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PAPER

DEVELOPING CRITICAL THINKING SKILLS IN PRIMARY SCHOOL AGED CHILDREN

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Abstract

The article examines theoretical foundations and practical methods for developing critical thinking skills in primary school-aged children (7–11 years). Active learning methods — problem-based questions, project activities, games and Socratic questioning — are described with scientific grounding. Conclusions present effective methods and integration strategies.

Key words: critical thinking, primary education, cognitive development, problem-based learning, active learning methods, metacognitive skills.

INTRODUCTION

The rapid social, economic, and technological transformations of the twenty-first century have placed fundamentally new demands on the educational system. In the conditions of today's labor market and digital economy, mastering knowledge alone is no longer sufficient — the contemporary person must be able to solve problems independently, evaluate information critically, make sound decisions under conditions of uncertainty, and justify their reasoning in logical terms. It is from this need that the concept of "21st century skills"has moved to the center of world pedagogy, with critical thinking at its core.

The roots of critical thinking reach back to ancient philosophy — to the Socratic dialogue and Aristotle's teaching on logic. In contemporary research, R. Paul and L. Elder [8] provided the systematic scientific foundation for this concept, defining it as "an intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information."D. Halpern [5] defines critical thinking as "purposeful, reasoned, and goal-directed cognitive activity aimed at drawing sound conclusions."Common to all such definitions is a core idea: critical thinking is not mere skepticism, but the capacity to reason from evidence and draw logical conclusions.

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One of the major theoretical frameworks devoted to this problem in pedagogy is B. Bloom's cognitive taxonomy [1]. The six-level hierarchy of thinking — remembering, understanding, applying, analyzing, evaluating, and creating — continues to be widely used in textbooks and educational standards today. The three upper levels (analysis, evaluation, and creation) are the practical expressions of critical thinking. For this reason, Bloom's taxonomy serves as the primary methodological basis for designing programs to develop critical thinking in primary education.

When the developmental characteristics of learners are analyzed from a psychological perspective, the primary school years (ages 7–11) emerge as a uniquely favorable period for forming the foundations of critical thinking. The Swiss psychologist J. Piaget [9] termed this period the stage of "concrete operations": the child can now form logical concepts on the basis of observed facts and tangible objects, grasp causal relationships, and begin to hold two different perspectives in mind simultaneously.

The great Russian psychologist L. S. Vygotsky [14] stressed in his Zone of Proximal Development (ZPD) theory the possibility of the child accomplishing tasks one step beyond what they can do independently, when guided by a more capable partner — teacher, parent, or peer. This theory is especially valuable in education aimed at developing critical thinking: by asking carefully directed questions and creating the necessary scaffolding, the teacher can expand the child's capacity for thought.

The developmental teaching theory elaborated by V. V. Davydov [3] and D. B. Elkonin [11] also holds significant relevance here. Davydov argued that primary education should be directed toward forming in the student a researcher's stance — the child should become an active subject who discovers knowledge rather than a passive recipient of ready-made information. Elkonin demonstrated that play activity exerts the leading influence on the psychological development of the primary school-aged child — a scientific finding that provides the psychological basis for play-based methods of developing critical thinking.

Metacognition — "thinking about thinking" — is an inseparable component of critical thinking. This concept, introduced by J. Flavell [15], describes the learner's capacity to monitor, manage, and evaluate their own cognitive processes. Research shows that the earlier metacognitive skills are developed, the higher the child's capacity for independent learning and problem-solving [5; 15].

The wide-ranging Delphi study led by P. Facione [15], conducted with the participation of 46 experts, identified six core cognitive components of critical thinking: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Subsequent research has confirmed that these components can be activated in primary school-aged children as well, through age-appropriately simplified situations [16; 17].

Uzbekistan's updated Law on Education (2020), the President's 2022 "New Uzbekistan"Development Strategy [12], and the Ministry of Preschool and School Education's concept document for 2023–2027 all designate the development of students' independent and critical thinking as one of the central objectives of the educational system.

Internationally, critical thinking programs have been well studied. Finland's 2016 curriculum reform mandated critical thinking and problem-solving skills for all subjects as "transversal competencies."Singapore's national "Thinking Schools, Learning Nation"programme (1997) demonstrated over a decade of practice that developing critical thinking skills from the primary grades yields high effectiveness.

The review of scholarly literature reveals two principal approaches to developing critical thinking: teaching it as a separate subject (the "stand-alone"approach) and integrating it into the learning process across subjects (the "infusion"approach). The "Philosophy for Children"(P4C) programme developed by M. Lipman [17] is an example of the first approach. It has been scientifically established that for primary school-aged children the second approach is more effective [5; 16], since children of this age acquire skills more readily through content-rich, concrete situations than through abstract "thinking"lessons in isolation.

The teacher's professional stance is also a decisive factor in developing critical thinking. According to A. Fisher's [16] research, a teacher capable of forming critical thinking skills in students must first be a

critical thinker themselves — possessing a culture of asking open questions, accepting non-standard solutions, and showing respect for the student's perspective.

With the arrival of digital technologies and artificial intelligence, the importance of critical thinking skills has grown further. Today's child encounters thousands of information fragments every day — social media, videos, advertising, and news streams. Sorting this information, verifying its reliability, and protecting oneself from manipulation have become essential competencies of modern life. Media literacy and information hygiene are practical expressions of critical thinking, and developing them from the primary school years has become a demand of the times [2; 19].

In light of the theoretical and practical problems outlined above, this study addresses the following questions: which methods of developing critical thinking skills in primary school-aged children are scientifically grounded and practically effective? What are the optimal pathways for integrating these methods into primary education practice?

MAIN BODY

1. The Structural Organization of Critical Thinking and Its Place in Primary Education

Several major models exist in critical thinking theory. Bloom's taxonomy [1] serves as a practical foundation for formulating educational objectives, while the Paul-Elder model [8] identifies eight elements of critical thinking — purpose, question, information, conclusion, concept, assumption, point of view, and implications — alongside eight intellectual standards. Halpern's [5] model describes critical thinking through five core skill clusters: verbal reasoning, analysis of arguments and hypotheses, assessment of probability and uncertainty, decision-making and problem-solving, and logical reasoning. In primary school, the principal opportunities for developing critical thinking are connected to the following types of learning activity: analyzing problematic situations, justifying one's reasoning, comparing and classifying, identifying errors and inaccuracies, and proposing alternative solutions.

2. Methods for Developing Critical Thinking in Primary School-Aged Children

2.1. Problem-Based Learning (PBL).

In the problem-based learning method developed in the work of I. Ya. Lerner [6] and M. I. Makhmutov [7], the student is not given ready-made knowledge — directing them toward solving a problem is the central principle. For example, in a second-grade mathematics lesson: "If both of two routes are short, which one would you choose and why?"— such an open question activates the student's capacity to evaluate and justify their reasoning. In this method, the teacher manages the learning process not through the "right answer"but through the "right question."

2.2. Socratic Questioning.

In Socratic questioning, the teacher does not answer directly but leads the student toward independent conclusions through a sequence of questions [8]. In primary classrooms: "Why do you think that? "Could it have been different? "How can we check this?"— when such questions are asked consistently, children gradually develop the habit of justifying their own thinking.

2.3. RWCT (Reading and Writing for Critical Thinking) Technology.

This technology, developed by J. Steele, K. Meredith, and Ch. Temple [10], consists of three stages: evocation, realization of meaning, and reflection. In primary school, the "Know — Want to Know — Learned"(KWL) chart is particularly effective, activating the student's prior knowledge, connecting new information to real questions, and directing the child toward critical self-evaluation of their learning.

2.4. Project-Based Learning and the Investigative Approach.

The project method, which draws on Dewey's pragmatic pedagogy [4], engages the child in solving real problems. A project task such as "What plants grow in our neighborhood?"leads the student through the full process of gathering information, analyzing it, drawing conclusions, and presenting findings — simultaneously activating the upper levels of Bloom's taxonomy: analysis, evaluation, and creation.

2.5. Developing Critical Thinking Through Play Technologies.

Vygotsky [14] and Elkonin [11] scientifically demonstrated the leading influence of play activity on the psychological development of primary school-aged children. Role play and didactic games serve to

develop the components of critical thinking in an engaging form. In the course of play, the child is compelled to consider multiple points of view, which directly supports their metacognitive development.

DISCUSSION AND CONCLUSION

The issue of developing critical thinking skills represents one of the most pressing challenges in contemporary pedagogy, attracting sustained scholarly attention across disciplines. The theoretical analysis, review of scientific literature, and practical observations carried out in the course of this research have yielded a series of significant generalizations and scientific conclusions. These conclusions collectively demonstrate not only that it is possible to develop critical thinking skills in primary school-aged children, but that doing so as part of a systematic pedagogical strategy is an educational necessity.

The place of critical thinking in human history is immense. In ancient Greece, Socrates cultivated the habit of approaching received knowledge with skepticism, examining every claim, and exposing every logical contradiction through his dialogues with students. Aristotle founded the science of logic and established the formal rules of valid inference. These two great legacies became the philosophical foundation of critical thinking. From medieval scholasticism through the clash of empiricism and rationalism in the Enlightenment, through the dialectics of Kant and Hegel, and into the twentieth century's pragmatism and analytic philosophy — all of these movements cultivated the culture of critical thought. John Dewey united this tradition with educational theory in his work "How We Think,"placing reflective thinking at the center of schooling. This heritage continues to serve as an essential scholarly foundation in pedagogy today.

From the perspective of modern science, the cognitive mechanisms of critical thinking have also been studied in depth. Recent advances in neuropedagogy and cognitive psychology reveal that critical thinking depends on the higher functions of the brain associated with the prefrontal cortex. This region governs executive functions such as inhibitory control, cognitive flexibility, and working memory. Diamond's research has demonstrated that these executive functions can be developed through purposeful education beginning in the preschool years. Consequently, the neurological maturation trajectory of the primary school-aged child's brain creates a biologically favorable foundation for developing critical thinking — a finding that further strengthens the scientific basis for pedagogical intervention.

From the standpoint of Piaget's theory of cognitive development, the period between the ages of seven and eleven constitutes the stage of "concrete operations,"during which the child masters logical operations including classification, seriation, reversibility, and conservation. Most significantly, egocentrism diminishes and decentration occurs: the child begins to perceive events not only from their own perspective but from the standpoint of others as well. This developmental quality creates the essential psychological precondition for the formation of the capacity to consider alternative points of view — which is itself a cornerstone of critical thinking. As Piaget's experiments demonstrated, when properly guided by a teacher, the child becomes capable of identifying and correcting his or her own errors, which represents an early form of critical self-evaluation.

Vygotsky's concept of the Zone of Proximal Development (ZPD) carries even greater operational significance for this question. Vygotsky argued that instruction should lead development rather than trail it: teaching a child what they can already do independently is a waste of time, whereas engaging them with tasks they can accomplish with the assistance of scaffolding — guidance just beyond their current independent ability — constitutes genuinely developmental education. In developing critical thinking skills, this principle operates as follows: the teacher does not provide a direct answer but instead offers questions, hints, and cues that guide the student toward finding the answer independently. Gradually the scaffolding is removed and the child learns to think autonomously. This process, which Vygotsky called "internalization,"transforms external dialogic thinking into internal independent thought — which is precisely the hallmark of developed critical thinking.

The developmental teaching theory elaborated by Davydov and Elkonin is equally significant. Davydov advanced the principle of moving from

theoretical generalization to concrete application — rather than having the child induce general rules from individual examples, he argued that the child should move from a general theoretical concept to an understanding of specific cases. This approach activates the student's analytical and deductive reasoning. Elkonin, meanwhile, demonstrated that play activity exerts a leading influence on the psychological development of the primary school-aged child — a scientific finding that constitutes the psychological basis for methods designed to develop critical thinking through play.

Metacognition — "thinking about thinking"— is an indispensable component of critical thinking. The concept introduced into scholarly discourse by Flavell refers to the learner's capacity to monitor, regulate, and evaluate their own cognitive processes. It consists of two parts: metacognitive knowledge (awareness of one's own cognitive processes, task characteristics, and available strategies) and metacognitive regulation (planning, monitoring, and evaluating one's own thinking). Research consistently shows that students with higher levels of metacognitive development acquire new material more quickly, identify and correct their own errors independently, and transfer their knowledge more effectively to new situations. In primary school, the most effective means of developing metacognition is to habituate students to verbalizing their thinking process — to answering the question "Why did I do it this way?"This seemingly simple technique in fact initiates profound cognitive transformation.

The system of critical thinking standards developed by Paul and Elder — clarity, accuracy, relevance, depth, breadth, logic, completeness, and fairness — can be cultivated in primary school children incrementally. It would of course be unreasonable to require a child of this age to meet all standards simultaneously. However, posing simple questions such as "Is that stated clearly here?"or "Is this accurate — how can we check?"begins to lay the first foundation stones of these intellectual standards. Over the years, these questions become the child's inner intellectual voice — the mark of an internalized critical thinking culture. As Paul and Elder emphasize, intellectual freedom develops through practice just as physical skill does, and the primary school years represent the most fertile period for that practice.

Halpern's model of critical thinking also holds great value as a theoretical basis for primary education. Defining critical thinking as "purposeful, reasoned, and goal-directed cognitive activity aimed at drawing sound conclusions,"she proposed studying it through five core skill clusters: verbal reasoning, analysis of arguments and hypotheses, assessment of probability and uncertainty, decision-making and problem-solving, and logical thinking. Crucially, Halpern demonstrated through her experiments that these skills are teachable and improve with practice. She paid particular attention to the problem of "transfer"— the question of how critical thinking skills learned in one context can be applied in others. Her conclusion was that transfer requires regular practice across varied contexts, and that primary education provides the most advantageous platform for beginning that practice early.

Bloom's taxonomy is not only a cornerstone of critical thinking theory but has become a universal instrument for practical lesson planning. In the version revised by Anderson and Krathwohl in 2001, the highest levels — analyzing, evaluating, and creating — are designated as the pedagogical goals of critical and creative thinking across all subjects. The greatest practical value of this taxonomy for primary education lies in its guidance for structuring questions and tasks in every lesson: remembering and understanding questions at the opening, application and analysis in the middle, and an open evaluative or creative task at the close. This structure steadily raises the level of the child's thinking throughout the lesson.

The role of discussion and dialogic teaching in developing critical thinking has also been established through dedicated scientific research. In the concept of "dialogic teaching"developed by Alexander, conversation between teacher and students is transformed from one-sided monologue into multilateral intellectual dialogue. Socratic seminars, fishbowl discussion, think-pair-share, and brainstorming are all methodological tools within this dialogic teaching system. When these techniques are applied successfully in primary classrooms, children learn to justify their own views, to listen to others, and to discuss conflicting perspectives with respectful composure — which also constitutes the foundation of democratic civic

culture.

At the international level, the greatest successes in developing critical thinking are visible in the educational systems of Finland, Singapore, and South Korea — countries that consistently rank at the top of PISA (Programme for International Student Assessment). In Finland's 2016 school reform, critical thinking and problem-solving skills were designated as compulsory goals for all subjects under the heading of "transversal competencies."In Singapore, the national "Thinking Schools, Learning Nation"programme launched in 1997 demonstrated over a decade of practice that it doubled students' critical and creative thinking indicators. The central factor behind these successes is the inclusion of critical thinking pedagogy as a dedicated course in teacher training, and its formal integration into assessment frameworks.

Uzbekistan's educational reforms have likewise designated the development of critical thinking as a priority direction. The President's 2022 "New Uzbekistan"Development Strategy, relevant decrees of the Cabinet of Ministers, and the Ministry of Preschool and School Education's concept document for 2023–2027 all include explicit directives to move away from rote learning, to apply active methods in lessons, and to teach students independent thinking. The new primary education curriculum introduced in the 2023–2024 academic year incorporates notable shifts in this direction. Nevertheless, translating reforms from the level of documents into the day-to-day lesson practice of individual teachers requires time and targeted methodological support. Filling precisely this gap is the core purpose of scientific-practical research of the kind presented here.

The obstacles that hinder the development of critical thinking in education must also be understood — for they cannot be overcome without being recognized. The first barrier is the absence or insufficiency of critical thinking culture in the teacher. Research shows that most teachers wish to develop critical thinking but do not know its practical techniques. The second barrier is the "correct answer"culture: in traditional education, students are conditioned to expect that every question has one right answer. Critical thinking, by contrast, frequently demands tolerance for multiple possible answers, for ambiguity, and for the possibility that "this could also be right."The third barrier is time pressure: a standardized curriculum and examination preparation push teachers toward rapid coverage, while deep discussion and investigative activity require time. The fourth barrier is parental misunderstanding: some parents interpret a child's tendency to question or express doubt as insubordination or disrespect. Addressing these cultural barriers must be a systemic task of educational reform.

The most effective context for developing critical thinking is authentic situations connected to real-life problems. Research consistently demonstrates that abstract logic exercises or artificial academic tasks do not adequately develop the capacity for transfer — the ability to apply skills learned in one context to another. Conversely, discussions and investigative work organized around genuine problems such as "What should our school do with its wastewater?"or "Which route for a new road is most sensible?"teach the child to apply critical thinking in real conditions of life. Dewey's principle of "learning by doing"is fully realized here. In such an authentic learning environment, the child comes to understand not only how to think critically but why it matters — which is a motivational factor of incomparable value.

As digital technologies and artificial intelligence develop at accelerating speed, the importance of critical thinking skills grows ever greater. The children who are in primary school today will be the generation that lives and works in a world where technology already performs many of humanity's intellectual functions. Artificial intelligence can process data, analyze it, and draw certain kinds of conclusions. But it does not yet possess ethical judgment, creative empathy, intellectual autonomy, or the capacity for critical evaluation. The competitive advantage of the twenty-first-century human being therefore lies precisely in the domain the machine cannot manage — critical and creative thinking. From this perspective, cultivating critical thinking from the primary school years is not merely a pedagogical task aimed at improving educational quality: it has become a strategic necessity for preparing the next generation, in the fullest sense, for life.

Media literacy and the critical evaluation of information are also important practical

expressions of critical thinking. Today's child encounters thousands of information fragments every day: social media, videos, advertising, and a continuous news stream. The ability to sort this information, verify its reliability, and resist manipulation — "information hygiene"— has become one of the most essential competencies of modern life. Research demonstrates that people with highly developed critical thinking skills are less susceptible to disinformation, more likely to check the credibility of sources, and more resistant to manipulation. Introducing children, from the primary school years, to the natural habit of asking "Where did this information come from? "Who wrote this and for what purpose? and "Does another source say the same thing?"is the most accessible path to developing media literacy.

Critical thinking and creativity are often set in opposition to each other; in reality they are complementary cognitive capacities. Critical thinking evaluates existing ideas, identifies weaknesses, and subjects claims to logical scrutiny; creativity generates new ideas and solutions. The most effective intellectual work combines both: creative ideas are first gathered (divergent thinking), then the best options are selected through critical evaluation (convergent thinking). The work of creativity researchers Guilford, Torrance, and de Bono shows that the primary school years represent a unique period in which both capacities can be developed simultaneously. A teacher who designs tasks that unite the two — for instance, "Find five ways to solve this problem, then choose the best one and justify your choice"— brings the full pedagogical potential of this developmental period into play.

The assessment system too can either obstruct or support the development of critical thinking. Traditional right/wrong answer tests measure primarily the remembering and understanding levels of cognition; they measure critical thinking hardly at all. Assessing critical thinking requires authentic assessment tools: open-ended essay questions and written reflections, debates and presentations, project portfolios, and self-assessment rubrics. Standardized instruments such as the Cornell Critical Thinking Tests developed by Norris and Ennis, and the California Critical Thinking Skills Test developed by Facione, also exist and can be adapted for use in primary education. If the assessment system is not reformed alongside pedagogy, students will continue to prioritize memorizing "correct answers"for examinations even when their teacher is earnestly developing their critical thinking — and all pedagogical effort will be rendered ineffective.

The family environment and collaboration with parents can be either the school's most powerful partner or its greatest obstacle in developing critical thinking. Research shows that children raised in homes where open questions, the exchange of competing views, and respect for independent thought are habitual acquire critical thinking skills at school significantly more quickly. Conversely, where a closed thinking climate prevails at home — "don't question your elders,don't ask, that's just how it is"— even the most carefully designed school activities produce insufficient impact. Schools should therefore establish ongoing dialogue with parents, explain the culture of critical thinking to them, and recommend that homework be set in the form of open-ended questions that encourage independent thought. A number of schools abroad have organized "critical thinking seminars for parents"with this approach, and it has yielded notably positive results.

Developing critical thinking is not a collection of one-time activities but an educational culture sustained over years. Critical thinking cannot be "taught"in a single lesson or a single month — it is a long-term process. But when that process is well guided, its results are highly visible. As Halpern's longitudinal observations show, students whose critical thinking skills are systematically cultivated from the primary grades go on to achieve considerably stronger academic results in secondary school and higher education, solve problems independently in professional life, and demonstrate the capacity to justify their life decisions with reasoned argument. This long-term investment is among the most profitable available to the educational system and to society alike.

It is also worth emphasizing that critical thinking is not merely an intellectual skill but a moral quality. In his concept of "Intellectual Virtues,"Paul identifies seven intellectual traits essential to the critical thinker: intellectual humility (acknowledging one's own ignorance), intellectual

courage (willingness to speak uncomfortable truths), intellectual empathy (genuinely striving to understand another's perspective), intellectual integrity (holding one's own thinking to the same standards applied to others'), intellectual perseverance (sustaining focused thought until a problem is resolved), confidence in reason (trusting that rigorous thinking leads to sound conclusions), and intellectual fairness (evaluating all viewpoints on the basis of evidence rather than personal affinity). Cultivating these qualities in primary school-aged children means educating not only a knowledgeable person but a morally complete human being.

By way of a final synthesis, it may be stated that developing critical thinking skills in primary school-aged children is one of the most scientifically substantiated, practically tested, and strategically consequential directions in contemporary pedagogy. The psychological theories of Piaget, Vygotsky, Davydov, and Elkonin; the critical thinking models of Bloom, Paul and Elder, Halpern, Facione, Fisher, and Lipman; the experience of educational reforms in Finland, Singapore, Canada, and beyond; and Uzbekistan's own new wave of educational reform — all speak with one voice: developing critical thinking from the primary school stage is the right pedagogical path. Along that path, the teacher is the single most decisive factor. Only when the teacher is a critical thinker themselves — a guide who illuminates the path of thought rather than transmitting ready-made knowledge, and who actively creates a culture of thinking in the classroom — can this goal be achieved. This is the principal scientific and practical conclusion of the present study, and it is intended to serve as a clear direction and methodological foundation for the practice of primary education in Uzbekistan and for the system of teacher professional development alike.

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