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GUIDING STUDENTS TO CREATIVE THINKING IN TECHNOLOGY LESSONS

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Abstract: This article highlights the pedagogical, psychological, and methodological foundations for developing students' creative thinking competence during the process of teaching technology in general secondary schools. In the modern educational process, students are required to acquire not only ready-made knowledge but also skills such as independent thinking, a new approach to problem situations, the development of original ideas, the proposal of alternative solutions, and the evaluation of their own performance results. From this perspective, the science of technology oriented toward practical activity possesses great pedagogical potential for developing the creative potential of students. Particular attention is paid to the role of the teacher as a facilitator, motivator, advisor, and evaluator, as well as the consideration of students' individual characteristics and the evaluation of results based on a competency-based approach.

Keywords: technology education, creative thinking, creativity, creative competence, innovative methods, project-based education, problem-based education, interactive methods, Design Thinking, SCAMPER, digital education, competency-based approach.

INTRODUCTION

In today's conditions of globalization and the rapid development of information technologies, new tasks are being set for the education system. A modern school graduate must possess not only a specific volume of knowledge and skills but also the competencies to adapt to changing conditions, make independent decisions, analyze problems, create innovations, and work effectively in a team. Therefore, the development of creative thinking in the educational process is becoming one of the important pedagogical tasks.

Creative thinking refers to an individual's ability to apply existing knowledge, experience, and imagination in new situations, approach a problem from an unusual perspective, put forward various ideas, and choose an optimal solution from among them. Such thinking is of great importance not only in the student's creative activity but also in their daily life, choice of professional direction, and social relationships.

The use of interdisciplinary integration, practical classes, problem situations, and project activities creates great opportunities for the development of creative thinking within the general secondary education system. In particular, technology is one of the most convenient subjects for implementing this task. Because within the framework of this subject, students connect theoretical knowledge with practical activity, work with various materials, create products, model, develop designs, and turn their ideas into tangible products.

The main feature of the technology lesson is to ensure the student's transition from "cognitive" activity to "creative" activity. Instead of simply repeating the finished sample, the student can add their own design solution, constructive idea, or functional proposal. As a result, the educational process is directed from reproductive activity to creative activity.

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1. Theoretical foundations of the concept of creative thinking

Creativity is a person's ability to generate new and useful ideas, view an existing problem differently, and go beyond conventional approaches. From a pedagogical perspective, creative thinking manifests in the student's independent, flexible, and original execution of educational tasks.

The main components of creative thinking include:

- **fluidity** - promoting many ideas in a short time;
- **flexibility** - the ability to see a problem from different perspectives;
- **originality** - proposing an unusual and unique solution;
- **improvement** - further development of an existing idea or product;
- **understanding a problem situation** - identifying the causes and consequences of the problem;
- **evaluation** - analyzing the practical possibilities of the proposed ideas.

A student's creative thinking does not form all at once. It develops in an environment of regular practice, free exchange of ideas, experimentation, and a lack of fear of mistakes. Therefore, during the lesson process, the teacher should, as much as possible, abandon the principle of "only one correct answer" and focus on searching for several acceptable solutions.

2. The role of technology in developing creative thinking

The subject of technology serves to develop the practical, constructive, and creative activities of students. Through this subject, students not only study the properties of various materials but also master the process of creating new products using them.

In technology classes, the student:

- creates an item;
- develops product design;
- selects materials;
- seeks constructive solutions;
- works with drawings and models;
- analyzes the functional characteristics of the product;
- defends their idea;
- evaluates the created product.

Each of these activities develops a specific component of creative thinking. For example, product design development develops originality, material selection develops flexibility, and the creation of multiple variants develops fluency.

Also, technology lessons allow students to form a sequence of "idea - project - product - analysis - improvement." This process develops not only the student's creative but also their critical and systematic thinking.

3. Principles for developing creative thinking in technology lessons

To effectively organize creative education, it is advisable to adhere to a number of pedagogical principles.

3.1. The principle of free thinking

An environment must be created where the student can freely express their thoughts. At the initial stage, a sharp assessment of whether an idea is "right" or "wrong" can reduce a student's initiative.

3.2. Principle of practical orientation

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When a creative idea is tested through practical activity, its value increases even further. Therefore, in technology lessons, theoretical information must be reinforced with practical tasks.

3.3. Principle of Alternative Solutions

Instead of repeating one ready-made solution, the student should be given the task of developing several solutions.

3.4. The principle of an individual approach

Each student has different interests, abilities, experience, and creative potential. Therefore, it is important to differentiate tasks according to their level of complexity.

3.5. Principle of Reflection

At the end of the lesson, the student should analyze their activities based on questions such as "What did I create?," "What problem did I encounter?," "What solution did I find?," and "How can I improve my product?."

4. Methods aimed at developing creative thinking

Using modern pedagogical methods to develop creative thinking in technology classes yields effective results.

4.1. Project-based learning

Project-based learning directs the student to study a specific problem independently or in a group and create a final product. The project process usually consists of the following stages:

1. identifying the problem;
2. setting a goal;
3. developing ideas;
4. selecting the most suitable idea;
5. planning;
6. product creation;
7. testing;
8. present the result;
9. reflection and improvement.

For example, in the project "Creating an eco-friendly product for a school," students can develop a useful product that helps reduce waste.

4.2. Problem-based learning

In problem-based learning, the student is not given a ready-made answer. He analyzes the problem independently, makes assumptions, and tests them.

For example:

Problem: "How can we reduce the use of single-use plastic products in the school cafeteria?"

Students propose several solutions to this problem, discuss their advantages and disadvantages, and create a practical model.

4.3. Brainstorming

"Brainstorming" serves to develop as many ideas as possible in a short period of time. When using this method, ideas are not initially criticized. At the next stage, they are analyzed and practical options are selected.

4.4. SCAMPER method

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SCAMPER helps improve an existing product or idea. Students are asked questions about replacing, combining, adapting, changing, using for other purposes, reducing, or organizing products in a new order.

For example, it explores how to transform a simple fabric bag into a multifunctional, convenient, and aesthetic product.

4.5. "Six Hats" Method

This method allows for viewing the problem from various perspectives. Students think about a product or project based on facts, emotions, risks, positive aspects, new ideas, and general conclusions.

4.6. "Mind Map" method

Using a mind map, concepts and proposals related to the central idea are systematized. This method is particularly useful in design, project planning, and product concept development.

4.7. Design Thinking

Design thinking guides the student to first understand the user's needs, then identify the problem, develop ideas, create a prototype, and test it.

The main stages of this approach are:

Empathy → Problem identification → Idea generation → Prototyping → Testing.

Using this approach in the science of technology teaches the student not just to create a beautiful item, but to create a product that meets the user's needs.

5. Developing creativity through project activities

Project activity is one of the effective pedagogical tools for the comprehensive development of creative thinking. Because during the project process, the student simultaneously analyzes the problem, collects information, creates an idea, makes a plan, develops a product, and evaluates the result.

For example, let's take the "Ecological Bag Design" project. Students first gather information about the environmental impact of plastic bags. They then develop ideas for the shape, material, size, and decorative elements of the eco-friendly bag. The group members exchange opinions and choose the most optimal option. At the next stage, a product prototype is created and its usability is tested.

At the end of the project, students will present their products. This evaluates not only the finished product but also the process of its creation, the solution to the problem, and the novelty of the proposal.

6. Pedagogical opportunities of problem-based learning

Problem-based learning strengthens the student's need for knowledge. The teacher creates a problem situation but does not provide a ready-made solution.

For example, a teacher can give students the following task:

"it is necessary to create a pencil case that is as durable and aesthetic as possible using the same amount of material." what constructive solution do you propose?

This task doesn't have a single answer. Students can experiment with different shapes, materials, and constructions. Thus, creative thinking develops through experience, error, and processing.

7. Practical tasks in technology lessons

To develop creative thinking, practical tasks must not only be aimed at a specific result but also provide the student with the opportunity to make a choice.

The following tasks can be used:

- "Create a useful product from waste materials."

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- "Design a multifunctional penalty for a school student."
- "Create three different design options for an eco-friendly bag."
- "Propose a space-saving furniture model for a small room."
- "Create a decorative item from recyclable materials."
- "Improve a simple product with a modern design."
- "Develop a model of a comfortable and safe workplace for students."

Such tasks encourage the student to create an independent product rather than repeating a ready-made sample.

8. Use of digital technologies

Today, it is becoming increasingly difficult to imagine the science of technology without digital tools. Graphic design, 3D modeling, digital drawing, robotics, and other technologies expand students' creative abilities.

In a digital environment, a student can create several variants of their idea, modify them, and quickly compare the result. This increases the opportunity to experiment and learn from mistakes.

At the same time, the goal of using digital tools should be not only to provide technical skills but also to transform the student's creative idea into a practical product.

9. The role of the teacher in creative education

In the context of creative education, the teacher's role is not limited to the traditional "educator" role. The teacher acts as a subject who organizes and directs the activities of students.

Teacher:

- **guiding** - helps the student understand the problem and define the task;
- **motivator** - encourages the student to research and experiment;
- **consultant** - provides methodological assistance when necessary;
- **facilitator** - organizes cooperation and exchange of ideas within the group;
- **evaluator** - analyzes the process and result based on established criteria.

In a creative lesson, it is important for the teacher to view each student's mistake not as a flaw, but as an experience leading to the next solution.

10. Competencies developed in students

Creative-oriented technology lessons develop several important competencies in students.

Creative competence - developing new ideas and implementing them in practice.

Communicative competence - the ability to clearly express one's ideas and listen to the opinions of others.

Collaborative competence - working in a team, distributing tasks, and achieving a common result.

Critical thinking - analyzing ideas based on evidence and identifying their strengths and weaknesses.

Problem-solving competence - identifying a problem, developing alternative solutions, and choosing the optimal option.

Digital competence - the creative and purposeful use of digital tools.

11. Criteria for evaluating creative activity

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When evaluating creative assignments, it is not enough to focus only on the final product. The student's research process, idea generation, and approach to problem-solving must also be taken into account.

Criterion	Content
Originality of the idea	Offering a new and unique solution
Diversity of ideas	Development of multiple alternatives
practicality	Applicability of the proposal in real conditions
Design	Aesthetic and functional aspects of the product
Independence	Student's independent decision-making
Collaboration	Effective work with the group
Presentation	Ability to justify their idea and product
Reflection	Ability to analyze one's own activities and results

The evaluation criteria can be defined as follows:

Such criteria allow the student to anticipate what they need to achieve and ensure the transparency of the assessment.

Conclusion

In conclusion, the subject of technology possesses great pedagogical potential for developing students' creative thinking. Practical activity within this discipline allows the student to transform their idea into a real product, experiment, analyze mistakes, and improve the result.

The purposeful use of methods such as project-based and problem-based learning, brainstorming, scamper, "six hats," "mind map," and design thinking in the process of developing creative thinking serves to increase students' creative activity. In this case, the teacher should act not as a provider of ready-made knowledge, but as a teacher who organizes, directs, and stimulates the student's research activity.

In a creative educational environment, it is important to treat every student's idea with respect, support alternative solutions, accept mistakes as a learning tool, and evaluate practical results.

Thus, focusing technology lessons on developing creative thinking fosters not only creativity but also communicativeness, collaboration, critical thinking, problem-solving, and digital competencies in students. This serves to educate an individual who corresponds to the competence goals of modern education, thinks independently, and is capable of creating innovations.

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