5E MODEL IN EDUCATION - A MODERN APPROACH TO TEACHING

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Abstract. *This article discusses a modern approach to teaching based on the 5E model, which is widely used in the educational process. The 5E model (Engage, Explore, Explain, Elaborate, Evaluate) is aimed at increasing student activity, independent thinking, and deep assimilation of knowledge. Each stage of the model allows students to arouse interest, create knowledge through experience, and evaluate the acquired knowledge. This approach, based on the principles of constructivist education, serves to effectively organize student-centered education. The article analyzes the advantages of the 5E model and its importance in improving the quality of education.*

Keywords: *5E model, modern education, learner-centered education, educational effectiveness, independent thinking, active learning, assessment process.*

Introduction

The Decree of the President of the Republic of Uzbekistan No. PF-134 dated May 11, 2022 "On Approval of the National Program for the Development of School Education for 2022–2026" stipulates the introduction of a national educational program based on international experience, modern methods and textbooks into the education system, and the emphasis on modern pedagogical technologies, teaching methodologies, and student-centered teaching is consistent with the principles of the 5E model. A modern approach to teaching requires a transition to research-based and problem-based methods that are more active than traditional methods, helping students develop not only theoretical knowledge, but also practical skills.

In the context of the rapid development of information technologies, globalization, and changing needs of society, the need to introduce innovative pedagogical technologies that help develop important competencies in students, such as thinking, problem solving, and independent learning, is becoming increasingly urgent. One such technology is the 5E model. It was developed in the United States in 1987 as part of the biology curriculum. The 5E model is used not only in the natural sciences, but has also been successfully adapted to the humanities and social sciences. The essence of the model is to organize the learning process into five main stages, each of which is aimed at actively involving students in the learning process, developing their research skills and critical thinking. The 5E model is based on the principles of the constructivist approach to learning, which emphasizes that knowledge is the result of the active cognitive activity of the learner. The key concepts of this approach are:

1. Active learning - students not only receive information from the teacher, but also actively participate in the learning process.

2. Research - students solve problems, conduct experiments and analyze data, which helps to deeply process information and form independent conclusions.

3. Developed critical thinking - students learn to evaluate information, formulate hypotheses, analyze and test them.

These principles underlie the stages of the 5E model, each of which focuses on a specific aspect of cognitive activity. The stages of the 5E model are as follows:

1. Engage (Introduction. Attract attention. Get excited. Get ready)

In this stage, the teacher creates an environment that arouses interest in students and encourages them to explore the topic in more depth. Various methods and techniques are used to arouse curiosity in students and encourage them to explore. This stage should establish connections. Past and present learning experiences, revealing previous concepts, and organizing students' thinking about the results of the current activity. It is important that this stage arouses students' enthusiasm for research and acquiring new knowledge. The following skills are developed in this stage: critical thinking, cooperation (communication), initiative.

Teacher's activities	Student activities
• Motivates and arouses interest • Builds on students' existing knowledge • Asks questions and encourages answers • Acts as a facilitator	• Listens attentively • Asks questions • Arouses curiosity • Demonstrates activity and advances hypotheses

2. Explore (Explore. Problem Solving. Active Participation)

The exploration stage provides students with a common framework for activities that expose them to current concepts, processes, and skills, as well as conceptual insights. Students may conduct laboratory work, where students apply previously acquired knowledge to generate new ideas and explore questions. Cognitive and physical skills are developed at this stage. During the exploration stage, students actively participate in searching for information, completing practical tasks, observing, and conducting experiments. The teacher's task is to create conditions for independent work, guide students' activities, and provide the necessary assistance in finding solutions. It is important that students not only collect information, but also analyze it and formulate hypotheses.

Teacher's activities	Student activities
• Observes and listens to student interactions • Asks clarifying questions • Provides time for reflection • Encourages collaborative learning	• Participates in activities • Listens and shares ideas • Records observations • Discusses alternatives

3. Explain (Explain. Strategic concepts. Method statement. Discussion of the idea)

After students have conducted research and received their results, the explanation stage begins, when they must explain their conclusions. The explanation stage focuses students' attention on a specific aspect of the research, provides an opportunity to demonstrate their conceptual understanding, skills, or behaviors. Students explain their understanding of the concept. At this stage, the teacher can lead students to a deeper understanding of the topic. The following skills are developed at this stage: cognitive and metacognitive, as well as effective oral and written communication, analysis, and evaluation. The teacher helps to systematize the knowledge gained, explains theoretical aspects, confirms or refutes hypotheses, highlights key points, and helps students formulate clear and complete explanations.

Teacher's activities	Student activities
• Provides definitions and explanations • Listens to students and builds on their ideas • Asks for clarification • Uses existing knowledge to improve the learning process	• Explains in his own words • Applies new concepts • Uses formal terms and definitions • Has a positive impact

4. Elaborate (Deeper Entry. New Problem. Active Participation. Written Statement)

During the elaboration stage, students apply the acquired knowledge in new situations. This stage allows students to expand and deepen their knowledge by solving more complex problems or studying related topics. This helps to develop creative thinking and helps students see the practical relevance of the material being studied. In this stage, skills such as metacognition, effective oral and written communication, as well as curiosity and imagination are developed. The teacher awakens and expands students' conceptual understanding and skills.

Teacher's activities	Student activities
• Promotes application in different contexts • Uses new terms and definitions • Explains and asks questions effectively	• Apply concepts to new scenarios • Expands understanding • Uses formal language and terminology

5. Evaluate (Evaluate. What was learned. Questionnaire period. Control)

At the final stage, both the student's activity and the learning process itself are evaluated. Assessment can be formative (for example, observation of the work process, feedback during assignments) or summative (final tests, projects, assignments). The following skills are developed at this stage: analysis and evaluation. It is important that the assessment not only records the final result, but also encourages students to reflect and self-assess.

Teacher's activities	Student activities
• Observes and evaluates student behavior • Promotes self-esteem • Asks open-ended questions • Provides clear conclusions	• Demonstrates understanding • Evaluates own progress • Answers open-ended questions

The advantages of the 5E model for the educational process include the following:

1. Activation of cognitive activity

The 5E model promotes active learning, in which students become active participants in the educational process. This increases their interest and motivation for learning.

2. Development of critical thinking. Each stage of the model is aimed at developing students' ability to analyze, synthesize, test hypotheses and solve problems in a rational way, thereby developing critical thinking skills.

3. Inclusive approach. The 5E model includes different learning styles and allows each student to work at their own pace, which promotes an inclusive educational process and adapts materials to different learning needs.

4. Preparing for Real-World Learning. By emphasizing inquiry and problem-solving, the model helps students develop real-world skills such as analyzing data, making informed decisions, and designing projects. Applying the 5E Model to Different Subject Areas: Although the 5E Model was originally developed for teaching science, it can be successfully adapted to other subject areas. For example, in the humanities, students can research historical events, analyze literary works, and

develop social projects. In mathematics, they can solve non-standard problems and test hypotheses using a variety of methods.

The 5E learning model has some shortcomings related to the specific nature of each stage. These shortcomings arise from the fact that the model is used as a linear sequence and that each stage is not isolated.

Disadvantages associated with the different stages of the model:

Engage. 1. Partially undermines the process by focusing on the content of the topic. This stage does not involve the teacher giving a lecture, defining terms, or explaining. The goal is to interest or arouse interest and connect it to the current topic.

2. Not enough attention is paid to this stage. In some cases, the engagement stage is not given enough attention, which can lead to students not being actively motivated in the learning process

Explore. 1. Time spent on practical activities. Laboratory studies or practical exercises at this stage can be long.

2. Lack of direct instructions - the teacher guides students to questions based on their research, but the answers are not yet sought.

3. The need to allocate time to clarify hypotheses - students are given time to reflect on the results of the research.

Explain. 1. Teacher-centered. Students explain their understanding of concepts and approaches, and the teacher corrects students' misconceptions.

2. Need for formative assessment: The teacher should ask follow-up questions to support the discussion and conduct formative assessment to determine whether students are ready to begin the developmental phase and whether additional guidance or support is needed.

Evaluate. 1. The complexity of designing assessments that align with the 5E model. It can be difficult to design assessments that effectively measure student understanding of the concepts in the model. 2. Using the model as the basis for a single lesson reduces the effectiveness of the individual steps, reducing the time and opportunity to challenge and reframe these concepts. It is best to use the model for two to three weeks. Then, each step serves as the basis for one or more lessons.

To overcome the shortcomings of the 5E model, we can use the following methods:

- Vary the sequence of activities. Changing activities throughout the lesson increases students' motivation to learn the material and reduces the cognitive load when performing various tasks.

- Use additional tools. For example, the GRASPS tool or the 4C/ID model's learning task system can be used to develop learning tasks and assignments during the research phase.

- Flexible use of the model. Although the 5E model is interpreted only sequentially, sometimes it is necessary to return to the previous cycle before moving on to the next with students. The teacher can move back and forth within the model several times.

- Use non-traditional forms of assessment. These include portfolios, concept maps, physical models and journals, presentations with student self-assessment (reflection).

There is no clear consensus on which non-traditional assessment methods are most effective. Accordingly, we present several options:

• The “green pen” method. The goal is to avoid drawing the student’s attention to errors highlighted with a red pen and to mark the most successful areas with green ink. This can increase self-assessment and motivation.

• Rating system. This system emphasizes competition: students strive to achieve better results than others. Competition allows them to improve their skills, increase self-esteem, and visually see their successes, which is very important for the overall learning process.

• Criteria-based system. Written assignments are assessed based on criteria. Criteria provide the most objective assessment, showing the student where they are achieving high results and where they need to work harder.

• Specification-based assessment. The system is focused on developing skills, has clear assessment criteria, and provides more time and opportunity for feedback.

• Questionnaire and self-assessment. This system allows students to self-analyze and reflect on their progress. Students complete an online questionnaire each week, sharing what they have learned, what they have learned about themselves, what they would like to improve, and how their work is being evaluated.

• Visualization and gamification. This assessment method can take a lot of time and preparation, but its implementation can increase student motivation and provide an opportunity to receive meaningful feedback. The goal is to visually represent the student's journey through a game-like experience.

Conclusion. It is important to remember that it is inappropriate to rely too often on such forms of organizing the learning process, since unconventionality can quickly become conventional, which can lead to students losing interest in the subject. This article analyzes the theoretical and practical aspects of using the 5E model in the educational process. The results of the study showed that the 5E model serves to effectively organize student-centered education, increase students' cognitive activity, and ensure deep and stable mastery of knowledge. The step-by-step structure of the model allows students to develop independent thinking, analyze problem situations, and assess their own knowledge. Also, the implementation of the 5E model in practice has a positive effect on improving the educational process based on modern pedagogical approaches and improving the quality of education.

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