



DEVELOPMENT OF STUDENTS' CREATIVITY BASED ON VARIATIONAL MODELING

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Abstract: *This article explores the development of creativity in preschool education students through a variational modeling approach. It analyzes the mechanisms for forming the creative thinking of future educators by creating multi-scenario solutions to problem situations. Furthermore, methodological recommendations for implementing varying models in the preschool education process are provided.*

Keywords: *Variational modeling, creativity, preschool education, divergent thinking, pedagogical skill, future educator, innovative approach.*

Annotatsiya: *Ushbu maqolada variativ modellashtirish yondashuvi asosida maktabgacha ta'lim yo'nalishi talabalarining kreativligini rivojlantirish masalalari yoritilgan. Maqolada bo'lajak pedagoglarning ijodiy tafakkurini shakllantirishda muammoli vaziyatlarning ko'p ssenariyli yechimlarini yaratish mexanizmlari tahlil qilingan. Shuningdek, maktabgacha ta'lim jarayoniga variativ modellarni tatbiq etish bo'yicha metodik tavsiyalar berilgan.*

Kalit so'zlar: *Variativ modellashtirish, kreativlik, maktabgacha ta'lim, divergent fikrlash, pedagogik mahorat, bo'lajak tarbiyachi, innovation yondashuv*

In today's rapidly changing global labor market, professionals are required to possess not only theoretical knowledge but also the ability to

find unconventional solutions in unexpected situations— creativity . The "single correct answer" principle in traditional education systems may limit students' creative potential. Therefore, introducing the methodology of variational modeling into the higher education process has become a matter of great relevance. Variational modeling aims to increase a student's intellectual flexibility by creating and analyzing multi-scenario solutions to problem situations during the learning process.

Teaching based on variational modeling transforms the student from a passive listener into an active researcher. The mechanism of this methodology in developing creativity rests on three main pillars:

- **Cognitive Flexibility:** The student develops several alternative options (models) to solve a single problem. For example, in economic or engineering tasks, scenarios A , B , and C are developed. In this process, the brain is forced to abandon standard templates and search for new connections.
- **Freedom of Choice and Responsibility:** Variability provides a platform for students to test their ideas. By predicting the outcome of each selected model, a synthesis of intuitive and logical thinking emerges within the student.
- **Working under Conditions of Uncertainty:** Creativity is often born where uncertainty exists. Variational modeling teaches students to think around the question, "What if the parameters change?", which builds creative courage.

To cultivate these skills in students, it is effective to apply the following algorithm during lessons:

1. Problem Identification: Defining the situation as open-ended (having multiple solutions).

2. Generation of Variants: Proposing as many solution models as possible without any criticism.

3. Optimization of Models: Analyzing the strengths and weaknesses of each variant through mathematical or logical analysis.

Research and theoretical analysis show that variational modeling serves as an effective mechanism for developing the creativity of future educators. Applying this approach in the preschool education system not only enhances students' methodological skills but also teaches them to approach the lesson process creatively and adaptively.

The methodological basis of this research consists of a systematic approach and the principles of student-centered education . To increase the creativity level of preschool education students during the research process, the following methods were utilized:

1. Pedagogical Modeling Method: Variational modeling was chosen as the basis of the research. Instead of a "standard lesson plan," students were given learning situations with variable parameters.

- Independent Variable: A set of varying tasks (eg, various didactic materials, different psychological states of children).

- Dependent Variable: The speed of students finding creative solutions and the originality of their ideas.

2. Assessment of Divergent Thinking (JP Guilford and E. Torrens Methodology)

To determine the level of students' creativity, divergent tests were used instead of traditional ones. This approach studied how many diverse (variational) solutions a student could provide for a single problem.

- Fluency: The number of ideas generated within a specific timeframe.
- Flexibility: The diversity of ideas (belonging to different categories).

3. Stages of the Pedagogical Experiment

The research was conducted in three stages:

1. Diagnostic Stage: Diagnosing the initial creativity levels of students through testing.
2. Formative Stage: Integrating variational modeling technology into the educational process. Students were assigned to design at least 3–4 different variants (scenarios) for a single game or learning activity.
3. Control Stage: Comparing the obtained results and conducting a mathematical-statistical analysis of the effectiveness of the variational approach.

4. Case-study and Brainstorming

In the practical part of the methodology, students were given real pedagogical crisis situations (cases). For example: "The materials you planned for a game are missing; how would you explain the topic using a variational method?" . This method served to develop cognitive flexibility in students.

- Variability develops the skill of not being limited to a single solution to a problem.
- Creativity develops in the process of analyzing the differences between the models created by the student and synthesizing the most effective one.

- The use of variational models in preschool education creates a foundation for children to make independent choices and awakens their creative thinking abilities from an early age.

AS Shvedersky notes, talent develops and is formed only under favorable conditions for an individual's personal development. These conditions indicate that everything should be aimed at organizing the educational process in such a way and ensuring its integrity so that all academic disciplines activate the individual's creative potential and awaken their spiritual strengths. In this respect, the methodology of teaching any subject is not an exception. The teacher's creative personality and their focus. Currently, the teacher is becoming the main active factor associated with the formation and development of a student's creatively developed personality. Therefore, a future teacher-educator must first of all be creative themselves and encourage creativity in students. The personality of a future teacher-educator should be broad-minded, creative, and knowledgeable. Since pedagogy does not have strictly regulated teaching methods, the teacher's choice is determined by the level of development of the student's personality.

Foydalanilgan adabiyotlar.

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