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LOGICAL THINKING AND APPROACHES TO SOLVING EVERYDAY PROBLEMS IN ENGINEERING EDUCATION.

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Abstract: This article is devoted to the study of logical thinking and approaches to solving everyday problems in engineering education. The article proposes methodological approaches for a more systematic and logical development of students' thinking through the use of everyday life situations

Annotatsiya: Ushbu maqolada muhandislik ta'limida mantiqiy tafakkur va kundalik hayotiy muammolarni yechish yondashuvlarini o'rganishga bag'ishlangan. Maqolada kundalik hayotiy vaziyatlardan foydalanish orqali talabalar tafakkurining yanada tizimli va mantiqiy rivojlanishi uchun metodik yondashuvlar taklif etiladi.

Аннотация: Статья посвящена исследованию логического мышления и подходов к решению повседневных задач в инженерном образовании. В статье предлагаются методические подходы для более системного и логического развития мышления студентов посредством использования повседневных жизненных ситуаций.

Kalit so'zlar: muhandis, kontekst, texnik bilim, mantiqiy tafakkur, muammo, optimallashtirish, ma'lumot

Key words: engineer, context, technical knowledge, logical thinking, problem, optimization, information

Ключевые слова: инженер, контекст, технические знания, логическое мышление, проблема, оптимизация, информация

INTRODUCTION

Engineering education requires not only technical knowledge, but also the development of students' logical thinking. Logical thinking enhances the ability of engineers to effectively solve problems, make decisions, and develop innovative solutions. This article examines logical thinking and approaches to solving everyday problems in engineering education. Attention is paid to important aspects such as 21st century skills (4K - critical thinking, communication, collaboration, creative thinking), employer requirements, and the application of engineering to solving social problems.

LITERATURE REVIEW AND METHODS.

The importance of logical thinking.

Logical thinking is the basis and an important tool of engineering activity. It can be described as the "professional agenda" of an engineer. Logical thinking is important in the field of engineering. It allows you to analyze problems, collect information, and process it systematically.

Through logical thinking, engineers increase their ability to effectively solve problems, make decisions, and develop innovative solutions.

1. Problem Analysis and Identification

Any project in engineering begins with solving a complex problem. Using logical thinking, an engineer:

· Determines the true root cause of the problem (equipment failure, structural weakness, software error, etc.).

· Breaks the problem into smaller parts and organizes them.

· Is free from unnecessary emotions and is based only on facts and information.

For example: When the water in the dam stops flowing, using logical thinking can determine whether the problem is a clogged pipe, a malfunctioning pump, or a control system error.

2. Developing and optimizing solutions

A problem can have multiple solutions. Using logical thinking, an engineer:

· Compares the pros and cons of each solution.

· Selects the most effective, economical, and reliable solution.

· Can foresee the long-term consequences of the solution.

Example: When building a bridge, compare different materials (concrete, steel) and structures and choose the strongest and cheapest option.

3. Anticipating and eliminating hazards

Engineering projects are directly related to safety. Logical thinking:

· Can foresee the dangers and risks that may arise at each stage of the project.

· Develops contingency plans for emergency situations.

· Teaches how to ask the question "What if ...?" (what-if analysis).

Example: Simulating how an airplane wing will perform under different temperatures and pressures when designing it. Or planning in advance what to do in the event of an accident at a nuclear power plant.

4. Efficiency and optimal use of resources

Any project is carried out with limited resources (time, money, materials, labor). Logical thinking:

· Helps find ways to complete the project in the shortest time and with the least cost.

· Prevents waste of resources.

Example: Saves time by planning the movement of workers and equipment on a construction site.

5. Creating innovations and developing new ideas

Creativity often begins with logical thinking. An engineer:

· Understands how existing technologies work.

· Thinks about which parts of them can be improved or a completely new principle can be created.

· Logically analyzes new ideas and sees the possibility of implementing them in practice.

Example: Creating an electric car is not only the invention of a battery, but also the efficient management of energy, the logical optimization of engines and alloys.

6. Making clear and confident decisions

Even in emergency or pressure situations, an engineer, thanks to logical thinking:

· Does not rush.

· Processes all information quickly.

· Makes the most correct decision based on evidence.

Logical thinking is the key for an engineer to turn theoretical knowledge into practical solutions. It makes an engineer not only a technical person, but also a reliable, responsible and strategically thinking specialist. 90% of success in engineering comes not only from knowing formulas, but also from understanding where, when and how to apply them (i.e., logical thinking). That is why modern engineering education programs pay special attention to developing logical and critical thinking skills in students.

RESULTS AND DISCUSSIONS.

Approaches to solving everyday life problems.

Approaches to solving everyday life problems play an important role in developing students' logical thinking. These approaches allow students to analyze and solve real-life problems. This helps them to work effectively in the field of engineering.

Engineering problems involve many factors and parameters with a high level of complexity, and context-dependent problems are usually related to real-life situations.

There are several approaches to solving everyday problems in engineering. They work on the basis of theoretical foundations:

a) Problem-Based Learning (PBL)

Definition: Students independently apply their knowledge and skills by studying real or near-life problems.

Theoretical foundation: Theory of constructivism, that is, knowledge is formed only in the process of active learning.

Advantages: Students learn to think independently, research and analyze to solve the problem.

b) Systemic approach

Definition: Viewing the problem within the framework of the entire system, analyzing all its elements and their interactions.

Theoretical foundation: System theory, systems theory.

Advantages: Allows for a holistic understanding of complex problems and optimal solutions.

c) Logical thinking and algorithmic approach

Definition: Step-by-step analysis of the problem and development of algorithmic solutions.

Theoretical basis: Logic, mathematical modeling, algorithm theory.

Advantages: The solution process is clear and systematic, reducing errors.

d) Project-Based Learning

Definition: Students work on a specific project and solve real problems.

Theoretical basis: Practical activities learning theory.

Advantages: Students develop teamwork, management, and problem-solving skills in real-world settings.

The process of solving everyday problems

Solving engineering problems typically involves the following steps:

1. Defining and understanding the problem — revealing the essence of the problem.

2. Data collection and analysis — gathering available information, extracting important facts.

3. Modeling the problem — creating a mathematical or conceptual model.

4. Developing solution options — considering several solution options.

5. Evaluating and selecting solutions — choosing based on efficiency, economic, and technical aspects.

6. Implementing the solution — developing and implementing the project.

7. Evaluating the results — monitoring and improving the effectiveness of the solution.

Approaches to solving everyday problems in engineering play an important role in the modern educational process. They help students develop not only technical knowledge, but also logical thinking, a systematic approach, and creative thinking. This prepares engineers to find effective answers to real-world problems.

CONCLUSION.

Various pedagogical methods and strategies can be used to introduce logical thinking and everyday problem-solving approaches into engineering education. For example, problem-based learning (PBL), project-based learning (PBL), and interactive teaching methods can be effective in developing students' logical thinking.

Logical thinking and everyday problem-solving approaches in engineering education help to increase students' ability to effectively solve problems, make decisions, and develop innovative solutions. The introduction of these approaches into the educational process serves to improve the quality of engineering education.

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