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EDUCATIONAL TECHNOLOGIES FOR DEVELOPING CRITICAL THINKING IN SCHOOL STUDENTS AS A MEANS OF PERSONAL SELF-DEVELOPMENT

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ABSTRACT

This article examines the use of interactive methods and educational technologies to develop critical thinking in school students as a means of personal self-development. Critical thinking is treated as purposeful, reflective, and self-regulated judgment that enables learners to analyze information, evaluate evidence, formulate questions, compare perspectives, and make reasoned decisions. The article discusses classroom conditions that support these abilities and emphasizes the teacher's role as a facilitator of inquiry rather than only a transmitter of information. Practical techniques are presented for use in reading, history, environmental studies, and other text-based lessons, including the "Basket of Ideas," cluster mapping, learning logs, short reflective essays, the margin-annotation technique, and cinquain writing. Each technique is described in relation to activating prior knowledge, organizing information, monitoring comprehension, encouraging dialogue, and supporting reflection. The discussion also highlights the value of problem-based tasks, questioning, argumentation, and collaborative learning for strengthening learner independence and engagement. When applied systematically, these approaches can help students connect prior experience with new knowledge, identify problems, justify conclusions, consider alternative viewpoints, and transfer learning to authentic situations. The article concludes that critical-thinking instruction can contribute simultaneously to students' intellectual autonomy, creative potential, and capacity for continued self-development.

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Keywords: *critical thinking, interactive methods, educational technology, self-development, primary education, student engagement.*

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Introduction

Contemporary education is expected to prepare learners to participate productively in a rapidly changing world. This goal requires more than the accumulation of information. Students need to learn how to identify relevant knowledge, analyze claims, evaluate evidence, communicate ideas, and make reasoned decisions. Critical thinking is commonly understood as purposeful and self-regulated judgment involving interpretation, analysis, evaluation, inference, and explanation (Facione, 1990). It can also be viewed as a metacognitive process that supports reflective judgment, problem solving, and decision making (Dwyer et al., 2014).

For school students, the development of critical thinking is closely connected with increasing intellectual independence. Two recurring classroom challenges are particularly important: students may become overly dependent on teacher direction, and they may quickly lose interest when learning is reduced to passive reception of information. A developmental perspective is therefore essential because the capacity to think critically grows as learners become increasingly able to reflect on what they know, how they know it, and which strategies are appropriate for a given problem (Kuhn, 1999).

In this context, the technology for the development of critical thinking (TDCT) can be treated as a pedagogical framework that places the learner's reasoning at the center of instruction. The teacher acts as a facilitator, organizer of independent learning, and partner in the search for solutions. Critical thinking begins with meaningful questions and clearly defined problems; it develops when students are expected to justify claims, compare alternatives, and revise conclusions in light of evidence. Research on critical-thinking instruction has found that dialogue, authentic or situated problems, and guided support are among the instructional features associated with stronger critical-thinking outcomes (Abrami et al., 2015).

Text-rich subjects such as literary reading, environmental studies, social studies, and history provide particularly useful opportunities for this work because students must interpret information, distinguish main ideas from supporting details, compare perspectives, and explain their reasoning. A recent systematic review of primary education likewise identifies textual, dialogic, digital, and practical classroom approaches as important ways of supporting critical thinking, while emphasizing the need for deliberate theoretical grounding and purposeful classroom dialogue (Jegstad et al., 2025).

Classroom Strategies for Developing Critical Thinking

A problem can stimulate thought, but independent critical thinking depends on a foundation of prior knowledge and experience. Students must be able to connect new information with what they already know, analyze and reorganize information, evaluate its reliability, and use it to reach conclusions. Interactive methods can support these processes when they are used systematically and when students are given sufficient time to explain, question, compare, and reflect.

Basket of Ideas

The "Basket of Ideas" is used at the beginning of a lesson to activate prior knowledge and organize individual or group contributions. Students record what they already know, believe, or assume about the topic. Their responses are then collected and discussed. The technique allows the teacher to identify existing knowledge and misconceptions while giving students an immediate role in constructing the lesson. It is most effective when initial ideas are revisited later so that students can compare their first assumptions with what they learned.

Cluster Mapping

Cluster mapping is a visual technique for organizing knowledge around a central concept. Students write a key word or idea in the center of the page and connect it with related concepts through branching lines. Additional branches can be added as relationships become clearer. The technique may be used before instruction to stimulate thinking, during instruction to structure new material, or after instruction to summarize learning. It can support both individual and collaborative work and helps students see connections that may be less visible in linear notes.

Learning Log

A learning log, referred to in the original approach as a "Board Log," is a structured writing activity in which students record their thinking while studying a topic. A simple two-column format can be organized around two questions: "What do I already know about this topic?" and "What new information have I learned?" The first column is completed before or at the beginning of reading, and the second column is developed as students encounter new information. During reflection, students compare the two columns, summarize what changed in their understanding, and identify points that require further discussion.

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The log may be completed individually and then discussed in pairs or groups. This sequence encourages students to formulate an initial position before hearing others' views. The final reflection can also become the starting point for a new task, such as a short investigation, discussion, or written response.

Reflective Essay Writing

Short essay writing can be used to help students clarify their own thinking. The central principle is simple: students write in order to discover and explain what they think. A brief essay on a clearly defined question values independence, originality, argumentation, and personal interpretation. After a class discussion, students may be given approximately 15 minutes to state a position, support it with reasons or evidence, and reflect on possible alternatives. The emphasis should be on the quality and coherence of reasoning rather than on reproducing a teacher-provided answer.

Margin-Annotation Technique

The margin-annotation technique helps students monitor comprehension while reading. Students use simple symbols in the margins of a prepared text to indicate how new information relates to their existing understanding. The method transforms reading from a passive activity into an explicit process of comparison, questioning, and self-monitoring.

The symbols can be introduced as follows: "V" indicates information that the student already knew; "+" marks new information; "–" marks information that differs from the student's previous understanding; and "?" identifies information that is unclear or requires further investigation.

Table 1

Margin-Annotation Symbols and Meanings

V	+	–	?
Already knew	New information	Thought differently	Question / unclear

The method requires active and attentive reading. Students who would otherwise pass over an unfamiliar idea are prompted by the question mark to recognize a gap in understanding. The teacher should select an appropriate text or passage, explain the symbols, define the time available, and establish a clear procedure for checking and discussing the annotations. Oral discussion after reading is especially useful because students can point to specific passages when explaining what was familiar, new, surprising, or confusing.

Cinquain Writing

Cinquain writing is a five-line synthesis activity that helps students condense their understanding of a topic. In a common classroom version, the first line contains one noun naming the topic; the second line contains two adjectives describing it; the third line contains three verbs associated with it; the fourth line is a short phrase or sentence expressing an idea or attitude about the topic; and the fifth line is a concluding word that summarizes the student's response. Because students must select and organize a small number of words, the activity encourages synthesis, reflection, and concise expression.

Table 2 summarizes how the six classroom techniques described above support distinct but complementary components of critical thinking.

Table 2

Critical-Thinking Techniques and Their Instructional Functions

Technique	Primary purpose	Typical student action	Critical-thinking function
Basket of Ideas	Activate prior knowledge	State what is already known, believed, or assumed about the topic	Surfaces prior conceptions and generates questions for inquiry
Cluster Mapping	Organize relationships among ideas	Connect a central concept with related concepts and subideas	Supports comparison, classification, synthesis, and conceptual organization

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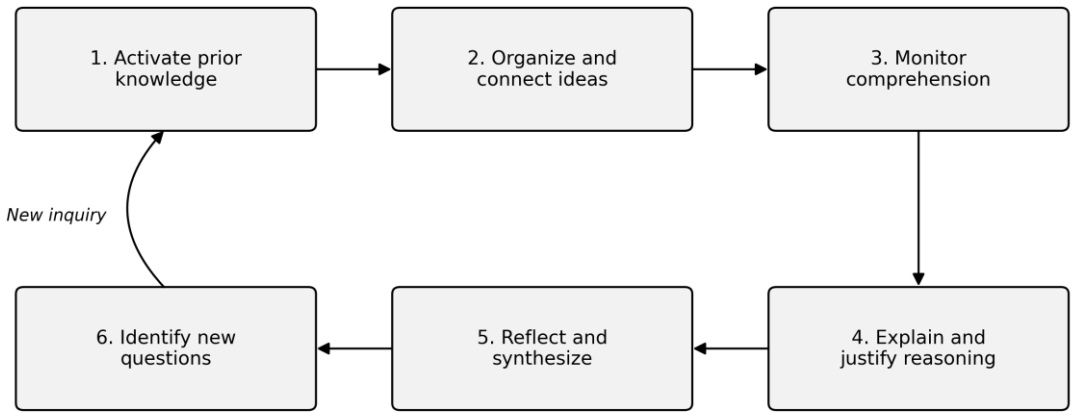
Learning Log	Monitor changes in understanding	Record prior knowledge and new learning, then compare the two	Strengthens metacognition, reflection, and revision of understanding
Reflective Essay Writing	Articulate and defend a position	Write a brief response that explains a view and gives reasons	Develops clarity, argumentation, independence, and evidence-based reasoning
Margin-Annotation Technique	Monitor comprehension while reading	Mark information as known, new, different, or unclear	Promotes active reading, evaluation of information, and question generation
Cinquain Writing	Synthesize learning concisely	Condense a topic into a structured five-line summary	Encourages prioritization, generalization, reflection, and concise expression

Note. The table synthesizes the instructional purposes and student actions described in the manuscript; it does not report measured effect sizes or experimental results.

Figure 1 presents the same strategies as a recursive instructional cycle in which reflection generates new questions for subsequent learning.

Figure 1

Instructional Cycle for Developing Critical Thinking



Note. This author-created figure is a conceptual synthesis of the classroom sequence described in the manuscript; it is not a tested causal model.

Implications for Students and Teachers

The techniques described above do not represent an exhaustive list of critical-thinking strategies. Their value lies in the way they reposition students as active participants in learning. In the primary and lower-secondary years, learners may not yet possess enough knowledge to produce fully developed arguments independently; nevertheless, carefully structured questioning, annotation, discussion, mapping, and reflective writing can help them practice the intellectual habits on which more advanced reasoning depends.

The use of critical-thinking strategies can also support teachers' professional growth. When teachers observe how students explain, question, compare, and revise ideas, they gain evidence about students' understanding that is not visible in recall-based tasks. This information can be used to adjust instruction, select more appropriate prompts, and create a classroom climate in which uncertainty and reasoned disagreement are treated as productive parts of learning.

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Across these activities, the development of critical thinking can be recognized in a set of recurring behaviors:

- posing questions and clarifying the problem that needs to be solved;
- seeking convincing reasons and evidence for a conclusion;
- thinking independently while participating constructively in social learning;
- connecting new ideas with previously acquired knowledge and experience;
- expressing an appropriate degree of confidence based on available facts;
- comparing and contrasting ideas or positions;
- applying knowledge in authentic situations;
- considering counterarguments and alternative points of view;
- evaluating the reliability and validity of information;
- generalizing from specific ideas while recognizing limitations; and
- identifying problems or unanswered questions within a text or information source.

Conclusion

Critical thinking develops when students are expected to do more than remember information. They need repeated opportunities to identify problems, ask questions, compare perspectives, evaluate evidence, explain reasoning, and apply prior knowledge to new situations. Interactive methods such as the Basket of Ideas, cluster mapping, learning logs, reflective essays, margin annotation, and cinquain writing provide practical structures for these processes. Used consistently, they can make classroom learning more active and reflective while supporting students' intellectual independence, creativity, and personal self-development. The teacher's role is central: effective implementation requires purposeful task selection, clear expectations, supportive dialogue, and reflection on both the learning process and its outcomes.

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