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# THE MECHANISM OF DESIGNING BASED ON STEAM EDUCATION TECHNOLOGY. DESIGNING THE ACTIVITIES OF BUILDING AND CREATING

Dilnoza Gafurova Saloxiddinovna
Uzbekistan-Finland Pedagogical Institute
Assistant of the Department of Preschool Education
dilnozagaffurova@gmail.com

**Abstract**:
This article discusses the importance of the project-based approach for preschool children based on STEAM technology, the development of children's logical thinking abilities through STEAM education, ideas for constructive play, design activities, and the advantages of engineering activities for children.

**Keywords**: Creativity in children, imagination, emotions, initiative, mobility and adaptability; formation of logical thinking, engineering, design, independence in the educational process, integrated education, STEAM activities and project-based learning, preschool education, STEAM educational technology and project design, constructive play, ideas for constructive play, construction activities for children.

## Introduction

Constructive play involves manipulating elements of the play environment to build new things. It can include various construction methods such as assembling, collecting, disassembling, sorting, molding, or labeling. Why is constructive play considered important for children? Constructive play develops a wide range of skills and behaviors, including: the physical skills necessary to manipulate and control the chosen toy or material (fine and gross motor skills), problem-solving abilities, flexible thinking, the ability to plan the use of materials for a design idea to become a reality, testing abilities, working with ideas, perseverance in the face of construction challenges, and teamwork behaviors necessary for successfully and collaboratively completing a task. Children should be encouraged to fully engage in and enjoy constructive play, as it offers valuable development opportunities and, according to Piaget, is an essential stage of play.

**Ideas for constructive play**. Often, when we think of construction games, we imagine building blocks or other commercial construction kits, but construction play can also include activities such as: assembling a toy train track; building an indoor castle; creating box constructions with recycled materials; building sandcastles; digging dams and rivers in mud; using clay to create; woodworking; sewing; and baking techniques.

There are many ways to maximize the benefits of constructive play. Simple methods to offer (or expand) the construction play experience in a preschool group room include:

1. Add a range of open-ended materials to the children's block play (or other construction sets) – pieces of fabric, wool balls, small tiles, shells, long ribbons, wooden boards, stones.
2. Add PVC pipes of different lengths, clean tin cans, and measuring tapes to the block play area.
3. Place various figurines and vehicles in the construction area. They can be used alongside construction sets.
4. Look for interesting block shapes to expand the child's ability to build and create.
5. Add paper and pens to the construction area so children can draw their construction ideas.
6. Prepare a set of pre-cut wood, strong glue, small hand saws, nails, and small hammers to introduce woodworking.
7. Use sheets, chairs, milk cartons, large boxes, paint, hay bales, tires, bamboo poles, or cubes.

The STEAM field is about creativity, art, and innovation. Modern education emphasizes the importance of creativity in contemporary innovative technologies. How should we explain the significance of the achievements of chemists and biologists to older preschool children? How can we spark their interest in these fields and develop their competencies in natural sciences? The answers to these questions lie in implementing the STEAM approach to teaching sciences. This can be done in any institution and significantly increases students' enthusiasm for learning natural sciences and their effectiveness in learning them.

The advantages of STEAM technology in modern education include:

Cognitive interest in technical sciences;
• Implementation of high-tech projects in an innovative economy;
• Application of scientific and technical knowledge to modern conditions;
• Revealing technical creativity potential and motivation;
• Developing creative and critical thinking skills;
• Active communication and effective collaboration;
• Professional orientation in the high-tech job market.

STEAM education is an attempt to solve real-world problems using scientific methods, technical applications, mathematical modeling, and engineering design. All of this makes the learning process more diverse and dynamic. In practice, children work in teams, conduct research and experiments, develop designs, programs, and models, and promote their products through social networks, online platforms, and websites. This enhances learning motivation and broadens their

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core knowledge in design and programming. In STEAM education, the approach is not only a method of learning but also a way of thinking.

In a STEAM learning environment, children acquire knowledge and immediately learn how to apply it. Therefore, as they grow up and face real-life challenges, whether it be environmental pollution or global climate change, they will understand that such complex issues can only be solved through collaboration, relying on knowledge from various fields. In this context, relying on knowledge from just one field is insufficient. The world is changing, and the education system must evolve and be enriched accordingly.

By integrating technology, engineering, art, and mathematics, STEAM education helps children see the connections between different areas of science and their interests. This approach also helps eliminate barriers when certain concepts or activities in science may present challenges for some children.

STEAM is particularly effective in three areas:

1. Helping science be more open and inclusive;
2. Clarifying the meaning of scientific concepts and culture;
3. Developing collaborative work where scientific and aesthetic components can be improved through mutual enhancement.

Why should STEAM education be implemented in preschool education?

- It stimulates interest in mathematics and natural sciences.
- It helps children independently acquire knowledge in technology, robotics, and design.
- It fosters the development of creative abilities and communication skills.
- It contributes to the early identification of a child's potential and their professional self-determination.
- When organizing the pedagogical process with preschool children based on the STEAM approach, it is essential not to burden them with complex processes or lengthy explanations. The teacher's goal in STEAM education is to show and explain the connections between processes in the simplest way possible, as well as to develop self-confidence in learning. Experiments are well-suited for achieving these objectives.

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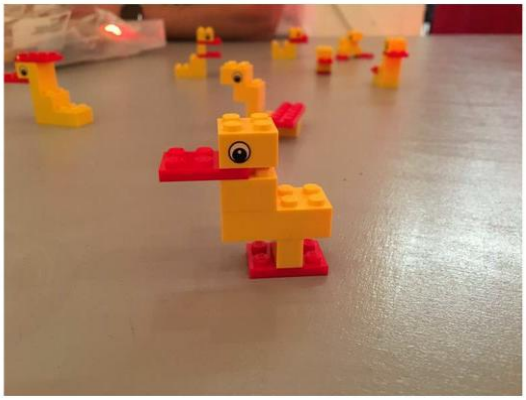


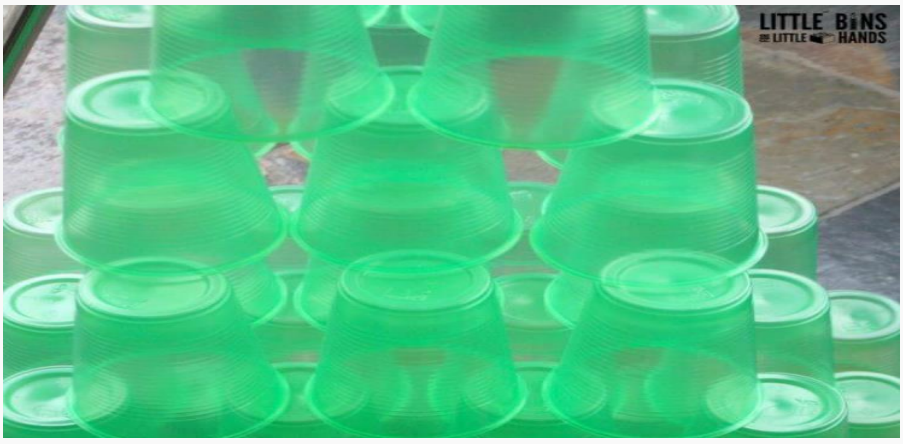
Making a Duck Shape with Lego

**Construction Activities for Children**

Below is a list of materials and specific construction projects.

1. **Plastic Containers**

Plastic cups are a valuable and inexpensive resource! Suggest building a tower with 100 cups with the children. This activity is a great construction task for independent play in the afternoon.



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With the cup tower challenge, children can stay engaged without being distracted by other unnecessary activities, and with just 100 cups, there is an opportunity to build a New Year's tree. Simple STEAM activities are a fantastic way to combine easy scientific experiments with New Year's fun for children!

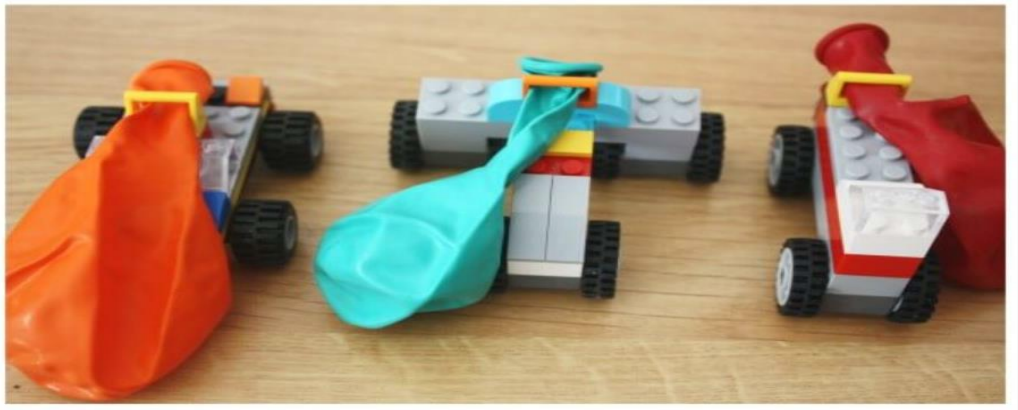
1. **Recycled Cardboard**

Take a stack of cardboard and cut out simple shapes for construction. We'll use several recyclable materials for building activities.
This cardboard-based construction activity is excellent and convenient for engineering play! Additionally, it's great for learning about solid foundations, creating a base, balance, and weight distribution. This activity provides plenty of hands-on learning opportunities.

2. **LEGO**

LEGO construction is both fun and easy. It provides an excellent opportunity to combine simple science and engineering for STEAM activities.

3.



Thus, when designing educational activities based on J. Piaget's concept, the methodology of the constructive approach stems from the scientific idea that a child's education is based on discoveries and direct interaction with the environment. The constructive concept of education radically changes the way a child's attention is developed. These results allow for the identification of key organizational and pedagogical conditions for enriching the modern preschool teacher's methodological culture: integrating the opportunities of the professional development system, methodological support, and the teacher's professional preparation, as well as the social-educational methodology of the teacher, aligning with a new model of educational activity design for children based on a person-centered, competence, and activity-based approach, grounded in cultural and constructive approaches. From this, the following conclusions can be drawn:

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When considering the design of educational activities for preschool children as the object of the teacher's work, the expected product is the core cultural development of preschool children's personalities.

The statement about the teacher's leading role in the educational process does not imply their actual and superior dominance in shaping the forms and methods of their activities. Instead, it recognizes the teacher's ability to organize the children's zone of proximal development.

Designing the teacher's educational activities with preschool children as a system is possible through the unity of its three components: methodology, didactics (didactic principles, rules, Mathematical education is the most important component of continuous learning throughout a person's life, essential for mastering almost all areas of knowledge, particularly natural sciences, technical, and economic fields. Without fundamental mathematical knowledge and skills, it is nearly impossible to have a sufficient direction in modern daily life. The foundations of mathematical thinking are laid in the early years of a child's life through practical situations. A child develops their mathematical abilities, understands the meaning of counting, and acquires initial ideas about numbers; they also learn about the shapes, sizes, weight, time, space, patterns, and structures of objects in their environment. A child who experiences the joy of working with shapes, quantities, numbers, as well as space and time, begins to assimilate their mathematical content even before school. A preschool child can also formulate and solve simple mathematical problems, but preschool education does not directly aim to teach school-type mathematics. As the child grows, they learn to apply their existing mathematical knowledge to solve everyday problems, such as telling time, measuring the size of a room, calculating money, organizing materials in a set, and so on. Thus, by the time they enter school, many children will have developed favorable conditions for successful school learning and further study of mathematics by having already assimilated mathematical content.

Examples of projects to be organized with preschool children:

1. **"I am Me!"** – Observing and documenting a child's growth, studying the growth dynamics, and comparing it with the growth dynamics of other children over a certain period of time.
2. **"How Do I Live?"** – Determining the number of family members, the ages of relatives, the number of rooms, and other related information.
3. **"We Measure Our Kindergarten / Buildings / Area"** – Using "homemade" measurement tools like distance, elbows, feet, steps, and various objects, and documenting the results.
4. **"Our Birthdays"** – Creating a birthday calendar with the children, identifying the month, sequence, year, and season.

5. **"Breakfast in Kindergarten" (with parents):** – Determining how many people attended breakfast, how many plates and spoons need to be prepared, how many chairs need to be arranged, how to set the table, and so on.

In the design program, the kindergarten can make use of the following materials for effective work:

- Various types of digital materials, such as magnetic boards with moving pieces for addition and subtraction.
- Toy money.
- Various sensory mathematical materials made of different materials (wood, plastic, etc.).
- Desk game materials, cards, and others.
- Items that can be assembled, sorted, filled, various containers of different shapes and sizes.
- Measuring cups, measuring tapes, scales, and other measuring tools.
- Scales with different weights and a cash register for a "store."
- Filling materials for molded shapes: sand, pebbles, water.
- Clocks of various sizes and "research character" designs.
- Construction sets and building materials.
- Calendars (annual, quarterly, monthly) with time indicators (day, month, year, days of the week, holidays) where notes and changes can be made.
- Mathematical publications, workbooks, printed didactic mathematical materials for children aged 0 to 8.
- Interactive whiteboards, tablets, and other computer devices, necessary software, various computer games, and access to educational electronic resources.
- Mosaic tiles, plasticine.
- Paints, pencils, markers.
- Video and audio recordings.
- The presence of geometric shapes (e.g., everyday objects, special play materials), numbers (e.g., posters with written numbers), and mathematical tools (e.g., measuring tapes, scales) helps children understand the world of mathematics.

For example, creating a learning workshop dedicated to mathematics in a kindergarten would be beneficial. The goal is to make math more tangible and accessible for children through hands-on experiences, allowing them to explore basic mathematical concepts in a practical and engaging way.

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