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# EXPERIENCE IN DEVELOPMENT OF THE UNIVERSITY MOOCS ENVIRONMENT TO SUPPORT PRE-SERVICE TEACHER TRAINING

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**Abstract:** *The paper considers some components of the digital educational environment of a modern teacher training university to support the educational process of teacher students (pre-service teachers). The relevance of such an environment in the long-term conditions of the pandemic as well as the martial law in Ukraine is indicated. It was these two factors that influenced the active development and use of the digital environment to support the academic educational process. One of the components of such digital educational environment is MOOC that is also used for informal education.*
*This paper also reviews the first results of the recently completed implementation of the EDX platform in the digital educational environment to support pre-service teacher training. The article analyses the trends in MOOCs development aimed to support teacher training; discusses the results of the survey related to using MOOCs during the pandemic and the martial law; considers steps of implementation of MOOCs to support teacher training.*

**Keywords:** MOOCs, pre-service teacher training, open EdX platform, university MOOC environment.

## INTRODUCTION

The new reality that the world educational system has faced requires academic institutions all over the world to react fast and adjust to the challenges of today. The 2030 Agenda for Sustainable Development adopted at the United Nations Sustainable Development Summit in September 2015 contains 17 Sustainable Development Goals including a new global education goal (SDG 4). SDG 4 aims at 'ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all' (United Nations, 2020).

During the COVID-19 pandemic, the focus of education has shifted to the use of digital educational environments and online studying in general. In order to achieve the aforementioned sustainable development goal, it is essential to provide all students with digital educational tools and expand the opportunities of non-formal learning in particular. The question of validation of non-formal learning, such as MOOC format, remains open in educational institutions all over the world (Strutynska & Umryk, 2021; Strutynska & Umryk, 2016; Yıldırım, 2022; Zhu, Sari, & Lee, 2022).

In March 2020 the COVID-19 Global Education Coalition has been established by UNESCO. In its work the Coalition focuses on three main flagships (UNESCO, 2020):

- connectivity,
- teachers,
- gender.

As for the first factor, the issue of the Internet access remains critical all over the world. According to UNESCO, nearly 465 million children and youth, or almost 47% of all primary and secondary schools, do not have access to educational platforms because they do not have the Internet connections at home (Alhazzani, 2020; UNESCO, 2020).

15% of the Ukrainian population faces the digital divide and does not have access to broadband internet. Many social infrastructure facilities are not connected to fiber-optic networks. Among them, there are 16 040 educational institutions, or 40% of schools (Ministry and committee for digital transformation, 2020).

Another factor that significantly affected education in Ukraine is the declared martial law, which has been in effect throughout the territory of modern Ukraine since February 24, 2022 until now. It is this factor that is decisive for a clear understanding of the advantages of using the digital environment of a modern university, in conditions where physical access to the university is not only undesirable due to the pandemic, but also impossible, due to the threat of physical execution or the destruction of the university as such. It is the digital educational environment and one of its components – the *NPU MOOC Environment* (in our case) that makes it possible to continue the educational process. In this direction, it is necessary to note the work of the Ministry of Education and Science of Ukraine regarding cooperation with a number of well-known representatives of the provision of digital services for formal and informal education. The Ministry of Education and Science of Ukraine, with the help of international partners, provides free unlimited access to such leading MOOC providers as Coursera and EdX to all higher educational institutions of Ukraine. This had a positive effect on the quality of educational services of higher educational institutions and made it possible to carry out self-study and self-education of both Ukrainian teachers and students. “More than 20,000 students and teachers have already joined Coursera and are successfully mastering online courses from Google, Meta, IBM, Microsoft, Amazon Web Services, as well as such leading universities in the world as Yale University, California Institute of the Arts, Duke University, Erasmus University Rotterdam and others. Many students study several courses at once. In general, Ukrainian students have already successfully completed more than 28.000 courses and received free certificates” (Ministry of Education and Science of Ukraine, 2022).

Next critical issue that educators face throughout the world is related to teachers. On the one hand, teachers currently bear a huge burden, both from the point of view of time and emotional state; on the other hand, it has arisen the challenge of training and retraining teachers in order to develop their digital skills required for the implementation of online learning.

Having analysed various pedagogical educational institutions in Ukraine, we can state that girls constitute more than 80% of pedagogical university students and respectively, the percentage of women working in the pedagogical field is much greater than that of men. Therefore, another issue to take into account is reducing the gap in training female students of training teachers' universities in the IT field, as basic IT skills comprise digital competence, which is of a special need today. As noted earlier, the solution to these acute problems might be found in training and retraining of teachers and developing their digital skills using in particular MOOC instruments.

Paper goal. This paper reviews the first results of the recently completed implementation of the Open EDX platform in the digital educational environment of the National Pedagogical University (NPU) with regard to the implementation of MOOCs to support teacher training. It attempts to address the following questions:

- analysing the trends in MOOC development to support teacher training;
- analysing first results of the implementation of NPU MOOC Environment (based open EdX platform);
- presenting the results of the survey related to using MOOCs in NPU during the pandemic and the war state;
- considering the steps of implementation of MOOCs to support pre-service teacher training in NPU.

**Research methods.** Authors have used the following research methods and tools for the investigation (2021–2022):

- survey;
- interview of the Ukrainian educators;
- documents and content analysis;
- MOOC statistics analysis;
- analysis of research papers;
- updating of the model of the NPU digital educational environment;
- development of the NPU MOOCs environment.

A total of 272 Ukrainian educators took part in the present research. The Ukrainian educators from the target group (university teaching staff from the National Pedagogical Dragomanov University, Kyiv, Ukraine), were involved in this process. The survey was created during this project which aimed to gather data on the readiness level of university teachers to use MOOCs in their professional activity and for lifelong learning.

## 1. ANALYSIS OF TRENDS IN MOOCS DEVELOPMENT TO SUPPORT PRE-SERVICE TEACHER TRAINING

With the beginning of the pandemic and, consequently, the quarantine, the interest in MOOCs has significantly increased (Qian, Li, Zou, Feng, Xiao, & Ding, 2022;

Strutynska & Umryk, 2016; Smyrnova-Trybulska, Sekret & Morze, 2021). Figure 1 shows the growth in the number of MOOC platforms in 2021 (the statistics taken from MOOC aggregator "Class Central"), (Shah, 2021).

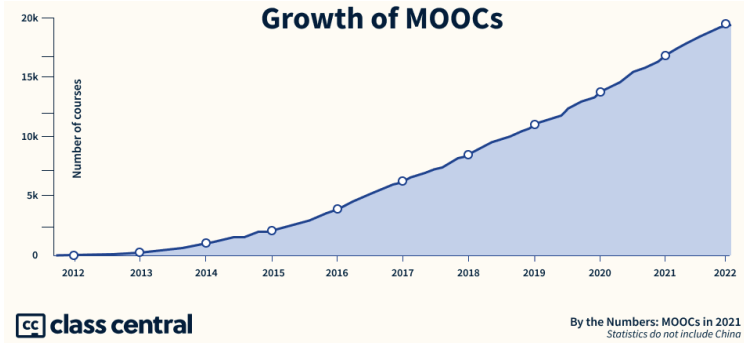



**Figure 1. Growth of MOOCs in 2021**

Source: Data gained from D. Shah, URL: https://www.classcentral.com/report/moocs-stats-and-trends-2021 (accessed on 25.09.2022).

At the same time, the latest trends in MOOC development include the following (Shah, 2021):

- MOOC providers focused on finding a business model, certificates and graded assignments moved behind paywalls. All the top MOOC providers also have completely paid courses;
- nowadays, more and more of the courses are created by companies every year (Google, Microsoft, Amazon, Facebook, etc.), not only by universities;
- the pandemic has also increased the adoption of online courses from Corporations and Governments around the world. This is where they are (and will be) looking for growth over the next few years.

The analysis of the courses that were the most popular in pre- and post-pandemic period (Figure 2) has shown that the following categories do not contain any courses intended to support teacher training.

At the same time, the need for high-quality training of pre-service teachers has become even more urgent due to the pandemic and the martial law and the challenges it poses: most students have no chance to visit schools for their teaching internship during the quarantine and wartime, as the schools are closed or destroyed as well. Therefore, it is necessary not only to change the approach to the professional training in their future professional field (Computer Science, Mathematics, Physics, Biology, etc.) due to the fact that Ukrainian universities mostly arrange the process of studying using blended learning technologies; but also prepare them for online working, blended and distance learning formats at schools. The ways that might help in the professional training of pre-service teachers include:

- developing and implementing courses for training the pre-service teachers to organise the educational process of online, distance and blended format and work effectively under such conditions;

- preparing pre-service teachers for the format of non-formal learning and the use of MOOCs in particular;
- finding out the readiness of pedagogical university teachers to improve their own qualifications by means of non-formal learning and to use and develop MOOCs in particular;
- preparing pedagogical university teachers (IT disciplines in particular) for training pre-service teachers in their own use and development of MOOCs.


**Figure 2. Comparing the most popular MOOCs in pre- and post-pandemic period**

Source: Data gained from D. Shah, URL: https://www.classcentral.com/report/the-second-year-of-the-mooc (accessed on 25.09.2022).

Therefore, the authors of the following study analysed the number and subject area of the MOOCs intended to support teacher training using MOOC aggregator "Class Central", (Figure 3).

The analysis of the courses found (about 470 courses) has shown that there are no available courses in Ukrainian language. Therefore, we found it necessary to create an environment for developing MOOCs aimed at training pre-service teachers in Ukraine.

Also, in Ukraine we have some MOOC platforms (Prometheus, EdEra, etc.). But they have only several MOOCs for teacher training (less than 10). That is why NPU as a teacher training university needs MOOCs development to support pre-service teachers.

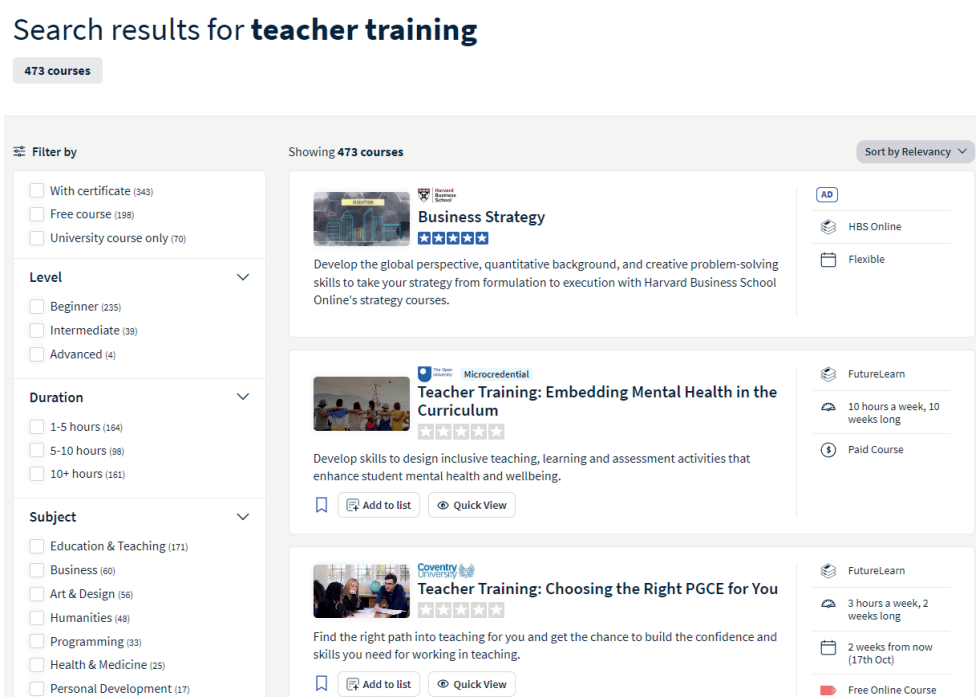



**Figure 3. Search results MOOC for teacher training**

Source: Own work based on data from URL: https://www.classcentral.com (accessed on 25.09.2022).

## 2. DEPLOYMENT OF NPU MOOCS ENVIRONMENT AS COMPONENT OF THE DIGITAL EDUCATIONAL ENVIRONMENT (BASED ON OPEN EDX PLATFORM)

Considering the importance of online learning during the pandemic and the martial law, especially in supporting teacher training at NPU we have systematically analysed opportunities for using MOOCs in higher education institutions as well as the existing MOOC development platforms.

The world statistics on the use of MOOCs have shown a rapid growth of MOOC platforms in recent years, in particular in the number of registered users. MOOCs have reached 220 million learners (excluding China). In 2021, providers launched over 3100 courses and 500 microcredentials (Shah, 2021). Table 1 shows top MOOC providers in terms of users and offerings.

As we examined in our previous research (Strutynska & Umryk, 2021) MOOCs are one of priority areas for the modern educational institutions. The conditions of the pandemic and the martial law in Ukraine encouraged leaders of educational institutions to reconsider and change approaches to the educational process. Specialists with different success rates try to model the digital environment of all structural and learning components of educational institutions. Nowadays, a lot of universities include MOOCs as part of such digital environments.

**Table 1. Top MOOC providers offerings by the end of 2021**

| MOOC provider | Learners (in million) | Courses | Microcredentials | Degrees |
|---|---|---|---|---|
| Cousera | 97 | 6.000 | 910 | 34 |
| EdX | 42 | 3.550 | 480 | 13 |
| FutureLearn | 17 | 1.400 | 180 | 22 |
| Swayam | 22 | 1.465 | 0 | 0 |

Source: Own work based on data from D. Shah, URL: https://www.classcentral.com/report/mooc-stats-2021 (accessed on 25.09.2022).

Based on our previous research (Strutynska & Umryk, 2021), the authors of this paper proposed a simplified model of the NPU digital educational environment (Figure 4):

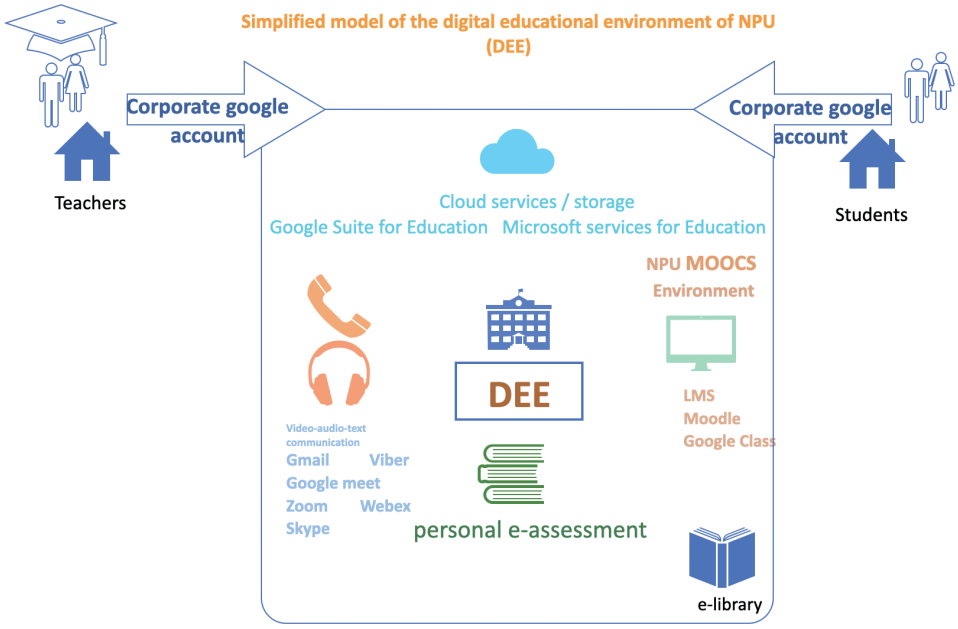



**Figure 4. Simplified model of the NPU digital educational environment**

Source: Own work based on Strutynska & Umryk, 2021.

As seen from Figure 4, MOOCs Environment is a component of NPU digital educational environment.

With regard to this global tendency, the use of MOOCs in the National Pedagogical University has been implemented along two main dimensions. The first one – the technical dimension involved purchasing a powerful server and transferring the main load of online learning to it. The second – software dimension was the development of all the components of the NPU digital educational environment:

- Distance learning systems (Moodle, Google Classroom etc.).
- MOOC learning systems – taking steps to recognize the results of students' work at the leading non-formal learning platforms such as Coursera, EdX, Prometheus, etc.
- Implementation of our own EdX platform to enable the development of MOOC courses for teacher training and retraining.

Work in the second dimension began with getting acquainted and analysing successful implementations of the leading MOOC platforms. NPU became a participant of Coursera for Campus Program and edX's Open Remote Access Program, which gave the students and teachers free access to the MOOCs of the platforms. With the help of these programs NPU acted as a consumer of the corresponding courses as well as administrated access to the platforms at the university level. NPU teachers began to integrate individual MOOC modules and disciplines into their own courses and use them for their own self-development and lifelong learning.

The next step was the creation and implementation of our own MOOC platform of NPU. The Open EDX platform NPU was built with (Open EdX, 2021) and consist of (Figures 5–6):

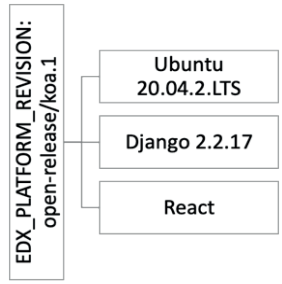



**Figure 5. Installing open EdX platform NPU**

Source: Own work.

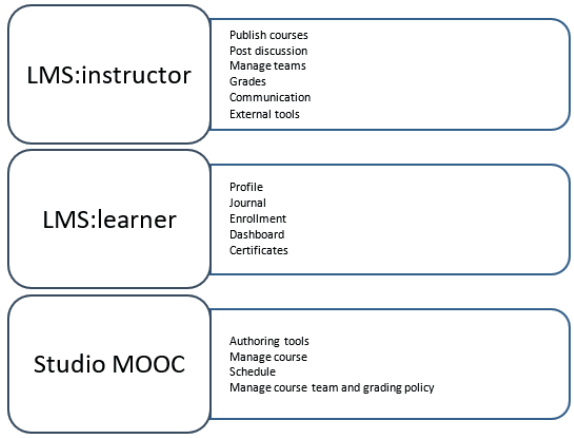



**Figure 6. Administrative portal open EdX NPU**

Source: Own work.

The main page of the NPU MOOCs environment is shown in Figure 7:

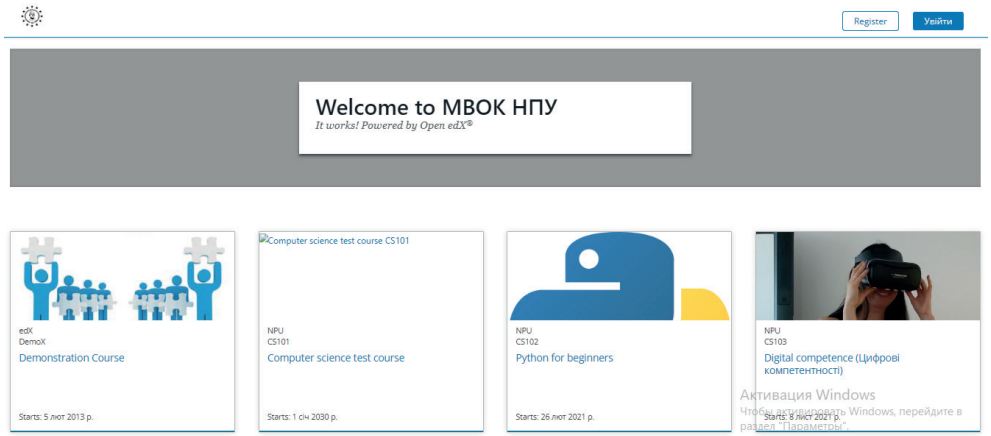



**Figure 7. The main page of the NPU MOOCs environment**

Source: Own work.

## 3. THE RESULTS OF THE DIAGNOSTIC SURVEY REGARDING THE USE OF MOOCS IN NPU DURING THE PANDEMIC AND THE MARTIAL LAW

The diagnostic survey was aimed at the target group connected with the use of MOOCs in NPU during the pandemic and the wartime. This target group consisted of 272 Ukrainian educators working at the NPU.

The online survey was developed in the Ukrainian language using Google Forms and was intended to gain the data on the Ukrainian educators' level of readiness to use MOOC in their professional activity and for lifelong learning. We guaranteed the participants that only anonymised data would be shared. The survey was conducted during the 2021–2022 academic year in the quarantine and the martial law.

The results of the survey related to using MOOCs in the NPU during the pandemic and the wartime from the target group are presented in Figures 8–10 below.

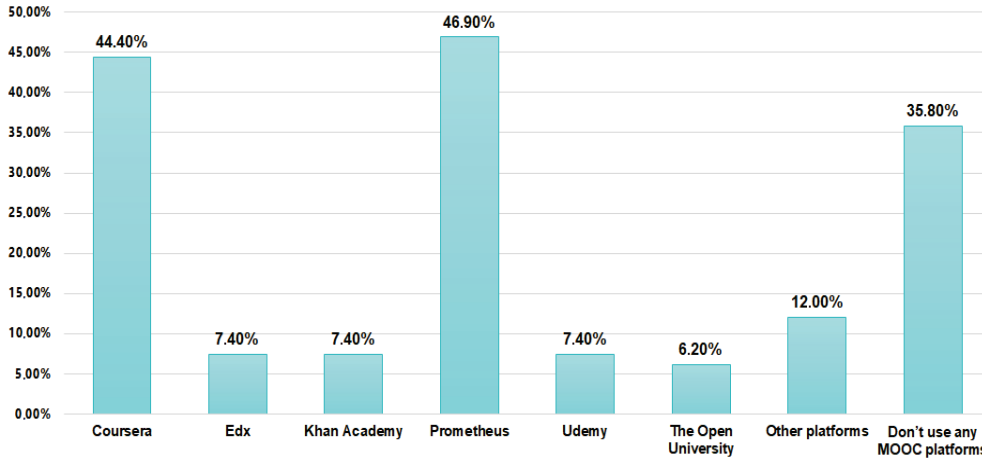
***Q.:*** *What MOOC platforms do you use in your professional activity?*

Survey responses on using MOOC platforms in the professional activity are shown in Figure 8 (multiple answers are possible, that is why the total responses can be more than 100%).

As seen from Figure 8, a significant part of NPU teachers (35.8%) do not use MOOCs in their professional activity.

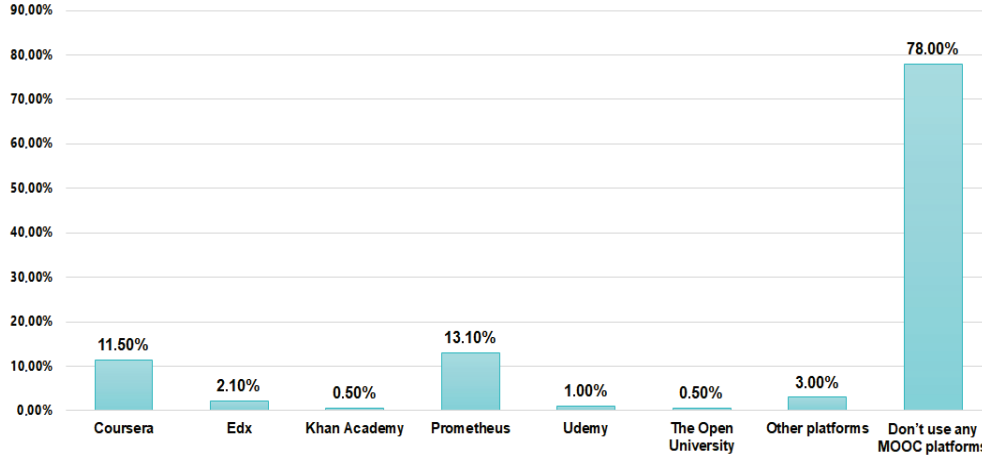
***Q.:*** *What MOOC platforms do you use for self-learning?*

Survey responses on using MOOC platforms for self-learning are shown in Figure 9 (multiple answers are possible, that is why the total responses can be more than 100%).




**F i g u r e 8. Survey responses on using MOOC platforms in the professional activity**

S o u r c e: Own work.




**F i g u r e 9. Survey responses on using MOOC platform for self-learning**

S o u r c e: Own work.

Figure 9 demonstrates that 78% of NPU teachers do not use MOOCs for self-learning. The answers to the next question are consistent with the previous two: almost 48% of the teachers cannot recommend MOOCs to their students as they do not use the platforms themselves (Figure 9).

***Q.:*** *Do you recommend MOOCs to your students?*
Survey responses on recommendation of MOOC for students are shown in Figure 10 (multiple answers are possible, that is why the total responses can be more than 100%):

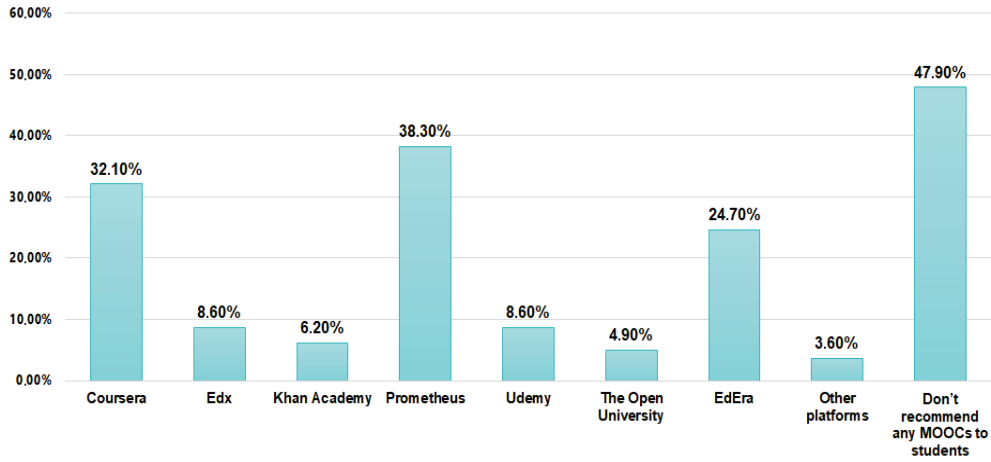



**Figure 10. Survey responses on recommendation of MOOCs for students**

Source: Own work.

The results of the survey have shown that there is a huge gap in the use of MOOCs to support teacher training in the NPU.

To overcome this gap, we are planning educational activities related to the use and designing of MOOCs for teachers and students in the NPU during 2022–2023 academic year.

***Training NPU teaching staff in the use of MOOCs***

We are provided courses for improving digital competence for NPU teaching staff under the programme "Digital Educational Technologies" (Umryk, Strutynska & Vakulenko, 2021) designed by authors of the present research. One of the modules of the programme is dedicated to NPU MOOCs Environment (see Table 2):

**Table 2. The context of module "NPU MOOCs Environment" for training NPU teaching staff**

| No | Topic name | Lectures and trainings (in hours) |
|---|---|---|
| 1. | Basic concepts of MOOCs. NPU MOOCs environment | 8 |
| 2. | The main principles video lectures development for educational purposes | 8 |
| 3. | Vlogging. Tools for keeping a video blog for educational purposes | 8 |
| 4. | Technical and software tools for the development of video lectures for educational purposes | 8 |
| 5. | Editing of video lectures for educational purposes | 8 |
| | **Total (in hours):** | **40** |

Source: Own work based on Umryk, Strutynska & Vakulenko, 2021.

***Training pre-service teachers (NPU students) in the use of MOOCs***

The mandatory course "Digital educational technologies" is provided for NPU students/pre-service teachers (Ramskyi, Yefymenko, Strutynska, Tverdokhlib, Umryk & Yefymenko, 2022) designed by authors of the present research. One of the topics of the programme is dedicated to MOOCs.

The context of this topic is as follows:

- The concept of Lifelong learning. MOOCs. MOOC providers. Registration on MOOC. Structure of MOOC. Requirements for the development of MOOC.
- Overview of Ukrainian educational MOOC platforms: Prometheus, EdEra, etc. Overview of world popular MOOC providers: Coursera, edX, FutureLearn, etc.
- Review of digital sources for teacher self-education. The Coursera platform for the NPU. EdX platform for the NPU.
- NPU MOOCs Environment.

## CONCLUSION AND DISCUSSION

The research conducted allows us to make conclusions about the following:

- with the beginning of the pandemic and, consequently, the quarantine, the interest in MOOCs has significantly increased. At the same time the pandemic has also increased the adoption of online courses from Corporations and Governments around the world;
- analysing the trends in MOOCs development to support teacher training has shown the gap in this field, especially for Ukrainian educators;
- first results of the implementation of MOOC in NPU educational process (based open EdX platform) have shown positive attitudes from university teaching staff and students to the implementation of the NPU MOOC Environment;
- the survey results have shown that there is a huge gap in the use of MOOCs to support teacher training in the NPU. To overcome this gap, we are planning educational activities related to the use and designing of MOOCs for teachers and students in the NPU during 2022–2023 academic year.

To address this issue, the authors of the present research as staff of the Center for Digital Educational Technologies of the National Pedagogical University (NPU) take the following steps:

1. Monitoring teachers to estimate their level of readiness to develop and use MOOCs in their professional activity;
2. Introducing a training module devoted to the development and use of MOOCs in digital competence courses for NPU teachers;
3. Preparing NPU teaching staff to design their own MOOCs (creating a video recording studio, establishing a unified structure for MOOCs created in NPU, developing MOOCs aimed at pre-service teacher training);
4. Implementing the use of MOOCs by students for non-formal learning;
5. Developing the mechanism of recognizing the results of students' non-formal learning.
6. Preparing pre-service teachers (NPU Master students) to design MOOC structure, MOOC content etc.

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