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THE ESSENCE OF THE STEAM APPROACH, ITS EMERGENCE AS AN EDUCATIONAL CONCEPT AND STAGES OF DEVELOPMENT

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Abstract

This article highlights the history, significance, development stages, and the role of the STEAM approach in modern pedagogy, which emerged in order to improve the quality of education in the current conditions of globalization.

Keywords

STEAM, history of STEAM, stages of development, STEM model, STEM concept.

In today's era of globalization, the use of innovative approaches in the education system is gaining great importance. In the modern educational process, it is not sufficient for students to acquire only theoretical knowledge; developing their independent thinking, problem-solving skills, and creative thinking is also an important task. From this perspective, introducing integrated approaches into the educational process has become one of the urgent issues. One such approach is **STEAM technology**.

The term **STEAM** consists of the initial letters of the English words **Science, Technology, Engineering, Art, and Mathematics**. This approach serves to develop students' knowledge in a comprehensive manner through the integration of various disciplines. Unlike traditional teaching methods, STEAM education is based on engaging students in practical activities such as conducting experiments, creating projects, and solving problem-based situations.

The STEAM approach was initially formed as the **STEM concept**. STEM education emerged in the late 20th and early 21st centuries due to the need to train competitive specialists in the fields of science and technology. Later, the need to incorporate elements of art and creativity into the educational process arose, and as a result, the STEM model evolved into the **STEAM model**. This transformation began to develop not only students' technical knowledge but also their creative thinking abilities.

The development stages of STEAM education include several periods. In the first stage, subjects were taught separately, while in later stages the integration between disciplines began to strengthen. At the present stage, problem-based tasks, project-based learning, experimental activities, and creative practices are widely used in the educational process. In addition, the STEAM approach helps develop competencies such as **critical thinking, problem solving, teamwork, communication skills, and the ability to generate innovative ideas**. This plays an important role in forming individuals who meet the requirements of modern society.

Today, STEAM education has become an important part of the educational systems of many countries around the world. Through this approach, special attention is paid to developing

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students' scientific thinking, creative approaches, and practical skills. As a result, students gain the opportunity to apply theoretical knowledge in real-life situations.

STEAM education, as a modern pedagogical approach, helps organize the learning process more effectively. Within this approach, students master theoretical knowledge combined with practical activities. They begin to understand the interconnections between different disciplines and can apply their knowledge while solving real-life problems. This contributes to increasing the effectiveness of the educational process.

One of the important aspects of the STEAM approach is that it increases students' activity and encourages them to conduct independent research. In traditional education, students mainly act as recipients of ready-made knowledge, whereas in STEAM education they appear as active participants and researchers. Students acquire knowledge independently through conducting experiments, creating projects, building models, and analyzing problem situations.

The STEAM approach also helps develop **innovative thinking** in students. Today, when technological progress is developing rapidly, preparing the younger generation for modern professions is one of the most important tasks. Therefore, strengthening interdisciplinary integration in education, applying elements of scientific research, and developing students' creative thinking are essential.

Research in the field of pedagogy shows that STEAM education helps students acquire knowledge more deeply. This is because students work with several disciplines simultaneously and understand the relationships between them. As a result, a holistic system of knowledge is formed. For example, knowledge learned in mathematics lessons can be applied in technology or engineering activities, while elements of art help develop students' creative thinking. In addition, the STEAM approach plays an important role in developing students' **communication and collaboration skills**. In project-based lessons, students work in groups, freely express their opinions, solve problems together, and strive to achieve a common result. This process helps develop a culture of teamwork among students.

The STEAM approach has become an important pedagogical concept in the modern education system and contributes to the development of students' scientific thinking, creative abilities, and practical skills. By applying this approach in the primary education process, it is possible to increase students' interest in science, develop their independent thinking, and form modern competencies.

Another important aspect of STEAM education is that it fosters students' interest in **scientific research activities**. In modern education systems, it is important not only to teach ready-made knowledge but also to teach students how to independently search for and discover new knowledge. The STEAM approach ensures this process. During lessons, students begin to understand knowledge more deeply through conducting various experiments, creating models, and working on small projects.

Applying the STEAM approach in **primary education** is especially effective. This is because students at this age are very curious about natural and environmental phenomena. They tend to learn more through observation, experimentation, and play. STEAM technology supports this natural curiosity and helps develop it further. For example, through simple experiments, constructing models with building sets, drawing pictures, or preparing small models, students can learn knowledge related to various disciplines simultaneously.

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In addition, STEAM education helps develop **systemic thinking** in students. Systemic thinking refers to the ability to approach a problem from different perspectives, analyze its causes and consequences, and find optimal solutions. Lessons organized on the basis of interdisciplinary integration allow students to analyze problems in a comprehensive way.

Another advantage of STEAM education is that it makes the educational process more interesting and interactive. Students acquire knowledge not only through ordinary lectures or explanations, but also through various types of activities. This process increases students' interest in the lesson and helps them master knowledge more firmly.

In modern pedagogical research, it is also emphasized that the STEAM approach has a positive impact on students' personal development. Through this approach, qualities such as independence, initiative, creativity, and responsibility are formed in students. In addition, students acquire the skills of freely expressing their opinions, listening to others' ideas, and working in a team.

Today, special attention is being paid to the implementation of the STEAM approach in the education systems of many countries. This is because this approach helps to train qualified specialists who will work in the fields of science, technology, and innovation in the future. Therefore, forming STEAM competencies in students from the stage of primary education is considered one of the important pedagogical tasks.

In general, the STEAM approach is considered an effective pedagogical concept that serves to organize the educational process on an integrated, practical, and innovative basis. By applying this approach in the primary education system, it is possible to organize the process of acquiring knowledge more effectively, develop students' creative thinking, and form modern competencies.

STEAM education occupies a special place in the modern education system as an integrated approach. The main goal of this approach is to ensure the close connection between various subjects and to develop students' knowledge in a comprehensive way. In the traditional education system, subjects are often taught separately, and students do not fully understand their interconnection. The STEAM approach, on the contrary, serves to form a holistic system of knowledge in students through the integration of subjects.

The emergence of STEAM education is directly related to the needs of modern society. In the 21st century, the fields of science and technology are developing rapidly. Therefore, the education system is also being improved based on new requirements. Modern society requires not only knowledgeable individuals, but also people who can solve problems, think creatively, and propose innovative ideas. The STEAM approach is an educational model aimed precisely at forming such competencies.

The theoretical foundations of STEAM education rely on scientific research in pedagogy, psychology, and didactics. In particular, according to the constructivist theory of education, students do not accept knowledge in a ready-made form but form it independently in the process of activity. The STEAM approach is also based on this principle. Students acquire knowledge by conducting experiments, making observations, creating models, and working on various projects.

Active participation of students is very important in STEAM education. During the lesson process, students become familiar with various problem situations and look for ways to solve them. This process develops students' skills of critical thinking, analysis, and drawing

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conclusions. In addition, students learn to justify their opinions, present evidence, and consider problems from different perspectives.

Another important aspect of STEAM education is its practical orientation. Students are not limited to simply memorizing theoretical knowledge but have the opportunity to apply it in practical activities. For example, calculations learned in mathematics can be applied in engineering projects, while knowledge learned in natural sciences is strengthened through various experiments. Elements of art expand students' imagination and develop their creative thinking abilities.

The application of the STEAM approach at the primary education stage is especially important. This is because students' interest in sciences is formed precisely during this period. If lessons are organized in an interesting and interactive way, students acquire knowledge more actively. STEAM technology helps enrich the learning process with engaging activities.

The STEAM approach also plays an important role in developing students' creative abilities. Creativity is considered one of the most important competencies today. The ability to create innovative ideas, propose new solutions, and think unconventionally is of great importance in modern society. STEAM education teaches students to approach different situations creatively. In addition, STEAM education helps develop students' communicative skills. In project-based activities, students work in groups, share their ideas with others, and make collective decisions. This process forms a culture of cooperation among students and develops their social skills.

In the process of the development of STEAM education, many pedagogical scholars have conducted scientific research. As a result of these studies, it has been found that the STEAM approach helps students acquire knowledge more deeply and develop their practical skills. Therefore, today special attention is being paid to the implementation of STEAM education in many countries around the world.

The effectiveness of STEAM education lies in its basis on interdisciplinary integration. Interdisciplinary integration allows students to study knowledge from different perspectives. This helps knowledge become more stable and systematic. For example, within one project, elements of mathematics, technology, and art can be applied together.

Today, STEAM education is considered an important component of the modern education system. This approach serves to organize the educational process on an innovative basis, activate students' learning activities, and develop their creative potential. The main idea of STEAM education is to form complex knowledge and skills in students through the integration of different subjects.

From a pedagogical point of view, the STEAM approach is based on the model of integrative education. Integrative education aims to form students' knowledge as a holistic system by ensuring connections between different subjects. In this process, students acquire knowledge not within separate subjects but on the basis of interdisciplinary relationships. As a result, students gain the opportunity to effectively apply their knowledge in solving real-life problems.

STEAM education also relies on the principle of project-based learning. Project-based learning ensures students' active participation in independent research, problem analysis, and finding solutions. This helps develop students' skills of independent thinking, problem analysis, and decision-making.

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The use of STEAM technology in primary education corresponds to the interests and age characteristics of students. This is because young learners are more inclined to acquire knowledge through play, experiments, and practical activities. The STEAM approach supports exactly this process. Various experiments, constructive activities, creating models, drawing pictures, and modeling during lessons make the learning process more interesting for students. In addition, STEAM education plays an important role in increasing students' motivation. In traditional lessons, students often remain passive listeners. In the STEAM approach, however, students participate as active participants. This process increases students' interest in learning and helps them acquire knowledge more deeply.

Another important aspect of STEAM education is the development of students' problem-solving competence. In modern society, people face various problems, and solving them requires logical thinking, analysis, and a creative approach. STEAM education serves precisely to form these competencies.

In addition, the STEAM approach also helps develop students' research activities. Students acquire scientific thinking skills by conducting experiments, making observations, and analyzing results. This creates a foundation for their future engagement in scientific research activities. Modern pedagogical studies have also noted that STEAM education has a positive impact on students' personal development. In particular, through this approach, qualities such as initiative, creativity, independence, and responsibility are formed in students. These qualities are important in educating a well-developed individual.

Today, special attention is also being paid to the development of STEAM education in the education system of Uzbekistan. Large-scale reforms are being implemented in our country to modernize the education system, introduce innovative technologies into the learning process, and develop students' creative potential. In this process, the implementation of STEAM technology in the educational process is of great importance.

In conclusion, the STEAM approach is one of the important directions of modern pedagogy, which serves to organize the educational process on an integrated, practical, and innovative basis. By applying this approach at the stage of primary education, it is possible to organize the learning process more effectively, develop students' creative and critical thinking, and form modern competencies.

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