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DEVELOPMENT OF PROBLEM SOLVING COMPETENCE AMONG STUDENTS BASED ON COGNITIVE EDUCATIONAL TECHNOLOGIES *(AS AN EXAMPLE OF PISA RESEARCH)*

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ANNOTATION: This article analyzes the essence of cognitive educational technologies, their role and significance in the formation of problem-solving competence in students. It also describes the current state and proposals for problem-solving based on the results of the PISA international assessment program.

KEYWORDS: cognitive technologies, problem-solving competence, PISA, critical thinking, constructivism, metacognition, competency-based approach.

INTRODUCTION

The main goal of education in the 21st century is to develop students' skills in independent thinking, analysis, problem-solving, and problem-solving. In this, modern pedagogical technologies, in particular cognitive learning technologies, play an important role, rather than traditional methods based on memorization of knowledge.

At the international level, the PISA (Programme for International Student Assessment) assessment program serves to determine students' knowledge and skills in solving real-world problems and shows the real effectiveness of the education system.

In today's era of globalization and rapid information change, the main task of the education system is to develop students' skills in independent thinking, making the right decisions in problem situations, logical analysis, and applying life knowledge in practice.

Cognitive educational technologies play a special role in the development of these competencies. Because these technologies activate the cognitive activity of the student, consider his personal experience, level of thinking and approach to the problem as the main factor. At the same time, real results of the quality of education are being determined through international assessment systems, in particular, the PISA program. This article analyzes these two areas - cognitive technologies and problem-solving competence through PISA assessments - in an interconnected manner.

MAIN PART

1. Theoretical foundations of cognitive educational technologies

Cognitive technologies are a teaching system focused on the thinking process of students. In these technologies, the main subject of learning is the student himself, who:

- searches for information;
- analyzes;
- synthesizes;
- draws independent conclusions;
- finds a solution to the problem.

Cognitive approaches are based on the following psychological and pedagogical theories:

Theory	**The main idea**
Constructivism	The student constructs knowledge on his own, not memorizes ready-made knowledge.
Metacognition	The student can analyze their own thought process.
Socioconstructivism	Learning occurs effectively through social interaction.

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Through these approaches, the teacher sees his role not as a teacher, but as a guide, advisor, and facilitator. Therefore, the following methods are widely used in the teaching process:

- "Brainstorming"
- "Cluster method"
- "Socratic conversation"
- "Problematic questions"
- "Debate" and "Discussion"
- "Case study" (working with real situations)

2. Problem-solving competence and its stages of formation

Problem-solving competence is the ability of a student to find effective solutions to new, uncertain, and complex situations using existing knowledge, experience, and a logical approach. This competence is formed in the following stages:

1. **Understanding the problem** – understanding the situation, isolating the main issue;
2. **Gather information** – mobilize existing knowledge;
3. **Hypothesis** – proposal of possible solutions;
4. **Analysis of solution options** – compare the advantages and disadvantages;
5. **Choosing the optimal solution**;
6. **Evaluation of the result** – reflection, drawing conclusions.

The competencies formed through these stages are used not only in the learning process, but also in everyday life.

3. PISA research and problem-solving competence

PISA (Programme for International Student Assessment) is an international programme that assesses the level of readiness of 15-year-old students in reading literacy, mathematics, science and problem-solving. It is held every 3 years and involves more than 80 countries.

In PISA 2012 and 2015, **"Problem solving"** was assessed as a separate area. The assessment tasks are close to real life and determine the following skills of the student:

- Time management
- Information analysis
- Choice making
- Finding solutions to problems through communication
- Using unfamiliar technologies

PISA 2018 Quote from the results:

State	Average score
Singapore	561
Japan	552
Estonia	523
Canada	518
Uzbekistan	~398

(Uzbekistan fully participated in PISA 2022 for the first time)

In the education system of these countries, methods focused on cognitive development are central. The teacher seeks to form the student not only as a learner, but also as an independent analytical person.

4. Current situation and proposals in Uzbekistan

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Uzbekistan has been actively participating in PISA studies since 2022. The current problem is that most schools:
• Traditional teaching methods based on memorization;
• The practice of teaching ready-made answers;
• There are lessons that are not focused on solving problem situations.
This hinders the development of competencies such as critical thinking, problem solving, and collaborative work in students.

THE ESSENCE OF COGNITIVE EDUCATIONAL TECHNOLOGIES

Cognitive educational technologies are teaching methods aimed at developing students' thinking, memory, attention, problem-solving and critical information processing skills. They are based on the following basic principles:
• Active acquisition of knowledge (constructivism);
• Learning to learn;
• Metacognitive (thinking about thinking) approach;
• Learning based on student activity;
• Reflection and self-assessment.
These technologies increase students' level of thinking, analytical skills, critical thinking and problem-solving competence.PISA tadqiqotlari va muammo yechish kompetensiyasi
PISA studies are conducted every three years by the OECD (Organization for Economic Cooperation and Development) and assess students' literacy, mathematics, science, and problem-solving skills.
Problem-solving skills refer to a student's ability to think logically and choose and use effective strategies in unfamiliar situations encountered in real life.
Problem-solving was assessed as a special area in PISA 2012 and 2015. Countries that scored high in this assessment (Singapore, Japan, Canada, etc.) have in their education systems:
• Learner-centered approaches;
• Practice-oriented tasks;
• Methods that stimulate cognitive activity are widely used.
Through these approaches, students not only acquire knowledge, but also acquire the ability to apply it to real-life situations.

ANALYSIS AND PROPOSALS ON THE EXAMPLE OF UZBEKISTAN

Uzbekistan participated in the 2022 PISA study. Preliminary results show that significant work still needs to be done to develop students' problem-solving competencies. In particular:
• Teaching critical and logical thinking;
• Showing multiple approaches to problems;
• Developing discussion and decision-making skills in group work;
It is important to equip teachers with modern cognitive methods in these areas.

SUGGESTIONS:

1. Include more problem-solving tasks in educational programs;
2. Retrain teachers based on cognitive technologies;
3. Use active methods aimed at solving real-life problems in each lesson;
4. Develop students' skills in reflection and reasoning.
5. Introduce lesson models based on cognitive technologies For example, conduct lessons with questions such as “How?”, “Why?”, “Is there another way?”
6. Integrate exercises like PISA tasks into the lesson Use real-life situations: transportation schedules, financial decisions, healthy lifestyles, etc.
7. Retrain teachers Organize seminars and master classes on cognitive methodology.

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8. Create a bank of problem tasks
PISA format for each subject

CONCLUSION:

Modern education should focus not only on the level of knowledge of students, but also on the formation of life competencies such as the ability to think, find the right solutions in problem situations, and make independent decisions. The use of cognitive educational technologies plays an important role in this. PISA studies allow us to determine the results of reforms and approaches implemented in this direction.

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