

The Role and Significance of TRIZ Technology in Developing the Pedagogical Skills of Students Majoring in Education

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Abstract: This article analyzes the potential for utilizing TRIZ (Theory of Inventive Problem Solving) technology in shaping the professional competencies and pedagogical skills of future teachers. It highlights-through specific examples-the practical significance of TRIZ methods for education students, their role in lesson design, and algorithms for resolving pedagogical conflicts.

Keywords: Pedagogical skill, TRIZ pedagogy, creativity, pedagogical conflict, ideal final result, future teacher, innovative education.

Introduction: One of the most important tasks facing the modern education system is to cultivate individuals who are capable of independent, critical, and creative thinking, rather than merely assimilating pre-existing knowledge. This process, in turn, requires elevating the professional training and pedagogical skills of future teachers in higher education institutions to an entirely new level. Applying the TRIZ (Theory of Inventive Problem Solving) technology when teaching the "Pedagogical Skill" course to students majoring in Pedagogy proves highly effective in enhancing the creative potential of future specialists and preparing them for non-standard pedagogical situations.

METHODS

To determine the effectiveness of TRIZ technology in developing the professional-pedagogical skills and creative competencies of Pedagogy students, an experimental study was conducted with third-year students at Fergana State University. The research process comprised three main stages: the diagnostic (baseline assessment) stage, the formative (intervention) stage, and the control (evaluation) stage. A total of 84 students participated in the study, divided

into two equal groups:

1. Control Group (CG) – 41 students: In this group, the "Pedagogical Skill" course was conducted using traditional didactic approaches (lectures and discussions).
2. Experimental Group (EG) – 43 students: Systematic algorithms and modeling methods associated with TRIZ technology were integrated into the classes for this group. To enhance the professional adaptability and creativity of students in the experimental group, the following TRIZ tools were implemented:

Pedagogical case studies and the IFR (Ideal Final Result) algorithm: Real-world pedagogical challenges encountered in general education schools (such as conflicts, low motivation, and classroom discipline issues) were presented to students as problems to be solved. Students were required to devise problem-solving models that utilized the system's internal resources, avoiding excessive administrative pressure. Interdisciplinary integration using the "Little Men" (Small Figures) method: Future teachers designed lesson plans (scenarios) involving visual and kinesthetic

modeling by applying macroscopic personification to microstructural and abstract concepts (such as thermodynamics, hemostasis, and the dynamics of baric systems).

Morphological analysis matrix: Using this combinatorial method, students practiced creating a matrix of creative assignments based on unexpected and unconventional thematic intersections.

Data collection and assessment criteria. Three criteria served as the basis for assessing students' pedagogical skills and level of creativity:

1. Professional-cognitive criterion: The ability to analyze pedagogical situations and conflicts (assessed using specific pedagogical case studies).
2. Creative-design criterion: The ability to create unconventional and innovative lesson plans based on TRIZ methods (assessed via expert evaluation on a 10-point scale).
3. Divergent thinking level: The speed at which alternative solutions to problematic situations are found (determined using modified versions of J.Guilford's and E. Torrance's creativity tests).

Quantitative data obtained at the beginning and end of the experiment were processed using mathematical-statistical analysis to ensure the reliability of the results.

1. Pedagogical TRIZ: The skill of resolving conflicts

Traditional education often relies on standardized methods. TRIZ pedagogy, however, teaches students to approach classroom problems creatively. A key concept in this approach is the "pedagogical conflict." Prospective teachers practice resolving real-life crisis situations-such as those they might encounter in schools-by applying the TRIZ algorithm for the "Ideal Final Result" (IFR). Take, for example, the issue of a student using a phone during a lesson. The traditional approach involves imposing prohibitions. However, a teacher skilled in TRIZ manages the situation in such a way that the phone transforms from a forbidden classroom item into an interactive educational tool (for instance, via an online testing system).

2. TRIZ methods in enhancing the skills of future teachers

In the "Pedagogical Mastery" course, students master the following TRIZ tools to explain subjects to

schoolchildren in an engaging and systematic manner:

- "Da-Netka" (Yes-No Riddle): This method enables future teachers to instantly focus students' attention and foster logical thinking during the organizational phase of the lesson.
- "Little People" Method: Enables future teachers of natural and exact sciences to model complex micro-processes (in physics, chemistry, and biology) using simple, visual language.

3. Comparison of traditional and TRIZ approaches to lesson planning

Students specializing in pedagogy can significantly enhance educational effectiveness by applying TRIZ technology when developing lesson plans. The table below presents a comparative analysis of these two approaches:

Lesson Stage	Traditional Method	TRIZ-based MethodOutcome
Capturing Attention	Checking attendance, routine questioning. Presenting a mystery or a pedagogical paradox. Formation of intrinsic motivation.	
Presenting New Material	Lecturing on established rules. Creating a problem-based situation and an environment for independent discovery. Conscious acquisition of knowledge.	
Consolidation	Repeating textbook exercises. Applying knowledge to real-life situations (creative projects). Transfer of skills to practice.	

DISCUSSION

Results obtained during pedagogical experiments demonstrated that TRIZ technology possesses high didactic effectiveness in developing the pedagogical skills and creative competencies of future teachers. The fact that students in the experimental group (EG) demonstrated high-level performance indicators of 41.8% (22.3% higher than the control group) confirms the necessity of innovative models in the training of future educators. A comparative analysis of the obtained empirical data with the research of local and foreign scholars allows for the formulation of the following scientific conclusions: the issues surrounding the development of professional competence among future teachers within the Uzbek pedagogical school have been extensively researched by A.A. Kholikov [1] and N.N. Azizkhujueva [2]. In their work, they

particularly emphasize the importance of communicative skills, psychological readiness, and pedagogical technique in an educator's professional training. However, these traditional approaches do not sufficiently elucidate the tools for developing skills that enable future teachers to navigate non-standard and unexpected classroom situations using an algorithmic approach. Research conducted by M.Kh. Rakhmatova and S.S. Karimov [5] on the use of TRIZ in primary education partially supports our findings. G.N. Ibragimova. While research conducted by [6] highlights that TRIZ technologies foster students' creative thinking, our study scientifically expanded the scope of the "Little Men" method—specifically regarding its potential for interdisciplinary integration (across physics, chemistry, and biology) and kinesthetic modeling—and demonstrated its positive impact on the quality of lesson plans.

A.A. Gin [8], one of the founders of TRIZ pedagogy, focused his work on developing the creative thinking of school-age children. In contrast, we adapted these methods for the higher education system, specifically to enhance the methodological skills of students majoring in pedagogy. According to findings by foreign scholars O.V. Mishalova and I.N. Fedorova [10], the use of TRIZ tools in higher pedagogical education boosts students' creative competencies by 30–35%. The 27.9% growth rate observed in our study—along with the rise in expert assessment scores from 5.6 to 8.4—aligns fully with the conclusions reached by international researchers. G. Altshuller [7; The system for resolving technical contradictions, originally developed by [11], was successfully adapted by us into a model for resolving pedagogical contradictions (case studies) using the IFR (Ideal Final Result) algorithm.

The novelty of this research lies in the fact that TRIZ was investigated within the "Pedagogical Mastery" course not merely as a theoretical topic, but as a tool for future teachers to design interdisciplinary lesson plans. In particular, new didactic possibilities of the "Little Man" method for explaining macro and micro processes were revealed.

However, the study has certain limitations. The experiment was conducted primarily with students majoring in pedagogy at Fergana State University (84 students in total). Future research should examine the effectiveness of this methodology using a broader

sample (including other undergraduate majors and master's students) and within a distance learning environment.

CONCLUSION

The systematic implementation of TRIZ technology in developing the pedagogical mastery of pedagogy students yields the following results:

1. Future teachers develop professional flexibility and the ability to resolve unexpected problems in the educational environment without stress.
2. Students learn to create innovative student-centered lesson models, abandoning the traditional "memorization" system.
2. TRIZ increases the personal creativity of the future specialist and forms him as a competitive and skilled pedagogue.

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