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STEP-BY-STEP PROCESSES OF STUDENT'S CREATIVE ACTIVITY WHEN PERFORMING PROBLEMATIC PHYSICS EXPERIMENTS USING MULTIMEDIA TOOLS

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ABSTRACT

The article examines in detail the step-by-step processes of a student's creative activity when performing problematic physics experiments using multimedia tools based on didactic requirements, criteria and principles.

The article discusses the issues of students' interest, motivation, emotions, surprise and cognitive needs when performing problematic tasks in physics using multimedia tools. It has also been shown that when external influences and internal effects are synthesized, the reader begins to act creatively.

Keywords: problem, experience, content, verbal, active, inactive, cognition, interest, creative, activity, affect, effect, synthesis, creative, thought, emotion.

The problem of implementing problem-based experiments in physics through the MVF is analyzed within the framework of the “student-learning material” system. This approach makes it possible to distinguish the interaction between the student and the content of problem-based experiments, to identify the relationships and interactions among the constituent components, primarily in relation to the student’s learning activity, and subsequently to conduct a content-based analysis of problem-based experiments implemented through the MVF as part of the learning material. Furthermore, this approach expands the scope for interpreting the procedural and mediated characteristics of the MVF.

Learning is a social function assigned to the student within the social division of labor and, through the interaction between learning and creative activity, distinguishes two learning situations:

a passive situation, which corresponds to traditional teaching and learning. This type of learning is based on the teacher’s verbal explanation and is primarily oriented toward memorization;

an active situation, which involves the creative performance of problem-based experiments and is grounded in students’ independent intellectual activity. The implementation of problem-based experiments represents a form of learning oriented toward the development of creative thinking.

The study of the content of problem-based experiments in physics through students’ creative activity stimulates interest in performing the problem-based experiments being learned. Interest in implementing problem-based experiments in physics through the MVF gives rise to motivation, emotions, curiosity, and cognitive needs. A person proceeds “from need to thinking, and from the dynamics of thinking to the dynamics of behavior.” Through the synthesis of external influences and internal effects, the student begins to engage in creative action. The achieved outcome is formed as a product of independent intellectual activity and creative thinking.

There are both common and distinct aspects in the creative activities of a creative scientist and a student. Creativity is a shared characteristic of the activities of both the scientist and the student. The scientist discovers problems that are unknown to science, whereas the student discovers truths that are unknown to him or her personally. In both cases, novelty primarily has

subjective value, since through creative action both the scientist and the student develop their own personalities. At the same time, while the scientist, through creative activity, contributes to the development of science and, through science, to the development of society, the student, by engaging in creative action, develops personal abilities and prepares himself or herself for the future. These two distinct characteristics of the products of creative activity are defined by the social nature of the activities of the scientist and the student.

Within the system of interaction between learning and creative activity, two types of relationships can be distinguished: those between the student and the learning material, and those between the student and objective reality. The first type of relationship arises between the student and symbolic representations (such as drawings, images, tables, diagrams, histograms, schematics, and formulas), since any learning material is materialized in the form of formulas or spoken language. The second type of relationship occurs between the student and objective reality. In the context of implementing problem-based experiments through the MVF, the objective reality in question corresponds to the domains of academic disciplines.

From the perspective of relationships, a student's creative activity consists of a two-stage process.

1. The process of encountering symbolic representations. In this stage, two types of changes are observed:

(a) the transformation of symbols into a consciously perceived state under the influence of the student;

(b) changes that occur in students under the influence of symbolic representations, namely, the comprehension of symbols and the meanings conveyed through them.

2. The process of transferring the meaning conveyed through symbolic representations into the relevant domain. In this stage, two further types of changes are identified:

(a) the transformation of symbolic representations into personally relevant meaning under the influence of the student, including understanding which domain of textual activity-specifically, which academic discipline-the content belongs to;

(b) changes that occur in the student's consciousness under the influence of symbolic representations, such as understanding, thinking, analysis, and synthesis.

Thus, in didactics, the study of symbols (such as drawings, images, tables, diagrams, histograms, schematics, and formulas), the description of their characteristics, and the analysis of the relationship between a symbol and the meaning it represents constitute a key methodological problem expected to be addressed through research.

Of the four changes identified, the two labeled "(a)" represent formal changes, whereas the two labeled "(b)" represent content-related changes. Formal changes occur in the process of performing problem-based experiments, while content-related changes occur within the student. The content-related changes that arise in students during the creative performance of problem-based experiments possess didactic value. Consequently, the analysis of content-related changes and their underlying nature constitutes a problem that lies within the field of the didactics of creativity.

References

1. Constitution of the Republic of Uzbekistan. Tashkent: Uzbekistan, 1992, 48 p.
2. Aynbinder, A. B. *Forms of Improving Demonstration Experiments in Physics*. Abstract of PhD dissertation (Pedagogical Sciences). Moscow, 1997, 25 p.
3. Allayorov, I. A. *Didactic Foundations of Active Learning in Management Disciplines*. Tashkent: Fan, 1994, 111 p.
4. Bogoyavlenskaya, D. *Paths to Creativity*. Moscow: Znanie, 1981, 96 p.

5. Galaguzova, M. A. *Theoretical Foundations of Forming a Creative Personality of a School Student in the Process of Polytechnic Training*. Abstract of Doctoral dissertation (Pedagogical Sciences). Moscow, 1988, 31 p.
6. Dorno, I. V. *Problem-Based Learning at School*. Moscow: Prosveshchenie, 1984, 31 p.
7. Zvereva, N. M. *Activation of Thinking in Physics Lessons*. Moscow: Prosveshchenie, 1980, 113 p.
8. Ivanova, A. A., Medvedsky, P. I. *Problem-Based Learning and Students' Experimental Activity*. Moscow: Prosveshchenie, 1986, 232 p.
9. Muñoz Alvarez, G., Greca, I. M., & Arriassecq, I. (2025). *Problem-Based Learning as a Strategy for Teaching Physics in Technical–Professional Higher Education: A Case Study in Chile.* Education Sciences, 15(8), 941. https://doi.org/10.3390/educsci15080941
10. Suyono, S. (2025). *Exploring Project-Based Learning for Enhancing Creative Thinking in High Schools: Bibliometric Analysis and Literature Review.*
11. Wang, C. et al. (2025). *The Impact of Project-Based Learning on University Physics Students.* Frontiers in Psychology, 1495105
12. Bohm, D., & Peat, F. D. (1987). *Science, Order, and Creativity.* Routledge