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Digital Competencies of the Teacher of the Future

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Abstract: Digital literacy has now established itself as a mandatory professional competency for teachers. Considering the perspectives of digital skills, we note the contradictions between the basic skills of pedagogical excellence, potentially actualized already in the short-term dimension. The research exploration aims to analyze the status of digital competencies in the general matrix of knowledge, skills, and abilities of teacher of the future. The article aims to position digital skills in three interpretations: as a part of flexible skills, as an element of fundamental skills, and as an independent component of pedagogical professional training. The optimal methodological arsenal to investigate this scientific and pedagogical problem consists of general scientific, pedagogical, and scientific-philosophical methods. The results of the article describe an acceptable balance of competencies of the teacher, which provides a high level of qualification, determining the role and place of digital skills in the system of professional excellence. Prospects for further research are predicting the correlation of theoretical-methodological and practical elements of digital competencies of a pedagogical specialist with segments of heavy and flexible skills of his professional training.

Keywords: digital skills, soft skills, educational strategies, pedagogy of the future, ICT-education, pedagogical competencies.

Introduction

The professional activity of a teacher is based on fundamental competencies developed over a long period of time to establish an educational paradigm. It should be noted that education is usually characterized by conservatism and very rarely resorts to radical transformations of its format and content. Only global processes (e.g., the influence of religion or science) can cause fundamental transformations in education in general and in the professional skills of the teacher in particular. Contemporary socio-cultural realities indicate that ICT constituent has become a factor that leads to a profound transformation of the matrix of teacher competencies. Moreover, in the short and long term, the impact of digitalization on pedagogical activity will only increase. The educational crisis caused by the pandemic constraints and the needless need to organize e-digital learning has become a kind of start for the final approval of digital skills as mandatory for pedagogical professionals. For the process of integrating ICT elements into the educational paradigm to be effective, educational strategies should be developed that will not only declare the importance of digitalization of education, but also form teaching-methodological, subject-practical, and organizational-logical settings to provide digital competencies for a teacher.

Research Problem

Paradoxically, the key problematic issue of the scientific and pedagogical discourse concerning the digital competencies of the teacher of the future is not the analysis of these skills directly. Let us note that in today's world, given the rapid renewal of existing technologies, it is quite difficult to predict the specific manifestations of the ICT segment, which will be actively implemented in education. Even in official educational strategies, we observe abstract statements about the informatization and technologization of education. However, these are rather declarative program elements, which state the irreversibility of innovative transformation of the ICT character in education and the importance of the digital segment in the educational sphere. At the same time, we do not observe any concretization of the use of digital competencies in a teacher's theoretical training or practical activities. Such an approach generates a certain uncertainty in positioning the status of digital competencies in the general system of future teachers' professionalism.

Research Focus

Focusing on the problem of ICT-cluster in the paradigm of pedagogical excellence of a teacher should be reoriented from the strategic dimensions, which focus attention on the importance of digital competencies (scientific and pedagogical community at the worldview-mental level has already realized the lack of alternative processes of informatization and technologicalization of education, especially after the crisis) to the practical manifestation of electronic and digital potential in educational activities.

Research Aim and Research Questions

The purpose of our research is to identify the key characteristics of digital competencies in the overall paradigm of the future teacher's professional mastery. The key question of scientific exploration is to predict two strategic components of a teacher's digital literacy in prospective educational strategies:

- content of digital competencies (modeling the skill level of the teacher of the future with an awareness of the importance of having the proper level of digital literacy)

- the format of using digital competencies (specifying the format of practical use of digital skills in the learning process, the organization of the educational process, or in the context of the formation of individual professional skills of the teacher).

Research Methodology

General Background

Scientific and pedagogical research methods of digitalization processes should include a wide range of theoretical and methodological aspects. The general scientific methodology should take into account the balance between methods exploring the current state of the digital educational system and digital pedagogical competencies and methods of predictive nature (forecasting, modeling, planning), which determine the potential and prospects of digitalization in the activities of a teacher in the future. Through the analysis (systemic, comparative, comprehensive) the paradigm of digital competencies and its relationship with other educational skills of the teacher is formed. Due to the focus of the study on the future prospects of educational development, it is important to carry out a comparative analysis of educational potential with and without ICTs. A separate methodological niche in the study of future prospects of pedagogical digital competencies is occupied by scientific-philosophical principles of synergetics.

The study of the digital competencies of a teacher requires the involvement of innovative scientific-methodological and technological methods and practices, through which the content and form of ICT-education are analyzed. Designs for Learning (DFL) is a relevant methodological approach to defining the digital professional competencies of a teacher, which will be in demand in the future. This is a relatively new research methodology that focuses on practical formulations of needs and desires for pedagogical activity (Åkerfeldt & Åberg, 2021).

One of the methodological techniques used to predict the development of digital competencies of the teacher was a bibliometric analysis of the achievements of the scientific and pedagogical discourse (over a ten-year period: 1996-2016) to identify general and specific trends of multimedia learning research (Li et al., 2019).

Sample / Participants / Group

The participants of the study are a complex image of a teacher of the future, guided in professional activities not only by fundamental educational skills but also successfully applying an element of flexible skills - digital competencies. Moreover, the evolution of such an image of a teacher in the future indicates the potential transformation of the role of digital skills in the general educational system and their acquiring the status of a fundamental component. Artificial intelligence, virtual reality - segments that become alternatives to the teacher, which requires the additional definition of their status in the educational environment.

The indicator of the reaction of participants in the educational process to the introduction of innovative digital formats is an important source of openness and informativeness of the research participants themselves (Dibek, 2021). Therefore, the results of modern scientific and pedagogical research on ICT's impact on the educational environment become the basis for modeling the image of the teacher of the future.

Future digital innovation projects will be radically transformational. In particular, the Teacher Education goes Digital (TEgoDi) project initiates digital transformation processes for all higher education (Müller et al., 2021). If the concept of a digital university in the full sense of the term is not yet a perfect manifestation, we may have the first full-fledged digital educational institutions in the near future. In such an environment, digital competencies will not be one of the mandatory elements of an educator's professional suitability, but the dominant indicator of the level of his or her teaching qualifications.

Research Results

A relevant algorithm for applying digital competencies is to realize the effective combination of pedagogical and technological knowledge (Falloon, 2020). This approach contributes to the full realization of the potential of digital resources in the pedagogical process. The results of the educational space that we get so far demonstrate the successful integration of ICT into educational systems. This promotes digital inclusion in educational programs (short-term instructional level) and educational strategies (long-term global, national, or local strategic level).

The current state of ICT in the educational industry is characterized by the analysis of qualitative rather than quantitative indicators. The problem of educational quality has become a litmus test for determining the role of information and communication technologies in today's educational environment (Fernández-Batanero et al., 2020). Expanding the problem of ICT use in the educational space, we identify several segments where the influence of digital format is increasing rapidly (see Table 1).

Table. 1

Distribution of ICT elements in segments of educational activities

An organizational and logistical cluster of the educational process	• Socio-cultural realities determine the change in the format of the educational process organization at the global level from face-to-face to distance learning, which is increasingly realized in the electronic-digital space. • Digitalization significantly changes the traditional logistical links inherent in the educational system (channels of distribution and translation of educational content, methods of communication between the participants of the educational process).
Educational and methodological support of the educational space	• Educational and methodological support is not focused on classical sources but is more often based on innovative digital pedagogical methods. • The teaching and learning arsenal is being transformed from a stable format into flexible digital models characterized by greater openness, accessibility, mobility, and inclusiveness

Individual level of digital literacy of a teacher	• Innovative elements of the digitalization of education introduce alternative dimensions for the teacher's personality (artificial intelligence and virtual reality are increasingly in need of positioning in the learning environment). • Digitalization opens new perspectives for such concepts of pedagogical activity as personal development, self-organizational manifestations, qualitative professional characteristics).
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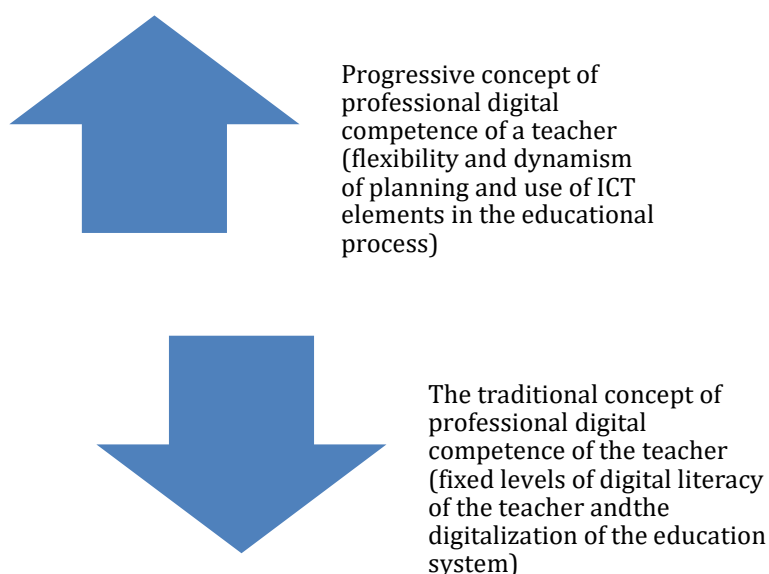
Source: authors' own development

Modern scientific and pedagogical research projects synergetic connections arising from the implementation of digital potential in the educational environment. An important aspect is the correlation of the level of digital literacy and activity between the participants in the educational process. In particular, educators are encouraged to determine the level of digital skills of students who will be offered a separate learning cluster (Lisbeth et al., 2018). The teaching and learning support of the course should focus on the ability of education applicants to perceive all its elements to the full. Practical professional activity automatically becomes effective training for the educator, because in working with education applicants, digital skills of using technology or using communication are improved in real-time (Duță & Cano, 2020).

Professional digital competence in the future is not a statement of digital literacy of the educator, but the ability to manage the individual digital capacity and digitalization capabilities of the educational system. Pragmatic approaches, which are fundamental in the modern sociocultural world, dictate such a model of implementation of digital competencies of a teacher in the future (see Fig. 1).

Figure 1

Models of digital competencies of a teacher in the education system



Source: author own development

The question of teacher training in the context of digital literacy remains open. It is obvious that consideration of the digital competencies of a future teacher, in general, is possible only in the context of professional training of this segment of pedagogical skills. Let us note that we are talking about pedagogical competencies, namely professional mastery of ICT resources of pedagogical direction. No matter how good one's ICT skills may be, their implementation as pedagogical competences is a rather complicated process which requires holistic pedagogical training. The processes of digitalization in the educational process are accompanied by the support of teaching-methodological and didactic clusters. Consequently, there are several variations on the algorithm of teachers' acquisition of appropriate digital competencies: inclusion of digital literacy in the curricula of teachers' training; courses to improve (or acquire) digital qualifications for current teachers; trainings and practices designed to provide digital competence updates actually online.

Note the methodological guidelines for organizing training and digital competency programs. According to experts, such training should be conducted in such a way as to include knowledge and practice regarding professional interaction, digital resources, teaching and learning, assessment, and student empowerment. Digital competency trainings should be effectively implemented in which teachers in the initial stages of mastering pedagogical digital literacy collaborate on digital educational issues regardless of their previous experience. In addition, training courses should structure their courses so that elementary-stage teachers can see them as role models (Reisoğlu & Çebi, 2020). A three-step algorithm for acquiring digital competencies is proposed:

- fundamental digital competence;
- specialized digital teaching competence;
- innovative professional digital competence (Starkey, 2020).

It should be noted the need to respect the principle of continuity in the assimilation of digital competencies. It is reasonable to compare this process with the mechanisms of updating the ICT elements themselves, which are expressed in the updating of software, creating new technologies.

One of the characteristics of the digitalization of the educational space is the socio-cultural coherence of this process (Supriyanto et al., 2019). ICTs are elements that permeate with their influence in all spheres of social activity. This leads to the demand for the formation of digital competencies not in the limited educational space, but also other spheres of activity. There is a synergetic effect of interaction between digital education (general and everyday-practical with professional-pedagogical). That is, a pedagogical specialist in the future can learn some elements of digital literacy based on previous experience received not in the educational space and adapt them to the requirements of pedagogical activity.

The main elements of the future teacher's digital competencies are closely connected with his/her individual qualities. Aspects that are considered important for the formation of a high level of digital skills are considered the following factors:

- resistance to digital distractions is a relevant point, analyzing digital information and communication factors, potentially redirecting the teacher's attention from the profile issues. Modern information and digital space is quite dynamic and saturated, which does not allow limiting the influence of information or methodology of other nature on specialized teaching and learning content.

- self-organization of professional qualities in the digital space. Synergetic models of modern scientific and worldview paradigm presuppose continuity of education. This means that a teacher, due to the actualization of self-organization principles (self-education, self-control, self-development) will constantly improve his/her level of digital competencies.

- the motivational aspect points to the awareness of the global role of the information and digital space and the understanding of the critical necessity of its application in the educational process. A competitive pragmatic educational environment dictates its own rules, which imply not just digital literacy, but pedagogical competencies (Ove et al., 2021).

The professional digital competencies of the educator include many aspects, one of which is the observance of ethical, legal, and safety elements (Usart Rodríguez et al., 2021). The threats associated with the use of digital in education will only increase in the future. This is due to the growth of quantitative characteristics of ICT elements in the educational process. Under such conditions, instructions should be implemented that will regulate the use of digital format, preventing potential risks. In the digital competencies of the educator, the cluster of safety and ethical issues should be actualized along with technological or information skills.

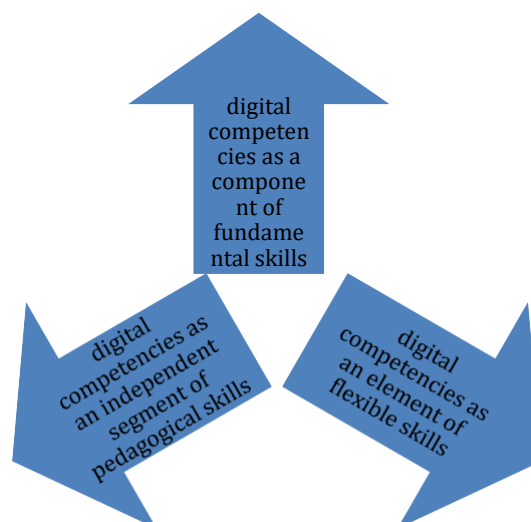
The notion of “cultural intelligence” Gokalp (2021) is introduced into the professional competence segment of the future educator. It is a kind of code of different socio-cultural attitudes which ensure compliance with the principles of humanization of the educational process under the aggressive influence of the ICT environment. Here it is important to reconcile pragmatic principles of digital competencies and flexible skills, which are responsible for ethical and humanistic principles in education.

Institutions must formulate a well-designed plan, driven by calibrated data, to get the long-term value of their learning analytics (LA) strategy. By tracking the digital footprints of educators and learners, institutions can identify relevant learning trends with predictive models to improve instructional delivery and build high levels of teacher proficiency (Mathrani et al., 2021).

Discussion

In our discussion of the problem of positioning the digital competencies of the teacher of the future, let us consider three options for the ratio of basic professional skills in the system of educational environment (see Fig. 2).

Fig. 2. Prospects for the status of digital competencies in the system of professional-pedagogical excellence.



Source: author own development.

The process of reorientation of the teacher's digital competencies in the modern educational system from the components of fundamental and flexible skills to an independent element in the structure of skills has begun. Digital competencies as an autonomous set of skills are seen as the most likely option for their positioning in the educational space. The prospect of digital skills becoming a separate cluster may in the future evolve into a process of defining digital competencies as fundamental factors of the education system.

ICT progress has led not only to the need to form digital competencies of participants in the educational process but also created the prerequisites for the emergence of new learning environments, the basis of which are technological resources (López-Belmonte et al., 2019). Distance learning systems, inversive learning formats, organizational-accounting electronic structures in education are by no means a complete list of innovative learning environments that are becoming an alternative to the classical representation of the functioning of an educational institution. Such environments have the ability to generate large amounts of data (Big Data) and offer a full-fledged analysis of the obtained educational results obtained during the educational process.

Such realities already cause certain contradictions between the traditional system of education, where the teacher is a key figure in creating and transmitting educational content, and innovative technologies, which are gradually taking these functions away from the teacher. If in the modern education system this contradiction has not yet reached a critical state of confrontation, then in the future, in which even more rapid growth of ICT elements is predicted, the formation of essential educational contradictions at the level: of live learning - online learning is possible.

Under such conditions, digital competencies become a kind of “bridge of understanding” between the traditional authority of the teacher and innovative technological learning environments. There is a process of reorientation of the educator's role in terms of didactic leadership into a translational coordinating dimension of professional activity.

The digital revolution in general has changed the worldview paradigm of scientific and pedagogical discourse. Three attitudinal options for the educator of the future are offered for the educator of the future:

- observation format, according to which the teacher meets all the requirements for an individual level of digital literacy, does not take the initiative to create their own digital learning content;
- the format of caution, according to which the teacher is critical of innovative transformations in education, guided in his professional activity by traditional pedagogical methods, using digital format only if there is no alternative to its use;
- integrity format, according to which the teacher actively integrates digital competencies into the educational process, trying to bring their own assets into the teaching and learning content (Tsybulsky & Levin, 2019);
- creativity format, according to which the teacher produces innovative digital elements not only using the existing assets but also creating a new format of digital learning environment, bringing into it innovative meanings of actualization of digitalization.

Conclusions and Implications

Thus, in the modern scientific and pedagogical discourse digital skills are positioned in two interpretations: as a part of flexible skills and as an element of fundamental skills. When considering the prospects of digital competencies, we emphasize the third interpretation - the potential ability of digital literacy to acquire the status of an independent component of pedagogical professional training.

Organizational, pedagogical, and didactic segments of a teacher's activity require active practical use of ICT resources, which leads to the need to acquire appropriate digital competencies. The scientific-pedagogical community should develop potential scenarios for the integration of the electronic-digital segment into the general paradigm of the educational space.

Digital competencies will be realized in the future in two essential educational dimensions:

- content of digital skills (actualization of digital competencies in curricula, working curricula, and educational strategies);
- the format of digital skills (digitalization of the learning process, organizational educational activities, individual practical educational activities of the teacher).

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