DOI: https://doi.org/10.46502/issn.1856-7576/2022.16.02.11

The innovative way of development of pedagogical sciences: a modern look at the study of current problems

La forma innovadora de desarrollar las ciencias pedagógicas: una perspectiva contemporánea sobre el estudio de temas actuales

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Recibido: 20/05/22
Aceptado: 22/06/22

Abstract

The article aims to identify the main innovative changes taking place in modern pedagogical sciences. The methods used to obtain the expected results: analysis of scientific sources, comparative analysis of the processed literature and its generalization, description of factual information, the method of synergy, and identification of the highest priority further innovative ways of transformation of the complex pedagogical sciences in modern conditions. As a result, the vectors of development of individual pedagogical sciences are outlined and the pedagogical conditions necessary for innovative approaches are indicated.

Keywords: Pedagogical sciences, innovations, methods of teaching and education, humanistic orientation, pedagogical technologies.

Resumen

El objetivo del artículo es identificar los principales cambios innovadores que se están produciendo en las ciencias pedagógicas modernas. Los métodos utilizados para obtener los resultados esperados: el análisis de las fuentes científicas, el análisis comparativo de la literatura procesada y su generalización, la descripción de la información fáctica, el método de la sinergia, y la identificación de las formas más prioritarias e innovadoras de transformación de las complejas ciencias pedagógicas en las condiciones modernas. Como resultado, se esbozan los vectores de desarrollo de las ciencias pedagógicas individuales y se indican las condiciones pedagógicas necesarias para los enfoques innovadores.

Palabras clave: Ciencias pedagógicas, innovaciones, métodos de enseñanza y educación, orientación humanista, tecnologías pedagógicas.

1. Introduction

Under the conditions of informatization, globalization, and synergy of education, science, and production, the problems of educational philosophy in the context of modern challenges of civilization have an impact on the person and education. Humanistic orientation of the complex of all educational sciences from human-centered, person-centered learning, continuous education to the development of adult education (andragogy) becomes important for the innovative development of pedagogical science. Considering these problems, we consider it relevant to specify some vectors of innovative development of pedagogical science, to analyze current trends of functioning and development of the complex of pedagogical sciences, as well as to offer our own definition of priority directions of further development of the philosophy of pedagogical science and pedagogical thought. This problem is actualized because of the challenges currently facing the world. COVID-19 pandemic opened the problem of introducing distance education, development of new methods of teaching, which require additional thinking. As a result of scientific search, and analysis of numerous studies of the development of

different areas of pedagogical science, it is possible to solve a number of problems: creating the right conditions for the formation of an innovative personality with innovative thinking and the ability to innovative activities in the modern knowledge society with numerous information flows; preparing people for life in a global space; development of dicentric pedagogy, based on mutual respect between all participants of the educational and pedagogical process. The study of the innovative way of development of pedagogical science contributes to the level of pedagogical and psychological culture of society. The innovative context of research and analysis in the conditions of globalization and development of civilization creates the prerequisites for the integration of Ukrainian pedagogical science into the European system. The aim of the article is to analyze modern views on the research of actual problems of an innovative way of pedagogical science development.

2. Theoretical Framework or Literature Review

The theoretical part of the study is built on a thorough review of modern pedagogical literature and on the principles of summarizing the previous experience of researchers. In particular, Rajab (2018) investigated the effectiveness of education using modern online technologies. At the same time, this specialist also compared the characteristics of online learning with its traditional forms. His research was influential in identifying the potential benefits of distance learning in crisis situations. Rajab (2018) summarized that there is not much practical difference between distance or traditional learning. Consequently, online technology can be used to provide training in crisis areas, particularly in those areas that have been affected by war. Cherng & Davis, 2019 characterized major innovations in the education system. The researchers focused on analyzing multiculturalism in contemporary pedagogy. Campani et al, 2019 described innovative innovations in higher education. Dominick et al, 2020, explored key challenges in contemporary education. The researcher paid special attention to the analysis of innovations in the educational environment. Capellini et al, 2020, analyzed the features of the use of cooperative learning in modern education. The researchers note that cooperative pedagogy provides socialization, the formation of knowledge and skills necessary in life, outside of educational institutions. At the same time, Cardoso et al, 2021 characterized the phenomenon of lifelong learning, as a set of public or private educational activities that guarantee the provision of human aspirations for lifelong learning. Franco et al, 2019 characterized the features of multicultural education, and explored the importance of inclusion in the modern education system.

Ukrainian researchers have partially joined the study of this problem. In particular, Demyanenko, 2021 characterized the peculiarities of the development of the modern educational process in Ukraine. Chasnikova et al, 2021 described the key innovations in modern education based on the analysis of the programs of the New Ukrainian School. So, the literature base of the study is quite thorough. As can be seen from the analysis of the literature, modern specialists have thoroughly focused on specific manifestations of innovative educational activity. Currently, scientific professional literature lacks

comprehensive visions of the possibilities of combining different types of pedagogical innovations. In addition, the above-mentioned scientists almost did not focus on the negative manifestations of the introduction of modern innovative teaching methods. Also, modern scientific studios do not comprehensively study the priority innovative methods of transformation of the complex of pedagogical sciences. Consequently, a comprehensive substantiation of the features of the implementation of innovative approaches is the purpose of our study.

3. Methodology

This study is built on the use of general scientific and special pedagogical research methods. Among the general-scientific methods, the following logical research methods should be mentioned: analysis, synthesis, induction, deduction. With the help of the concretization method, it was possible to approach thoroughly to the study of STEM-education system (Science technology engineering mathematics), covering natural sciences, technology, engineering (technical creativity), and mathematics. This direction of education, in general, deepens the connection between the natural sciences and innovative technologies. Consequently, a prominent part of this study is devoted to the analysis of this technology. The article also uses the method of abstraction. It is used in moving from abstract concepts (theoretical study of modern innovative approaches) to concrete conclusions (recommendations for further implementation of innovative teaching system). Certain attention is focused on empirical pedagogical methods of information interpretation. The problem of further implementation of innovative technologies and their perspective is reflected on the basis of the prognostic method.

Strengthen the literature review on the research topic and take stock of what was obtained when consulting the research

4. Results and Discussion

Pedagogical technologies and innovations

The description of the theory of historical-critical pedagogy is based on three main aspects: the revolutionary changes in traditional pedagogy and the reactionary nature of the new (Matthews, Mclinden & Greenway, 2021, p. 1-21); the scientific of the traditional method and the pseudoscientific nature of some new methods; the democratization of modern educational institutions. The structural elements of pedagogical innovations are worked out in practice. The scientific approach to pedagogical technologies allows effective implementation of the designated educational goals; systematize, plan and reduce the unpredictability of the educational process; ensure sustainable interaction of all participants in the educational process (Demyanenko, 2021, p. 185). The growth of scientific interest in pedagogical technologies is due to the need, first, to substantiate and implement simpler and more effective ways of achieving educational goals; second, to reduce the unpredictability of the educational process; third, to give stability (stability) to the relations of subjects. The phenomenon of “educational (pedagogical) technology” has

absolute advantages. It is implemented as a systematic, consciously planned activity aimed at improving the qualifications of teachers and their competence in solving educational tasks. Accordingly, by the level of design the educational technology can be mass and universal, but by the level of its implementation - exclusively authorial. In the innovative, informational space, the function of the teacher himself changes, not just a carrier of knowledge, but the modern teacher should have the ability to implement "knowledge in action" (Dominick et al, 2020, p. 1641). In addition, the educator must be pedagogically developmental oriented, an investigator of pedagogical theory and practice, charged with multiple functions (constructive collaboration with school leadership, developing planning and other documentation, working with other institutions, etc.) (Mrvar et al, 2019, p. 110). A critical attitude towards the paradigm of modern science helps to identify different, qualitatively new possibilities of scientific activity, taking into account the social, cultural, and subjective aspects in comprehending the real reality (Fernandes & Silva, 2020, p. 1677). Foreign scholars identify a clear difference between technological innovation and pedagogical innovation. Scientific and technological progress actually provides the emergence of new information and communication technologies, but it is not a pedagogical innovation. It is pedagogical innovation that is seen in moving away from traditional methods and actively pursuing new ones, because it is important to open up to innovation, including taking into account the intercultural characteristics of different peoples (Franco et al, 2019, p. 705).

Innovative views on the development of pedagogy and the education system

Modern civilization challenges make certain adjustments in the development of pedagogical sciences: globalization leads to the simplification of borders, the creation of a single economic space and a common information sphere; there is a transition from industrial to scientific and information technologies; and there is also a threat of self-destruction of humanity (presence of weapons of mass destruction, numerous environmental problems). Therefore, the humanistic orientation of pedagogical sciences, the development of the concept of human-centrism, and the sustainable (balanced) development of society are important. The majority of pedagogical works of Vasyl Sukhomlynskyi (1918-1970), the famous Ukrainian teacher, are devoted to ideas of humanism. Today, the ideas of humanism, humanity, and charity are no less relevant to the development of pedagogical thought and are realized through the development of all intellectual, physiological, and potential capabilities of the individual. Harmoniously and the comprehensively developed person realizes his abilities and opportunities through creativity. To implement the relevant ideas, it is important to take into account the uniqueness of each, the individual characteristics of pupils, which is hereditary and formed in a particular social environment (family, immediate surroundings, and the social environment in general). Vasyl Sukhomlynskyi believed that for the spiritual development of pupils it is not enough just to get knowledge, assimilate the content of educational material provided by the educational program, and noted that it is necessary to form a moral culture.

In our opinion, the integration of pedagogical sciences into a single scientific and educational space is promising. The multiculturalism of all educational processes becomes important to harmonize the globalized world and ensure equal access to quality education in different scientific and educational systems of the world. Also, the association of institutions of higher education and production is the basis for the formation of a kind of interdisciplinary team to expand the views and determine the directions of further development of society, production, and economic spheres (Campani et al., 2019; Chasnikova et al., 2021). A relatively new approach is the introduction of cooperative learning in institutions of higher education Cooperative Learning (CL) - cooperative learning as a special methodology is widespread in the UK, USA, Portugal. According to the famous educator John Dewey, cooperative pedagogy provides socialization, the formation of knowledge and skills necessary in life, outside of educational institutions (Capellini et al., 2020, p.1688; Loudon, 2019, p. 284-286). Gender pedagogy is also a separate area of the complex of modern pedagogical sciences. We consider gender as a dimension of the social structure of society, and gender pedagogy is aimed at creating comfortable conditions for the socialization of education applicants (both boys and girls).The significant test was the pandemic caused by the spread of COVID-19 because for all the possibilities of Internet resources and the search for numerous means to implement lifelong learning, the educational institution also provides socialization of students and affects the formation of a positive social-emotional state of students, is a fairly safe environment for their stay (Montenegro, 2021). A separate challenge for education has become the introduction of distance learning, which requires a systematic and planned. At present, there are still a number of constraints for effective use: outdated stereotypes, lack of ability to use certain Internet resources for educational purposes, lack of effective pedagogical techniques, methods of implementing this type of learning, lack of proper technical support, legal uncertainty in the organization of distance learning. The continuity of the educational process is also ensured through the implementation of online resources for learning, which are interesting to consider from the perspective of Edgar Morin and given his seven modules, in particular, the sixth module “learning to understand”. The entire educator training course is based on the following steps: welcome, case study definition, leading to integrated thinking, research and deepening knowledge, practical application of knowledge gained, and bibliographic references Cardoso et al., 2021).

It is distance learning that allows the educational process to be carried out synchronously (through videoconferencing) and asynchronously (by arranging tasks and learning materials in different applications, taking into account the fact that education applicants will process it at a convenient time for themselves). It is distance learning technologies imply comprehensive use of problem-research methods and application of the acquired knowledge in collaborative or individual learning activities. This way of interaction contributes to the development of critical thinking, communication culture, teamwork skills, i.e., in this way the technologies of person-centered learning are effectively used (Tsekhmister, et.al., 2021b). As a result of such an approach to the implementation of the educational process, applicants form the ability to critically assess the information received, to argue their own opinion. However, in our opinion, distance learning is the

most effective for the implementation of practical tasks of andragogy. Adult education opens up a wide range of opportunities for self-realization (expansion and deepening of knowledge, development of abilities, advanced training) for each person. This approach to continuing adult education can be considered as the main vector of andragogy development in the XXI century.

Pedagogical innovation requires from the teacher a certain transformation of knowledge, recognition of the need for creative activity, and a new understanding of knowledge (Vasconcellos & Maciel, 2019, p. 747; Franco, Silva & Torisu, 2019, p. 698-715). Accordingly, in the innovative system of the pedagogical activity, the functions of the teacher himself change, who must act essentially as a researcher, who hypothesizes in determining the tasks, planning and critically evaluating the content of educational material. In general, reflection for the teacher provides more objective real knowledge about his or her own practice (Cardoso et al., 2021, p. 2610-2611). To overcome isolation and create a unified educational space, it is important to study the experience of foreign countries on the development of pedagogical sciences and the search for ways of improvement. Implementation of foreign experience, particularly European, is important for Ukraine, and some aspects are actively implemented in the practice of school education, vocational training (Demyanenko, 2021, p. 176-188). The main aspect here is not just gaining knowledge, acquiring skills and abilities in education applicants, and the formation of competencies for life in a multicultural and democratic society (Chasnikova, 2021, p. 125). That is why STEM education (Sociology Technology Engineering Mathematics), which covers natural sciences, technology, engineering (technical creativity), and mathematics, has gained wide popularity in recent years. This direction of education strengthens the connection between natural sciences and innovative technologies (Fernandes & Silva, 2020, p. 1669-1684). The introduction of STEM education allows higher education graduates to find jobs faster and fill relevant vacancies (NG & Park 2021, p. 193-204). Based on the U.S. experience, it should be taken into account that it is important not just to acquire a set of knowledge, but to be able to apply it in the changing conditions of social life (Denga, 2020, p. 38-44). The implementation of STEM education involves not only the disciplines that are part of STEM but also include disciplines in psychology and the social sciences Additionally, STEM education promotes a combination of theory and practice. The use of STEM not only in creative but also technical specialties promotes creativity, allows a better understanding of what to work on more and how to improve one's performance (Loudon, 2019, p.285). The introduction of STEM opens up new possibilities for the use of different types of activities during the educational process. Consistency, focus on learning content, active learning, and teamwork between educators and co-teachers are important in the implementation of the educational process (NG & Park, 2021, p.194; Dominick, Alves & Silva, 2020, p. 1629-1651). What is important is that students are constantly reflecting on the content of what they are learning and how to voice their reflections and thus move forward and improve their learning outcomes. Reflective thinking is an engine for unifying the learning process and increasing the social awareness of the participants in the educational process (Roa, De La Torre et al, 2021, p.154; Matusov & Pease-Alvarez, 2020). The applications of

appropriate programs in STEM education are based on beliefs, self-efficacy, content knowledge, pedagogical skills, teachers' technological skills, and curriculum requirements. Thus, preparing educators for STEM education in an integrated context by raising their awareness, expanding their technological and mathematical knowledge, and finally implementing innovative methods is carried out.

The effectiveness of the educational process is determined by monitoring the level of learning achievements and assessment of the results of the relevant tasks of education applicants. Here we should mention the peculiarities of the assessment process in educational institutions and analyze modern approaches to the system of assessment of applicants for education, in particular, the formative assessment during training and education. Under the influence of formative assessment develops self-regulation and intrinsic motivation in educational applicants (Vasconcellos & Maciel, 2019, p. 743-765).

Its primary purpose is to diagnose, correct, and predict student achievement, which occurs during the educational process (Denga, 2020, p. 40-41). Formative assessment focuses on assessing the process rather than the results and activates the learning activities of educational applicants (Kincal & Ozan, 2018, p.79; Chasnikova et al., 2021, p. 122-131). Therefore, assessment acts as a motivational component of the educational process, positively influencing the psycho-emotional state of the child. Skillfully using in the work with applicants for education modern methods of assessment, including verbal and visual, the teacher creates a favorable psycho-emotional atmosphere, a positive attitude to the process of learning, stimulates the development of the motivational component of learning. And it is important that assessment develops a thirst for knowledge and self-development, and not be a punishment for laziness or slow perception of educational material.

Features of an innovative educational system

An innovative educational system is characterized by the introduction of innovations, acting as the main factor of development, and also includes innovative activities and innovative processes. By its content, innovation systems can be divided into artificial, where educational processes are modeled based on forecasts, intentions, monitoring studies, and natural - the implementation of the educational process occurs based on consciously realized aspirations to achieve clearly defined educational goals (Tsekhmisteret. al., 2021a). The digital revolution has lasted more than 70 years and is actually a multifactorial transition from analog to the digital way of processing, transmitting, and storing information, which is accompanied by the rapid growth of hardware and software. How should education and the modern educational institution evolve? In the era of digitalization, it is important to create and actively use educational resources and various digital platforms that allow the use of interactive and multimedia content. An innovative system should have a modern educational and material base, including multimedia and computer facilities, quality Internet connection, i.e., numerous equipment to create a digital educational environment. However, now the world is moving into a post-digital space and the point is not that there is no digitalization, but that its

existence is not new and unusual, because it is just a fact that has happened (Capellini, Bello & Reis, 2020, p. 1685-1701). Thus, in today's society, the function of the co-educator of education itself is changing. For example, in higher education learning is focused on the student, they need to create a space for intellectual and creative development through learning through research (Matthews et al, 2021, p.11). The "pedagogy of dialogue" becomes relevant, where educators and co-educators are equal participants in a conversation of "critical dialogue in action," sharing experiences, cultural practices, goals, and attitudes (Matusov et al, 2020, p.5; Kincal; Ozan, 2018, p. 77-92). No longer innovative in content, but modern in implementation approach is the introduction of entrepreneurial approach in the educational process, the use of dual learning.

5. Conclusions

Considering the above-mentioned innovative vectors of pedagogical sciences development, we can conclude that pedagogy as a multidimensional science requires constant scientific search.

The focus of scientists' pedagogy as a complex science remains to require a clear formulation and solution of pedagogical problems, the implementation of reform ideas, taking into account the state of development of civilization. Innovative ways of development require an effective response to the needs of society, modernization of the means of implementation of the educational process and implementation of modern approaches to the education of the younger generation, the formation of a motivational component of all participants in the educational process.

The conducted research, based on the analysis of scientific sources, comparative aspects, and generalization of scientific-methodological foundations of the development of pedagogical thought, determination of the most priority further innovative ways of transformation of the complex of pedagogical sciences, does not exhaust all aspects of the designated problem. Among the further directions of scientific search can be noted: justification of features of implementation of the entrepreneurial approach in the system of higher education, dual training in professional training of specialists of different profiles, as well as more broadly to reveal the modern vectors of development of comparative pedagogy.

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