although most respondents were at medium and low levels: teachers were poorly versed in the essence of digital competence, had underdeveloped technological skills, and, consequently, had little experience of using them in their practice. Similar conclusions were reached by Beneyto-Seoane and Collet-Sabé [3], noting that even teachers with a high level of digital competence in personal life did not teach their students in this field. Researchers used semi-structured interviews to identify the specifics of these processes in the practice of teaching Barcelona pre-service primary school teachers and concluded that it was necessary to rethink teacher training from the standpoint of incorporation and end-to-end learning model.

Analysing the technical skills of ICT use by final year master students in primary education in Murcia (Spain), Prendes-Espinosa, Castañeda-Quintero and Gutiérrez-Portlán [20] set five tasks to test such knowledge and skills: the ability to create a written document in a word processor; knowledge of the use of the spell checking in text documents; the ability to organise, analyse and synthesise the information through the tables, graphs or charts; knowledge of how to create a multimedia presentation in any program; knowledge of how to analyse a multimedia presentation made by another person. Researchers concluded that the pre-service primary school teachers had a high level of technical skills in creating and editing text documents, while in the producing and analysing of digital multimedia products, most respondents were at a medium and low level. At the same time, students had poorly implemented skills of teamwork, leadership, and cooperation.

De Rossi and Restiglian [6] conducted a similar study for the masters in primary education in Italy, but they used a more sophisticated diagnostic technique: first, the researchers organised a digital storytelling master class for students, ending with a semi-structured questionnaire (16 closed and two open questions) and then asked to create your own digital story. To assess the quality of the documentary narrative, the method of expert evaluations (self-assessment of the students, university teachers, and school teachers) was used. According to the evaluation of the so-called "documentary competence" of the majority of respondents in all three groups of experts was at a medium level. Studying the relevance of continuing education of teachers at Brazilian universities with an emphasis on the use of ICT in their practice, Rodrigues and dos Santos [21] used an interview method aimed at establishing the amount of pedagogical,

technological, and pedagogical-technological (methodological) knowledge of the respondents. The researches came to the conclusion that they were insufficient and there was a need for continuing training of students and teachers in the methods of using e-learning resources in practice.

Záhorec, Nagyová and Hašková [28] presents the results of an empirical study on the use of digital educational means in the work of Slovak primary school teachers in lessons in various subjects. Through a survey of teachers, the researchers found that these tools were used mainly for the presentation (explanation) of a new topic and various demonstrations. Much less often, educators used them to test and assess students' knowledge with the modern voting systems or web tools on the Internet. In addition, e-learning resources were mostly used in the teaching of natural sciences, which according to the authors' beliefs was a positive fact, as these subjects required abstract thinking and abstract imagination, and to make students better aware of the essence of the presented topics, it was desirable to use a wide range of digital technologies.

Thus, exploring the readiness of primary school teachers to use digital educational resources, modern foreign researchers mostly study their digital competence, digital literacy, documentary (technological) competence, and technical skills, without resorting to a detailed theoretical analysis of the internal structure of these phenomena of a student or a teacher. The methods of questionnaires and interviews, practical tasks for creating a digital educational product (a narrative, a text, a multimedia presentation), and the method of expert evaluation are mainly used. According to most of these studies, the readiness of primary school teachers is at low and medium levels, which is rightly considered to be insufficient for the effective organization of the educational process in primary school, although technical (technological, projective) skills of the students in these countries are better developed.

In Ukrainian research on the problem of developing the pre-service teachers' readiness to use digital educational resources, there is a similar trend in the studied phenomena of teachers and methods of diagnosing them: Bobrovytska and Semenikhina [4], Boiko [5], Khyzhniak et al. [12], Shamunova [23], Velychko et al. [25]. At the same time, the works of Ukrainian scholars more fully reflect the structure of the teacher's personal formations and their component-by-component measurement.

Thus, a number of scientific papers [16, 19, 26, 27] consider the general structure of the future teachers' readiness to use digital educational resources in the unity of motivational, target, informational, operational and activity, and reflective components (although their names may differ slightly, the essence of these components is identical). For example, in the informatic competence of pre-service primary school teachers Petukhova [19] identified such components as knowledge, practical skills, motivation, and reflection. According to the results of her empirical research, which used the methods of pedagogical observation, debate, control creative work, questionnaires, and testing, it was found that the respondents' knowledge and motivation were best developed while, according to the level of development of practical skills and reflection, most of them belonged to the low and medium levels.

Measuring the operational and activity component of related personal phenomena of pre-service primary school teachers, namely readiness to design information and communication environment, use information technology, digital educational resources [14], etc. led the scientists to similar conclusions about the insufficient level of its development for effective professional activity with the use of e-learning resources. Most respondents were at low and

medium levels, with significant deficiencies in pedagogical, methodological, and technical knowledge and skills. To diagnose the level of development of the operational and activity component of these formations, scientists mainly used methods of performing practical tasks, quasi-professional activities, and expert evaluation. At the same time, electronic textbooks, multimedia presentations and testing programs predominated among the multimedia tools used in primary school teaching, which partly coincides with the results of Spanish and Slovak scientists presented above.

Olefirenko [18], Rybalko [22] studies are devoted to diagnosing the level of development of the projective component of the pre-service primary school teachers' competence and readiness in the field of digital educational resources. The development of technological (operational) criteria was tested by each of the researchers using the method of practical tasks followed by an expert evaluation of digital products created by the students. As a result, they came to similar conclusions about the mostly low and medium levels of students' readiness to design such tools.

Thus, the studies present the relevance of the problem and similar approaches to its solution. Researchers use methods of questionnaires, interviews, practical tasks, quasi-professional activities, and expert evaluation and come to similar conclusions about the mostly low and medium levels of development of pre-service primary school teachers' readiness to use digital educational resources in professional activities. In Ukrainian research, there is a more thorough theoretical study of the structure of personal phenomena of the future primary education specialist related to this readiness, although at the same time in the scientific works little correlation is reflected in developing operational and activity and projective components of the readiness and their studying in dynamics of professional training from bachelor's to master's degree.

3. Methods

The methodology of empirical research consisted in the gradual application of the technology of quasi-professional activities of pre-service primary education specialists and the method of expert evaluation. The technology of quasi-professional activity was implemented by setting a task on modeling the educational process in primary school for the students of bachelor's degree in Primary Education, and for master students there was a task for modeling the educational process in higher educational institution (HEI) using the most common digital educational resource – multimedia presentation. During the task, students had to demonstrate skills in designing a digital educational resource (projective component of the readiness) and its application in class (operational and activity component of the readiness).

To assess the results of quasi-professional activities of bachelor and master students, the method of individual expert evaluation was used, implemented through selecting experts from among the university teachers of professional courses of the specialty Primary Education and primary school teachers and instructing them on how to analyse the results of students' quasi-professional activities. After reviewing the videos of lessons (classes), the experts filled out a Google form, which provided an expert evaluation of the quasi-professional activities of future primary education specialists.

Describing the criterion-level structure of future primary school teachers' readiness to use

digital educational resources, Khyzhniak [13] singled out motivational and value, cognitive, operational and activity and projective components, as well as intuitive and receptive, re-productive, productive, and research and creative levels of their development. Based on this criterion-level structure, we diagnosed the levels of developing operational and activity and projective components of the future teachers' readiness to use digital educational resources in professional activities under traditional conditions of training at HEI, for which we selected 60 respondents from the 4th-year bachelor students and 2nd-year master students in the specialty Primary Education.

The choice of different degrees of higher education for empirical research is explained by the desire to find out how the ability to design and apply digital educational resources without special influence (under traditional conditions of training at HEI) changes from one degree to another. The formation of operational and activity and projective components of the pre-service primary school teachers' readiness to use digital educational resources in professional activities we diagnosed using the method of quasi-professional activities, which took the form of modeling the educational process in primary school and university based on self-designed digital educational resources.

4. Results of the study

The tasks for the bachelor and master students were similar in essence, and the difference was related to the proposed audience for modeling the educational process: primary schoolchildren or bachelor students. The choice of the quasi-professional task was based on the results of questionnaires and testing of students of both levels of higher education, which showed their greatest awareness of such a digital educational resource as a multimedia presentation.

So, the bachelor students (30 participants) were offered the task: "Develop a lesson plan (Language, Mathematics or Science – optional). Design a multimedia presentation to accompany it with. Make a video of your own quasi-professional activity, modeling the lesson according to the developed lesson plan and presentation".

For master students (30 participants) the task was as follows: "Develop a plan of a lecture on teaching methods (Language, Mathematics or Science – optional) for the bachelor students. Design a multimedia presentation to accompany it with. Make a video of your own quasi-professional activity, modeling the lecture according to the developed lesson plan and presentation".

The results of the quasi-professional activities of the bachelor and master students were revealed on the basis of analysis of the videos on the following parameters:

1. Implementation in the presentation of the main methodological requirements for teaching the relevant subject (methodological) material (the first question in the expert evaluation form).
2. Methods and techniques of working with presentation slides in class / lesson (questions 2 and 3 of the expert form).
3. Presence in the presentation of the general structure and main types of slides: information-explanatory, training-control, logical-plot, physiological-psychological ones (questions 4 and 5 of the expert form).

4. The software environment in which the presentation is designed, the types of information presented in it, the variety of modern information and communication technologies used in the presentation (questions 6, 7, and 8 of the expert form).

According to the first two parameters we measured the formation of the operational and activity component of the future primary education specialists' readiness to use digital educational resources in professional activities, the next three – the level of development of the projective component of this personal formation.

The analysis of videos of the quasi-professional activities of the bachelor and master students was conducted using the method of expert evaluation. Thus, the experts, who were experienced university teachers and primary school teachers (total number – 10 participants, practical experience of each is more than ten years), were asked to analyse the videos and evaluate them based on the indicators. The examination was conducted using Google cloud services, namely, Google Forms (figure 1).

Quantitative analysis of expert evaluation was performed by adding the number of points (each video was analyzed by 2 people), given by the experts. The maximum number of points during the evaluation of each of the components (operational and activity and projective) was 30 points. Subsequently, we conducted a separate distribution of respondents of bachelor's and master's degrees according to the levels of development of each component using the corresponding table (table 1).

Table 1

Table of distribution of the number of points received by the respondents according to the levels of developing the components of their readiness to use digital educational resources.

The level of developing the components of readiness to the use of digital educational resources	Points
Intuitive and receptive	1–7
Reproductive	8–14
Productive	15–21
Research and creative	22–30

Quantitative analysis of the results showed that the level of development of both operational and activity and projective components of the future primary education specialists' readiness to use digital educational resources in professional activities for both bachelor's and master's degrees in primary education in traditional training is characterized by certain differences (figure 2, figure 3), but they are insignificant in numerical terms and in essence.

As it can be seen from the figures 2 and 3, at the reproductive and intuitive and receptive levels, there is a slightly lower percentage of master students than bachelor ones, and, accordingly, there is an increase in the productive and research and creative levels. However, future bachelors and masters retain the correlation between the levels of developing the components of readiness to use digital educational resources: for the operational and activity component, the largest number of respondents are at the reproductive level, less – at the intuitive and receptive level. Further significant quantitative differences between the productive and research and creative levels are noted. For the projective component, the highest percentage is also observed at the

Експертне оцінювання відеозапису уроку
Шановний експерте! Заповніть подану форму, проаналізувавши відеозапис уроку.
*Обов'язкове поле

Шифр відеозапису уроку *
Ваша відповідь

Оцініть реалізацію методичних вимог до викладання мовного матеріалу за шкалою від 1 до 5. *

1 2 3 4 5
Неявні грубі методичні помилки ○ ○ ○ ○ ○ Методичні помилки відсутні

Які методи роботи з мультимедійною презентацією використано в ході уроку *

Інформаційний
 Тренувальний
 Контрольний
 Комунікаційний
 Продуктивний

Які прийоми роботи за слайдами використано в уроці?

Структурні
 Тезові
 Графічні
 Проблемні

Оцініть дотримання структури мультимедійної презентації за шкалою від 1 до 3.

1 2 3
У презентації відсутні структурні частини ○ ○ ○ Тричастинну структуру витримано повністю, також наявні слайди-переходи між частинами

Які типи слайдів наявні в мультимедійній презентації?

Інформаційно-пояснювальні слайди
 Тренувально-контрольні слайди
 Логічно-сюжетні слайди
 Фізіологічно-психологічні слайди

Оцініть мультимедійність презентації за шкалою від 1 до 5.

1 2 3 4 5
У презентації використано лише графічну інформацію ○ ○ ○ ○ ○ У презентації використано всі форми подання інформації: графічна, звукова, текстова, числова, відео.

Які технології було використано в презентації?

Анімація тексту
 Анімовані зображення
 Скрайбінг
 Креолізація тексту
 Інфографіка
 Інтерактивні постери
 Ніяких
 Інше: _____

Яке програмне середовище, на Вашу думку, використано для створення презентації?
Ваша відповідь _____

Надіслати

Figure 1: The expert evaluation form.

reproductive level, the productive level is in second place, then – research and creative, and the lowest percentage is at the intuitive and receptive level.

Numerical results show that the projective component of the future primary education specialists' readiness to use digital educational resources without targeted learning develops better than operational and activity one. Technologies for creating e-learning resources are mastered by the students better than the method of their use in primary school lessons or classes in HEI. The development of the operational and activity component directly depends on a specially organized educational process in which learning to use digital educational resources will be conducted systematically in classes in all professional courses. These results coincide with the findings of other scientific studies [19–21], which confirms the reliability of the results.

In addition, the analysis of numerical data showed that even in the absence of targeted training, some students (about 6,0 – 7,0%) independently master the technological and methodological

Operational and Activity Component of the Readiness

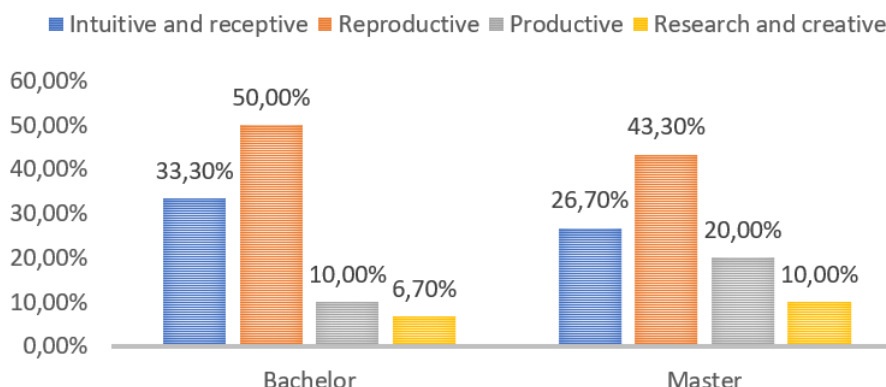


Figure 2: Diagram of the development of the operational and activity component of the future primary education specialists’ readiness to use digital educational resources.

Projective Component of the Readiness

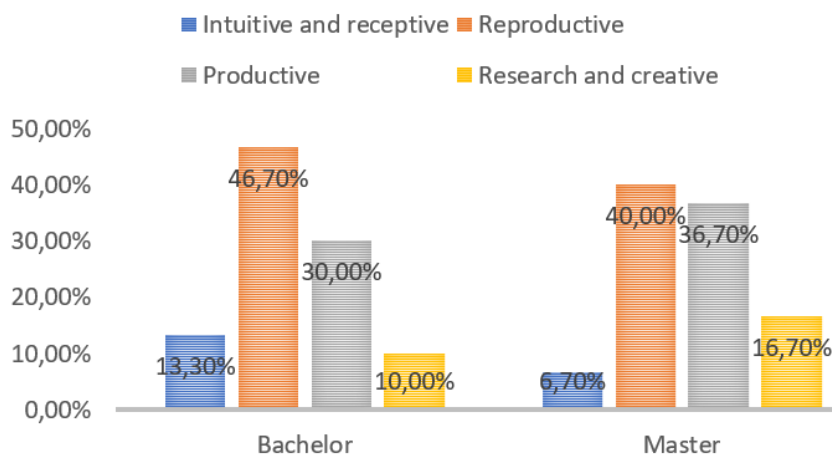


Figure 3: Diagram of the development of the projective component of the future primary education specialists’ readiness to use digital educational resources.

features of using digital educational resources and until the completion of a master’s degree they change the level of development of operational and activity and projective components of readiness to use these tools in professional activities to productive or even research and creative levels. However, this percentage is insignificant, and the need for special training in the use of electronic educational resources is an important area of reforming the process of training future primary education specialists.

Conducting a qualitative analysis of the quasi-professional activities of the bachelor and master students of the specialty Primary Education, we made the following generalizations:

1. When choosing the subject or methodological content of a multimedia presentation for a lesson, both prospective bachelors and masters of primary education mostly correctly implement the basic methodological requirements for teaching the relevant material. Thus, 83,3% of prospected bachelors reflected in their presentations the required structure of the native language lesson, mathematics or science in primary school. In the presentations of master students, the percentage of methodologically correct works was similarly high – 86,6%.
2. Reproductive specimens predominated among the methods and techniques of working with slides of presentation in the lesson in primary school and classes on professional methods in the HEI. Thus, modeling a lesson in primary school, bachelor students used presentation slides mainly for visualization, so they used the information method, where the image on the slide only illustrates the words of the teacher and helps to understand the subject material better (53,3%). Only in 23,3% of the bachelors' presentations, we observed the use of the training method; in 13,3% – slides with questions and test tasks; in 10,0% of methodological presentations, there was a problematic method of presenting the subject material, which was implemented through animation and creolization of the educational text.

In the lectures of master students, the information method also took the first place – 73,3% and the methods used by the respondents did not differ in diversity: there were almost no problematic (6,7%) and thesis (10,0%) methods, and structural (40,0%) and graphic (33,3%) methods were presented commonly. Master students showed practical ignorance of the methods of working with the presentation in the lecture, often rereading the text from the slides.

3. Bachelor and master students of the specialty in Primary Education are mostly familiar with the general three-part structure of the multimedia presentation and adhere to it. In 86,6% of the analysed presentations of bachelor students and 93,3% of master's presentations, there was an introductory slide (for primary school it included the topic of the lesson, a virtual guest, etc.; for the HEI it was the slide with the lecture theme, content, etc.), the main part that conveyed the content of the lesson, and the final part, where students mostly posted the tasks for homework.

Not knowing the main types of slides of the methodological presentation (informational and explanatory, training and control, logical and plot, physiological and psychological), students mostly used only informational and explanatory slides (70,0%), without providing current control of the subject and methodological knowledge of their students, initial revision of material, feedback, etc. Presentations for primary school used physiological and psychological slides, which are necessary for younger students, with physical education minutes, dynamic pauses, elements of psychological relief, etc. (46,6%), but their quantity and quality cannot be considered to be satisfactory. The least attention the designers of the presentations paid to the logical and plot slides, which should clearly distinguish the stages of the lesson (16,7%).

4. The predominant software environment in which the respondents designed the method-

ological presentations was PowerPoint, which was used by 96,6% of bachelor students and 93,3% of master students. In some cases, students used Impress and Prezi. In our opinion, this is due to students' poor awareness of other software shells for creating multimedia presentations.

Prospective bachelors and masters little implement the essence of the term "multimedia", using mainly graphic and textual information (100%) in the presentations for primary school. Video in presentations for the young learners was used by 23,3% of students, separately the sound was not used for educational purposes at all. In the methodological presentations for higher education, textual information (60,0%) took the leading place, followed by text and graphics (20,0%), video (13,3%), and sound (6,7%).

- Multimedia presentations of future primary education specialists are quite poor in the use of modern technologies. In the analysed samples, both at the bachelor's and master's levels of higher education, infographics, interactive posters, educational comics, and tasks on online educational platforms were almost absent (figure 4).

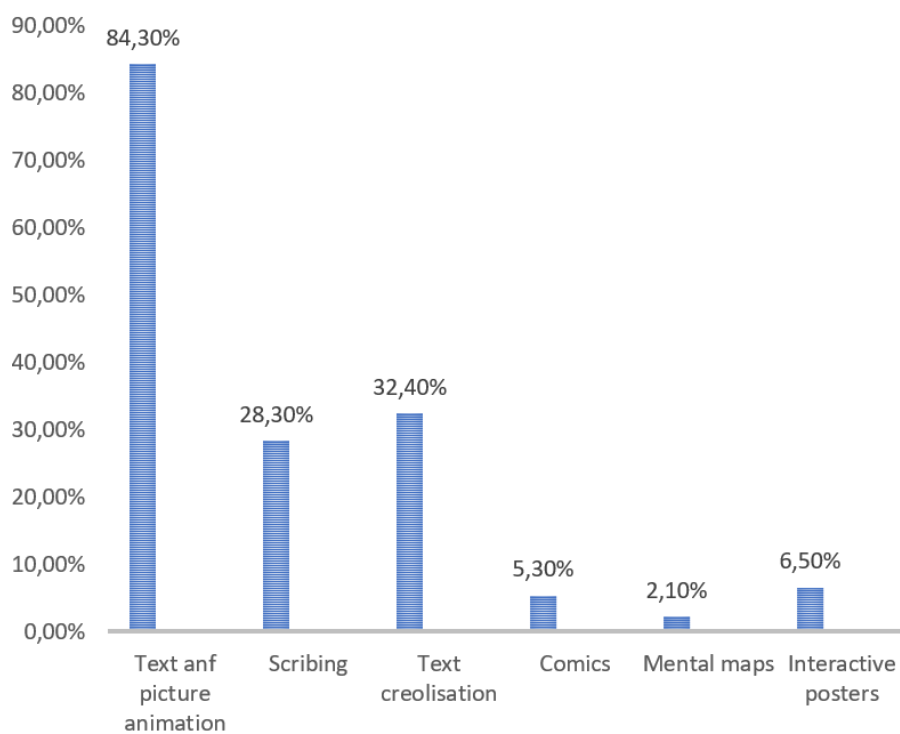


Figure 4: The use of ICT technologies in multimedia presentations of future primary education professionals.

5. Conclusion

The general results of the empirical study aimed at identifying the levels of operational and activity and projective components of future primary education specialists' readiness to use

digital educational resources in professional activities show that the majority of the respondents have a reproductive level of development of these components: for operational and activity component – 50,5% of bachelors, 43,3% of masters; for the projective one – 46,7% of bachelors, 40,0% of masters. The intuitive and receptive level (33,3% of bachelors and 26,7% of masters) is next in terms of the number of respondents for the operational and activity component, and the productive level (30,0% of bachelors and 36,7% of masters) is for the projective component. For both components, the smallest number of respondents show affiliation to the research and creative level (from 6,7% to 16,7%). The projective component of the future primary education specialists' readiness to use digital tools without specially organized training develops better than the operational and activity component, but only about 6–7% of the students are able to increase the level of operational and activity and projective components of the readiness to use digital educational resources.

Operational and activity and projective components of the future primary education specialists' readiness to use digital educational resources have the following features:

- among the methods and techniques of working with slides of the presentation in the lesson in primary school and classes on professional teaching methods in HEI the reproductive samples dominate: information method and structural and graphical methods of information processing;
- students are familiar with the general three-part structure of a multimedia presentation and adhere to it, but mostly do not navigate the main types of presentation slides, using only informational and explanatory samples, and are poorly acquainted with the software environments for presentations which are alternative to PowerPoint;
- prospective bachelors and masters use in presentations both for primary school and for HEI mainly graphic and textual information;
- digital educational resources of future primary education specialists use a limited range of modern ICT, there are almost no infographics, interactive posters, educational comics, tasks on online learning platforms, etc.

Conclusions from the quantitative and qualitative analysis of the results of the empirical study mostly coincide with the positions obtained by scientists in such studies, which increases their reliability. Under the current system of professional training of pre-service primary school teachers, the level of development of operational and active and projective components of their readiness to use digital educational resources is insufficient. Therefore, mastering the theoretical and practical principles of working with digital educational resources in primary school lessons and classes in HEI should be an important part of training prospective specialists in primary education and be implemented systematically in all classes of the professional cycle.

Prospects for further research include the experimental study of effective ways to digitize the professional training of future specialists in primary education, which will increase their readiness to use digital educational resources in professional activities, as well as the development and testing of relevant educational content.

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