Problems and Perspectives of Pedagogical Research in the Context of Digitalization

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Abstract

Digitalization has a significant impact on the pedagogical field, defining its theoretical-methodological and practice-oriented components. The purpose of scientific exploration is to highlight the problems of pedagogical research that they face in the context of digitalization. Information and communication technologies have become the main object of pedagogical research. This has led to a reorientation from subject to object in the pedagogical field. In addition, the technological-digital space is gradually conquering the methodological arsenal of the pedagogical cluster. The classical methods of pedagogical research are actively supplemented by innovative information and digital methods, which demonstrate their effectiveness and relevance. The article aims to analyze the interaction of classical and innovative pedagogical research clusters in the theoretical and practical dimensions of the educational system. Ukrainian educational institutions became a platform for scientific research. A promising direction of research is the development of a unified model of pedagogical research that meets the realities of the modern educational space. So, the era of digitalization has transformed the format in pedagogical research and introduced new aspects to their purpose.

Keywords:
digitalization of education, pedagogical research, pedagogical research methods, educational ICT, digital educational space, digital-skills.

1. Introduction

Modern socio-cultural space is characterized by dynamism, which leads to changes and transformations in the educational environment. Currently, the dominant factor in the development of all spheres of social activity is considered technology, information, communication, and digitalization. In this context, education has already formed long-term strategies associated specifically with ICTs and the digital world. Pedagogical research of a strategic nature is also formed in accordance with the conditions of functioning of the educational system in the information and digital environment.

The information and digital format, in addition, has one fundamental practical feature, which is the rapidity of the processes taking place in it. The pedagogical sphere is not an exception in this respect either. Consequently, we have recently seen a shift in the focus of pedagogical research from strategic to practice-oriented.

Pedagogical research is an important link in the education system. A key feature of their planning and implementation is continuity and the need for continuous improvement. The conservatism of education is a thing of the past, as digitalization requires constant updating of the teaching and learning arsenal (similar to the updating of technology or software).

One of the areas of pedagogical research is the manifestation of the features of the educational process in the transition from the real to the virtual-digital dimension. Sociocultural realities have led to radical changes in the education system. Society at a certain stage of its development has stated the oversaturation of technology. Information and communication from an auxiliary element of the educational process became the main one. The COVID-19 pandemic period was a stage of confirmation of the digital space in the educational process. At the same time, it became a stimulus for practical pedagogical-research activity. In addition, digitalization revealed quite a few problems related to the implementation of pedagogical research.

In the online environment, traditional pedagogical methodology proved to be incompetent because it was largely content-oriented rather than form-oriented. Concentration on the content aspects manifested itself in the professional training of pedagogical staff. Digitalization reoriented the educational process into a format, which led

to a revision of methodological guidelines for the organization of the educational process.

The need to revise the organization of the educational process in the new digital realities has become evident. Categories and concepts of traditional pedagogy proved to be ineffective in complex socio-cultural conditions. Consequently, the conceptual provisions of digital pedagogy, or more precisely, digital didactics, are now being formed [1]. Pedagogical research is intended to become tools that will ensure the further development of education in general.

2. Methods

Scientific and pedagogical methods were used in scientific exploration. The analysis was used to highlight the peculiarities of pedagogical research methodology in the information and digital space. Thanks to the comparative analysis we can compare the effectiveness of classical and innovative teaching-methodological arsenal. System analysis allows us to investigate the strategic component of fundamental pedagogical research. Forecasting and modeling methods provide a characterization of the prospects of pedagogical research in the information and digital space.

The scientific-philosophical dialectical and synergetic methodology allows to comprehend not only the format but also the target component of pedagogical research in new conditions. The information-digital space becomes the environment in which those or other methodological developments manifest their effectiveness. Identification of optimal pedagogical strategies and practices by the synergetic orientation of the modern educational system.

3. Results

The information-educational space is actively asserting itself in the educational environment. The digitalization of pedagogical research covers all levels of education:

- preschool educational cluster;
- general school system;
- vocational education;
- higher education;
- postgraduate education.

The authors of the scientific reconnaissance focused on the peculiarities of pedagogical research in the clusters of preschool and primary education and the humanities and sciences discourse of higher education.

The study reveals trends towards a significant increase in the processes of digitalization in scientific and pedagogical activities. Pedagogical research used to organize the educational process is no longer focused solely on human dimensionality. There is a reorientation towards information and communication resources and technological-digital tools that shape teaching and learning

potential. Information replaces experience, technology replaces skill - these are the realities of digitalization of the educational space.

Note that the percentage of information and digital cluster in pedagogical research conducted at different educational levels is equally high, which indicates the global nature of the process of digitalization of education. ICT-based pedagogical innovations are successfully implemented and, most importantly, demonstrate effectiveness in both preschool and higher education. Consequently, we can assert the demand for information and digital capacity among all stakeholders of the educational space, regardless of the age of education applicants or the status of teachers.

Transformation of pedagogical research methodology focuses on the reorientation of the relationship of all subjects of the educational process. This is associated with the introduction of distance learning, virtualization of the educational system, and a significant increase in the level of informatization of the educational process.

The results of a comparative analysis of the effectiveness of basic pedagogical research (pedagogical observation, analysis, and experiment) conducted in the traditional classical educational space and the innovative digital environment indicate the following points:

- first, conducting pedagogical research has changed the goal dimension, reorienting the goal of activity from human measurability to proceduralism (with respect for humanistic ideals);
- second, the implementation of pedagogical research is no longer separated from the overall educational process, but is integrated into it, since educational ICT cannot function separately from general educational principles;
- thirdly, the results obtained from the pedagogical research conducted become not a constant that has become, but an expedient variable that varies improves, and develops.

Digitalization acts as a certain catalyst, revealing the weaknesses of the educational system, which should be strengthened by the methodological potential of pedagogical research. This feature has especially shown its relevance in the period of pandemic restrictions faced by the educational sphere. With the help of ICTs, substantial amounts of information (statistical data, results of pedagogical research, worldview beliefs) were quickly processed and quickly transmitted in society. This gave rise to a certain dependence of society on information, which took a dominant role in the worldview system, displacing ideological, cultural, and even professional contexts.

Digitalization has become a powerful unifying factor for the participants of the educational system. Technological devices and electronic digital space have greatly expanded the communication component of

pedagogical realities. The new socially interactive environment needs an appropriate organization of the educational process [2]. Consequently, pedagogical research is directed to the manifestation of effective formats of cooperation and interaction between applicants for education, teachers, administrators of educational institutions, and future employers. Information dissemination, data exchange, control, and regulation of learning content - all this becomes possible and available with the use of digital tools.

The key parameter of the new educational realities is the personalization of the subject of the educational system with the opportunity to develop his personal preferences and abilities. Consequently, pedagogical research related to synergetic models, self-organization, and interdisciplinarity is actualized. "Techno-pedagogical abilities are a way and value of education available to everyone" [3].

The availability of digital technologies and information and communication means in the arsenal of the modern teacher allows maximum activation of the personal approach in pedagogical activity [4]. If the activity and system approach is more focused on the traditional educational model, the personal approach is approved in the context of the development of information and digital technologies. Due to the digital space and diversity of communication channels, pedagogical potential has an opportunity to be realized in a human-centered way. It means that a teacher has all the possibilities to organize an educational process, guided by the personal characteristics of an individual applicant for education. Note that modern information and digital technologies make it possible to identify individual qualities with great accuracy by conducting simple and convenient research using an online format.

Thus formed the principles of pedagogical research, relying on ICT, conduct an in-depth analysis of the subject of the educational space. Note that here is formed an obvious contradiction associated with the fact that on the one hand - the teacher or student becomes the main object of pedagogical research, on the other - the basis of the research is the information and digital aspect.

Digitalization in the modern world has become synonymous with progressiveness[5]. The use of ICT in the educational process significantly increases the indicators of pedagogical excellence. As a result, the quality of education - the fundamental axiological dimension of this sphere - has increased. Modern progressive pedagogical excellence is formed of several key components:

- creativity;
- competence;
- humanism;
- digitalization.

As we can see, the digital aspect is highlighted as a separate component of pedagogical excellence, which indicates the fundamentality of this trend in the formation of future educational strategies. At the same time, the remaining indicators are difficult to provide in the modern sociocultural space without the information and digital component.

The creative element is an important part of pedagogical activity and depends on the individual qualities of the teacher and the student. The especially relevant creative component appears in preschool and primary education. Play, improvisation - this was characteristic of the manifestation of talent or creativity. However, digitalization has greatly increased the possibilities for the creative dimension in education.

Digitalization is positioned as a process passing through certain stages and formed at appropriate organizational levels [6]. Pedagogical research aimed at the study of ICT in education focuses mainly on organizational aspects, as digitalization acts mainly as a tool. In this case, the issue of highlighting the planning, documentation of the course, and registration of the results of pedagogical research is actualized. The information and digital space has provided a qualitatively new practice of describing the stages of pedagogical research.

In the course of pedagogical research, a variety of processes characterizing the educational process take place. The subject, object, and object of pedagogical research in the information and digital environment lose permanence. Information, communication, and digitalization provide dynamism of key elements of educational and pedagogical space: goals, hypotheses, and objectives. The digital world allows significant amounts of data to be developed quickly and accurately. Elements of artificial intelligence can issue optimal options for the development of events. Consequently, pedagogical research does not depend solely on the researcher. In this way the multidimensionality of research is ensured when a result provoked by a human factor or technical error is made wrong.

Pedagogical research results have also undergone significant transformations in the context of digitalization. For the result, the key parameter is the format of its ordering. Information and communication technologies allow the formation, broadcasting, dissemination, and interpretation of pedagogical research results

The predictive variations of pedagogical research in the context of digitalization are no longer exclusively concerned with long-term educational strategies. Information and digital technologies allow for short-term simulations or projections of pedagogical practices. Pedagogical activities that are planned in the educational environment are analyzed in potentially possible scenarios. Thanks to digitalization, researchers have opportunities to calculate possible problems and avoid them in the planning process.

Computer programs, artificial intelligence, computing technologies - this provides pedagogical

research at the empirical, functional, hypothetical, theoretical, experimental, and predictive stages.

Another important aspect of pedagogical research in the conditions of information and digital development is interdisciplinary integration. The interaction of didactic and technological components is a promising direction in education [7].

ICT competence of a teacher is a prerequisite for his/her professionalism. ICT education becomes an important element of training a future specialist in any field of science. ICT organization is decisive for the administrative link of educational institutions. As can be seen, none of the clusters of the educational system can provide the necessary level of provision or receipt of educational services without information and digital support.

During the research of pedagogical activity, we see the active use of digitalization already in preschool education. Game models, actively used as methods of the educational process, are increasingly based on digital and electronic platforms. Pedagogical studies of education at the preschool or school level indicate a noticeable increase in the role of ICTs. This is facilitated not only by the professional dimension but also by socio-cultural realities that significantly increase the proportion of children using digital and electronic technologies in everyday life. Consequently, the information and digital space is becoming a familiar environment for children. Education cannot ignore such trends, increasingly involving ICTs in the pedagogical process.

In the modern dimension of pedagogical research, the Ed-Tech format[8] is increasingly asserted. Educational technology projects explore the role and place of ICTs and digital formats in pedagogy.

"Augmented reality (AR) is gaining popularity in educational processes because of its recognized effectiveness for teaching and learning. Pedagogical approaches indicate that the success of the application depends not only on the technical characteristics of AR technology but also on the pedagogical strategies for their implementation. A study of this pedagogical phenomenon has revealed the effectiveness of moderating variables on student learning outcomes with AR interventions" [9].

The increasing popularity of virtual reality (VR) has sparked the interest of scientists and educators to explore its potential as a learning environment for different areas of education. Now pedagogical research on VR has moved from a general educational dimension to specific moments of pedagogical activity [10].

The new technological-digital realities of modern education clearly interpret the essence of the digital-skills characteristic of pedagogical research subjects (co-researchers and educators). "Pedagogical digital competence (PDC) means the ability to consistently use their views, knowledge, and skills, to plan and conduct, as well as evaluate and revise on an ongoing basis the teaching supported by ICT. PDC, based on theoretical and methodological programs, current practical pedagogical research, and proven experience and proven functionality, aims to improve the quality of education" [11].

One of the aspects that are actualized in the context of pedagogical research is the issue of social pedagogy [12]. Undoubtedly, digitalization is an important socio-cultural phenomenon of modern society. Therefore, pedagogical research is not limited to professional-educational elements, but also expands on the issues of global strategies for the development of pedagogical art.

Those trends that determine the development of modern civilization point to the promising use of information and the digital environment. Consequently, the current trend of pedagogical research is to study the impact of ICTs on the organization of the learning process.

Let us distinguish two promising areas of pedagogical research in the context of the digitalization of society (see Fig. 1).
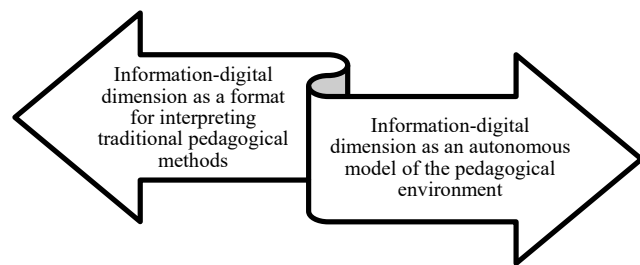
Fig. 1. Prospective pedagogical research

Source: Own development by the authors

Recent pedagogical research has revealed problematic issues related to the use of ICTs in education. In particular, we are talking about the imperfection (and sometimes absence) of actual teacher training programs on the use of information and digital resources in pedagogical activities [13]. On the other hand, education applicants should be provided with separate guidelines or instructions that will help to align the available technological and digital capabilities with the target components of education.

This article examines the methodological transformations of pedagogical research in the context of the digitalization of education. The classical pedagogical methodology has been modernized by digital and information updates. The traditional methodological elements were supplemented by new ones, focused on digitalization and informatization of education.

4. Discussion

The key practical parameters of the educational space are the skills and abilities acquired by applicants for education or used by teachers and administrators of educational institutions. Classical education has long been based on hard-skills - fundamental knowledge acquired, provided, or transmitted in an educational environment. Modern socio-cultural space with its dynamics and unpredictability has actualized a new dimension of practice-oriented skills - soft-skills. Accordingly, pedagogical research was aimed at studying and analyzing the flexibility and relevance of educational components. At the same time, a problem of inconsistency arose, when the methodology of classical pedagogical research could not reveal the essence and features of the new realities of the educational space.

This is how the role of information and communication technologies, which have moved from an auxiliary or alternative cluster to the cohort of fundamental elements of the educational system, was actualized. With the help of information and digital potential, the traditional pedagogical methodology has acquired new capabilities. Accustomed pedagogical analytical or experimental activities demonstrated higher productivity and performance using digital algorithms or information technology.

The second point of actualization of the information and digital cluster in the educational system should be considered the allocation of digital-skills as a separate independent element of realization of knowledge, skills, and abilities by all subjects of the educational process. With the allocation of digital skills into a separate cluster, the process of organizing new pedagogical research focused on the study of the positioning of information and digital space in the educational environment began.

The processes of digitalization fully embrace the modern educational system. The pace of digitalization is staggeringly dynamic and needs a response from the educational sphere. At present, there is an urgent need for methodological justification of the new digital realities of education. One of the areas of pedagogical research is the study of the structure of the digitalization of the educational system. Learning design theory helps to implement such research [14]. The importance of structured information and digital space is obvious.

The information and digital world has caused a certain reorientation of pedagogical research to consider the design aspects of the pedagogical process [15]. The issue of pedagogical content format has become urgent because the information and digital space implies a psychological and pedagogical focus on the advantage of form over content. A bright picture becomes the leitmotif of the digital environment in all areas of its active implementation. The educational cluster is no exception in these processes.

The global task of pedagogical methodology development is to harmonize practical research with theoretical justification. The basis of this coordination should be the supremacy of the creative component, ensuring the freedom of the researcher and the adaptation of research to the current scientific picture of the world [16].

The growth of pedagogical research has not solved the problem of educational quality [17]. The reason for this is the uncertain nature of excellence and heterogeneity of criteria for assessing the state of education. These points appear at the state, cultural, and professional levels. In this context, the information-digital factor can fulfill the mission of unifying the tools and the target component of pedagogical research.

There are several models of pedagogical research conducted digitally:
- general;
- independent;
- social [18].

The type of model used has basic characteristics and in different contexts affects the educational process.

5. Conclusion

Pedagogical research is a systemic element of the education system. The results of scientific research point to the revitalization of the dynamics of pedagogical activity of primary and secondary schools (preschool and school system) and higher schools (vocational and higher education) under the conditions of digitalization of education. Information and digital space effectively transforms the existing traditional methodologies of pedagogical research, expanding their capabilities. Technological innovations, information and communication support, and digital space expand pedagogical potential, namely:
- significantly increase the amount of information that becomes available and relevant in pedagogical research;
- significantly improve the communicative capacity, which is an important factor in the translation of new pedagogical ideas and principles;
- successfully ensure the mobility and dynamism of pedagogical activity, contributing to the maintenance of educational development.

Pedagogical research carried out in the context of digitalization disrupts the fundamental problems in education, which leads to difficulties in their implementation. However, we note that only powerful information and digital support will identify the problems of modern pedagogy and contribute to their solution. Consequently, the prospects for further pedagogical research are closely intertwined with the innovativeness provided by the information-digital component.

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