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Increasing the digital competencies of teachers through mass open online courses (MOOC): design, implementation and evaluation

In the article the effectiveness of mass open online courses (MOOCs) in the development of teachers' digital competencies was examined. MOOC represents a large-scale approach to professional development that can reach a wider audience. Assessing the impact of such courses on teachers' digital skills is crucial in improving educational resources. This article evaluates MOOCs designed to improve digital literacy skills. A survey was conducted with the participation of 78 teachers and 114 undergraduate students of Karaganda Buketov University. The data were analyzed through descriptive and summary statistics to assess the effectiveness of MOOCs. This study is an innovation in the integrated assessment of MOOCs, designed specifically to enhance the teachers' digital competencies. Unlike previous studies, the study uses mixed methods to ensure a thorough assessment of the course's impact on skill development and student satisfaction. When developing the course, the focus was on multimedia resources and practical applications. This research paper highlights the importance of a well-designed MOOC to address the teachers' digital needs and provides actionable recommendations for the effective application and development of MOOCs in the future. In addition, the results of the study contribute to the literature on professional development and offer ideas for optimizing MOOCs for educational purposes.

Keywords: MOOC, digital competencies, professional development, online learning, educational technology, survey analysis, electronic education, digital literacy.

Introduction

During the period of mass digitalization of society, the requirements for teachers to introduce modern technologies into the practice of teaching increase from year to year and find their effectiveness. During the analysis of the scientific literature, we found that the issue of using digital technologies in the field of education is considered in several directions according to the research of Foreign, Russian and domestic scientists. There are quite a few foreign and domestic studies that reflect various theoretical and practical aspects of the development and implementation of the MOOC and its development. M. Ebner, E. Lackner and M. Kopp believes that MOOC is a trending phenomenon in electronic education. J. Ross, C. Sinclair, J. Knox, S. Bayne, H. Macleod comprehensively analyze the role of the teacher in the MOOC, which, in their opinion, is significantly different from the functions of the teacher in traditional teaching. A number of authors describe the MOOC as an "Internet course with interactive participation and open communication", arguing that "being a high point of modern network learning, it will stimulate the formation of professional network communities, as well as the expansion of international contacts of teachers of higher educational institutions".

Discussion

This literature review provides a comprehensive analysis of basic research related to the MOOC, digital competencies and professional development. The review is guided by the role of digital skills in education, the design and effectiveness of MOOC, and the effective practices of best experiences from transparency learning. Sarzhanova G.B. (2024) in the work "Digital competencies of a teacher in the context of educational transformation" emphasizes the important role of digital competencies in modern education. The study examines the various frameworks for the development of digital skills among educators and proves that effective training in digital competence is important. It argues for the achievement of technological literacy — the need for continuous professional development, provides a comprehensive overview of how digital competence justifies successful learning in the digital age, and argues for the need for teachers and learners to speak and be fluent in the language of advanced technology to improve learning outcomes [1].

Smagulova G.Zh. (2021) in the scientific work "The development of future foreign language teachers' digital competences in creating multimedia tutorials" explores the potential of MOOC as a tool for professional development. The study promotes the development and implementation of the MOOC, focusing on its effectiveness in improving the skills of students. In her opinion, MOOC can become an effective tool for professional development, demonstrating the significant potential of teachers in improving their digital skills that meet professional requirements [2]. Zhang, M. and Zhang, Y. (2023) in the study "Multimedia resources in MOOC: improving learning efficiency" analyzes the impact of general multimedia resources on the learning efficiency of MOOC. They believe that adding multimedia elements such as videos, interactive simulations, and audio improves student activity and understanding. Their study proves that multimedia resources contribute to a more effective learning experience in online courses. They believe that multimedia resources show that MOOC play a key role in enhancing the learning experience, supporting the idea that different content formats improve engagement and understanding [3].

Choi-Lundberg et al. (2022) in their research work explores how interactive content affects participation in MOOC. They found that interactive elements such as quizzes, discussion forums, and game-specific activities significantly increase student engagement and satisfaction. Small, portable, wireless devices such as smartphones and tablets, and their software and mobile apps, can enable flexible anytime anywhere learning for a variety of purposes including accessing and creating multimedia content; VR, AR and clicker capability; situated learning with geolocation context sensitivity; and collaborating and communicating with peers and teachers via Web 2.0. The study emphasizes the importance of introducing interactive features to maintain students' interest. That is, it emphasizes the positive impact of interactive content on student activity, showing that such opportunities are important for increasing participation in the MOOC [4]. Their study provides a comprehensive assessment of the effectiveness of MOOC, which shows that although MOOC usually achieve their educational goals, there is diversity in outcomes based on course design and conduct researchers propose a nuanced assessment of MOOC using quantitative and qualitative methods, shedding light on the variability of effectiveness and the factors that influence the successful outcomes of the course [4, 148].

Iniesto F. et al. (2022) highlights the importance of user feedback in refining MOOCs to meet accessibility standards. The study shows that a universal design for learning (UDL) approach offers valuable insights for making MOOCs more accessible to all learners, regardless of their specific needs. The researcher provides practical recommendations for compiling MOOCs for teachers, focusing on aligning the course content with the needs of professional development and using effective learning strategies [5]. Chen C. (2023) emphasizes that effective design and implementation of MOOCs for educators require understanding the target audience's needs and incorporating interactive learning elements. The authors highlight that successful MOOCs include adaptive learning materials and provide opportunities for interaction between participants and instructors, which contributes to deeper learning and increased engagement [6]. In the context of MOOCs, fostering self-directed learning is crucial for enhancing learner engagement and achieving educational outcomes. Zhu, Bonk, and Berri (2022) emphasize that motivation and the use of effective learning strategies are pivotal in encouraging self-directed learning among participants. They argue that tailored instructional approaches and supportive online environments can significantly impact learners' ability to set goals, manage their learning, and persist through the course [7]. Cabrera and Fernández Ferrer (2017) found that experts from traditional universities are often more skeptical about the impact of MOOCs on established educational practices, viewing them as supplementary rather than transformative. In contrast, experts from open universities tend to embrace MOOCs as a core component of their educational strategy, leveraging them to reach a broader audience and support their mission of accessible education. This study underscores the evolving perceptions of MOOCs across different types of institutions and highlights the need for tailored strategies to maximize their effectiveness in diverse educational contexts [8]. Wilson, R. and Lee, J. (2024) in the work explores new trends and challenges in the use of MOOC for professional development. Their study discusses future trends, including advances in technology and new pedagogical approaches that can improve the effectiveness of the MOOC, and examines future trends and challenges of MOOCs for professional development, offering insights into possible innovations and directions for improving these educational tools [9].

Despite extensive research on MOOC and digital competencies, there is limited empirical evidence for the comprehensive assessment of MOOC specifically designed to enhance digital skills among teachers. This study aims to bridge this gap by evaluating the effectiveness of the MOOC in improving the digital competence of teachers and providing action recommendations for course design.

To increase the digital competence of teachers, a massive open online course (MOOC) was developed, the purpose of which was to introduce modern digital tools and methods of their effective use in the educational process. The course content is carefully planned and structured to cover the main aspects of digital technology and its application in the educational environment. The course included several modules, each focused on the area of digital competence, such as the creation of interactive presentations, the use of videos and the development of multimedia tutorials.

Wilson (2024) provides a detailed bibliometric analysis of research trends in the Journal of Research on Technology in Education, including the growing body of work focused on MOOCs. The study highlights how MOOC-related topics have increasingly become a central theme in the journal, reflecting broader shifts in educational technology research. This analysis also emphasizes the expanding network of researchers collaborating on MOOC studies, which indicates a robust and evolving interest in understanding the impact and development of MOOCs in various educational contexts [9, 300], and our research on comprehensive assessment of MOOC specifically designed to enhance digital skills among teachers is limited. This study aims to fill this gap through a detailed analysis of the effectiveness of the MOOC and feedback from participants.

MOOC course was placed on the platform https://mook.buketov.edu.kz/, which provided access to training materials and tools for monitoring progress. The platform made it possible to monitor the progress of participants, conduct testing and provide feedback. An advertising campaign was carried out, which included the use of social networks, email newsletters and webinars to attract teachers. During the training, participants were supported by forums, chats and e-mail, which contributed to the prompt solution of emerging problems.

Methods and materials

To assess the effectiveness of mass open online courses (MOOC) in the development of digital competencies and skills of teachers, a combined research approach was used, which includes quantitative and qualitative methods. The main goal was to test the impact of the course on the skills and reliability of participants in the use of digital technologies. The study was attended by 78 teachers of Karaganda Buketov University and 114 students of Master's and Bachelor's degrees. Participants were randomly selected from among those who signed up for the course and agreed to participate in the study. The main characteristics of the choice: age, level of education and professional experience. The survey is designed to collect data on the participants' perception and assessment of the course. It included the following sections:

General information: age, education, experience in using digital technologies.

Course content rating: how participants evaluated the content, structure and applicability of the material.

Satisfaction: the degree of satisfaction with the course and its impact on professional development.

Practical application: how effectively the participants apply the knowledge gained in practice. The survey was distributed to participants via email and the MOOC platform. Data collection was carried out in two stages: a preliminary survey, that is, an assessment of the initial level of digital competencies and skills before the start of the course, the results of which presented on Table 1.

T a b l e 1

The level of digital skills of participants before the start of the course

Digital skills				Satisfaction with the level of digital skills development
the ability to work with a text editor	the ability to work with multimedia files (using programs for editing photo, video and audio files)	ability to work with spreadsheets	the ability to create electronic presentations using special programs	
61,7 %	20,6 %	12,7 %	9,1 %	52 %

After the survey, i.e. at the end of the course, measure changes and evaluate the effectiveness of the course (Table 2).

The level of digital skills of participants at the end of the course

Digital skills				Satisfaction with the level of digital skills development
the ability to work with a text editor	the ability to work with multimedia files (using programs for editing photo, video and audio files)	ability to work with spreadsheets	the ability to create electronic presentations using special programs	
77,7 %	67,6 %	57,7 %	73,1 %	91 %

While descriptive statistics are based on the calculation of tools, standard deviations and frequency distributions to assess changes in general satisfaction and digital competencies, in reference statistics use significance tests to determine the statistical significance of changes between pre-and post-survey studies.

Correlation analysis: study the relationships between different variables, such as the level of satisfaction and the level of use of digital technologies in practice.

To evaluate the results, the method of comparison before and after the survey was used. The analysis included a comparison of changes in the digital competence and reliability of participants. A qualitative analysis of open answers was also carried out to identify the main topics and issues related to the course (Fig. 1).
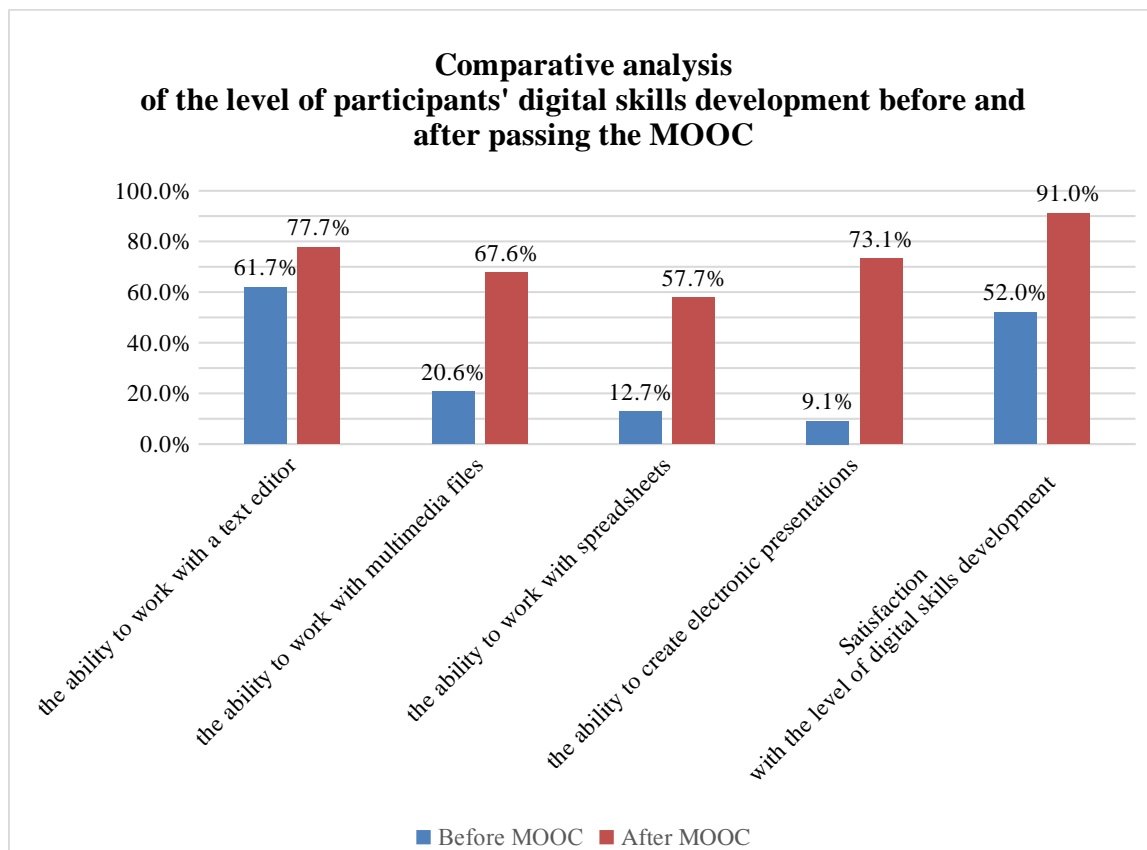

Figure 1. The level of participants' digital skills development before and after passing the MOOC

Regular monitoring was carried out and feedback from participants was collected through forums and surveys to identify problems and directions for improving the course. This made it possible to make adjustments to the content and format of the course in real time (Fig. 2).

During the study, all ethical standards were observed. The participants were given full informed consent and the confidentiality of their data was guaranteed. The study was approved by the Ethics Committee.
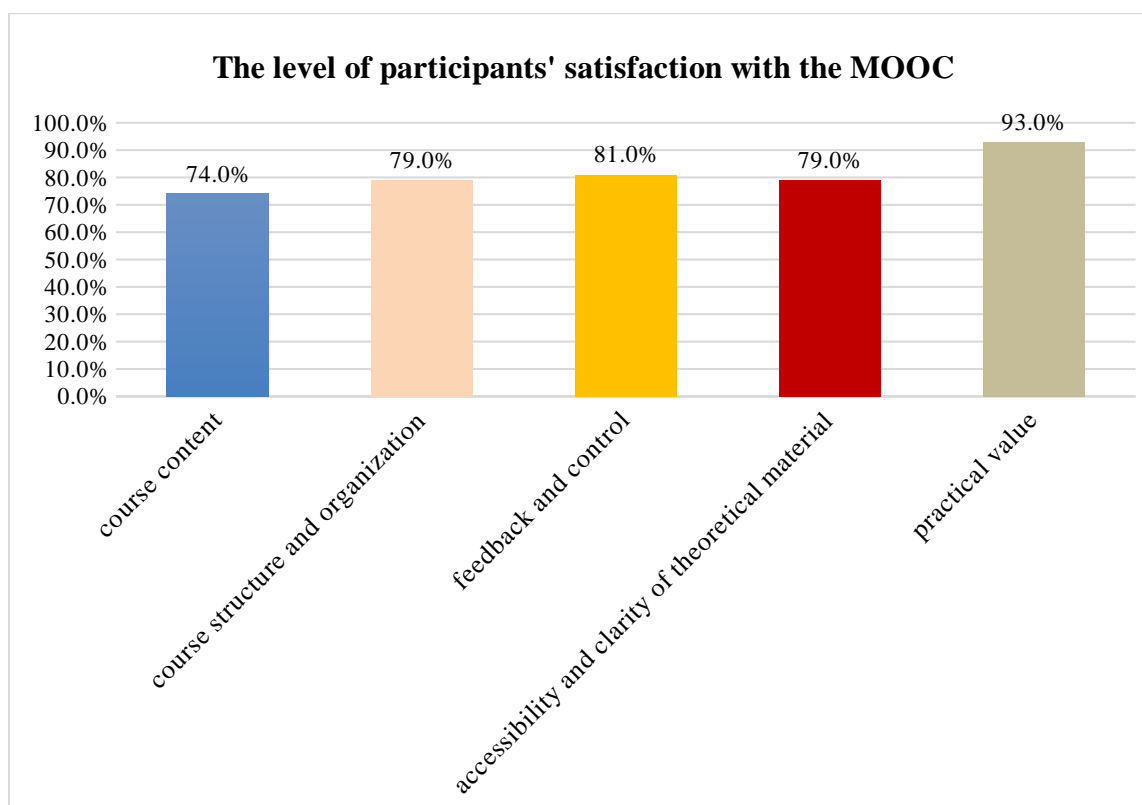
Figure 2. The level of participants' satisfaction with the MOOC

As for the results of the study, the level of digital competence of participants showed a significant improvement in the level of sleep at which they completed the course. In particular, skills in creating multimedia materials and using digital tools for educational purposes have increased significantly. This is confirmed by the data of subsequent surveys, in which the majority of participants reported that they relied on the use of digital technologies. The results of comparisons between pre-and post-survey surveys showed a statistically significant improvement in digital competence scores. Related samples changes between preliminary and subsequent surveys using the T test were statistically significant (p <0.05), which confirms the effectiveness of the course.

The participants noted that the acquired knowledge and skills are actively used in their pedagogical practice. This includes creating interactive presentations, videos, and using educational platforms to interact with students.

In general, this is consistent with the results of the authors' research, compiled in the literature review section of the study, which also noted the positive impact on the development of the MOOC. However, unlike these studies, our study addresses in more detail the aspects of the use of multimedia tools and their impact on the trust of teachers.

Observed improvements in teachers' confidence in the use of digital technologies [4, 151], which found that increased digital competencies were associated with increased confidence in learning practices. This confirms the importance of improving the professional qualifications of teachers in the field of digital technologies.

Based on the results obtained, it is recommended to continue using the MOOC in advanced training of teachers. It is important to adapt the course content to the current needs of teachers and ensure that the materials are constantly updated. It is also worth considering the introduction of additional practical tasks and projects for further consolidation of knowledge. Despite the significant results, this study has several limitations. First, the selection was limited to participants from Karaganda Buketov University, which may limit the generalization of the results. Secondly, the duration of the course and long-term control of the application of knowledge are not provided.

Conclusion

The study showed that the MOOC significantly improves the digital competencies of teachers. The participants showed increased confidence in the use of digital technologies and the successful application of the acquired knowledge in practice. This demonstrates the effectiveness of online courses as a tool for professional development. Importance of research makes an important contribution to understanding the role of MOOC in the development of digital competencies of teachers. This confirms that online learning can become an effective tool for improving the skills and reliability of teachers in the use of digital technologies.

In conclusion, recommendations are given, such as the continuation and expansion of the use of the MOOC for the professional development of teachers, paying special attention to the adaptation of courses to current educational trends and the needs of participants. You should also consider implementing regular updates to the course content and adding additional practical modules.

For a deeper understanding of the long-term impact of MOOC on the professional development of a teacher, studies with longer control periods and larger samples are needed. Future research may also focus on comparing different online learning formats and their impact on teacher competencies.

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Г.Ж. Смагулова, Г.Н. Акбаева

Жаппай ашық онлайн курстары (ЖАОК) арқылы оқытушылардың цифрлық құзыреттіліктерін арттыру: жобалау, енгізу және бағалау

Мақалада педагогтардың цифрлық құзыреттіліктерін дамытудағы жаппай ашық онлайн курстарының (ЖАОК) тиімділігі зерттелді. Білім беру технологиясы қарқынды дамып келе жатқандықтан, педагогтар тиімді біртұтас педагогикалық үдеріс үшін цифрлық құралдармен жаңарып отыруы керек. ЖАОК кең аудиторияға қол жеткізе алатын кәсіби дамудың ауқымды тәсілін білдіреді. Мұндай курстар

оқытушылардың цифрлық дағдыларына әсерін бағалау осы білім беру ресурстарын нақтылау және жетілдіру үшін өте маңызды. Мақалада оқытушылардың цифрлық құзыреттіліктері мен кәсіби дамуына назар аудара отырып, осы дағдыларды жақсартуға арналған ЖАОК бағаланған. Академик Е.А. Бөкетов атындағы Қарағанды университетінің 78 оқытушысы мен 114 докторанты және магистранттарының қатысуымен сауалнама жүргізілді. Деректер ЖАОК-тың тиімділігін бағалау үшін сипаттамалық және қорытынды статистиканы қолдану арқылы талданды. Бұл зерттеу оқытушылардың цифрлық құзыреттіліктерін арттыру үшін арнайы әзірленген ЖАОК-ты жан-жақты бағалаудағы жаңалық болып саналады. Алдыңғы зерттеулерден айырмашылығы, бұл зерттеу курстың дағдыларды дамытуға және оқушылардың қанағаттанушылығына әсерін тиянақты бағалауды қамтамасыз ету үшін аралас әдістерді қолданады. Курсты жобалауда мультимедиялық ресурстар мен практикалық қолданбаларды біріктіру де басты назарда. Берілген жұмыс оқытушылардың цифрлық қажеттіліктерін шешуде жақсы жобаланған ЖАОК маңыздылығын көрсетеді және келешекте ЖАОК-тың тиімді қолдану мен дамыту үшін іс-әрекетке жарамды ұсыныстар береді. Сонымен қатар, онлайн кәсіби даму бойынша әдебиеттерге үлес қосады және білім беру мақсаттары үшін ЖАОК-ты оңтайландыру туралы түсініктерді ұсынады.

Кілт сөздер: ЖАОК, цифрлық құзыреттіліктер, кәсіби даму, онлайн оқыту, білім беру технологиясы, сауалнаманы талдау, электрондық білім беру, цифрлық сауаттылық.

Г.Ж. Смагулова, Г.Н. Акбаева

Повышение цифровых компетенций преподавателей с помощью массовых открытых онлайн-курсов (МООК): проектирование, внедрение и оценка

В статье изучена эффективность массовых открытых онлайн-курсов (МООК) в развитии цифровых компетенций педагогов. Поскольку образовательные технологии быстро развиваются, педагоги должны обновляться цифровыми средствами для эффективного целостного педагогического процесса. МООК представляют собой масштабный подход к профессиональному развитию, который может охватить более широкую аудиторию. Оценка влияния таких курсов на цифровые навыки учителей имеет решающее значение в улучшении образовательных ресурсов. Авторами оцениваются МООК, предназначенные для совершенствования навыков цифровой грамотности. Проведено анкетирование с участием 78 преподавателей и 114 докторантов и магистрантов Карагандинского университета имени академика Е.А. Букетова. Данные были проанализированы посредством описательной и итоговой статистики для оценки эффективности МООК. Настоящее исследование является новшеством в комплексной оценке МООК, разработанной специально для повышения цифровых компетенций преподавателей. В отличие от предыдущих исследований, в нем используются смешанные методы, позволяющие обеспечить тщательную оценку влияния курса на развитие навыков и удовлетворенность обучающихся. При разработке курса основное внимание было уделено мультимедийным ресурсам и практическим приложениям. Данная научная работа подчеркивает важность хорошо спроектированного МООК для решения цифровых потребностей учителей и дает действенные рекомендации для эффективного применения и развития МООК в будущем. Кроме того, результаты исследования вносят определенный вклад в литературу по профессиональному развитию и предлагают идеи по оптимизации МООК для образовательных целей.

Ключевые слова: МООК, цифровые компетенции, профессиональное развитие, онлайн-обучение, образовательные технологии, анализ анкет, электронное образование, цифровая грамотность.

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