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NATALIA RIEZANOVA 

Innovation in the Context of the Modern Education Model

ORCID: 0000-0003-3094-4881, Ph.D. in Philosophy, Associate Professor, Associate Professor of the Department of Political Science and Law, National University “Zaporizhzhya Polytechnic”, Zaporizhia, Ukraine

Abstract

The phenomenon of innovation and its significance for the modern model of education are subjected to scientific reflection, the semantic transformation of the concept of “innovation” and its modern understanding are analysed. It is noted that “innovation” is closely related to such categories as “new”, “discovery”, “creativity”, and the process of innovation is a challenge to the needs of society. The article defines the content of innovation as a form of objectification of the new, which is assigned the status of a factor of social development, analyses the conditions for successful implementation of innovations and the formation of innovative thinking as a necessary component of modern education. The innovative orientation of thinking is analysed through the prism of social and pedagogical innovation processes and is considered as a property of a modern personality. It is innovative thinking that ensures the success of innovative activities, overcoming stereotypes, openness to learning new things and active use of new, non-standard ways of solving complex problems. As part of the learning process, innovative thinking is carried out at the cognitive and instrumental levels and enables the emergence of an innovative personality as a special quality of a person in the modern world.

Keywords: innovation, innovative culture of personality, innovative education, innovative personality, innovative thinking, innovative skills

General statement of the problem

Modern social development is impossible to imagine without innovations, which are a form of renewal of society at all its levels and a factor of general social development. Today, innovations are increasingly playing the role of the main tool for solving problems arising in society. Innovations, combining the achievements of science with production capabilities, meet the growing needs of society through the innovations created, and are a prerequisite for its development.

The globalisation of the world community and increased competition have led to the fact that the flow of innovations is becoming more focused and reproducible on a continuous basis, and the level of development of countries is being assessed by their innovation capacity. Overall, investments in science and innovation have been remarkably resilient in the face of the economic downturn (WIPO, 2022). In this regard, scientists have started talking about the transition of the most advanced countries of the world to a new type of civilisation development — innovative, which marks the next step in the progressive development of society, and in the future becomes a benchmark for the whole world.

The innovation sphere is directly related to the problems of national education systems and the search for an adequate new model of education that would develop innovative skills and lay the foundation for an innovative culture of the individual. The study of innovations allows formulating a science-based innovation policy aimed at creating social, economic and organisational conditions for the entire innovation cycle, which ensures the transfer of new knowledge to the manufacturing sector of the economy and other areas of the social system.

The relevance of this issue is determined by the accelerated processes of innovative development of the modern world, which outpace the possibility of their adequate scientific understanding. The process of cognition provides a holistic view of the object to the subject, makes it possible to understand its essence and generic meanings, optimising social practice. Possessing an arsenal of priority opportunities, it allows us to study even future fragments of reality. Understanding innovation as a complex phenomenon implies the need to solve a whole range of theoretical problems of understanding the essence of the phenomenon in order to achieve the main goal: “to know in order to prevent, manage, optimise” (Heiets, 2006, p. 186).

Subject of research

The theoretical understanding of the phenomenon of innovation as a modern form of objectification of a new and fundamental factor of social development gives an idea of the challenges facing modern education. The need to change the learning process and education as a social institution in a meaningful and technological way is becoming a necessity and a challenge of the times. The emergence of an innovative type of thinking is determined not only by the requirements of the present, but also by the peculiarity of future professional activity, which is characterised by the presence of non-standard situations, limited time for information recognition and decision-making, a state of high intellectual tension and constant readiness for maximum productive work. Clarifying the nature of the innovation process and its main features helps to understand effective ways of forming innovative thinking and innovative personality in the process of human learning at different stages of the educational process.

Analysis of recent publications

The special study of innovations began in the 30s of the XX century in the bosom of Western economic science. The founder of innovation issues was the German economist Schumpeter. Schumpeter's followers, who focused their research attention on the role of the economic effect of major technical and technological innovations, were a number of authors: Bernal, Van Dyne, Galbraith, Kleinknecht, Clark, Mensch, Southe, Freeman, and others.

Among the most significant scientific works of the last decade of the XX century on the study of innovations are the works of Ansoff, Oppenländer, Santo, Twiss, Waterman, Huczek and others.

The question of the role of innovations in the process of social development can be found in the works of Akhieser, Baburin, Kelle, Knyazeva, Kretov, Kryuchkova, Lapin, Lukov, Prigozhin, Sazonov, Sorokin, Turkin, Fonotov, Shkitin, Karpova and others. The issues related to innovation management were considered by Balabanov, Dergachova, Kruglova, Kryuchkova, Kuzhev, Nikolayeva, Rummyantseva, Salomatin, Utkin, Fathutdinov and others.

The problems of developing an innovative methodology were raised in the works of Dudchenko, Kryuchkova, Yakovlev. Works devoted to the analysis of the formation of the "new" – Knyazeva, Sheremet and Zelenin, Shumilin, Engelmeyer, Elfimov. Studies related to the analysis of the problem of discovery in the philosophy of science – Balabanov, Knyazeva, Kryuchkova, Maidaniv. A panorama of relevant studies is presented in the works of Bazhal, Heiets, Gerasimchuk, Ilyashenko, Kvasniuk, Lukinov, Zavgorodna, Liakh, Mokliak, Pazenko, Tabachkovsky, Shynkaruk, Sandiga, and others.

The theoretical works of scientists are quite substantial. They reflect the evolution of the doctrine of innovation and the methodological foundations of knowledge of innovation processes; global trends and patterns of innovation dynamics; reproductive and functional purpose of innovations; technology of innovation and decision-making; mechanisms for regulating innovation development, etc.

Presentation of the main material

A distinctive feature of the modern world is large-scale, rapidly unfolding innovative transformations. Today, the global community is purposefully striving for continuous renewal in various spheres of its life.

Looking back at the historical roots, it turns out that innovations were originally referred to as cultural phenomena that did not exist at previous stages of society's development, but which appeared at this stage and were consolidated in it both in a symbolic form and in changes in the ways and results of human activity. In the context of economic science, innovations were understood as a separate type of innovation – technical and technological innovations. The

researchers emphasised the ease of achieving economic effect when introducing technical innovations, and stressed the important role of scientific and technological changes in economic processes and socio-economic development of both society as a whole and a single enterprise. This explains the fact that in the scientific literature we are often confronted with a narrow interpretation of innovation, when the scientific and technical aspect dominates the understanding of innovation, which relates to the creation and production of new products, innovations in technology that contribute to the rapid achievement of commercial effect.

Innovations have accompanied humanity throughout its history, but they have long remained outside the scope of scientific research and became an object of study relatively recently, at the turn of the 19th and 20th centuries. It is to this time that the category of “innovation” and its further development and semantic enrichment dates back. Innovation (from the late Latin «innovatio» – innovation, novelty) in the broadest sense of the word means a new way of doing something. The concept of innovation includes discovery – an increase in knowledge and invention – a new way of using existing knowledge. The term «innovatio» was first used in anthropology and ethnology in the 19th century and originally meant the process of introducing elements of one culture into another.

Innovations that take place in one area of society can cause completely unexpected changes in other areas. As a necessary condition for change, innovations are playing an increasingly important role in our lives. There is even a new scientific field called “innovatics”, the most important problem of which is the study of the processes of spreading innovations. The process of spreading innovations within a social system, as well as their movement between subsystems, is called diffusion. While in the past the process of spreading any innovation took several centuries, at the end of the XX century the development of communication means and the removal of information barriers contributed to a sharp acceleration of diffusion processes. For example, the «great diffusion leap» of the late twentieth century was associated with the development of computer communication networks.

American researcher Drucker (2020) identified seven main sources of innovation: 1) an unexpected change in the situation, someone’s success or failure, a reaction to an unforeseen external influence; 2) a discrepancy between the changes in reality and people’s perceptions and expectations; 3) identification of shortcomings in the course, rhythm, logic of a process; 4) changes in the structure of production or consumption; 5) demographic changes; 6) changes in the public consciousness (moods, attitudes, values); 7) the emergence of new knowledge.

However, not every emergence of new knowledge causes a diffusion process. A huge number of inventions in all spheres of society are simply ignored. An analysis of several hundred large-scale technical innovations over the past

two centuries shows that there is a time lag (lag) of 15 to 40 years between the invention and the start of diffusion. Moreover, one or more successful implementations (innovations) does not guarantee further diffusion. Therefore, it is proposed to distinguish between the triad of invention, innovation and diffusion, understanding innovation as the process of initial implementation of an invention. Inventive and innovative activities provide the potential for change. Only the process of diffusion transforms this potential into a change in social practice.

Drucker believes that the time gap between the birth of new knowledge and its adoption is approximately 25–30 years. This pattern has remained a stable constant throughout the history of civilisation and is probably inherent in the nature of knowledge. His concept of the evolution of science as a change of paradigms – ways of posing problems and methods of solving them – is widely used in innovation. A number of scholars propose to distinguish innovation from simple improvement, local improvement. An innovation requires a set of organisational and technological changes, reorganisation of the production process, staff training, and behavioural changes.

Today, innovations in the educational process are most often understood as: non-standard lessons; individual work; control and assessment of students' learning achievements (through quizzes, tests, assignments, workbooks, etc.); classroom, group and additional learning; electives of students' choice (deepening knowledge); problem-based and modular learning; inviting scientists, cultural and artistic figures to lessons; economisation and environmentalisation of education; scientific experimentation when learning new material; application of technological advances (from slides, through films, tape recorders, televisions to computer-based learning, computer classrooms, radio and television broadcasts and «Internet systems», multimedia technologies, etc.) (Petruk, 2019, p. 5).

The specificity of innovations in various spheres of society makes it difficult to formulate a single definition that is convenient for all cases. However, the scientific literature identifies five main stages of the innovation adoption process (Figure 1).

The speed of innovation is also determined by five main factors: the relative advantages of the innovation; compatibility with the environment, existing values and past experience; complexity of adoption; the possibility of testing before making a final decision; and communication visibility, the degree to which the results of the innovation can be seen and evaluated by others.

In addition, the effectiveness of innovations is largely determined by social determination, i.e. the extent to which society is ready to accept the innovation. The society may be eager for change, but it may also be tired of the confusion caused by the previous innovation. Demand for innovation also depends on the phase of the social system's life cycle. As already mentioned, the problems of

researching innovations are extremely relevant for the modern economy. According to economists, diffusion of innovations is the process of transferring innovations through communication channels between members of a social system. Innovations are ideas, products, solutions, technologies, etc. that are new to a given business entity. The form and speed of the diffusion process depend on the power of communication channels and the peculiarities of information perception by the subjects.

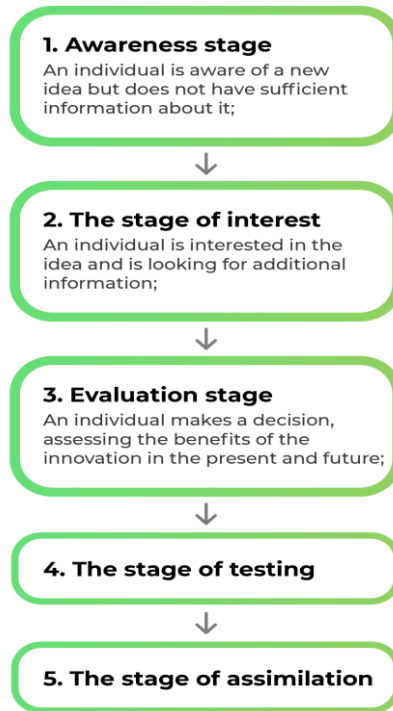


Figure 1. Stages of the innovation adoption process

Critical thinking is regularly cited as an essential 21st century skill, the key to success in school and work. Given the propensity to believe fake news, draw incorrect conclusions, and make decisions based on emotion rather than reason, it might even be said that critical thinking is vital to the survival of a democratic society. Haber explains how the concept of critical thinking emerged, how it has been defined, and how critical thinking skills can be taught and assessed. Haber describes the term's origins in such disciplines as philosophy, psychology, and science. He examines the components of critical thinking, including:

- structured thinking,
- language skills,

- background knowledge,
- information literacy, intellectual humility,
- empathy and open-mindedness (Haber, 2020).

The processes of transition from initial uncertainty to further conviction and individual risk perception also play an important role. Too many fast, underdeveloped innovations do not have the expected effect and sometimes cause significant harm. In the postmodern era of total simulation and imitation, the worldview and intellectual self is of utmost relevance (Levkulych, 2022, p. 142).

In the late twentieth century, innovation was understood as a process of fundamental research that resulted in innovations, and then a process of applied research that resulted in innovations – the introduction of new methods, technologies, and products.

This model mainly deals with formal or explicitly defined knowledge obtained in the process of basic research. In this model, basic research is located at the beginning of the causal chain that ends with productivity growth. Basic research produces theories and discoveries that are redefined in applied research, then tested in the development process and then marketed as industrial innovations and put into use. Each level of the linear model produces an output that is passed on as input to the next level. The flow of knowledge is unidirectional, meaning that later stages do not provide input to earlier stages. The model suggests that the boundaries within which basic research is conducted have a significant impact on the possibilities for technological innovation.

However, the debate about the structure of the innovation process itself that has emerged at this time has sharply criticised the classical linear model of innovation and its basis, which is the primacy of science with basic research and the secondary nature of applied research of an empirical nature.

It is now becoming increasingly clear that the linear model of innovation, which assumes a causal relationship between scientific knowledge and innovation, is the exception rather than the rule, and is more appropriate for industrial societies. Innovations are not exceptional events that occur only under very specific circumstances. On the contrary, they should be understood as a natural way of gaining competitive advantage. Innovation is to some extent a ubiquitous phenomenon that can occur at any time in all areas of the social system.

Innovations cannot be reduced to the creation of new scientific knowledge. On the contrary, they represent a multifaceted (multisectoral) process that includes the production, acquisition and dissemination of new knowledge, experimentation with new combinations of knowledge, development and design of a new product and technological process, copying and adaptation of existing innovations, etc. New scientific knowledge will not automatically lead to in-

creased innovation. On the other hand, innovation does not always require the emergence of new scientific knowledge.

Innovation is an ambiguous and highly uncertain process. Coping with uncertainty by gathering additional information and knowledge can be seen as an inherent characteristic of innovation processes. Therefore, innovation cannot be understood as a rational process with a clear sequence of stages. On the contrary, a complex feedback mechanism should be taken into account. In such non-linear processes, individual innovation activities can be both a cause and a result, a consequence and a precondition.

Conclusion

The most important characteristic of modernity is innovation processes that permeate all spheres and levels of social reality. Innovations are a prerequisite for the development of society, combining the achievements of science and production capabilities, and they meet social needs through the innovations they create. In order to stay afloat in the information age, it is not so much necessary to acquire once and for all established knowledge as to master the skills of searching, managing, analysing and classifying this knowledge.

The need to develop innovative thinking, characterised by creativity, criticality, constructiveness, and a combination of intuition and rationality, is coming to the fore. The synergy of several ways of thinking has the greatest social effect, although this phenomenon is quite rare and occurs in only 4–5% of the population. Innovative thinking itself cannot emerge without effort. It is born only when human thought overcomes certain obstacles, i.e. contradictions. A person, not having a special way of thinking to overcome obstacles by nature, tries to find a new, special method of solving them when faced with them. The consolidation of innovative skills within the modern model of education provides an opportunity to master the methods and techniques of innovative activity that allow you to identify a problem, penetrate its essence and, on this basis, construct and productively solve complex, non-standard tasks. This cannot be achieved without an innovative environment – an appropriately organised space of life that promotes the development of an individual's innovative resource. It is into such an innovative environment that the modern educational process should be transformed.

To truly master innovative thinking as well as innovation methods, it is important that pupils and students solve both educational and practical problems. They should become participants in innovation processes. This is the main difference between innovations in new generation education systems, which in turn determines their technological parameters. The development and implementation of innovative educational systems and technologies is a complex but extremely relevant problem of the modern education model.

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