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# HOW DO PLANTS GROW AT HOME? (STEAM PROJECT: AUTOMATIC IRRIGATION SYSTEM AND GROWTH GRAPH)

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***Abstract:*** *This article aims to guide primary school students in the practical study of plant growth and development processes based on the STEAM (Science, Technology, Engineering, Arts, Mathematics) approach. It details a project involving the creation of an automatic irrigation system using simple household materials and monitoring plant growth dynamics through mathematical graphs. The article emphasizes the importance of integrating theoretical knowledge with practice, developing critical and creative thinking, fostering teamwork, and problem-solving skills. Additionally, project-based teaching methods and their role in enhancing the scientific potential of young children are discussed.*

***Keywords:*** *STEAM, natural sciences, plant growth, automatic irrigation, graphs, practical application, project-based learning, interdisciplinary integration, innovative lesson, creative thinking.*

**Introduction:**

Today, the main goal of the education system is to train competitive personnel who possess modern knowledge, skills, and competencies, are capable of critical and creative thinking, and can solve problems. For young students, STEAM (Science, Technology, Engineering, Arts, Mathematics) technologies play a crucial role in achieving this goal. STEAM technologies – this is a learning methodology

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based on an interdisciplinary approach, which guides students to learn not only theoretical knowledge but also through practical skills. Through this approach, students develop their professional activities and gain the ability to scientifically analyze real-life problems and find practical solutions.

Teaching natural sciences in primary grades with a STEAM approach increases children's interest in the environment, forms scientific literacy in them, and teaches them to find creative solutions to problems encountered in daily life. The project "Little Researchers: How do plants grow at home?" serves exactly these purposes. This project helps children practically learn about the life cycle of plants, the necessary conditions for their growth, and the importance of caring for them. During the project, they acquire knowledge about the basics of engineering and technology by building a simple automatic irrigation system, and also develop their mathematical skills by creating growth graphs.

The Importance of the STEAM Approach and Its Manifestation in This Project

The STEAM approach offers several important advantages in education:

* Ensures interdisciplinary integration: In the plant project, botany (Science), the irrigation system (Technology and Engineering), drawing the growth process (Art) and calculating/graphing data (Mathematics) form a cohesive whole.

* Encourages creative thinking: Children can think of ways to build an automatic irrigation system from simple materials, decorate it, and discover new ways to visualize plant growth.

* Develops teamwork and communication skills: Implementing the project in groups teaches children to work together, exchange ideas, and solve problems collaboratively.

* Serves as an important stage in career selection and professional training: Even in primary grades, such practical projects awaken children's interest in scientific and engineering fields, laying the groundwork for their future career choices.

Development Through Innovative Lesson Plans

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Innovative lesson plans – this is teaching methods that, unlike traditional education, encourage students to learn actively, experiment, and solve problems independently. The project "How do plants grow at home?" is organized based on the following STEAM elements:

* Project-based learning: Students (learners) work in groups to find solutions to real problems. In this project, their problem is to effectively water the plant and observe its growth.

* Scientific experiments: Reinforcing learned topics on an experimental basis. Children observe how plants grow under different conditions (for example, less water, more light) and conduct experiments.

* Art and design elements: Developing visual and aesthetic thinking, creating innovative products. They will have the opportunity to decorate the irrigation system, document the plant growth process through drawings, and aesthetically decorate their mini-gardens.

Impact on Professional Activity Formation

Lessons taught through STEAM technologies play an important role in preparing the student (learner) for their future career. Although this is a primary school project, it forms the following important skills:

* Problem-solving skills are formed: It teaches how to solve small problems that arise when creating an automatic irrigation system (for example, water not flowing correctly, the system clogging).

* Technology mastery is facilitated: Children become familiar with simple mechanical and sensor (humidity sensing) principles, which lays the groundwork for them to master more complex technologies in the future.

* The student becomes an active participant in social and economic life: They learn to feel ecological responsibility by caring for the environment, saving resources, and understanding nature.

Innovative lesson plans based on STEAM technologies are invaluable not only for imparting knowledge but also for preparing students for modern

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professional activities and developing their creative and engineering thinking. Therefore, every teacher should strive to use this approach in their work.

Implementation Methods and Methodological Recommendations

To effectively implement this "Little Researchers" project, it is advisable to follow the following methodological recommendations:

* Plan lessons based on STEAM: It is necessary to integrate scientific (botany), technological (automatic irrigation element), engineering (system construction), artistic (visual representations, design), and mathematical (measurement, graphing) aspects in each topic.

* Give project-based assignments: Children can independently or in groups develop their projects and implement them in practice.

* Stage 1: Planning (Engineering, Art): Selecting the plant type, pot size, materials for the irrigation system (for example, plastic bottle, string, needle, syringe) and measuring tools. Planning how to record plant growth (drawing, table).

* Stage 2: Building (Engineering, Technology): Constructing an automatic irrigation system (for example, applying the capillary effect by passing a cotton string from a water container to the pot or making a small drip irrigation device).

* Stage 3: Observation and Data Collection (Science, Mathematics): Measuring the plant's height daily/weekly and entering the data into a table. Recording changes such as the number and color of leaves.

* Stage 4: Analysis and Visualization (Mathematics, Art): Creating graphs (bar or line) based on the collected data. Documenting the plant growth process through pictures or short videos.

* Stage 5: Presentation (Art, Communication): Presenting project results to classmates. Explaining what they learned and what conclusions they reached.

* Use STEM laboratories and digital platforms: Simple measuring tools can be used, as well as simple electronic tables on a computer (for example, Google Sheets) to create growth graphs. If possible, creating "time-lapse" videos on a phone camera to observe plant growth also develops technological skills.

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* Organize career-oriented activities: Provide brief information about gardening, agronomy or engineering professions, explaining their importance in daily life.

* Innovative approaches to assessing mastery: Assessment should determine knowledge and skills not only through tests but also based on projects, presentations, and portfolios. Children's work during the project, change journal, drawings, and presentations can serve as a basis for assessment.

Orientation towards Scientific Research and Innovative Developments

In developing children's professional activities, STEAM technologies awaken their interest in scientific research. Through innovative lessons, learners:

* Acquire research skills. This is demonstrated in this project by collecting data on plant growth, analyzing it, and drawing conclusions.

* Strive to develop innovative products. The automatic irrigation system is such a "mini-innovative product".

* Are able to create startup ideas and implement them in real life. Ideas such as improving the simple irrigation system or adapting it for other plants may arise. This, in turn, leads to not only individual professional development but also the popularization of science and technology in society.

Global Trends in Education and STEAM

Modern education worldwide is closely linked to areas such as digitalization, artificial intelligence, environmental issues, and robotics. Therefore:

* The STEAM approach is considered one of the main strategic directions in international education systems.

* In developed countries such as Finland, South Korea, the USA, and Japan, STEAM-based teaching methodology has been an integral part of general curricula.

* This approach is achieving success in interesting students not only in science but also in creativity, critical thinking, and advanced technologies. The plant project encourages children to find solutions to global problems such as environmental protection and rational use of water resources, along with biology.

Current State of STEAM Approach in Uzbekistan

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In recent years, large-scale reforms have been carried out in Uzbekistan to improve the quality of education, professional development, and training of competitive specialists. These include:

* The establishment of STEAM schools and innovation centers.

* Strengthening the principle of interdisciplinary integration in curricula.

* Launching “Youth Technoparks,” startup projects, and scientific Olympiads to increase the scientific potential of young people. This enables students to be equipped with practical knowledge and skills close to real life. Such STEAM projects in primary grades form the basis of the above reforms.

Proposals and Future Tasks

To effectively prepare students for professional activities, the following proposals can be put forward:

* Establishing STEAM laboratories in every educational institution, even if they consist of simple materials.

* Retraining and improving the qualifications of pedagogical staff to suit the STEAM methodology.

* Integrating curricula with modern technologies, for example, teaching how to use simple mobile applications to observe plant growth.

* Involving students in international STEAM projects – through foreign online courses or summer schools.

* Increasing career guidance activities in cooperation with parents, the public, and employers.

Conclusion

As modern society develops rapidly, raising a flexible, independent-thinking, and technologically literate young generation is becoming the most pressing issue. Innovative lesson plans based on STEAM technologies are one of the most effective tools in this regard. "Little Researchers: How do plants grow at home?" projects like this STEAM-based approach prepare primary school students not only with theoretical knowledge but also with practice, problem-solving, and professional development – a key to sustainable progress in education. Therefore,

teachers, methodologists, and leaders of educational institutions need to pay serious attention to this process and fully support the STEAM approach. This is an important investment for the future of our children.

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