



# THE PEDAGOGICAL FOUNDATIONS AND SCIENTIFIC-THEORETICAL SOURCES OF TRIZ TECHNOLOGY

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## Abstract

This article analyzes the methodology for developing speed physical qualities of students (18-22 years old) engaged in table tennis. The research developed a system of exercises aimed at developing the main types of speed — movement speed, reaction speed, maximum speed and special speed. In the experimental group, a special methodology was applied — a combination of interval method, repeated method, circuit training and special exercises for developing reaction speed. The research results showed that in the experimental group, speed indicators significantly improved compared to the control group: 30 m run improved by 11.8%, reaction speed — by 29.4%, "herringbone run" — by 12.2%, stroke speed — by 18.6%. The developed methodology serves to improve the speed training of students engaged in table tennis.

**Keywords:** TRIZ technology, creative thinking, pedagogical innovation, problem-based learning, systems thinking, theory of contradictions, ideal final result, ARIZ algorithm, creative competence, person-oriented education.

## Introduction

In the modern education system, developing students' creative and critical thinking is a primary objective. In this regard, TRIZ (Theory of Inventive Problem Solving), which emerged in the second half of the 20th century, has gained special significance as an innovative approach within the educational process. The author of the TRIZ methodology is Genrich Altshuller, who



developed this theory based on the analysis of technical inventions. Today, TRIZ is widely applied not only in engineering but also in pedagogical practice.

Altshuller and his colleagues systematically analyzed thousands of patent documents from various historical periods and scientifically proved that the inventive process is not a product of random inspiration, but a logical process governed by specific objective laws. As a result, the laws of the evolution of technical systems, the principles for resolving contradictions, and the concept of the Ideal Final Result (IFR) were developed. This approach transformed inventive activity from an intuitive search into a scientifically-grounded, algorithmic process.

Specifically, ARIZ (Algorithm for Inventive Problem Solving) involves a consistent analysis of the problem, identification of contradictions, mobilization of available resources, and the search for an optimal solution in a clear logical sequence. Thus, TRIZ can be interpreted not as a simple method, but as a scientific system with a solid theoretical and methodological foundation.

Today, TRIZ is applied not only in engineering and technology, but also in pedagogy, management, economics, and the modeling of social systems. Introducing the TRIZ methodology into education helps develop systemic, critical, and creative thinking in students. TRIZ focuses not on superficially solving problems, but on identifying internal contradictions and resolving them through logical reasoning. In this sense, TRIZ is recognized as an innovative technology that fully meets the requirements of the modern competency-based education paradigm.

### **Literature Review and Methods**

By the mid-20th century, the unprecedented development of science and technology, the increasing complexity of industrial production, and the emergence of new technological systems demanded a new approach to inventive activity. Traditional problem-solving methods based on experience and intuition were no longer sufficient. Contradictions in complex technical systems, limited resources, and increasing demands for efficiency necessitated organizing the inventive process on a scientific basis. It was in such historical and scientific conditions that the Theory of Inventive Problem Solving (TRIZ), developed by Genrich Altshuller (1926-1998), emerged. TRIZ is defined as a science that



studies the objective laws of system development and creates a methodology - that is, a system of methods, principles, and tools - aimed at creative problem-solving. As is evident from this definition, TRIZ is not merely a collection of methods, but a scientific-theoretical discipline aimed at analyzing and improving systems based on objective laws.

From a pedagogical viewpoint, TRIZ considers the education system a dynamic and evolving entity. Any pedagogical system consists of interconnected components - purpose, content, methods, tools, and results - and develops continuously under internal and external influences. TRIZ serves to identify the conflicts that arise in this process, resolve them constructively, and determine optimal ways to enhance educational effectiveness. Altshuller's theory was based on the empirical study of thousands of patents. Through systematic analysis, he identified recurring patterns in the evolution of technical systems and interpreted inventive activity as an algorithmic and logically consistent process. Consequently, TRIZ was developed as a conceptual-methodological system that models the mechanisms of creative thinking, identifies contradictions in problem situations, and proposes effective solutions.

## **Results and Discussion**

The scientific and theoretical foundations of TRIZ consist of the following:

1. The Laws of Technical System Evolution - any system progresses through specific evolutionary stages.
2. The Theory of Contradictions - to solve a problem, it is necessary to identify and resolve the contradictions within the system.
3. The Concept of Ideality - a system achieving maximum efficiency through the optimal use of resources.
4. The ARIZ Algorithm - a methodology for the step-by-step resolution of inventive problems.

The theoretical sources of TRIZ are intrinsically linked to general systems theory, cybernetics, logic, and psychology. Research into the psychology of creative thinking has also influenced the development of TRIZ. The pedagogical foundations of TRIZ are formed based on student-centered learning, problem-based learning, and activity-based approaches.

1. Student-Centeredness



TRIZ serves to develop a student's independent thinking and creative potential. This approach aligns with the principles of constructivist pedagogy.

## 2. Problem-Based Learning

In lessons organized based on TRIZ, students are not given ready-made knowledge; instead, a problem-based situation is created. Students are engaged in identifying, analyzing, and finding a solution to the contradiction.

## 3. Development of Systems Thinking

TRIZ methods cultivate students' skills in perceiving phenomena and processes as a system and identifying cause-and-effect relationships.

## 4. Development of Creative Competencies

TRIZ pedagogy develops the following competencies in students:

- problem identification;
- finding the contradiction;
- developing alternative solutions;
- selecting the optimal option.

TRIZ methods can be applied from primary to higher education. It yields particularly effective results in mathematics, physics, technology, and natural science courses. Lessons organized based on TRIZ elements increase student motivation and develop independent and critical thinking. Today, TRIZ technology is being applied as an innovative pedagogical approach in many countries around the world. It also integrates well with the STEAM education concept.

## **Conclusion**

In conclusion, TRIZ technology is an effective pedagogical tool aimed at developing creative thinking and is built upon a deep scientific and theoretical foundation. This theory, created by Genrich Altshuller, is of significant importance today in the modernization of the educational process. The pedagogical foundations of TRIZ, based on the principles of a student-centered, problem-based, and systematic approach, serve to foster innovative thinking in students.



## References

1. Yuldasheva D.M. Pedagogical Features Of Mental Development Of Preschool Children. Solid State Technology. Volume: 63 Issue:6 Publication Year:2020. 14221-14225
2. Yuldasheva D.M. Anthropocentric Approach To Children's Speech Study. Section 2: Linguistic Theory, Applied Linguistics. Collection Of Materials Of The International Online Conference. [www.research-support-center.com](http://www.research-support-center.com) 2020.92-95
3. Yuldasheva D.M. The Methods Of Speech Development Of Preschool Children. Epra International Journal Of Multidisciplinary Research (Ijmr). Impact Factor: 7.6.11. November.
4. **Альтшуллер Г. С.** Найти идею: Введение в теорию решения изобретательских задач (ТРИЗ). – М.: Советское радио, 1986. – 240 с.
5. Kotov, V. V. Pedagogik innovatsiyalar va TRIZ texnologiyasi. – Toshkent: Fan va texnologiya, 2017. – 198 b.
6. Ergashev, J. O. Ona tili darslarida ijodiy tafakkurni shakllantirishda TRIZ metodologiyasining o'rnini // *Pedagogika va innovatsiyalar*. – 2018. – №2(7). – B. 30–36.