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TECHNOLOGIES FOR TEACHING CREATIVITY TO PRIMARY SCHOOL STUDENTS

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Abstract: This article examines the topical issues of developing creative abilities in primary school students, who constitute the foundation of the continuous education system. The purpose of the research is to analyze modern pedagogical technologies that serve to form students' creative thinking through "Technology" classes in primary education, and to outline the scientific and methodological foundations for introducing them into educational practice. The process of organizing the educational-cognitive and creative-practical activities of students during primary school technology classes serves as the object of the research. The article provides an objective analysis of how students' creativity, spatial imagination, and independent thinking can be effectively enhanced through project-based technology, problem-based learning, the STEAM approach, and didactic games, alongside the formulation of corresponding scientific conclusions.

Keywords: Primary education, theory of technology education, creative ability, creative thinking, divergent thinking, pedagogical technologies, project-based learning, problem-based learning, TRIZ technology, STEAM approach, cognitive development.

The processes of globalization, digitalization, and rapid integration within the global educational ecosystem necessitate fundamentally new conceptual approaches to cultivating the intellectual and creative potential of society. In the 21st century—an era defined by information and advanced technologies—the primary determinant of societal progress is no longer the mere acquisition of knowledge, but rather the capacity to apply this knowledge in non-standard situations, drive innovation, and demonstrate creative problem-solving. Consequently, one of the most strategic imperatives facing modern pedagogy is the cultivation of an independent, autonomous individual capable of adapting to a rapidly evolving information environment, thinking critically, and generating creative solutions to complex challenges. Unquestionably, the foundational bedrock of this developmental process is established during primary education, widely recognized as the most sensitive and critical period of human cognitive development.

The psychophysiological characteristics inherent to primary school students—specifically, their heightened epistemic curiosity, expansive imagination, and cognitive plasticity—render this stage the optimal window for fostering creativity. Within this educational phase, the subject of "Technology" (formerly labor education) assumes unparalleled didactic significance. It serves as a crucial mechanism for translating theoretical knowledge into practical application, thereby enhancing logical, algorithmic, and spatial reasoning, while equipping students with the competencies to creatively manipulate material reality. Distinct from other core educational disciplines, Technology classes synchronously engage the student's cognitive and psychomotor faculties. This synergistic activation facilitates the formation of novel neural pathways across various centers of the nervous system, ultimately culminating in a profound expansion of creative thinking.

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LITERATURE REVIEW AND THEORETICAL FRAMEWORK

An analysis of academic literature and fundamental research indicates that creativity is not merely the production of artistic works, nor is it solely an innate genetic trait exclusive to gifted individuals. Rather, it is a universal mechanism for generating ideas and approaching practical problems unconventionally—a mechanism that is formed as a result of targeted and systematic pedagogical intervention. In their theories of creativity, American psychologists J. P. Guilford and E. P. Torrance categorize human cognition into convergent thinking (oriented toward a single correct solution) and divergent thinking (oriented toward exploring multiple solutions to a single problem). Cultivating creativity in primary school inherently necessitates the development of this divergent thinking.

According to L. S. Vygotsky's psychological framework, a child's cognition and imagination develop through their practical actions and object-oriented activities. In his seminal work, *Imagination and Creativity in Childhood*, Vygotsky asserts that any invention by a child is the product of their interaction with the environment and their enriched lived experience. Building upon Jean Piaget's theory of cognitive development, children aged 7 to 10 are in the "concrete operational" stage; thus, they grasp abstract concepts more rapidly through physical objects and hands-on activities. From this perspective, Technology classes in primary education serve as a unique practical pedagogical domain that transforms the student from a passive consumer of information into an active creator.

Within the theory and methodology of Technology education, fostering creativity in students strictly demands abandoning traditional reproductive methods (which merely involve copying a teacher-provided model) in favor of a transition toward productive methods (independent invention, design, and the creation of new products) and innovative pedagogical technologies. Consequently, the integration of modern technologies into the educational process is an absolute imperative of contemporary times.

MODERN TECHNOLOGIES FOR FOSTERING CREATIVITY IN PRIMARY EDUCATION

To enhance the efficacy of Technology classes in primary education and to unlock students' creative potential, the application of a range of advanced pedagogical technologies has been empirically and theoretically validated. The most effective among these are scientifically analyzed below.

1. Project-Based Learning (PBL) Technology

Project-based technology entails an independent cognitive, investigative, and constructive endeavor aimed at resolving a specific practical or theoretical problem, driven by the student's personal interests. Pioneered by educational theorists such as John Dewey and William Heard Kilpatrick, this methodology currently stands as one of the most effective instruments for elevating educational quality. The implementation of project-based technology in primary school Technology classes encompasses a systematic sequence of stages:

- **Problem Definition and Ideation:** The educator introduces a challenge. For example, "Constructing a model of an eco-friendly city using paper, cardboard, and recycled materials." Students aggregate their concepts through brainstorming.

- **Technological Design:** Selecting the requisite raw materials and tools, drafting a preliminary sketch of the artifact, and formulating an operational algorithm.
- **Practical Execution:** The direct physical construction of the project, assembling components, and working in strict compliance with safety regulations. During this phase, the student's fine motor skills and spatial reasoning are engaged at maximum capacity.
- **Presentation and Reflection:** Showcasing the finalized product, defending its merits and functional principles, as well as critically analyzing any errors encountered during the process.

The project method cultivates crucial creative and life competencies in students, including a sense of responsibility, time management, collaborative teamwork, and, most critically, the perseverance to bring an initiated endeavor to its logical conclusion.

2. Problem-Based Learning Technology

Problem-based learning technology is an educational method that prompts students into active intellectual inquiry by establishing cognitive barriers—namely, artificial contradictions—within the instructional process. The principles of problem-based education, pioneered by the scholarly school of M. I. Makhmutov, are exceptionally well-suited for Technology classes. If students are provided with predefined, step-by-step instructions during a lesson, they function merely as mechanical executors. However, when presented with a well-formulated problem, they transform into inventors.

For instance, in a Technology class, an educator might provide students exclusively with paper and glue, tasking them with constructing a structural foundation capable of supporting a 1-kilogram weight. A conventionally thinking student might initially assert that a flat sheet of paper cannot sustain such a load. Yet, through the process of problem-based inquiry, students practically discover that the physical and mechanical properties of the material can be fundamentally altered by rolling the paper into a cylinder, folding it like an accordion, or constructing a triangular prism. Such a pedagogical approach enhances essential creative attributes in students, including analytical problem-solving, active experimentation, and the capacity to derive constructive insights from errors.

3. TRIZ Pedagogy (Theory of Inventive Problem Solving)

By its very nature, the TRIZ methodology is a rigorous logical system designed to algorithmically develop human inventive capacity. Originally developed for engineering fields by G. S. Altshuller, this theory is currently being actively adapted to primary education. The primary objective of TRIZ pedagogy is to dismantle cognitive inertia—the stereotypic, template-bound thinking patterns in children—and to guide them into an unbounded realm of imagination.

Utilizing elements of TRIZ, such as the "Method of Focal Objects" and "Morphological Analysis," yields substantial efficacy in Technology classes. In the Method of Focal Objects, students select two completely unrelated items (e.g., a "clock" and an "apple") and artificially synthesize their attributes (resulting, for example, in an edible clock or an apple mechanism that tracks time). Although seemingly whimsical or fantastic, this exercise breaks down the child's rigid mental frameworks and eliminates cognitive apprehension. Within children's creativity, it is

precisely these divergent and unconventional associations that lay the structural groundwork for future real-world innovations.

4. The STEAM Educational Approach (Science, Technology, Engineering, Art, Mathematics)

Widely adopted in global educational practices, STEAM educational technology represents the pinnacle of interdisciplinary integration. Organizing primary school Technology classes through the prism of the STEAM approach fosters a holistic scientific worldview among students. This framework trains students to perceive knowledge not as fragmented, isolated segments, but as a unified system.

For example, when a fundamental topic like "Constructing a Windmill Model" is explored through the STEAM lens, students calculate the length and pitch of its blades (**Mathematics**), conceptually grasp the principles of wind energy conversion (**Science**), engineer a balanced structural system to maintain stability (**Engineering**), physically process and manufacture the components (**Technology**), and apply aesthetic enhancements using national motifs (**Art**). This complex, multifaceted process demands a sophisticated level of creative synthesis from the student. The learner concurrently acts as the designer, the engineer, and the artisan of their project. Ultimately, the objective of creativity is precisely to manifest such pragmatic and functional beauty.

EMPIRICAL ANALYSIS AND RESEARCH RESULTS

The practical application of the aforementioned pedagogical technologies in the educational process demonstrates that interactive and problem-based heuristic methods significantly multiply students' creativity metrics compared to traditional teaching approaches. Based on E. Torrance's framework, scholars have defined the following criteria for evaluating the creative performance of primary school students:

1. **Fluency:** The ability to generate a large number of ideas within a specific unit of time.
2. **Flexibility:** The capacity to approach a problem from diverse perspectives and rapidly adapt strategies..
3. **Originality:** The ability to produce entirely novel, unique responses or products that differ from those of others.
4. **Elaboration:** The aptitude for enriching a simple initial idea with intricate details to transform it into a finished product..

Observations confirm that students instructed through project-based learning and elements of the TRIZ (Theory of Inventive Problem Solving) framework do not merely present superficial end results; rather, they begin to pay meticulous attention to the nuanced details of their creations. Through Technology lessons, children find practical answers to the pragmatic question, "Why do I need this?" via creative application. Furthermore, collaborative group work facilitates the socio-psychological functions of education, fostering an environment where children learn to respect the ideas of peers and cultivate a synergetic creative atmosphere.

The successful development of creativity in primary education is also intrinsically linked to the teacher's professional and methodological competence. In contemporary Technology lessons,

educators must relinquish the role of an authoritarian knowledge purveyor (dictator) and assume the roles of a guide (facilitator), consultant, and collaborator. Students' creative explorations—no matter how illogical or unconventional they may seem—should never be subjected to harsh criticism; instead, they require positive psychological reinforcement. Acknowledging the right to make mistakes during the learning process is instrumental in helping children overcome fear and in awakening a spirit of unhindered creativity.

In conclusion, fostering creativity among students through Technology classes at the foundational stage of continuous education represents a strategic imperative of modern civilization and national educational advancement. The scientific-pedagogical analyses conducted within the scope of this research demonstrate that merely understanding practical labor processes is insufficient; it is crucial to harmonize this with modern educational technologies. The systematic and cyclical integration of project-based learning, problem-based educational scenarios, adapted TRIZ elements, and the STEAM interdisciplinary approach into the curriculum fundamentally elevates not only students' psychomotor skills but, most importantly, their creative and cognitive capacities.

Based on the findings of this research, the following scientific and practical recommendations are proposed to enhance the quality and methodology of education:

First, during the modification of State Educational Standards and curricula for primary education, to expand the scope of topics within the "Technology" subject that stimulate productive-creative activities rather than purely reproductive labor;

Second, to introduce specialized educational and methodological modules on modern creativity-enhancing technologies (specifically, PBL and STEAM approaches) into professional development courses for primary school teachers;

Third, to broaden the resource and material base for students' practical work, enriching technology classrooms with modern didactic tools and integrating digital technologies (such as elementary 3D modeling or basic robotics elements).

Ultimately, any innovative technology introduced into educational practice serves as a primary catalyst and guarantee for shaping a well-rounded generation equipped with free and creative thinking.

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