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MODERN TECHNOLOGICAL DEVELOPMENT AND THE MODERNIZATION OF SOCIAL SCIENCES AND HUMANITIES

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Abstract:
Based on a study and analysis of philosophical and pedagogical literature, as well as an examination of the findings of sociological research, this article identifies the qualitative transformations occurring within the "science–technology–production (practice)" system that constitute the essence of the contemporary technological revolution and are закономерно interconnected through a common underlying nature. It examines trends in the modernization of education amid the contemporary technological revolution and explores the possibilities of using information and communication technologies in the educational process at higher education institutions, taking into account the specific characteristics of the humanities.

Keywords: Social sciences and humanities, modern technological revolution, informatization of education, information and communication technologies in education, Internet technologies.

Introduction

Since the mid-twentieth century, developed countries around the world have been experiencing a process of qualitative transformation in the technologies they employ, which has come to be known as the modern technological revolution. In domestic academic literature of the second half of the twentieth century, this process was described in terms of the modern scientific and technological revolution (STR). Throughout this article, the terms "modern technological revolution" and "modern scientific and technological revolution" are used synonymously.

The widespread use of the term "modern technological revolution" is associated with an expanded interpretation of the concept of "technology." According to theorists of post-industrial society, the technological approach can now be applied to all aspects of social life. For example, J. Galbraith defines technology as the systematic application of scientific knowledge to the solution of practical problems [3, p. 12]. D. Bell, H. Brooks, and S. Kasprzyk emphasize the fundamental possibility of repeatedly applying scientifically developed technologies to any field of human activity in order to achieve social or individual objectives [18, pp. 245–246].

In the history of research on the scientific and technological revolution, various approaches have successively emerged: attributive, communicative, paradigmatic, methodological, and

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systemic. The theoretical and practical aspects of the STR have been explored in the works of V. G. Afanasyev, G. N. Volkov, N. I. Dryakhlov, B. M. Kedrov, V. A. Kutyrev, N. V. Markov, N. N. Moiseev, J. Moss, V. T. Pulyaev, V. S. Stepin, and B. P. Shulyndin. However, the multifaceted nature of the scientific and technological revolution has made it difficult to distinguish between the concepts of "the content of the STR," "the directions of the STR," and "the essence of the STR."

In our view, particular attention should be paid to the position of scholars who define the essence of the modern technological revolution in terms of fundamental changes in human existence and in humanity's relationship with the world as a whole. The essence of these changes lies in humanity and its practical activity moving beyond the portion of the world commensurate with human beings and beyond the limits of ordinary human experience [17, p. 15].

We share the interpretation of the modern technological revolution as a set of interconnected qualitative transformations unfolding within the "science–technology–production (practice)" system.

Let us examine the nature of these transformations.

The first qualitative transformation takes place in science. It involves scientific knowledge extending beyond that part of objective reality within which the human organism evolved and exists and which is accessible to human sensory perception.

M. K. Mamardashvili traces the roots of this transformation to the unique human capacity to think about what human beings themselves are not and cannot become, to orient themselves toward a higher order, and to strive for knowledge of it. In other words, it is the capacity to "know what has no bearing on the consequences for human existence and interests, is incommensurable with them, and cannot be limited by any of them" [6, pp. 123–124].

According to V. S. Stepin, the distinctive feature of the fourth global scientific revolution lies in the implementation of comprehensive research programs aimed at understanding historically developing systems characterized by synergistic effects and the fundamental irreversibility of processes. Particular attention is devoted to natural systems that include human beings as one of their components. These include global ecological systems, biotechnology—especially genetic engineering—human–machine systems, including complex information systems and artificial intelligence systems, as well as biomedical objects [13].

Research involving historically developing systems provides a striking example of science moving beyond the boundaries of the specifically "human world." This qualitative transformation is associated with the informatization of science as a social institution. O. V. Rayetskaya examines the positive and negative consequences of this process in her research [10].

The second transformation associated with the content of the STR consists in the emergence of qualitatively new technologies capable of performing the functions of universal logical thinking. These technologies are specifically designed to process information and make decisions, thereby "replacing" the human brain and, in certain respects, performing more effectively than it does. Thus, technological development exhibits the same tendency as

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scientific development: humanity is moving beyond the boundaries of the sphere commensurate with itself. This tendency is evident in the expansion of the information sphere, the transition to digital methods of storing and processing information, the increasing requirements for information quality and security, and the creation of intelligent systems and information-based urban environments [4, p. 11].

The third qualitative transformation occurs in the interaction between science and technology. It involves a "change of leadership" in the science–technology relationship, with science advancing ahead of technology. In the eighteenth and nineteenth centuries, and generally even at the beginning of the twentieth century, science could formulate and solve only those problems that had arisen from material practice, as represented by technology and production. The fundamental novelty of the contemporary situation is that scientific knowledge is not merely applied in production and technology; rather, it paves the way for their progressive development. The "drilling" function of science, as described by B. M. Kedrov, has become so significant that the emergence of nuclear energy, cybernetics, radio electronics, space exploration, bionics, and other fields would have been impossible without prior scientific inquiry.

The fourth transformation, closely connected with the preceding ones, takes place in the sphere of production. Changes in science and technology now enable human beings to withdraw from direct participation in technological processes while retaining the most important functions: overall management, the formulation of goals and objectives, general supervision of technological systems, their design, the selection of optimal solutions from the full range of alternatives proposed by computers, the prediction of outcomes, the substantive interpretation of the data obtained, and the development of new operational models and strategies.

The nature of these activities, together with the expansion of fields in which several generations of technology may be replaced during a person's working life, requires a high level of professional competence and cultural development. It also requires the ability to operate under conditions of uncertainty, choose among alternative solutions, and adapt to a changing sociocultural environment—in other words, to adopt a creative approach to activity. In philosophical terms, the individual is characterized as a "subject of the infosphere" (I. V. Solovyov) [12]. In didactic terms, this is expressed through the concept of "independent activity competence" (M. A. Fedorova) [16].

The information-driven transformation of educational systems observed worldwide reflects the fundamental changes taking place in human existence as the modern technological revolution unfolds. The effectiveness of professional education today is associated with the extent to which its content anticipates changes in science, technology, and technological processes, as well as the time required to introduce these changes into production [15, p. 5]. The effectiveness of teaching methods is determined by how well they correspond to contemporary approaches to understanding scientific and social regularities.

As is well known, a creative approach to activity, now regarded as an essential component of individual competence, can develop only under conditions of contradiction between established patterns of activity that form part of social experience and new, changing conditions

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in work, cognition, and communication. Two interrelated conditions for successfully addressing this challenge are improving the quality of students' independent work and using teaching technologies appropriate to the current stage of scientific and technological development.

The problem of organizing independent learning activities was already addressed in the works of ancient philosophers, including Socrates, Plato, and Aristotle, and remains relevant today. Its theoretical foundations were developed in the works of P. I. Pidkasisty, who analyzed independent work from two perspectives: as a means by which teachers organize and manage students' independent activities, and as a specific form of educational cognition from the students' perspective [9, p. 150].

Since the mid-twentieth century, students' independent learning activities have become a subject of research in higher education pedagogy. Gradually, this area has developed into an integrative scientific phenomenon incorporating different approaches: theoretical (E. Ya. Golant, B. P. Esipov, L. V. Zharova, A. S. Lynda, R. M. Mikelson, P. I. Pidkasisty, M. N. Skatkin, and others); technological (V. P. Bespalko, M. V. Klarin, G. K. Selevko, A. I. Uman, and others); and personality-oriented [16, p. 17].

Many aspects of organizing students' independent work (SIW) remain controversial. In particular, there is no consensus regarding the essence and content of independent work, the principles governing its organization, or its relationship to the concepts of "independence" and "independent activity." According to the position adopted in this study, independent work is a form of organizing independent learning activity [16, p. 19]. The components of this activity include the emergence of motivation, the formulation of goals, the identification and resolution of cognitive tasks, and the monitoring of the process and its outcomes. Independent activity is aimed at mastering educational content and developing personal independence.

Of particular interest is the position of researchers who consider independence from two distinct but interrelated perspectives: as a characteristic of a student's activity in a particular learning situation and as a personal trait. The external manifestations of student independence include planning one's own activities, completing assignments without the teacher's direct involvement, self-monitoring, and making corrections. The internal dimension of learning independence comprises the learner's needs and motivations, as well as the intellectual, moral, and volitional efforts directed toward achieving a goal without outside assistance [14, p. 126].

Of course, complete student independence is hardly realistic in the educational process. The level of independence should be determined with due consideration of the extent to which teacher involvement is objectively necessary. Recent didactic literature distinguishes between two levels of independence: reproductive and productive. As noted above, the productive level acquires particular importance under the conditions of the modern technological revolution.

The expected learning outcomes of independent work for bachelor's students across all fields of study include knowledge of the laws governing the development of nature, society, and thought, as well as the fundamental values of world culture. They also include proficiency in the basic tools for managing information and the ability to work within global computer networks.

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An important challenge for contemporary didactics is to identify appropriate teaching technologies. Specialists pay particular attention to the implementation of information and communication technologies (ICT), especially Internet technologies. For example, I. V. Robert substantiates the concept of the "didactics of educational informatization" in terms of realizing the didactic potential of ICT [11]. M. N. Berulava develops a methodological platform for a network-based educational strategy. The author emphasizes the advantages of the virtual learning environment, including learners' initiative in obtaining information, high motivation to assimilate it, psychological comfort, and the correspondence of information to the dominant cognitive, communicative, and affective styles and strategies of individual learners [1, pp. 9–11].

The solution of educational tasks appropriate to the contemporary stage of scientific and technological development is increasingly associated with Web 2.0 technologies, which enable users to collaborate and publish information online in various formats, following Tim O'Reilly's interpretation [7]. The development of social networking services has given rise to phenomena described by various terms, including the wisdom of crowds, crowdsourcing, wikinomics, and public support [8, p. 114]. These phenomena are based on the possibility of engaging large numbers of people directly in creating new collective documents, books, and standards. Recent didactic literature has discussed the distinctive principles of an educational system suited to the aims of education in the post-industrial era, known as Education 2.0, by analogy with Web 2.0 [2].

However, the organization of students' independent learning activities in humanities courses through the use of ICT, particularly Web 2.0 technologies, has not yet been studied comprehensively.

According to the position adopted in this study, independent student work in a philosophy course can be defined as a specific form of learning activity that involves students' awareness of their abilities, motivations, goals and objectives, methods and techniques for studying philosophy, as well as approaches to monitoring and self-monitoring their learning and developing cognitive independence. The total workload for the philosophy course in a bachelor's degree program is four credits (144 hours). Of these, 96 hours (2.7 credits) are allocated to independent work.

Following G. A. Kruchinina, information and communication technologies (ICT) will be understood as "a body of knowledge about the methods and means of organizing learning under conditions involving the use of computers, as well as the (qualitatively new) learning process itself under conditions in which computers are used as technical teaching aids" [5, p. 61].

A number of principles can be identified for organizing students' independent work (SIW) in philosophy courses using ICT tools, which contribute to the development of students' productive level of independence: (1) personalization of learning, involving the design of individual development trajectories for learners; (2) a combination of differentiated and integrative approaches to learning; (3) unity and integrity in the organization and self-organization of independent learning activities, with managerial functions gradually transferred from the teacher to the student; (4) consistency and interrelationship between an individual's

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internal potential and the external conditions in which it is realized; (5) variability of the educational environment, identification of contradictions between stable features of activity representing an element of social experience and new, changing conditions of students' cognition and communication, and the provision of opportunities for choice; and (6) the dialogic nature of learning and the creation of a reflective educational environment.

Several stages can be distinguished in the organization of SIW: the diagnostic and analytical stage, the formative stage, and the reflective and evaluative stage.

At the diagnostic and analytical stage, a study was conducted to assess the level of independence developed among first-year undergraduate students. The methods used included interviews, questionnaires, and observation. It should be noted that students assessed their independent work skills in dealing with philosophical information with a fairly high degree of accuracy.

Thus, 45% of the respondents indicated that they could only retell lecture and textbook material within the scope of the university curriculum, while 15.7% stated that they could present material from primary sources and specialized philosophical literature. A total of 33.3% of students were able to independently search for primary sources and specialized philosophical literature on topics of interest to them. Meanwhile, 11.8% reported that they could discuss philosophical problems freely. Regarding sources of philosophical information available on the Internet, 76.5% of students used only Wikipedia, the Free Encyclopedia (ru.wikipedia.org).

An assessment of the development of learning motivation demonstrated that students understood the importance of studying philosophy for the development of their general cultural awareness (70.6%). However, half of the respondents (49.3%) demonstrated only a moderate level of personal interest in philosophical issues. Students recognized the importance of using information and communication technologies in their future professional activities, assigning this factor an average score of 4.1 on a five-point scale. They also expressed a willingness to study the philosophy course with the help of ICT tools.

At the formative experimental stage, students were offered differentiated assignments from which they could choose, including both reproductive and productive tasks involving the use of ICT. Independent work at the reproductive level includes working with dictionaries, encyclopedias, reference books, electronic books, and digital teaching materials. Remote access to educational and scholarly publications is provided through electronic library systems. Students' work with the "Internet-Based Assessment Tools in Education" system (www.i-exam.ru) can also be classified as reproductive activity. The "Learning" and "Self-Assessment" modes allow students to solve test questions repeatedly, consult explanations of correct solutions, and access hints regarding incorrect answer options. Methods used to assess students' knowledge include oral questioning, interviews, and university-based assessment tests.

Students' productive independent activities involving Internet technologies included creating public pages on social networking platforms and maintaining personal blogs. These materials were used to organize discussions during seminars, conduct business games, and prepare reports and essays. This type of productive activity was chosen by 12.5% of students, while

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another 9.4% selected a different form of productive independent work: creating personal or group websites devoted to specific sections of the philosophy course, namely "Philosophy in Its Historical Development," "Philosophical Problems of Knowledge," and "Contemporary Philosophical Problems of Science and Technology."

At the reflective and evaluative stage, students were encouraged to assess their own SIW. Students who maintained blogs noted that this format allowed them to publish information freely, discuss philosophical problems, communicate with other students about academic matters, and search for primary sources and specialized literature on topics of interest to them. Students who chose to create websites were attracted by the opportunities to develop new documents, reference diagrams, multimedia materials, hyperlinks, glossaries, and other resources.

Engaging students in productive activities using ICT tools is an important factor in developing sustained learning motivation. For example, students who created blogs and websites rated the practical benefits of using Internet technologies to study philosophy at 7–8 points on a ten-point scale and their interest in the subject at 9–10 points. From the learners' perspective, the usefulness of independent work is also reflected in the fact that other students can use the materials they create.

Students who engaged in independent work exclusively at the reproductive level rated the benefits of using ICT in the study of philosophy at 4–5 points on a ten-point scale and their interest in the subject at 5–6 points.

There are grounds to argue that Web 2.0 technologies make it possible to combine the distinctive characteristics of humanities subjects, particularly philosophy, with the advantages offered by ICT tools. Independent searching, analyzing and transforming information, publishing the results of one's work, and engaging in specially organized communication are all activities that are fully consistent with the spirit of philosophy.

It is important to note several difficulties that arise when organizing SIW using these technologies. Maintaining a blog and developing a website require considerable time and effort on the part of students. Other challenges stem from the complexity of philosophical material, difficulties in selecting relevant content, identifying key ideas within the vast flow of information, and verifying the reliability of sources. Certain difficulties in organizing communication among students were also observed.

It can be concluded that the effectiveness of students' independent work increases when it is differentiated, combines various types of reproductive and productive learning tasks, and involves the appropriate use of active and interactive forms and methods of organizing student activities, Internet technologies, and technologies that promote face-to-face communication, such as business games, debates, projects, brainstorming sessions, problem-based learning, and other approaches.

The stages, principles, and forms of work discussed above contribute to the development of students' productive independence, enhancing their professional and personal potential in line with the prevailing trends in scientific and technological development.

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