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## **Формування цифрової компетентності в підготовці майбутніх учителів в Україні та КНР**

### **Історія статті:**

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**Анотація.** Актуальність проблеми формування цифрової компетентності майбутніх педагогів у закладах вищої освіти є очевидною, оскільки технічний прогрес розвивається в надзвичайно стрімкому темпі, а цифровізація вже проникла в усі сфери життя, зокрема в систему освіти. Метою наукової роботи є порівняти підходи державної освітньої політики до формування цифрової компетентності майбутніх учителів у КНР та Україні. Для отримання нових результатів у дослідженні було використано такі теоретичні методи: аналіз педагогічної літератури, нормативних документів, онлайн-платформ, освітніх сайтів, систематизація й узагальнення досліджень учених, організації курсів у підготовці майбутніх учителів – для зіставлення різних підходів до формування цифрової компетентності майбутніх учителів. Зазначено, що цифрова компетентність є ключовою в навчанні впродовж життя, а також однією зі складових професійної компетентності вчителя, відповідно до Профстандарту вчителя початкових класів, вчителя ЗЗСО та вчителя початкової освіти. Визначено поняття цифрова компетентність і обґрунтовано, що його значущість змінюється відповідно до розвитку цифрового сучасного суспільства. Проаналізовано державну освітню політику України та КНР, зокрема нормативно-правову базу, яка регламентує розвиток цифрової компетентності в країнах. З'ясовано, що проблема цифрової компетентності є нагальною в обох країнах, зокрема в КНР, де її розв'язання здійснюється більш прогресивно, завдяки потужним ресурсним можливостям. Наведено приклад змісту навчальних дисциплін, а саме «Засоби цифрової підготовки», «Кібербезпека», «Медіаосвіта» (Україна), «Основи комп'ютерного використання», «Використання мультимедійної техніки» (КНР), їхнє місце в навчальному процесі, години на вивчення, форму контролю навчально-пізнавальної діяльності тощо. Ці навчальні дисципліни спрямовані на формування цифрової компетентності майбутніх учителів у закладах вищої освіти України та КНР. Зазначено, що подальші розвідки дослідження стосуватимуться вивчення й аналізу державної освітньої політики країн Європейського Союзу щодо формування цифрової компетентності, зокрема в підготовці майбутніх учителів

**Ключові слова:** інформатизація, цифрова грамотність, підготовка вчителя, змішане навчання

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## Development of Digital Competence in the Training of Future Teachers in Ukraine and People's Republic of China

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**Abstract.** The relevance of the issue of forming digital competence of future teachers in higher education institutions is obvious, since technological progress is developing at an extremely rapid pace, and digitalisation has already penetrated into all spheres of life, including the education system. The purpose of this study is to compare the approaches of the state educational policy to the development of digital competence of future teachers in China and Ukraine. The following theoretical methods were used to obtain new results: analysis of pedagogical literature, regulatory documents, online platforms, educational sites, systematisation and generalisation of scientific research, organisation of training courses for future teachers – to compare different approaches to digital competence of future teachers. It is noted that digital competence is key in lifelong learning, as well as one of the components of a teacher's professional competence, according to the professional standard of primary school teachers and general secondary education teachers. The concept of digital competence is defined and it is proved that its significance changes in accordance with the development of digital modern society. The article analyses the state educational policy of Ukraine and China, in particular the regulatory framework regulating the development of digital competence in the countries. The issue of digital competence was discovered to be urgent in both countries, in particular in China, where its solution is carried out more progressively, due to powerful resource capabilities. An example of the content of academic disciplines is given, namely "digital training tools", "cybersecurity", "Media Education" (Ukraine), "fundamentals of computer use", "use of multimedia equipment" (China), their place in the educational process, hours to study, a form of control of educational and cognitive activity, etc. These academic disciplines are aimed at developing the digital competence of future teachers in higher education institutions of Ukraine and China. It is noted that further research will concern the study and analysis of the state educational policy of the European Union countries on the development of digital competence, in particular in the training of future teachers

**Keywords:** informatisation, digital literacy, teacher training, blended learning

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## INTRODUCTION

In the modern world, technological progress aimed at digitalising all spheres of life, in particular the education system, encourages an increase in the level of digital competence of every citizen. The national strategy for the development of education in Ukraine for 2012-2021 [1] indicates that modern youth is characterised by a rather low level of moral, spiritual and, most importantly, cultural development. This is primarily due to the imperfection of the content of school education and the discrepancy between teacher training and modern requirements. If the responsibility for modernising the content of school education lies solely with the Ministry of Education and Science, then the issue of training a highly qualified, modern teacher of the new generation is also the subject of the responsibility of the higher education institution.

The new professional standard of a teacher embodies a modern approach to defining the listing and description of general and professional competencies. The general competencies include civil, social, cultural, leadership, and entrepreneurship. The list of professional competencies includes the following: language and communication, subject-methodical, information and digital, psychological, emotional and ethical, pedagogical partnership, inclusive, health-protective, design, predictive, organisational, evaluative-analytical, innovative, reflexive, as well as lifelong learning ability.

While most of these competencies have been relevant for quite a long time, digital competencies have been emphasised for the past few years both globally and in Ukraine and China in particular. The reason for this increased attention is believed to be the rapid evolution of technological progress, which expands educational opportunities for all countries, which cannot be said about the adequacy of teacher staff training. Since 2020, increased interest in digital competence is also caused by the “special” learning conditions around the world caused by the COVID-19 pandemic. The forced transition to blended learning in almost 200 countries of the world, caused by quarantine restrictions, proved that the development of digital competence occupies a prominent place in the process of training future teachers in higher education institutions. Therefore, the problem of forming digital competence in the process of training future teachers is now relevant and requires a solution both at the state level and at the level of higher educational institutions. An important role here is played by studying the experience of other countries, in particular China, as a powerful country in Information Development.

Given the relevance of the chosen topic, it is worth noting that the issue of forming the digital competence of future teachers has become the subject of research by many Ukrainian scientists. As an example, the essence of

digital competence of future teachers and its development by means of multimedia technologies was considered by R. Hurevych [2], “the Structure of Digital Competence and Digital Culture” was studied by A. Gurzhiy and V. Lapinsky [3], M. Zhaldak, Yu. Ramskyi, M. Rafalska [4]. The “Model of ICT Competency Standard of University Teachers in the Context of Improving the Quality of Education” was addressed in their research by N. Morse and A. Kocharian [5].

In their research work G. Henseruk “analysed European standards for defining digital competence, namely the European Commission's Digital Competence Framework for Citizens (DigComp) project, digital competence standards on the European network EUROPASS, which include information management, cooperation, communication, content and knowledge, ethics and responsibility, assessment and problem solving, technical operations” [6]. O. Ovcharuk substantiated the importance of digital competence of future teachers, analysed the process of regulatory support for this process in Europe, and drew a parallel with Ukraine [7]. Interesting and, at the same time, valuable for research are the practical developments of L. Petrova, who reveals the essence of information and digital competence of an educator, defines its significance for professional activity [8]. The problems of informatisation of the educational process (within the framework of the implementation of state programmes) in certain provinces of the people's Republic of China are revealed in the works of Chinese scientists Z. Zhilin and G. Jianhou [9]. The study of the Axiology of education in Europe and Asia (on the example of China) in historical retrospect based on the cultural-historical approach was carried out by I. Khotchenko [10]. All the questions mentioned above relate to the nature, structure, and the need for the development of digital competence of future teachers. The specification of approaches of the state educational policy of Ukraine and the people's Republic of China to the development of digital competence of future teachers was not the subject of study.

*The purpose of the present study* is to compare the approaches of the state educational policy to the development of digital competence of future teachers in China and Ukraine.

## MATERIALS AND METHODS

To achieve this goal, that is, to compare the approaches of the state educational policy to the development of digital competence of future teachers in China and Ukraine, the following theoretical research methods were applied in a complex: analysis of pedagogical literature, systematisation and generalisation of scientific research – to compare

different approaches to the development of digital competence of future teachers, aimed at obtaining new scientific results in the study.

The following regulatory documents were used in the study:

- the draft of the Concept of Development of the Digital Economy and Society of Ukraine for 2018-2020 [11];
- “Digital Agenda – 2020” [12];
- “Concept of digital competence development in Ukrainian society” (Project) [13];
- On approval of the concept of digital competence development and adoption of the action plan for its implementation: Order of the Cabinet of Ministers of Ukraine [14];
- “Digital Competence Framework 2.0” [15];
- “Description of the digital competence framework for Ukrainian citizens” [16];
- On approval of the Concept of Teacher Education Development [17];
- draft State programme within the framework of the Twelfth five-year plan called *Three Links and Two Platforms* [9; 18];
- *Three Comprehensives, Two Highs and One Large* [9; 18];
- The “Internet +” Strategy [19].

In addition, to compare the approaches of Ukraine and China to the development of digital competence in the training of future teachers, online platforms, educational sites that host courses for teachers were analysed in order to familiarise them with digital services and provide methodological recommendations in this direction.

Obtaining scientific results in the research contributed to the analysis and comparison of courses in the training of future teachers, namely: “Digital training tools” [20], “Information and Pedagogical Studios” [21] (Ukraine), “Fundamentals of Computer Use” [22], “Use of Multimedia Technology” [22] (China). The place of study of the discipline in the organisation of the educational process, the content of academic disciplines, the number of allocated credits (hours), the form of monitoring the educational and cognitive activities of applicants for higher pedagogical education were analysed. Therefore, analysing the above, the following stages of this study can be distinguished:

- analysis of scientific and pedagogical literature;
- generalisation and systematisation of the results obtained;
- study of the legal and regulatory framework, online educational platforms, websites, courses in training future teachers of Ukraine and China in the context of this issue;
- comparison and collation of the results of information collection.

At the first stage, scientific and pedagogical literature was analysed and the state of the problem of forming digital competence of future teachers in higher education

institutions in Ukraine and China was studied. At the second stage, the results obtained were summarised and systematised. At the third stage, the legal and regulatory framework of Ukraine and China was studied, online educational platforms, websites, and courses that contributed to the training of future teachers of Ukraine and China, namely, the development of digital competence, were analysed. It was also indicated what organisational and methodological training was provided by the Ministry of education and science of Ukraine and the Ministry of education of the people’s Republic of China during the transition to distance and blended education due to the coronavirus pandemic. At the fourth stage, the results of information collection were compared and collated, as well as conclusions were drawn, and prospects for further research were determined.

## RESULTS AND DISCUSSION

### **Definition and Development of Digital Competence in Ukraine**

Today, the issues of digital transformation of society are urgent in Ukraine, as stated in the Concept of Development of the Digital Economy and Society of Ukraine for 2018-2020 [11]. One of the main goals of the “Digital agenda – 2020” project is defined as “the accessibility of digital technologies; creation of new opportunities for the realisation of human capital, development of innovative, creative and “digital” industries and businesses; development and global leadership in the export of “digital” products and services. The document highlights the main principles by which Ukraine should develop in the digital space and defines the necessary steps to digitalisation in various spheres” [12].

There are many definitions of the concept of “digital competence” today, since its significance changes in accordance with the needs of modern digital society. The concept of “digital competence” includes:

- capabilities and skills of effective use of digital technologies in everyday life;
- capabilities and skills to critically evaluate the information;
- motivation to participate in digital culture and technical skills related to computer literacy;
- dynamic holistic integrative education of the individual, being their multi-level professional and personal characteristic in the field of digital technologies and the experience of their use [4; 5; 7].

In particular, the Digital Competence Framework defines digital competence as “a dynamic combination of knowledge, capabilities, skills, ways of thinking, attitudes and other personal attributes in the field of information and communication and digital technologies, determining an individual’s ability to successfully socialise,

carry out professional and/or further learning activities using such technologies” [13]. The article considers the digital competence of a future teacher as the capability to apply information and communication, and digital technologies in activities, namely in professional ones. Next to digital competence, you can find such synonymous concepts as information and communication, information and digital competence.

Since 2013, the European Commission has introduced a project on the system of general digital competence of citizens, clarifying the concepts of “digital competence”, “digital environment”, “digital content”, “digital tools”, “digital communication”, etc. In 2016, the corresponding document “The Digital Competence Framework 2.0” was published [15]. It defines that digital competence should be interpreted as being sufficiently proficient in using digital tools in all areas of one’s life [16]. Special attention is paid to the digital competence of teachers (*Digital competence framework for teachers* [15]), which is reflected, clarified and expanded in the updated document for 2017 (*European framework for the digital competence of educators* [23]). It defines 6 branches (characterised by different levels) of the digital competence of teachers and students and their 22 components.

In 2020 in Ukraine, according to the updated and expanded “Digital Competence Framework”, a draft Concept for the Development of Digital Competencies in the Ukrainian society was developed, which defines that digital competence should be considered “... confident, critical and creative use of information and communication technology (ICT) tools for work, employment, training, leisure, inclusion and/or participation in society ...” [13]. This project provides for both clarification and expansion of the requirements for the level of digital competence of teachers, which was not defined in the Concept of Teacher Education Development, but it is also stated that the future teacher should master “... pedagogical technologies, including those using elements of information and communication technologies and digital technologies...” [17]. This Concept provides for the development of a comprehensive National Strategy, Action Plan and Digital Competence Framework for Ukrainian citizens [16] to develop digital competence of all citizens, regardless of the professional group. The main tasks and ways of their implementation are outlined, taking into account the real capabilities of the country. It is worth noting that on March 3, 2021, the Cabinet of Ministers of Ukraine endorsed the Concept for the Development of Digital Competencies [14] and approved the action plan for its implementation. The main goal of this Concept is to identify priority areas and main tasks for the development of digital skills and digital competencies, improving the level of digital literacy of the population, in particular able-bodied people, elderly citizens,

low-income families, people with disabilities, and other vulnerable groups of the population, in the context of the development of the digital economy and digital society [14].

### **Solutions to Informatisation of Teachers Training in China**

In China, the country’s educational policy on the development of digital competence is somewhat more progressive than in Ukraine. Back in 2012, a conference on informatisation of education was held, where it was decided to introduce a draft State programme within the framework of the Twelfth five-year plan called *Three links and two platforms* [9; 18], which will contribute to the development of digital competence of Chinese citizens, in particular people working in the education sector. Special emphasis was placed on raising the level of informatisation in rural areas, equalising all provinces in access to digital technologies. Another programme *Three comprehensives, two highs and one large* [9; 18] should fully provide the conditions for the development of digital competence among all participants in the educational process, take care of Internet availability in all educational institutions of the people’s Republic of China [17; 19].

In 2015, the Internet+ Strategy was published on the official website of the Ministry of education of the people’s Republic of China [19], which envisages the creation of an open teacher training environment that would provide “the opportunity to learn everywhere at any time”. Secretary General Xi Jinping stressed that without informatisation, there will be no modernisation. The most important feature of the “educational revolution” is the “double transformation” of learning and teaching methods, and teachers play a key role in this process. Teachers should take into account the peculiarities of the “digital generation” and to meet their needs, master the digital learning environment. The president of Beijing Normal University noted that the scale of education in China is strong, the level of teacher training lags behind the pace of development of the scale of education. Therefore, supporting the “Internet +” Strategy and seeing this as an urgent need for current teacher education, he is ready to introduce an innovative model of teacher training [19].

In China, in April 2018, the regulation of the Ministry of Education “Informatisation of Education 2.0. Action plan” (hereinafter referred to as the regulation) [18] has been promulgated, which was the implementation of the “Internet + Education” national programme [19], “National plan for medium and long-term education” [18], “Education Development Thirteenth Five Year Plan” [18], “Education Informatisation Ten-Year Development Plan” [18] and other documents on informatisation of the educational environment. By 2022, the state plans to fully implement the Provisions [20]. The need for the

modernisation of education, namely its informatisation is emphasised in the document. It is noted that the People's Republic of China, given the resource potential, should hold a leading position in the world in terms of digital competence of teachers and citizens in general, and if necessary, ensure informatisation of education at the international level and help move into its "new era of education". That is, China has started developing a "New Generation Artificial Intelligence Development Plan" [18]. The country has set a course for the implementation of the "Education Modernisation 2035" plan [18].

However, although China is positioned as a progressive, developed country of high technologies, which has quite powerful digital resources, the level of informatisation of teachers and future teachers is not high enough. Therefore, in order to overcome this discrepancy, a multilevel public service of the digital education system is created, an online learning space is planned, monitoring and development of criteria for assessing the digital competence of all participants in the educational process, changes in teacher training and retraining.

### **Formation of Digital Competence of Future Teachers in Ukraine and the People's Republic of China: A Practical Aspect**

Both in Ukraine and in the People's Republic of China, significant adjustments are being made to teachers training programmes. Training of future teachers in institutions of higher pedagogical education in Ukraine on the example of Kharkiv National Pedagogical University involves the development of digital competence of applicants at the first (bachelor's) level of higher education in the field of education 01 Education. Starting from the first year, students study the normative academic discipline "digital training tools" [20], which is a component of the complex academic subject "Pedagogy". During the study of this academic discipline, students develop information and digital competence, increase the competence level in general, which meets the state and European requirements for it competence of specialists in pedagogical specialties. It is important that future teachers are aware of the information pedagogical reality regarding its further use in pedagogical activities and learn to make effective pedagogical decisions by means of information and communication technologies.

60 hours (2 credits) are allocated for studying the module "Digital Training Tools", however, it is worth noting that only 20 of them are classroom-based, and 40 hours are devoted to self-study. The discipline "Digital Training Tools" consists of the following topics: "Information and Digital Competence of the Future Teacher", "Educational Resources for Joint Work on Projects", "Unified Information Educational Environment", "Mobile, Distance

and Blended Learning", "Network Educational Technologies". The course ends with a comprehensive exam [20].

At the second (master's) educational level of higher education, students study the academic discipline "Information and Pedagogical Studios", which contains "Media Education" and "Cybersecurity" modules [21]. The course (2 credits) introduces future teachers to the concepts of "information literacy", "media literacy", "media pedagogy", "media competence" according to UNESCO materials, the classification and function of modern media, types and functions of media and their role in shaping the contemporary worldview of young people. While studying the peculiarities of audiovisual image perception, future teachers learn to critically perceive audio and video materials, create multi-genre audiovisual works, and use media technologies to create educational content. Given that cybersecurity is considered as a component of future teacher's professional competence development, applicants get acquainted with Ukraine cybersecurity laws [24], organisational and methodological principles of implementing a global cybersecurity culture, means of safe work on the internet, communication security, data protection and privacy features in social networks, organisational and methodological principles of a safe environment of an educational institution for the implementation of e-learning and distance learning, the use of open educational resources and massive open online courses. The means of diagnosing educational and cognitive activity is to pass a comprehensive exam in the academic discipline "Information and Pedagogical Studios".

In the People's Republic of China, in teacher training at the first educational level of secondary and high school (humanitarian and creative specialties), starting from the first semester of the first year, the obligatory discipline is "Basics of Computer Use" [22] with 2 credits (32 hours), which ends with an examination; in the first year of the second semester "Using Multimedia Technology" [22] with the same number of hours and form of control. These are two key disciplines that take 64 hours to study in the first year. However, if desired, students can continue studying information technologies at the second (master's) educational level of higher education by choosing appropriate courses (selective disciplines) [25].

It is worth noting that the pandemic has made its own global adjustments to the education system, in particular, China has become the first country to respond to these challenges. The Ministry of education of the people's Republic of China issued an order (02.04.2020) on the proper organisation and management of online learning in colleges and universities during the pandemic period. The document clearly defines the general requirements and various areas of tasks for the organisation

of distance learning [26]. An online platform with links to courses for teachers was immediately set up on the official website of the Ministry of Education of the People's Republic of China, providing knowledge on how to organise the teaching and learning process in such an unusual environment. The main slogan of this stage was "Suspending Classes Without Stopping Learning". For the convenience of users, a table was offered to them, describing the content of the course, indicating the author, purpose of its creation, an active link, current dates of online lectures, etc. [26]. The Ministry of education and science of Ukraine also organised the creation of the website "Teaching and Learning in Quarantine: Changes in the Education System", issued "Recommendations for the Introduction of Blended Learning in Institutions of Professional Pre-higher and Higher education" [27], "Recommendations for Organising Current, Semester Control and Certification of Students Using Distance Technologies" [28], which significantly facilitated the work of teachers in this direction.

## CONCLUSIONS

Based on the above, we can conclude that the issue of forming a high level of digital competence of future teachers is a complex challenge to the modern educational system of Ukraine and China, and the educational policy of both countries is aimed at forming the digital competence of future teachers. However, it is worth noting that it was in China that the process of informatisation began much earlier in comparison not only with Ukraine but also the European Union. It is also imperative

that the Chinese teacher training system had problems in the following aspects: changing the demand for teachers in accordance with the requirements for the quality of education; changing the requirements for the academic qualification of teachers in accordance with the requirements for the academic qualification of education. At the same time, a significant advantage of the Peoples Republic of China within the framework of the issue under study is that the country has taken a clear course for training and retraining of information and digital competence of teachers, which is implemented through the availability of a resource base in the country and appropriate competent specialists. It is also worth noting that having analysed the courses of academic disciplines that are aimed at shaping the digital competence of future teachers in higher education institutions, it could be argued that in Ukraine and China, sufficient attention is paid to the substantive content and the educational process for studying this issue is very well organised. Regarding the organisation of blended learning during the pandemic, both the Ministry of education of the people's Republic of China and the Ministry of education and science of Ukraine provided methodological assistance to teachers of institutions of all levels of education, which facilitated further work. Digital competence training courses, free online courses, webinars, etc. have been created. Thus, realistically speaking, this process is only gaining momentum in Ukraine, while in China it is working at full capacity. The reason for the lag, according to the author, is the imperfect legal and regulatory framework of the country and the lack of appropriate resources.

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