The Role of Digital Technologies in Building Research Competencies of Future Doctors of Philosophy

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Abstract

Aim. Digital technologies support learning, so the search for innovative approaches is ongoing. The aim of the research is to study the role of digital technologies in developing research competencies of future Doctors of Philosophy (PhDs). The aim was achieved through the Likert scale, calculation of the variability coefficients, the level of acquired knowledge and Cohen's kappa coefficient, correlation index.

Methods. Continuous study of the methodological foundations of scientific research was provided through the iSpring Market, and Comindwork online programmes. Learning English involved using the BBC Learning English application, while OpenLearning was used to develop knowledge on the dissertation topic.

Results. It was determined that the respondents who studied pedagogy, psychology, social work (Group 1) expanded their basic knowledge the most (21%). Respondents who studied journalism (Group 2) developed autonomous learning (23%). The future PhDs acquired knowledge in three subjects at a high level, contributing to developing professional competencies.

Conclusions. The practical significance of the research is in developing training for PhDs with the use of digital technologies. The research prospects are related to comparing the effectiveness of training of first- and second-year PhDs as a result of the use of innovative technologies.

Keywords: information technologies, scientific research, research process, critical thinking, technical competence

Introduction

The development of digital technologies contributes not only to the education of schoolchildren and students but also to the expansion of research competencies of future PhDs. Digital technologies contribute to expanding access to academic literature and the practical implementation of research results (Fuentes-Cancell et al., 2022). Digital technologies facilitate the search for the most characteristic scientific data that form the basis of scientific research. The given information helps to reflect the relevance of this study.

Digital technologies facilitate using digital materials from libraries of different countries, which expand the possibilities of research activities. The future scientist/researcher can be integrated into the scientific/academic space through cooperation with scientists/researchers from different countries. This approach promotes motivation to write and defend future scientific work. This process can also be implemented through participating in relevant scientific conferences (Liu et al., 2020). Conferences can be held offline and online using the Google Meet, Zoom, Microsoft Teams applications. Digitisation of learning contributes to the development of autonomous learning, and provides the possibility of uninterrupted consultation (Molina, 2022).

The research competence of future PhDs develops because of the ability to analyse scientific sources with the aim of further using it in one's own

work. The acquired skills are also necessary for conducting practical experiments, which will become the basis of scientific work. The relevance of the chosen topic is important, as it further contributes to developing research competence (Sever, 2023). Studying existing materials in a selected area establishes cause-and-effect relationships that help identify the gaps in the selected topic. This is because future research should be related to the principles of scientism, which contributes to fulfilling research objectives. The use of modern information technologies facilitates the search for various approaches for conducting research, thereby expanding cognitive aspects (Suyo-Vega et al., 2022). Modern technologies promote the search for alternative ways to solve problems.

Future PhDs also have the opportunity to develop information processing competence due to the analysis of existing information, using creativity skills (Wei et al., 2022). Information processing competence can be built through work with scientometric databases and search engines (Science Research, Web of Science, Scopus). This helps to find the solution to scientific problems for presentation of research results with structured and adapted relevant information (Ye et al., 2021).

Features of digital technologies' use to develop first-year PhD students' research competencies are studied superficially. The aim of the paper is to identify the effectiveness of digital technologies in educating future PhDs, taking into account the level of their research competence.

The following research objectives enabled attaining the aim:

- develop teaching & learning mechanisms for first-year PhD students with the use of digital technologies;
- determine the effectiveness of the digital technologies that were used for teachers and future PhDs taking into account their advantages;
- identify skills developed by the respondents with a view to their specialisation (pedagogy, psychology and social work; journalism);
- determine the level of acquired knowledge by different groups of respondents, which is directly related to the development of research competencies.

Literature Review

E-learning contributes to the realisation of research potential of future PhDs, as it facilitates adaptation to knowledge development. High-quality education can be ensured through the use of the Erasmus+ platform, which includes various types of projects and scientific topics. Erasmus+ promotes the development of scientific projects as a result of the optimal use of modern information resources (Alonso De Castro & García-Peñalvo, 2020). Digital technologies for training academic staff promote the integration of professional, pedagogical and technological knowledge for integration into the educational process at the University of Wrocław. Training with the use

of digital technologies in 2017-2018 resulted in the increased efficiency of knowledge among PhDs of various majors. The results showed that graduate students in engineering majors had the highest performance (Demeshkant, 2020). The informatics laboratory was created to develop practical digital literacy skills for training PhD students. The learning process was based on the use of non-standard approaches to research using digital technologies. Digital technologies facilitated the planning and design of research results. Teaching-Learning-Lab was used to answer the research questions, facilitating experiments' conduct (Demarle-Meusel et al., 2017).

Robotics expands the prospects of current research. For this purpose, Turkish researchers analysed 124 Theses of graduate students in robotics, and created a single database. It was established that the use of Lego and Arduino applications expanded research in information technology and natural sciences (Gunes & Kucuk, 2022). Information technologies contribute to the development of new skills and training models of future PhDs. The use of cross-training using traditional and modern methods was based on interpersonal interactions, technological and social support. Modern technologies facilitated access to educational resources. When the blended approach was used for learning, it involved conducting practical classes in the laboratory, while theoretical material was studied online (Johnson King et al., 2022). Digitisation of university libraries contributes to the development of research competencies. Digital libraries facilitate grouping of literature according to the subject, making searching for the necessary information easier. The use of sound files also promotes knowledge development on a certain topic (Otike et al., 2022).

Information and communication engineering expands research opportunities. This approach enhances graduate students' motivation and affects their abilities' development. Information and communication engineering facilitates calculations, and helps to develop practical skills. This contributes to the development of systems thinking and increases the level of innovative achievements (Yin et al., 2022). Informatisation of the educational process facilitates the training of academic staff who meet the current requirements of the information society. LibGuides technology provides access to academic resources from various libraries. LibGuides facilitate quick information retrieval, which reflects information literacy. The LibGuides online service is widely used at Cape Peninsula University of Technology (Becker et al., 2022). Information technologies increase the level of professional competence in the work with scientific information. Modern technologies help to find the solution of specialised problems, thereby developing research competence. Digital technologies facilitate the implementation of research projects (Vázquez et al., 2022).

A review of academic literature established that most researchers studied the advantages of information technologies in educating graduate students. Research gaps are related to the development of separate programmes for educating future PhDs, promoting research competencies.

Methods

Research design

The first stage of the research provided for the development of mechanisms to ensure the development of research competencies of future PhDs. Emphasis was placed on the training of first-year PhD students, as the subjects are similar, aimed at expanding academic knowledge. The choice of subjects involved studies of Methodological Foundations of Scientific Research, Academic English, Knowledge Development on Dissertation Topic. The subjects were taken as the basis of the study because they are the basis for the development of research competences. One should, first of all, master scientific approaches and methods in order to develop scientific knowledge for conducting research. The development of learning mechanisms was also based on the search for the most appropriate digital technologies that would meet the learning criteria. For this purpose, more than 100 modern programs and applications were analysed, and the most effective ones were identified.

The second stage of the research provided for determining the effectiveness of the digital technologies used in education. Effectiveness was identified among teachers and future PhDs.

The third stage of the research involved determining the skills that were developed in the process of building research competences by future PhDs. The identification of characteristic skills was based on the use of observation by teachers, which was associated with an increased level of scientific competence of future PhDs. To detail the research, the skill level was determined among two groups of future PhDs: Group 1 was represented by respondents majoring in pedagogy, psychology and social work; Group 2 – journalism.

The third stage of the research also identified the acquired knowledge by different groups of first-year PhD students in three different academic subjects. The acquired knowledge level helped determine the effectiveness of digital technologies for education. The acquired knowledge was measured based on the degree of assimilation of the educational material and the possibility of its practical application in one's research.

Sampling

The experimental part of the study involved 118 respondents, 100 of whom were future PhDs, 18 were teachers. The respondents were representatives of Alfred Nobel University (Dnipro, Ukraine) and the State Higher Educational Institution Uzhhorod National University (Uzhhorod, Ukraine). Only first-year PhD students were involved in the study, because they do not have proper level of knowledge and research competencies, and have a similar training programme. Future PhDs were divided into two groups. Group 1 was represented by respondents specialising in peda-

gogy, psychology and social work (60 people). Group 2 was represented by respondents studying journalism (40 people). It was Initially planned to involve 180 respondents, but 32 of them were studying in the second year, which could affect the final results.

Methods

Methods of analysis and comparison were used to identify approaches to training future first-year PhDs and the possibility of using modern technologies. The approach was aimed at expanding knowledge about the selected studies, which would further improve the quality of their work. The iSpring Market programme (n.d.) was chosen to provide training, which contributed to conducting lectures and the study of methodological approaches and methods. The Comindwork application (n.d.) was used to develop learning stages, making the organisation of the research process more effective. The BBC Learning English application (n.d.) was used for the study of the English language, and provided an access to information resources. OpenLearning (n.d.) was used to work with the academic supervisor, as well as to ensure appropriate communication activities.

The study also identified the effectiveness of digital technologies iSpring Market, Comindwork, BBC Learning English and OpenLearning to ensure the development of research competencies. The effectiveness of the used digital technologies was determined after 3 months of training (November 2021 – January 2022). Effectiveness was determined for teachers and future PhDs. The obtained data using a Likert scale allowed calculation of the coefficient of variation (Bell, 2021). The Likert scale provided scoring from 1 to 4 (reflecting the number of technologies) depending on their significance for the respondents. The data was collected electronically, which contributed to the automation of the research and subsequently facilitated calculations. Cohen's kappa coefficient was used to compare the obtained data between the two groups of respondents.

$$k_v = \frac{s \times {}^1/_{2n}}{x} \tag{1}$$

s – set deviation of indicators;
x – a sample value within the study.
n – the loyalty coefficient, which ranges from 1 to 5 (1 is the least advantage, 5 is the greatest advantage).

The use of the results of the Likert scale was aimed at identifying the skills that were developed by groups of future PhDs. The results obtained through a Likert scale were displayed using percentage data. Independence, expanding basic knowledge, critical thinking, solving complex problems, assessing possible consequences, and developing communication skills were the most pronounced skills. The results were presented using percentage data.

The work also provided for the identification of the level of knowledge obtained by first-year PhD students. The results were obtained by calculating the coefficient of the level of acquired knowledge, which reflected the effectiveness of digital technologies. The coefficient was developed by the authors of the article:

$$C_{k.d.} = \frac{(n_r+n_i)\times t}{m_{max}} \quad (2)$$

n_r – obtained grades in the educational process for the development of research competencies;
n_i – a grade for learning independence;
t – the coefficient of time spent (0.5 – the assignments for the development of research competencies were completed on time; 0.1 – the assignments were completed with a significant delay)
m_{max} – the highest score that could be obtained during the study (equals 5 in this study).

The level of knowledge is high, if the coefficient ranges between 0.7 and 0.9; medium level – 0.5 to 0.7; low - less than 0.5.

The Cohen's kappa coefficient was used to compare the data.

Data analysis

Data analysis involved the use of statistical tools by the authors to verify the calculated results. The calculation of statistics was applied at the second and third stages of the study. At the second stage of the research provided for the comparison of the obtained data on the effectiveness of digital technologies used for education. The data obtained from teachers and from future PhDs were compared. At the third stage of the research, data was obtained as a result of comparing the level of knowledge obtained by two groups of respondents. For this purpose, a statistical calculation of Cohen's kappa coefficient was carried out, which facilitates the processing of the obtained results (Zhang et al., 2023):

$$d = \frac{(M_1-M_2)}{\sqrt{\frac{S_1^2+S_2^2}{2}}} \quad (3)$$

M_1, M_2 – average indicators of the specified values for Group 1 and Group 2 for training future PhDs;
S_1, S_2 – mean square deviation of the indicated values for Group 1 and Group 2 for training of future PhDs.

If the estimated value approaches 0, there is a strong relationship between the values; up to 1 – weak relationship; up to -1 – no relationship.

The correlation index was also used for additional statistical analysis, revealing the relationship between the studied values (Yin et al., 2022).

$$J_r = \sqrt{1 - \frac{(y_i - \check{y}_i)^2}{(y_i - \bar{y}_i)^2}}, \quad (4)$$

y_i – the level of the dynamic series, which reflects uniform statistical values that are aimed at determining the change between different indicators;
$\check{y}_i$ – the average level of the dynamic series;
$\bar{y}_i$ – the theoretical level of the dynamic series, which reflects the conditional stability of one indicator before another.

Values are correlated if the indicators approach 1.

Statistics are aimed at reflecting the reliability of the presented information as a result of the use of additional indicators.

Data collection

According to the Likert scale (this scale was used to collect data from respondents), teachers and future PhDs assigned each of the used technologies the appropriate number of points. 1 point corresponds to the lowest efficiency, 4 points — to the highest efficiency. Data was collected using the Telegram messenger, which enabled tracking the availability of data from all participants. The results had to be sent within two days. In the second stage of the study, a Likert scale was used to determine the skills that future PhDs developed.

Ethical criteria

Ethical norms were considered during the research per international standards (The Norwegian National Research Ethics Committees, 2016). Ethical norms were related to ensuring equal conditions for all participants in the experiment, as well as maintaining confidentiality. In order to maintain confidentiality, the paper did not contain personal data of the research participants, as well as the correlation of answers with the personal data of respondents.

RESULTS

The training of PhDs should be aimed at the development of scientific potential, logical thinking, which is based on research competence. For this purpose, their training is based on the study of general subjects and narrowly focused ones that correspond to a separate scientific field. The training mechanisms were intended to include the following scientific subjects, which were aimed at developing the research competence of future PhDs: methodological foundations of scientific research, the English language of a scientific direction, and the development of knowledge by the dissertation topic. The principles of providing training in the presented subjects are given below.

The subject Methodological Foundations of Scientific Research is based on the study of methodological approaches and methods that contribute to scientific research. The methods should be aimed at finding opportunities for research in accordance with the dissertation topic. Uninterrupted training became possible due to the use of the iSpring Market online programme (n.d.). iSpring Market contributed to the creation of appropriate lectures and their support with practical assignments. The use of the application was aimed at identifying the most appropriate methods for conducting research on the given topic. This programme makes it possible to ensure communication between future PhDs, which will help to find the most favourable scientific approaches to research. It also contributes to determining their content and predicting the impact on the search for new scientific approaches. The advantages and disadvantages of known methods (observation, analogy, modelling, abstraction, induction, formalisation) were also studied using iSpring Market. The Comindwork application (n.d.) was used to form the main stages of training, which facilitates their management, collective work and exchange of learning materials.

The subject Academic English is aimed at the development of the global competence of future PhDs, and the expansion of communication. In the process of learning, knowledge of the English language contributes to the exchange of academic information among researchers, participation in international conferences. Improved understanding of academic English facilitates access to various shared information resources beyond one country. The use of the BBC Learning English application (n.d.) made it possible to find texts according to topics and scientific interests for the study of specialised technology. BBC Learning English helps to learn English with material from a variety of programmes and recordings. Grammatical structures, verbal transformations, and approaches to arguing one's opinion were also studied, and discussions were held using logical relationships. The application promotes the development of creative skills, which makes it possible to show individuality while learning English and be able to identify aspects of academic topics. The application contributes to the creation of favourable conditions for learning as a result of the use of corrective approaches for identified inaccuracies. This is the case during the pronunciation of words, translation, search for synonyms for the correct description of academic issues.

The knowledge development on the topic of the dissertation provides for the interaction of the future PhD with the academic supervisor. The process is aimed at the in-depth study of the topic, the search for new approaches to research, the identification of existing gaps, which will enable the creation of new research. For this purpose, the use of the OpenLearning application (n.d.) was proposed for the support of the necessary communication, ensuring the organisation of training, and the exchange of academic opinions. The OpenLearning application made it possible to store text information, audio materials, drawings, which can also be exchanged through the application. The interaction with the academic supervisor was carried out on the

basis of the interactivity principle, which was aimed at intensifying brain activity. This was reflected in the acquisition of new knowledge, development of skills as a result of constant interaction, which was used in the fulfilment of the assigned tasks. Multimedia technologies made it possible to distribute the most characteristic approaches to the study of the topic and the possibility of independent acquisition of academic knowledge. Interaction with the academic supervisor is aimed at the development of technical competence with the use of digital technologies, which contributes to solving problems of various complexity. Modern technologies also contributed to the development of educational models in accordance with the topic of research, which enabled adjusting a more highly specialised direction.

The effectiveness of the used digital technologies for future PhDs and teachers was determined after 3 months of training. Emphasis was placed on the achievements, the ease of adaptation of digital technologies to the educational and research process, and the expansion of academic knowledge. The quality of assimilation of new information for the systematisation of academic knowledge, the degree of facilitation of the organisation of the educational process was taken into account when measuring the effectiveness. Table 1 provides the results of the coefficient of variation calculations.

Table 1

The Effectiveness of The Use of Digital Technologies According to the Answers of Future PhDs and Teachers

Variety of a digital technology	Teachers' answer	Future PhDs' answer	Comparison of indicators using the Cohen's coefficients	Comparison of indicators using the correlation index
iSpring Market	0.93	0.84	0.0521	0.705
Comindwork	0.84	0.94	0.0527	0.732
BBC Learning English	0.81	0.85	0.0483	0.901
OpenLearning	0.87	0.88	0.0219	0.894

Source: Own research

The study's results revealed that the effectiveness of most of the technologies used, according to teachers and future PhDs, is high. According to teachers' answers, the iSpring Market programme is the most important, as it facilitated access to academic materials from different countries. The programme also promotes the exchange of experience with various participants of the educational process. For future PhDs, the Comindwork programme is of the greatest importance, as it was used for the organisation of study time, its combination with research work. The OpenLearning application provides equality for various participants of the educational process, as it facilitates the coordination of work with the academic supervisor

for the development of research competencies. The BBC Learning English application showed a slightly lower performance because it involves independent study of a large amount of information. The application provides for a specialised study of the English language, which requires great efforts to develop research competencies. These data are necessary for searching information, as it requires a high level of knowledge.

The skills that were acquired for different groups of future PhDs as a result of the use of digital technologies of various orientations were identified. Group 1 is represented by future PhDs majoring in pedagogy, psychology and social work; Group 2 – journalism. The results were obtained through the use of a Likert scale among teachers (Figure 1).

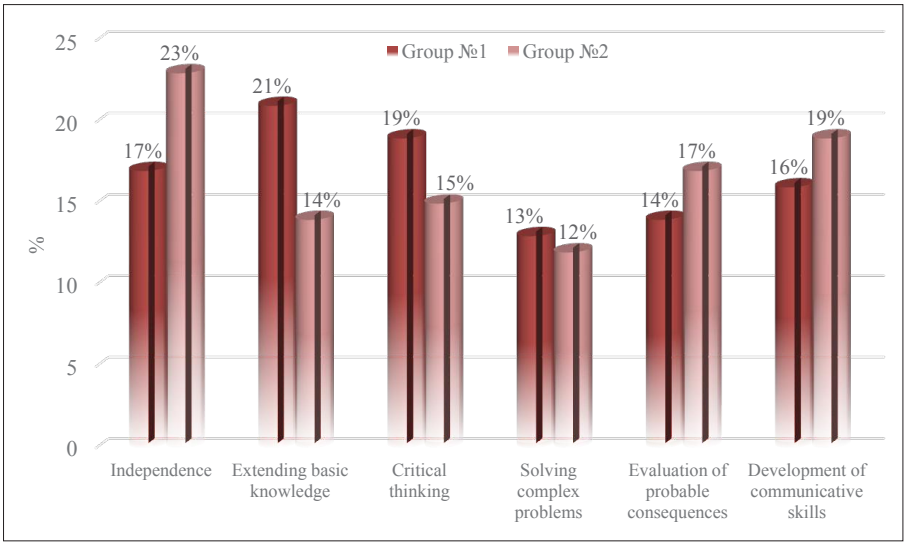

Figure 1
Developed Skills of Future PhDs after Training

Source: Own research

The obtained results showed that PhD students primarily expanded basic knowledge related to the use of digital technologies. The expansion of knowledge was aimed at finding new mechanisms for the development of research competences. The expansion of basic knowledge is based on the research as a result of the study of general information aimed at understanding methodological data. Critical thinking was also developed among the respondents of Group 2, which made it possible to identify gaps in existing research. The established gaps made it possible to identify the direction of further research in the field of pedagogy, psychology and social work. Critical thinking is interconnected with active analysis of learned information, shaping one's own opinion.

Group 2 respondents developed independence first of all, which was reflected in the search for academic information necessary for their research

activities. Independence is based on the analysis of learned information, which is important for future research and which is irrelevant. The development of independence also consists in the use of digital technologies not only for the purpose of studying information that was presented by teachers. Communication skills were also developed by the Group 2 respondents, as these skills are important for journalists. Communication helps to find the necessary information for future research projects, and helps to find new ideas for self-expression. Developed communication skills help in the collection of experimental material, which will be used for the development of spontaneous ideas and the involvement of appropriate journalistic investigation. This approach will enable identifying new areas of research, which will affect the novelty and quality of research work. Communication skills can also contribute to conducting interviews, the results of which can be used in the main work. Developed communication helps to conduct a detailed interview and get answers to the necessary questions.

It was established that the respondents developed the skills of assessing probable consequences (they rank 5th for Group 1, and rank 3rd for Group 2). Evaluating possible consequences is interconnected with the development of critical thinking, as it contributes to the analysis of learned information. Digital technologies facilitate the search for a variety of information, which is reflected in its evaluation for the possibility of inclusion in future research.

The skills for solving complex problems were developed to a lesser extent among both groups of future PhDs. It is interconnected with logical thinking and requires specialised knowledge. Solving complex problems that will be included in the research is achieved by dividing them into basic elements through active learning. The skill also requires creative abilities, which will allow identification of the most favourable informational materials.

At the final stage of the research, the level of knowledge of future PhDs in various areas with the use of digital technologies was measured. The obtained experimental data were calculated using the coefficient of the level of acquired knowledge and provided in Table 2.

Table 2

The Level of Knowledge Acquired by Future PhDs, Which Is Aimed at Building Research Competences

Academic subjects	Level of acquired knowledge		Comparison of the obtained levels using Cohen's coefficient	Comparison of indicators using the correlation index
	Group 1	Group 2		
Methodological Foundations of Scientific Research	0.815	0.816	0.0042	0.972
Academic English	0.855	0.883	0.0374	0.869
Knowledge Development on Dissertation Topic	0.874	0.872	0.0019	0.943

Source: Own research

The study found that the obtained results correspond to a high level of knowledge. Group 1 respondents showed the highest results for the development of knowledge in accordance with the dissertation topic, which manifested itself in the independent acquisition of new knowledge. It also contributed to the search for new approaches to the presentation of academic materials that affect research competencies. Knowledge development on dissertation topic promotes the development of professional competence and systematicity, which affects the comprehensive study of the researched topic.

As for Academic English, Group 2 respondents showed the highest level, which contributes to the development of professional competence and research activity. Learning the English language with the help of BBC Learning English made it possible to study journalistic topics. A high level of knowledge of the English language helps to ensure intercultural professional communication in the scientific field, which opens access to scientific knowledge. Achieving a high level in the English language enables drawing logical parallels as a result of studying the researched topic from academic sources of different countries.

The Methodological Foundations of Scientific Research among the two groups were also developed at a high level, but with lower indicators. The results are related to the necessary search for approaches to the coverage of the subject of one's research, which requires specialised academic knowledge. The research is based on the use of knowledge from different subjects, which contributes to the search for innovation. This approach also contributes to the development of creative skills, which affects prognostication and the selection of the most acceptable indicators for future research. Effective assimilation of the methodological foundations of scientific research facilitates the search for creative approaches to the fulfilment of tasks, which affects the realisation of creative potential.

Discussion

Expanding the research competencies of future PhDs can be achieved through the study of various publications in a separate academic field. The use of digital technologies facilitates bibliographic analysis of articles published in Scopus. The literature analysis facilitates the search for rational approaches for conducting practical research (Chiware & Becker, 2018). Using digital technologies to train graduate students promotes the assimilation of knowledge, especially during COVID-19. Digital technologies can be included in the learning process due to establishing similar and different features compared to the traditional approach. Digital technologies promote the development of prospects for developing research competencies (Wolfschwenger et al., 2021).

The level of digital competence of teachers involved in academic education is important for improving the research competence of future PhDs. The learning process was ensured through the use of the TPACK digital

system, which provided for the development of pedagogical and technological skills. The results showed that the TPACK system facilitates research if a certain sequence is followed, which excludes a negative correlation (Demeshkant et al., 2022). The study has not found any specific advantages of the use of digital technologies to ensure the training of future PhDs, however, skills that were developed in PhDs during the period of training with the use of digital technologies were identified. The skills were identified based on the distribution of PhDs into different professional groups, which contributed to the detailed study.

European projects contribute to ensuring the educational process, including the studies of future PhDs. Digitisation of the educational process with the help of Erasmus+ improves learning efficiency. The programme helps to monitor the dynamics of the achieved results to identify the most typical projects for research. It also facilitates the comparison of main results with intermediate ones (Alonso de Castro & Garcia-Penalvo, 2022). The experience of European countries contributes to the training of future PhDs by expanding training mechanisms. The expansion of research concepts can be based on the use of leading concepts, the modernisation of the structure and development model (Nebelenchuk et al., 2022). The training of postgraduate students in Ukraine in 2016 was based on applying the European model, which contributed to the search for effective forms for developing research competence. The use of digital technologies contributed to the creation of individual projects, which promoted the realisation of real projects by graduate students. The research competence development programme was based on preparation, analysis of the situation, development of the project concept, and its completion. It was established that this approach contributes to developing instrumental, systemic and communicative skills, which is reflected in innovative activity (Meniailo & Gura, 2019). Using digital technologies for educational networks promotes the development of digital skills. Virtual education helps provide informal learning that facilitates access to different platforms. ResearchGate enables finding the necessary information, contributing to its systematisation and evaluation for developing research activities. ResearchGate also enables the search for academic information in various formats, which is reflected in various didactic guidelines (Estrada-Molina et al., 2022).

In contrast to the presented works, no advantages of programmes for searching library information were found in the conducted research. However, training mechanisms for first-year PhD students were developed, which are aimed at the specific use of certain technologies in the research process. Educational mechanisms were based on ensuring a comprehensive learning process, excluding the division into separate elements (search for information, development of practical skills, search for calculations methods, etc.).

Academic libraries contribute to developing digital technologies that can be used to develop the research activities of future PhD students. Digi-

tal technologies facilitate qualitative research based on the rapid modernisation of technologies. Digital technologies provide a high level of organisation and use of software to present research findings (Bell, 2021). In this study, the advantages of digital libraries are not identified, but the advantages of the technologies used in education for teachers and future PhDs are established. It was found that the iSpring Market application facilitates access to academic materials from different countries, the Comindwork programme helps the future PhDs in time management.

The analysis of academic literature revealed that the majority of works dealt with determining the effectiveness of digital technologies or the specifics of the development of research competence. The main part of academic articles describes digital technologies that can be used when working with academic literature. In our study, mechanisms were developed to ensure the training of future first-year PhDs using digital technologies. The work examines approaches to studying the Methodological Foundations of Scientific Research, Academic English, Knowledge Development on Dissertation Topic. The work established the technologies' effectiveness (iSpring Market, Comindwork, BBC Learning English, OpenLearning) for teachers and future PhDs. The level of the research competence of future PhDs as a result of studying the subjects of the first year was also determined.

Conclusions

The analysis carried out by the authors confirms the relevance of the selected topic, which is determined by the use of digital technologies for developing research competencies of future PhDs. Digital technologies help to find the necessary academic information, conduct research, develop communication, organise the research process, etc.

The process of training future PhDs was based on the development of three directions using digital technologies. The iSpring Market (n.d.) and Comindwork (n.d.) applications were used to ensure the study of the methodological foundations of scientific research. The BBC Learning English application (n.d.) has contributed to studying Academic English; OpenLearning (n.d.) facilitated cooperation with an academic supervisor.

The paper found that the iSpring Market application (0.93) has the greatest advantage among teachers, Comindwork (0.94) – among future PhDs. The authors believe that the results are related to different functionality, as the first application is used for conducting classes, the second – for the organisation of research work. The skills that different groups of respondents developed during the training period were identified in the course of the study. Group 1 respondents majoring in pedagogy, psychology, and social work developed their basic knowledge (21%) and critical thinking (19%). Group 2 respondents who studied journalism primarily developed independence (23%) and communication skills (19%).

The study established that the PhDs of Group 1 showed the highest efficiency for knowledge development on the dissertation topic (0.874). Group 2 achieved a high level of knowledge of the English language (0.883), which is positive for journalistic activity.

The practical significance of the work is related to the possibility of expanding the training programme for first-year PhD students using modern digital technologies. The results can contribute to uninterrupted research activities and academic knowledge development. Research prospects involve comparing the possibility of using digital technologies to conduct theoretical and practical research.

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