IMPROVING THE INTEGRATION OF RELATED SUBJECTS TO BUILD TECHNICAL UNDERSTANDING IN TECHNOLOGICAL HIGHER EDUCATION STUDENTS

Yusupova Feruza Komilovna
Fergana State University
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ABSTRACT

In the present era, one of the key tasks in training specialists at higher educational institutions is the formation of competitive, adaptable, mobile, and highly qualified professionals. In this context, the search for and implementation of innovative technologies in pedagogical education, along with the revision of traditional principles and approaches to shaping and further developing the professional qualities of future graduates of higher educational institutions, has acquired particular urgency. Analysis of scientific literature indicates that, in addressing the improvement of the quality of professional training for students in higher education, their readiness to enhance the integration of related disciplines in the formation of technical concepts holds a special place. This is determined by the high level of development of science and production, which is characterized by the integration of technical and natural-scientific knowledge.

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In the scientific literature, the issue of modeling the integration of teaching methods for related disciplines is widely covered. Modeling the integration of teaching methods in the natural sciences, as well as the process of the model for improving the integration of related disciplines among students in higher educational institutions, serves the optimization of priority directions in the development of educational and production technologies, taking into account their specific features. As a theoretical and methodological foundation, approaches

were selected that focus on revealing the integrative properties and qualitative characteristics of an integral complex of mutually systemically linked elements in the process of integrating teaching methods for related disciplines.

Research highlights the PICRAT model as occupying a prominent position. The PICRAT model serves as a theoretical framework for guiding students' interdisciplinary technological integration. It enables teachers to develop students' thinking abilities, motivate them, provide practical guidance, and evaluate their progress. The model comprises the following components: Passive (passive), Interactive (interactive), Creative (creative); Replaces (replacement), Amplifies (amplification) and Transforms (transformation). This model allows teachers to pose two fundamental questions: "What are students doing with technology?" and "How does the use of technology affect the teacher's pedagogical activity?"

The sequence for improving the quality of students' technical concepts consists of the following components:

- motivational-target (providing the necessary didactic conditions to enhance preparation quality through the integrated teaching of natural science methods);
- cognitive-content (the content of natural sciences within the information-educational environment of higher educational institutions);
- organizational-activity (methods of integrating the teaching of natural sciences);
- criteria-evaluation (monitoring the effectiveness of the integration process);
- effective (determining the effectiveness of the tested model according to planned outcomes and relevant criteria and indicators).

In implementing the model, students' educational and cognitive activities are carried out within the framework of integration processes in the information-educational environment of higher educational institutions, based on the following principles: modernity of factual material in teaching (natural-science education); interesting presentation of educational material; activation of student activity at all stages of learning; awareness in learning; high-complexity exercises; sustainability in mastering knowledge, skills, and competencies; intensive development of intellectual abilities; the educational character of teaching; and the professional orientation of education.

Methods of integration include: creating stable motivation for students to acquire new knowledge through creative approaches (designing a system of value-semantic relations and monitoring personal educational and extracurricular achievements); developing methods for organizing students' educational, cognitive, and practical activities (project-based learning, independent student work using information technology tools, and interdisciplinary games); control and evaluation methods (monitoring students' educational achievements and difficulties, and assessing the place and significance of acquired knowledge and skills); and methods for forming a personal information and educational environment (relying on the teacher's or student's personal experience, professionalization and informatization of education, and open planning of learning outcomes).

The model has two main components: the communication process among students from different departments and the identification or development of special interdisciplinary integration applicable to teaching both subjects. For instance, two subjects were utilized to clearly demonstrate expected results during the identification or development of special

interdisciplinary integration. As a result of the dialog component of this model, students in the technological education field gain a clearer understanding of what they are learning from related disciplines and can strengthen technical concepts within themselves.

The communication process assists teachers in reviewing the content and timing of covered material, enabling students to better evaluate mutual relations and more effectively apply knowledge and skills acquired across disciplines and within a single course to other courses. These dialogs produce a list of technical concepts related to technological education and associated disciplines. Subsequently, teachers of technological education and related disciplines review, identify, or develop educational samples and materials for use in bachelor's-level courses. The purpose of these examples is to help students recognize and understand the relevance of interdisciplinary integration in studying various disciplines and to support the application of technical concepts in interdisciplinary contexts. The ultimate success of the model lies in how students learn and develop their knowledge through interdisciplinary pathways. Implementation can occur in several stages. The first stage concerns the integration of two subjects-technological education and related disciplines.

Although the model can function across all levels of numerous disciplines and courses, testing is planned in a limited number of sections per course using two subjects: analysis of technological education and related disciplines. Following initial testing, the analysis will be extended to all sections of technological education and related disciplines. The second stage will incorporate other disciplines from the main curriculum, such as mathematics, biology, chemistry, humanities, or social sciences departments, to implement the interdisciplinary integration model.

Goals and components of the model. In the global context of globalization and internationalization of education, improving the system of professional-pedagogical training for future teachers, shaping their pedagogical activities, and creating an electronic monitoring system for the development of creative potential, the application of the PICRAT model in enhancing the integration of related disciplines in the formation of technical concepts enables students to organize and comprehend their experiences individually and interactively. All natural and social sciences rely on theoretical models, which specialists use to understand the physical picture of the world.

Initially, by summarizing key works based on R. Dubin's theory, D.A. Whetten identified four essential elements common to all theoretical models: what, who, why, and where.

First, models must include sufficient variables, constructs, technical concepts, and details to render theories comprehensive, requiring adequate data for this purpose. Second, models must examine the categories or structure that allow theorists to understand the world in new ways through the interrelationships of components. Third, proposed models must provide logical foundations supporting how and in what form the components are connected.

Fourth, models must be bounded by context indicating who, where, and when they are applied. The emergence of technological integration models. Many scholars have adopted technological integration models according to their own methods. They employed self-created models in classroom settings without substantiating or comparing them against competing models. K.S.Kuhn advanced ideas for model improvement, designating certain basic theoretical features of models as superior. These features vary slightly depending on the field

of application; theoretical models in this domain serve different purposes in specific scientific models, with results applied in student-related educational research.

The PICRAT model. As a theoretical model guiding students' interdisciplinary technological integration, the PICRAT model enables teachers to stimulate thinking, motivate, guide practice, and evaluate student work. While any theoretical model explains certain features well but overlooks others, PICRAT is effective, student-oriented, and pedagogy-based. It is comprehensible and useful for teachers because it directs the most beneficial ideas regarding interdisciplinary technological integration.

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