UDC 004.9+371.3

THE USE OF DIGITAL TECHNOLOGY IN THE TRAINING OF MODERN TEACHERS

Shkurenko O.V.
c.p.s., sen.lec.
ORCID: 0000-0003-2774-6294
Boris Grinchenko Kyiv University, Kyiv, Bulvarno-Kudriavska str., 18/2, 04053
Stetsyk S.P.
c.p.s., as.prof.
ORCID: 0000-0002-5668-6182
National Pedagogical Dragomanov University, Kyiv, Pyrohova str., 9, 01601
Komar O.A.
d.p.s., prof.
ORCID: 0000-0003-0289-2359
Pavlo Tychyna Uman State Pedagogical University, Uman, Sadova str., 2, 20300

Abstract. On the basis of the analysis of the potential of digital technology, the article describes the experience of using digital technology in the process of training of future teachers in the context of updating the content of education. Students' use of mobile devices and apps in university practice has been studied. An example of a section of the professional methodology lesson presents the peculiarities of the use of a number of online apps in the process of training of future teachers. Using the MindMaps method with online tools Bubbl.us and Flinga, the term "digital education" is formulated. The basic characteristics of the modern teacher are distinguished: the ability to motivate, to be a competent person, to have leader's qualities. The potential of digital technologies is leading to innovations in teaching methods of school subjects, which requires finding new methodological approaches and updating teaching methods. An example of students' applying of BYOD technology while doing practical tasks using the Mindmaps method is presented. Based on the experience of using online apps, the results of students' choice of test programs considered optimal for further use in professional activity are described. Digital technologies are considered to be effective tools for the teacher, which increase students' interest in learning teaching methods and form their subject competences. Findings of the final survey among students helped to compile methodological recommendations as for the use of digital technologies at the lesson. Future teachers have the opportunity to acquire relevant knowledge, practical training for further professional activity. The authors did not attempt to analyse all the available digital technologies and apps. Since there are a great number of them, an attempt was made to distinguish digital technologies and apps according to the ways of their use: motivation, extension of reality during the study of new material, use of didactic simulations, infographics; conducting formative assessment, development of tests; carrying out final evaluation.

Key words: digital technology; training of modern teachers; digital competence; cloud technologies

Introduction.

The principles of the New Ukrainian School's educational process structure pre-determine its transformation, which shifts the role of the subject teacher as a carrier of knowledge to the teacher, that creates optimal conditions for students to help them acquire key competencies, motivate them to take action in order to create new knowledge for life. Digital learning technologies are called to help with this transformation of the educational process. One of these technologies is mobile-based e-learning.

The use of mobile devices in education is taking place in many developed countries. The use of mobile apps enables students to gain controlled access to educational content and allows the teacher to manage the educational process with the control over its effectiveness. The search for new methodological approaches to the organization of the educational process in higher educational institutions, taking into account the opportunities of digital technologies, is becoming urgent.

In order to improve the digital competence of future teachers by means of introduction of digital technologies to the educational process, we studied the state-of-the-art of the use of mobile devices and apps in university practice by conducting a survey among the students of higher educational institutions: Borys Grinchenko Kyiv University, National Pedagogical Dragomanov University, Pavlo Tychyna Uman State Pedagogical University. It gave the possibility to find out what mobile tools and apps can be used in the classroom without additional training. This survey gave an idea of the extent to which digital technologies can be used for information search by the students and their indirect use in educational process.

Figure 1 presents the results of the survey among 3rd year students (112 respondents), as to what apps and services they use on mobile devices?

1. Browser.
2. Mail client.
3. Instant messaging client (Viber, Hangouts, Telegram, etc.)
4. Calendar (organizer).
5. Cloud service programs (Dropbox, Google Drive, etc.).
6. Apps for social networking (Facebook, Twitter, etc.).
7. E-book reader (FBReader, CoolReader, EbookDroid, Play Books and more).
8. Office programs (analogues of Word, Excel, etc.).
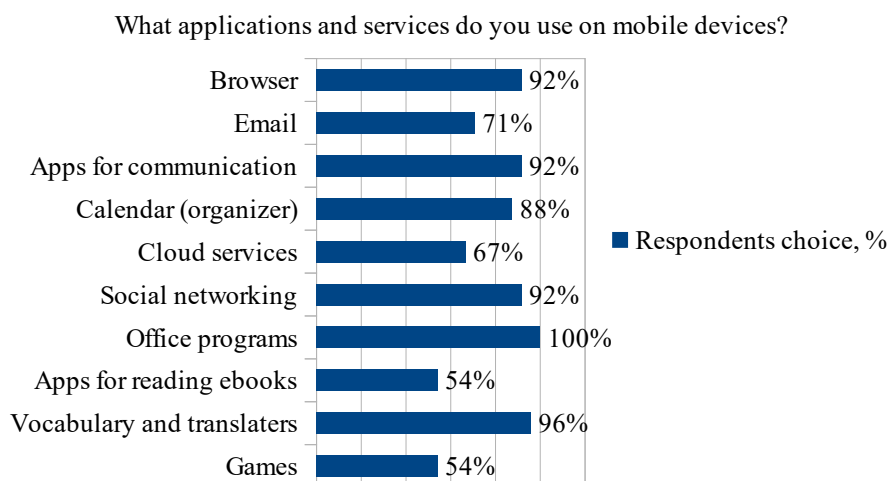9. Dictionaries and translators (including online translators).
10. Games.

What applications and services do you use on mobile devices?

Application	Respondents choice, %
Browser	92%
Email	71%
Apps for communication	92%
Calendar (organizer)	88%
Cloud services	67%
Social networking	92%
Office programs	100%
Apps for reading ebooks	54%
Vocabulary and translaters	96%
Games	54%

Figure 1 - The use of digital technologies by the students of pedagogical specialties

The survey shows that office programs, dictionaries and translators, messengers and browsers as well as calendar are most commonly used on mobile devices. The students are much less likely to use e-book readers, games, and cloud service

programs (Dropbox, Google Drive, etc.). Such students' interest in the use of digital technologies gives grounds to considering them promising in educational activity, in particular for the training of future teachers.

Main text.

Today, there are many available digital educational technologies. However, the way of their use in the process of future teachers' training remains under researched.

Problem statement: presentation of the results of the study of the possibilities of using digital technologies in training of future teachers in the context of modernization of the content of education and description of methods of the use of digital technologies in higher educational institutions in the process of future teachers' training.

Analysis of Publications The problem of digital competence is revealed in the works of N. Bakhmat [9], V. Bykov [1], A. Gurzhiy [10], L. Kartashova [9], V. Lapinskiy [12], N. Morze [13], O. Spirin [11], and others.

Researchers [1], [5], [13], who have investigated the use of digital technologies in addition to positive assessment of their effectiveness point out risks that may reduce the effectiveness of their use in education.

Paul A. Kirschner points out that there are three widespread myths that hinder the effective use of digital technologies in the educational process: modern generation is able to learn with modern mobile devices; each student has his/her own learning style; students should be allowed to determine where and when to study autonomously [7]. The youth are good at using mobile devices for consumer and gaming purposes, but have significant difficulties in using them for educational purposes.

Discussion

We are presenting an example of a section of an introduction to professional methodology lesson that demonstrates the use of digital technology in the training of future teachers in higher educational institution. During the class, we will analyse some digital technologies that, in our opinion, will be an effective tool in the hands of the teacher to increase the interest of students to study the discipline and to form their subject competences.

At the acquaintance (introduction) stage, we use the interactive "Icebreaker" exercise, the goal of which is to compare ourselves (associations) with new technologies: a digital device (desktop, smartphone, laptop, smart watch, fax, push-button phone, media, etc.) for setting up group members to active work, increasing motivation to learn new material, contributing to a relaxed atmosphere in the classroom. We then invite students to indicate their emotions with the help of ExitPoll tool by ClassroomScreen.com. Thus we see the general psychological mood of the group at the beginning of the class. At the end of the class we once again check the mood of students and see the impact of the use of digital technologies on the emotional state of students.

After analyzing the emotional state of students, we use the exercise "Incomplete Sentence" to find out what students expect from this class. To do this exercise quickly, we use the Menti.com application, where we formulate the task to continue the sentence, "I expect this course ...".

We have the following answers:

New knowledge that will be useful for professional and personal development, the use of new programs, the use of digital technologies for formative assessment of students, professional development, digital tools for teachers to create educational dimension, etc.
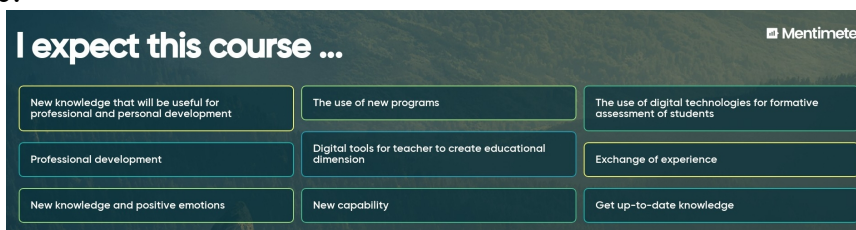

I expect this course ... 🔲 Mentimeter

New knowledge that will be useful for professional and personal development	The use of new programs	The use of digital technologies for formative assessment of students
Professional development	Digital tools for teacher to create educational dimension	Exchange of experience
New knowledge and positive emotions	New capability	Get up-to-date knowledge

Figure 2 - Students' motivational aims at the beginning of the class

Rationale for the relevance of the proposed topic. Student training is conducted according to the DigComp 2.0 standard, which identifies the main components of digital competence in 5 areas: 1) information and digital data; 2) communication and cooperation; 3) creation of digital content; 4) security; 5) solving problems [4].

Together with students using the method MindMaps as well as online tools Bubbl.us and Flinga we formulate the definition of "digital education". It is the education, the functionality of which is digital technologies implemented in the Internet.

At the same time, we found out what a modern lesson with digital technology should be like, and therefore what a modern teacher should belike. We also distinguish the basic features of a modern teacher (Bubbl.us).

The most important feature of a modern teacher:

13% - able to motivate to study;

9% - competent person;

7% - has leader's qualities;

3% - uses digital technologies;

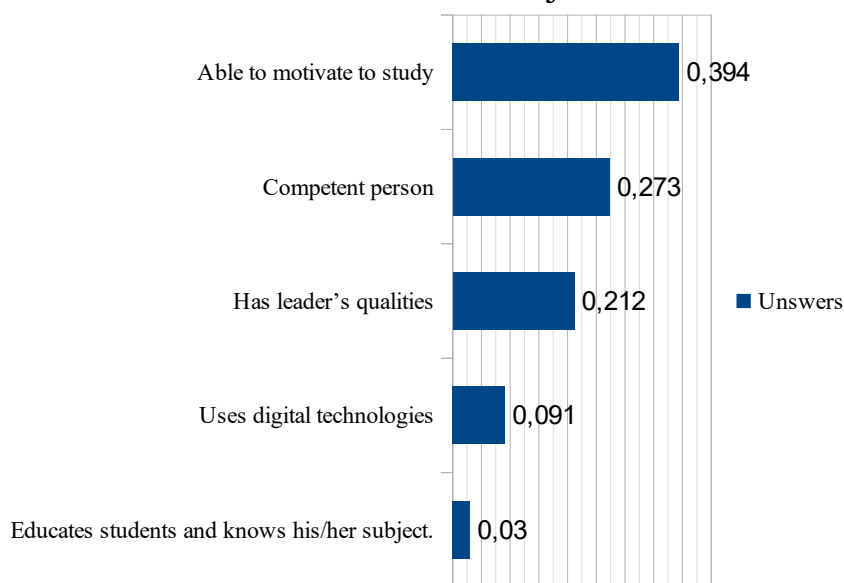1% - educates students and knows his/her subject.

Figure 3 - Basic features of a modern teacher by students

From the analysis of the results of the students' survey (Figure 3), we have identified the main features of a modern teacher: the ability to motivate, be a competent person, have leader's qualities. Based on the distinguished characteristics of a modern teacher, we emphasize the importance of its adaptation to new digital technologies in the context of the so-called flexible skills, the essence of which lies in the fact that due to the rapid emergence of various digital technologies, the modern student, after initial education, may obtain such a profession, which has not yet been created.

Future teachers should understand that learners should not be forbidden to use gadgets, but they should use them for educational purposes. Modern gadgets are attractive to students, so prohibitions cannot solve the problem. It will be more effective to direct such curiosity toward learning.

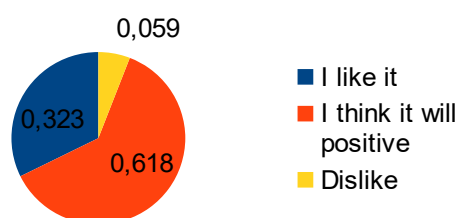My attitude towards using gadgets by students on the lesson

- I like it
- I think it will positive
- Dislike

Figure 4 - Results of the teachers' and students' questionnaire as for the suitability of the use of gadgets in the classroom

The potential of digital technologies is leading to innovations in the teaching methods of school subjects, and that requires finding new methodological approaches and updating the methodology of their use. One of the options for implementing this approach is digital technology Bring your own device (BYOD) [3].

Here is an example of using BYOD technology during practical tasks using the method Mindmaps.

Mindmaps help organize and classify information received, think effectively, memorize, remember, solve creative tasks, and be able to visualize and express internal processes of information processing, make changes, refine them.

In our work we use online apps to create Mindmaps, such as: MindMeister, Bubbl.us, Mind 42, Spiderscribe. While doing practical tasks, students in groups characterize the programs they have worked with and evaluate them for their ease of use as a teacher and as a student. A screenshot or link to the work report is uploaded to the Padlet online board, indicating their group data. The criteria for evaluating online apps are: publicity, intuitive interface, accessibility, brightness of the map, the ability to save and upload to the storage device.

The analysis of program ratings shows that Bubbl.us is the easiest app to use while MindMeister has a bright set of schema elements. Mind 42 is giving trouble registering, and the free version of Spiderscribe lets you create only black and white maps.

Another effective educational tool is Flinga, which makes it easy to create online co-working environments. It was created by Finnish developers. There are two environments to choose from: the Flinga Wall and the Flinga Whiteboard. Direct

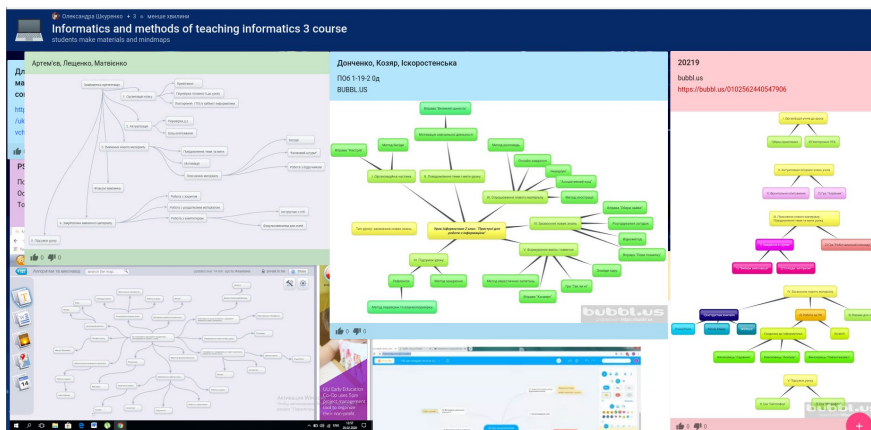link, input code and QR code are provided for sharing.

Figure 5 - The outlook of the report uploaded to the Padlet online board

Possibilities of using Flinga in the educational process are as follows: to activate the acquired knowledge at the beginning of the class; to formulate students' questions during seminar or lecture and follow-up answers; to brainstorm related to task solution search ideas.

One of the basic forms of work at the seminar is to monitor existing online apps for test creation and testing. The students, after using online apps, made the choice of the test programs that they considered appropriate for further use in their professional activities. The following online apps have been proposed for monitoring: Google forms; Kahoot; Triventy; LearningApps; Menti.com; Plickers; Quizlet; Online test drop; Formative; Socrative (112 respondents):
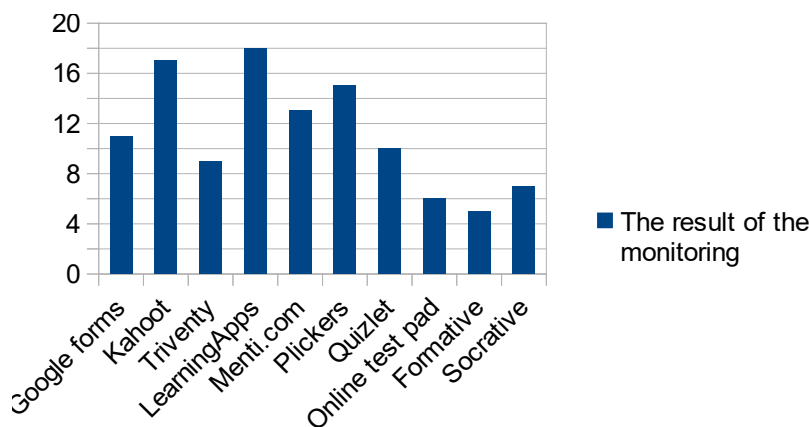

Figure 6 - Chart reflecting the results of the analysis of online test programs

From the chart, we found out that three online knowledge assessment apps, such as LearningApps, Kahoot and Plickers, are the best (over 15 likes). These apps have their own peculiarities related to the differences in their use.

Kahoot is an app designed for quick survey of elementary school students, it has a bright interface, requires mobile devices from respondents.

LearningApps has many options for creating tests, a ready-made library of tasks and the possibility to create classes (conducting formative assessment).

Plickers has similar features, except for the ready-made task library. In addition, its main advantage over LearningApps is that it is only necessary for the teacher to have mobile device, the students get cards with Q-codes. It is reasonable to use Plickers during: a front-end poll (lesson); a front-end poll at the beginning of the lesson; A /B - material presentation testing; conducting tests / final assessment; analysis of the teacher's work in dynamics.

Studying the methodological features of the use of digital technologies by future teachers is an optimal prerequisite for creating a modern educational environment that will help students acquire key competences, motivate them to take action to create new knowledge.

Results of the Research.

After a series of seminars, students undergo module control. It provides questionnaires in order to determine the best digital technologies and apps for teaching purposes in further pedagogical activities.

Basic questions of the questionnaire:

1. How many programs should be used during the lesson?

2. What digital tools do you use when updating knowledge?

3. What digital tools do you use when explaining new material?

4. What digital tools do you use when consolidating the material studied?

5. Which online test apps are useful for formative assessment of students?

6. What educational platforms will help a teacher prepare for the lesson?

Based on the results of the questionnaire, we have developed guidelines for teachers as for the use of digital technology in the lesson.

1. The optimal number of online apps for use in the lesson should be limited to three.

2. It is reasonable to use Flinga app when updating knowledge.

3. At the stage of learning new educational material we use MindMaps, presentations, infographics, etc.

4. During consolidation of the material studied and formative evaluation, we use online test programs.

5. Platforms to help the teacher prepare for the lesson are: Canva, Lesson, Educaplay and more.

So, in a modern lesson, a teacher uses presentations, infographics, online whiteboard, extension of reality, online tests, videos, and more. Using the following tools and technologies, a teacher can:

- motivate students using presentations (Google Slides, Prezi, Libre Office Impress, Power Point and others), video programs (Biteable, Sanva, Powtoon, Pixton, Toondoo, etc.);

- when learning new material, use extension of reality (Classroom, WallaMe), use simulations (Go-Lab), online boards (Padlet; MindMeister, bubbl.us), use infographics (easel.ly, Visual.ly, etc.);

- conduct formative assessment, create tests (LearningApps, Kahoot, Quizlet, etc.);

- conduct final assessment by means of on-line tests using Q-codes: Plickers.

Summary and conclusions.

The suitability of the use of digital technologies in the training of future teachers is conditioned by the tendency of restructuring the educational process in accordance with the Concept of the New Ukrainian School and taking into account modern innovations in the field of providing educational services.

These technologies and apps allow to organize effective learning of information technologies with increasing interest of students, as well as to form their educational, informational, experimental, research and professional competences.

We did not attempt to analyse all the available digital technologies and apps. Since there are so many of them, we tried to distinguish them according to the variants of their use: motivation, extension of reality during the study of new material, use of didactic simulations, infographics; conducting formative assessment, development of tests; carrying out final evaluation.

Digital technologies can greatly enhance the learning process, but it requires a legal framework in order to regulate the shere of use of digital devices in educational institutions. Otherwise, they create additional problems that may pose the question of the quality of the knowledge gained. It also necessitates a sound strategy for the introduction of digital technologies into the educational process, taking into account current legislation.

References:

1. Bykov V. Yu. (2013). Mobilnyi prostir i mobilno oriientovane seredovyshche internet-korystuvacha: osoblyvosti modelnoho podannia ta osvitnoho zastosuvannia [Mobile space and mobile-oriented Internet environment: features of model presentation and educational application] in Informatsiini tekhnolohii v osviti [Information technology in education], issue 17, pp. 9-37.

2. Davis T. (2016). The BYOD evolution: Three common approaches. Retrieved from https://www.enter-prise-cio.com

3. European framework for the digital competence of educators, (2017). Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/fcc33b68-d581-11e7-a5b9-01aa75ed71a1/language-en

4. Harju V., Koskinen A., Pehkonen L. (2019). An exploration of longitudinal studies of digital learning // Educational Research, issue 61, vol. 4. pp. 388-407.

5. Kyslova M. A., Semerikov S. O., Slovak K. I. (2014). Rozvytok mobilnoho navchalnoho seredovyshcha yak problema teorii i metodyky vykorystannia informaitsiino-komunikatsiinykh tekhnolohii v osviti [Development of the mobile learning environment as a problem of theory and methodology of using information and communication technologies in education] in Informatsiini tekhnolohii v osviti [Information technology in education] issue 42, vol. 4, pp. 1-19.

6. Mato-Vazquez D., Alvarez-Seoane D. (2019). The implementation of ICT and DLM in the teaching practice of Primary Education // Campus Virtuales, issue 8, vol. 2, pp. 73-84.

7. Paul A. Kirschner & Jeroen J.G. van Merriënboer (2013). Do Learners Really Know Best? Urban Legends in Education, Educational Psychologist, issue 48, vol. 3, pp. 169-183   DOI: 10.1080/00461520.2013.804395

8. Striuk M. I., Semerikov S. O., Striuk A. M. (2015). Mobilnist: systemnyi pidkhid [Mobility: a systemic approach] in Informatsiini tekhnolohii i zasoby navchannia [Information Technologies and Learning Tools], issue 49, vol. 5, pp. 37-70.

9. Kartashova, L.A., Plish, I.V. and Bakhmat, N.V. (2018). Rozvytok tsyfrovoi kompetentnosti pedahoha v informatsiino-osvitnomu seredovyshchi zakladu zahalnoi serednoi osvity [Development of the digital competence of the teacher in the information and educational environment of the institution of general secondary education] in Informatsiini tekhnolohii i zasoby navchannia [Information Technologies and Learning Tools], issue 6, vol. 68, pp. 193-205. Retrieved from http://lib.iitta.gov.ua/713236/

10. Hurzhii A. M. (2015). Formuvannia profesiinoi kompetentnosti maibutnikh uchyteliv trudovoho navchannia zasobamy informatsiino-komunikatsiinykh tekhnolohii [Formation of professional competence of future teachers of labor training by means of information and communication technologies] Monohrafiia [Monograph] in TOV Firma „Planer" [LLC Firm «Planer»], Kyiv-Vinnytcya, Ukraine. Retrieved from http://ito.vspu.net/repozitariy/gurevitc/book/%D0%9C%D0%BE%D0%BD%D0%BE%D0%B3%D1%80%D0%B0%D1%84%D0%B8%D1%8F_2015.pdf

11. Spirin, O. M. (2009). Informatsiino-komunikatsiini ta informatychni kompetentnosti yak komponenty systemy profesiino-spetsializovanykh kompetentnostei vchytelia informatyky [Information-communication and informational competences as components of the system of professional-specialized competences of the teacher of informatics] in Informatsiini tekhnolohii i zasoby navchannia [Information Technologies and Learning Tools], issue 5, vol. 13. Retrieved from http://eprints.zu.edu.ua/3733/

12. Bykov, V. Yu., Lapinskyi, V.V., Shyshkina, M.P., Spirin, O. M., Rudenko, V. D., Demianenko, V. M., Oliinyk, V. V., Skrypka, K.I., Savchenko, Z. V., Horbachenko, V. I. and Pylypchuk, A. Yu. (2010). Zasoby informatsiino-komunikatsiinykh tekhnolohii yedynoho informatsiinoho prostoru systemy osvity Ukrainy [Means of information and communication technologies of the unified information space of the education system of Ukraine] Monohrafiia [Monograph] in Instytut informatsiinykh tekhnolohii i zasobiv navchannia NAPN Ukrainy [Institute of Information Technologies and Teaching Learning tools of NAES of Ukraine], Kyiv, Ukraine. Retrieved from http://lib.iitta.gov.ua/667/

13. Morze N., Vember V., Hladun M. (2019). Vykorystannia tsyfrovykh tekhnolohii dlia formuvalnoho otsiniuvannia [Use of digital technologies for formative assessment. The open e-learning environment of the modern university] // Vidkryte osvitnie e-seredovyshche suchasnoho universytetu [The open e-learning environment of the modern university], pp. 202-214. Retrieved from http://www.irbis-nbuv.gov.ua/cgi-bin/irbis_nbuv/cgiirbis_64.exe?C21COM=2&I21DBN=UJRN&P21DBN=UJRN&IMAGE_FILE_DOWNLOAD=1&Image_file_name=PDF/oeeemu_2019_spetsvip._21.pdf

Abstract. *У статті на основі аналізу можливостей цифрових технологій описаний досвід їх використання в процесі підготовки майбутніх учителів в умовах оновлення змісту освіти. Вивчено стан використання студентами мобільних пристроїв і застосунків в університетській практиці. На прикладі фрагменту заняття з фахової методики представлено методичні особливості застосування низки онлайн додатків у процесі підготовки майбутніх учителів. За допомогою методу MindMaps з онлайн інструментами Bubbl.us та Flinga, сформульовано означення поняття «цифрова освіта». Виокремлено базові ознаки сучасного вчителя: вміння мотивувати, бути компетентною особистістю, мати лідерські якості. Можливості цифрових технологій призводять до новацій в методиці навчання шкільних предметів, що потребує пошуку нових методичних підходів та оновлення методики їх навчання. Представлено приклад застосування технології BYOD під час виконання студентами практичних завдань із застосуванням методу Mindmaps. На основі досвіду використання онлайн додатків, здійснено опис результатів вибору студентами оптимальних на їх думку тестових оболонок для подальшого використання у професійній діяльності. Розглянуто цифрові технології, як ефективні інструменти викладача, що підвищують інтерес студентів до вивчення фахових методик та формуватимуть у них предметних компетентностей. За результатами підсумкового анкетування серед студентів створено методичні рекомендації з використання цифрових технологій на уроці. Майбутні вчителі мають можливість отримати відповідні знання, практичну підготовку для подальшої професійної діяльності. Автори не намагалися розглянути усі наявні цифрові технології та додатки. Оскільки їх існує дуже багато, була здійснена спроба їх виокремлення за варіантами застосування: мотивація, доповнення реальності при вивченні нового матеріалу, використання дидактичних симуляцій, інфографіка; проведення формувального оцінювання, створення тестів; проведення підсумкового оцінювання.*

Ключові слова: цифрові технології, підготовка сучасного вчителя, цифрова компетентність, хмарні технології.

Article sent: 23/10/2021
© Shkurenko O.V., Stetsyk S.P., Komar O.A.