

Enhancing Middle School Students' Critical Thinking in Social Studies through Animation-Assisted Problem-Based Learning

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Abstract

This study examined how animation-assisted Problem-Based Learning (PBL) improved middle school students' critical thinking in Social Studies. A collaborative classroom action research design involved 30 Grade VII students and comprised a pre-cycle baseline followed by two action cycles, each conducted in two meetings through planning, action, observation, and reflection. Five indicators were assessed: observation and fact identification, questioning and problem identification, literacy and data searching, inference and logical argumentation, and communication and evaluation of thinking outcomes. Data were collected through tests, observation, student worksheets, interviews, field notes, and documentation, and were analyzed quantitatively and qualitatively with source, technique, and time triangulation. The mean score increased from 66.67 at baseline to 82.00 in Cycle I and 95.33 in Cycle II, while learning mastery rose from 46.67% to 93.33% and 100%. The largest indicator gains occurred in literacy/data searching and communication/evaluation. The findings indicate that animated videos were most effective when used as problem stimuli within structured inquiry, evidence comparison, peer response, and reflection. Thus, animation-assisted PBL can strengthen critical thinking progressively when visual scaffolding is integrated with explicit evidence-based discussion and evaluation.

Keywords

Animated Video; Critical Thinking; Problem-Based Learning; Social Studies

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1. INTRODUCTION

Critical thinking is a central learning outcome for Social Studies because students are expected to interpret social and environmental information, distinguish evidence from opinion, evaluate competing explanations, and communicate decisions responsibly. These demands are increasingly important in twenty-first-century schooling, where higher-order thinking skills (HOTS) and the 4Cs critical thinking, creativity, communication, and collaboration are embedded in student-centered learning expectations. In Indonesia, the Merdeka Curriculum similarly emphasizes reasoning, inquiry, contextual learning, and the development of the Pancasila Student Profile rather than factual recall alone. Recent studies show that curriculum implementation becomes more meaningful when learners are asked to analyze authentic issues and justify claims rather than merely reproduce textbook information (Arviani et al., 2023; Rohali & Hamimi, 2024; Sadiyah et al., 2024). For Social Studies, this orientation is particularly relevant because the subject integrates geography, history, economics, and social life, all of which require students to interpret evidence and consider multiple perspectives.



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The classroom baseline in Grade VII.1 showed that this expectation had not yet been fully realized. Conventional instruction was dominated by teacher explanation, textbooks, short question-and-answer exchanges, and individual tasks. The combined pre-cycle mean was 66.67, and only 46.67% of the 30 students met the minimum mastery criterion. The indicator profile revealed an uneven pattern, observation and fact identification reached 86.67%, questioning and problem identification 85.83%, literacy and data searching only 54.17%, inference and logical argumentation 76.67%, and communication and evaluation of thinking outcomes only 30.00%. Thus, students could often notice visible facts and formulate basic questions, but they were substantially weaker in searching for supporting information, constructing evidence-based reasoning, presenting arguments, responding to peers, and evaluating the quality of solutions. These baseline data justify an intervention that does more than increase activity; it must deliberately connect observation, inquiry, evidence use, argumentation, communication, and evaluation.

The theoretical basis for this intervention combines critical-thinking pedagogy, constructivist learning, and cognitive scaffolding. (Brookfield, 2017) argues that critical thinking develops when learners identify assumptions, examine evidence, consider alternative perspectives, and reflect on the reasoning behind judgments. In the present study, those processes were operationalized into five observable indicators suitable for Grade VII Social Studies: observation and fact identification; questioning and problem identification; literacy and data searching; inference and logical argumentation; and communication and evaluation. PBL provides a constructivist structure for these processes because students encounter a meaningful problem, organize what they know and need to know, investigate information, construct explanations, and evaluate proposed solutions. Animated video adds a cognitive scaffold by making spatial, environmental, and historical processes visible and discussable; however, its pedagogical value depends on being connected to questions, evidence, and tasks rather than used as passive entertainment (Berney & Bétrancourt, 2016; Klefodimos, 2024).

Recent empirical work supports the potential of this combination. (Anggraeni et al., 2023) reported in a systematic review that PBL consistently supports critical thinking when authentic problems, collaborative inquiry, and reflection are implemented coherently. (Subagiyo et al., 2023) found substantial gains in students' critical thinking through PBL assisted by animated video in physics. (Purba et al., 2022) also reported a high gain in critical thinking among junior high school students taught with video-animation-assisted PBL. (Taningrum et al., 2024) showed that animated videos embedded in PBL improved critical-thinking performance, while (Fitriani et al., 2024) demonstrated positive effects of PBL with learning videos on motivation, critical thinking, and Social Studies outcomes. More recent work similarly indicates that PBL with audio-visual support can improve critical thinking in Social Studies contexts (Ilyas et al., 2026; Kalkautsar et al., 2026). These studies establish a strong empirical foundation, but they mainly report aggregate outcomes or experimental effects rather than documenting how distinct critical-thinking components change through iterative classroom reflection.

A sharper research gap therefore concerns the process rather than the simple question of whether PBL or animated video 'works.' Existing studies frequently compare intervention and control groups, report pretest-posttest gains, or treat critical thinking as a single total score. Less attention has been given to classroom-action evidence showing which specific dimensions improve quickly, which remain difficult, and how teacher adjustments between cycles address those weaknesses. The gap is also relevant to Social Studies, where students must move across different knowledge domains. Environmental-resource problems require causal reasoning about human-environment relations, whereas historical problems require comparison of sources, interpretation of evidence, and evaluation of competing explanations. A process-oriented study can therefore reveal whether the same PBL structure supports critical thinking across different Social Studies content while still requiring different forms of scaffolding.

The state of the art has shifted from treating digital media as a motivational add-on toward integrating media into the epistemic work of problem solving. Studies on animated or digital PBL environments increasingly emphasize inquiry prompts, information verification, collaboration, and reflective evaluation rather than exposure to multimedia alone (Jihanifa et al., 2025; Kartika et al., 2025; Lafifa & Rosana, 2023; Mamonto et al., 2024). In parallel, recent critical-thinking assessment research argues that performance evidence should capture justification, argument quality, and the use of evidence, not only selected-response accuracy (Butler, 2024; Calma & Davies, 2025; Schoute & Alexander, 2025). The present study is positioned at the intersection of these developments by using animated video as an initial problem representation, PBL as the inquiry structure, and a five-indicator analytic rubric as the basis for tracing changes in students' thinking across action cycles.

The novelty of this study lies in its multidimensional, reflective mapping of critical thinking within a classroom action framework. Rather than claiming novelty from the mere combination of PBL and animation, the study tracks five linked indicators from fact identification to communication and evaluation, compares the pre-cycle with two revised action cycles, and shows how specific instructional modifications were directed at the weakest indicators. Cycle I emphasized guided inquiry into natural-resource use, climate change, and disaster risk, reflection then identified limited source evaluation and uneven oral participation. Cycle II responded by requiring comparison of at least two pieces of evidence, assigning rotating presentation roles, using peer-evaluation rubrics, and adding written reflection in a historical inquiry on the prehistory and Hindu-Buddhist period. This makes the contribution not only outcome-oriented but also instructional: it explains how scaffolding was adjusted when particular dimensions of critical thinking lagged behind.

Accordingly, this study aimed to describe and analyze the improvement of Grade VII students' critical thinking through animation-assisted PBL in Social Studies and to explain how iterative classroom adjustments supported that improvement. The expected contribution is twofold: theoretically, the study clarifies how visual scaffolding, problem inquiry, evidence use, argumentation, and peer evaluation interact across distinct critical-thinking indicators; practically, it offers teachers a cycle-based strategy for diagnosing and strengthening weak components of student reasoning. The integrated research question was: how does animation-assisted PBL, implemented through two reflective action cycles after a conventional baseline, improve students' abilities to identify facts, formulate problems, search for data, construct logical arguments, and communicate and evaluate their thinking in Social Studies?

2. METHODS

Critical thinking is a central learning outcome for Social Studies because students are expected to interpret social and environmental information, distinguish evidence from opinion, evaluate competing explanations, and communicate decisions responsibly. These demands are increasingly important in twenty-first-century schooling, where higher-order thinking skills (HOTS) and the 4Cs critical thinking, creativity, communication, and collaboration are embedded in student-centered learning expectations. In Indonesia, the Merdeka Curriculum similarly emphasizes reasoning, inquiry, contextual learning, and the development of the Pancasila Student Profile rather than factual recall alone. Recent studies show that curriculum implementation becomes more meaningful when learners are asked to analyze authentic issues and justify claims rather than merely reproduce textbook information (Arviani et al., 2023; Rohali & Hamimi, 2024; Sadiyah et al., 2024). For Social Studies, this orientation is particularly relevant because the subject integrates geography, history, economics, and social life, all of which require students to interpret evidence and consider multiple perspectives.

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students met the minimum mastery criterion. The indicator profile revealed an uneven pattern, observation and fact identification reached 86.67%, questioning and problem identification 85.83%, literacy and data searching only 54.17%, inference and logical argumentation 76.67%, and communication and evaluation of thinking outcomes only 30.00%. Thus, students could often notice visible facts and formulate basic questions, but they were substantially weaker in searching for supporting information, constructing evidence-based reasoning, presenting arguments, responding to peers, and evaluating the quality of solutions. These baseline data justify an intervention that does more than increase activity; it must deliberately connect observation, inquiry, evidence use, argumentation, communication, and evaluation.

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3. FINDINGS AND DISCUSSIONS

Findings

The pre-cycle established a clear baseline before PBL and animated video were introduced. The mean of the two assessments was 66.67, with 14 of 30 students (46.67%) reaching mastery. The profile was uneven. Observation and fact identification (86.67%) and questioning/problem identification (85.83%) were already relatively high, but literacy/data searching was 54.17%, inference/logical argumentation was 76.67%, and communication/evaluation was only 30.00%. Classroom notes showed that students usually relied on the teacher and textbook, rarely compared sources, and tended to submit written answers without publicly defending or evaluating them. This pattern confirmed that the main weaknesses were not simply factual knowledge but the use of evidence and the social articulation of reasoning.

Table 1. Development of Mean Scores and Learning Mastery

Stage	P mean	K mean	Combined mean	Students mastered	Mastery (%)
Pre-cycle	61.00	72.33	66.67	14/30	46.67
Cycle I	80.00	84.00	82.00	28/30	93.33
Cycle II	92.00	98.67	95.33	30/30	100.00

Cycle I produced a substantial change after PBL was introduced with animated videos, worksheets, group inquiry, and presentation. The combined mean rose to 82.00 and mastery to 93.33%, leaving two students below the criterion. The five indicators reached 92.50% for observation/fact identification, 91.67% for questioning/problem identification, 80.00% for literacy/data searching, 91.67% for inference/logical argumentation, and 54.17% for communication/evaluation. Field notes and worksheets showed that students more consistently recorded facts from video stimuli and began to seek additional information from books and digital sources. However, source selection was often accepted without comparison, and oral participation remained concentrated among a few confident students. Student feedback also pointed to limited discussion time, which sometimes reduced the quality of group solutions.

Reflection after Cycle I directly shaped Cycle II. Groups were required to compare at least two pieces of evidence, two students who had not reached mastery received individual checks, and rotating presentation roles were introduced so that speaking responsibilities were distributed. Peer-evaluation rubrics and written reflection were added. Cycle II, using historical content on prehistory and Hindu-Buddhist civilization, resulted in a combined mean of 95.33 and 100% mastery. Indicator scores reached 98.33% for observation/fact identification, 98.33% for questioning/problem identification, 95.00% for literacy/data searching, 98.33% for inference/logical argumentation, and 86.67% for communication/evaluation. All five indicators were therefore in the very-good category, although communication/evaluation remained the lowest relative score.

Table 2. Development of the five critical-thinking indicators

Indicator	Pre-cycle (%)	Cycle I (%)	Cycle II (%)	Change (pp)
Observation and fact identification	86.67	92.50	98.33	+11.66
Questioning and problem identification	85.83	91.67	98.33	+12.50
Literacy and data searching	54.17	80.00	95.00	+40.83
Inference and logical argumentation	76.67	91.67	98.33	+21.66
Communication and evaluation	30.00	54.17	86.67	+56.67

The qualitative evidence supported the numerical pattern. One student explained that the animated video helped make important Social Studies facts clearer and easier to remember, reflecting the improvement in purposeful observation. Another student reported becoming more curious after seeing a visual representation of the problem, which was consistent with stronger problem formulation. In argumentation, a student noted that group discussion provided different perspectives and made the reasons offered more complete and logical. For communication, a student stated that greater understanding from group preparation increased confidence when presenting, while another reported becoming more willing to respond during discussion. These statements were consistent with classroom records showing more distributed participation, more explicit references to evidence, and more peer response in Cycle II.

The high scores in the first two indicators require careful interpretation. Unlike the earlier article version, the revised thesis does not show 100% from the first action cycle. The pre-cycle values were already high (86.67% and 85.83%), then increased to 92.50% and 91.67% in Cycle I and 98.33% for both in Cycle II. This pattern reduces the risk of a ceiling-effect interpretation and is empirically consistent with the nature of the tasks: students could initially identify visible facts and basic problems, but PBL and video helped them become more precise and independent. The strongest developmental changes occurred in the indicators that were weakest at baseline—literacy/data searching increased by 40.83 percentage points and communication/evaluation by 56.67 points—showing that reflective action was directed toward genuine classroom needs.

The sequence of student work also showed a qualitative shift in what counted as an acceptable answer. During the pre-cycle, many responses were short descriptions that reproduced information supplied by the teacher. In Cycle I, worksheets increasingly contained problem statements, supporting facts, and proposed solutions, but several groups still treated the first source they found as sufficient. By Cycle II, the worksheets required explicit comparison of evidence and a reason for preferring one explanation over another. In the historical topic, groups were asked not only to identify artifacts or describe Hindu-Buddhist influence but to connect those traces to competing explanations and defend which interpretation was better supported. Presentation records likewise showed a shift from simply reading group answers toward answering peer questions and revising a conclusion after feedback. These patterns provide an important complement to the percentages because they indicate changes in the quality and independence of reasoning rather than only higher numerical scores.

The reflection records further show that the intervention was responsive rather than repetitive. Cycle I did not simply precede Cycle II chronologically; its weaknesses were translated into concrete redesign decisions. Limited source verification led to the two-evidence requirement. Uneven participation led to rotating group roles and presenters. Weak peer response led to a peer-evaluation rubric and evidence-based response prompts. Time pressure led to clearer task segmentation. The teacher also reduced direct explanation during Cycle II so that students had to use the available evidence more independently. Consequently, the rise in communication/evaluation should be read together with changes in participation structure, not as an automatic by-product of repeated exposure to PBL. This evidence strengthens the claim that reflection functioned as an active mechanism of instructional improvement.

Discussion

The findings indicate that animation-assisted PBL supported critical thinking not through a single media effect but through an instructional sequence in which visual representation, inquiry, evidence gathering, argument construction, presentation, and reflection were connected. This interpretation is consistent with systematic evidence that PBL is most effective when authentic problems initiate inquiry and when collaboration and reflection are integral rather than peripheral activities (Anggraeni et al., 2023; Jaganathan et al., 2024). The result also extends studies that report positive aggregate effects of PBL on critical thinking (Aini et al., 2021; Razak et al., 2022; Susilawati & Supriyatno, 2023) by showing the different trajectories of five specific dimensions. The relatively high baseline in observation and problem identification contrasted with the much lower starting points in data literacy and communication/evaluation, demonstrating why a single total score can conceal important instructional needs (Silva et al., 2024).

The interaction between animation and PBL can be understood as a complementary division of pedagogical functions. Animated video provided a concrete, temporally organized representation of phenomena that students could observe together. In Cycle I, environmental and resource processes that might be distant or difficult to observe directly became visible problem contexts. In Cycle II, maps, heritage images, and narrated historical sequences supported the interpretation of evidence and chronology. Research on animation suggests that moving visual-verbal representations can reduce abstraction and support attention when they are aligned with learning tasks (Berney & Bétrancourt, 2016; Haq & Irawati, 2022; Kleftodimos, 2024). Yet the present findings show that viewing alone was insufficient. The larger gains appeared after students had to record evidence, compare sources, explain claims, and respond to peers. In other words, animation supplied shared perceptual material, while PBL transformed that material into epistemic activity.

This finding is in dialogue with recent studies on video-assisted PBL. (Subagiyo et al., 2023) reported strong critical-thinking gains in a physics context, and (Purba et al., 2022) found high improvement among junior high school students studying substance pressure. (Taningrum et al., 2024) likewise found that PBL-based animated video improved critical thinking, while (Fitriani et al., 2024)

reported benefits for critical thinking and Social Studies outcomes. These studies support the overall direction of the present results. However, the current classroom-action evidence adds a process explanation: the effect was not uniform across indicators, and the largest improvements corresponded to targeted modifications made after reflection. This is particularly important for Social Studies, where critical thinking requires both content interpretation and discursive practices such as weighing evidence and considering alternative explanations.

Literacy and data searching improved from 54.17% to 95.00%, one of the largest gains. At baseline, students depended heavily on the teacher and a single textbook. Cycle I introduced guided searching, but the teacher's reflection showed that source evaluation remained inconsistent. The Cycle II requirement to compare at least two pieces of evidence changed the nature of the task from information retrieval to information judgment. This progression aligns with recent critical-thinking scholarship emphasizing that reliable reasoning requires not just access to information but also the ability to judge its relevance and evidentiary value (Butler, 2024; Calma & Davies, 2025; Schoute & Alexander, 2025). It also echoes findings that technology-supported learning can strengthen critical thinking when students are required to evaluate and discuss information rather than merely consume digital content (Song & Cai, 2024; Supriyatno et al., 2020). Inference and logical argumentation rose from 76.67% at baseline to 98.33% in Cycle II. The improvement appears related to explicit scaffolding around claims, evidence, reasons, and conclusions, combined with group discussion. This mechanism is consistent with the view that PBL encourages learners to articulate what they know, identify what needs investigation, test explanations, and revise conclusions as new information becomes available (Ghani et al., 2021; Smith, 2022). The transition from environmental problem solving to historical source comparison is also theoretically useful. Although the content domains differed, both required students to connect evidence with conclusions. This suggests that the five-indicator framework captured transferable reasoning practices rather than only topic-specific recall. Nevertheless, because the content changed across cycles, the increase should be interpreted as developmental evidence within CAR, not as an experimental causal effect attributable solely to PBL or animation.

Communication and evaluation developed most slowly in absolute performance despite showing the largest total gain, from 30.00% to 86.67%. Several factors explain this pattern. First, these skills were minimally structured during conventional instruction, so students had little experience presenting, challenging, or revising arguments publicly. Second, group work can allow confident students to dominate unless participation is deliberately distributed. Third, evaluative communication is cognitively and socially demanding: a student must understand the content, organize an argument, attend to another group's reasoning, judge the quality of evidence, and respond appropriately in real time. These demands help explain why Cycle I presentation alone produced only 54.17%. Improvement became stronger after Cycle II added rotating roles, peer-evaluation rubrics, evidence-based response prompts, and written reflection. This interpretation is consistent with research showing that critical-thinking dispositions and practices are shaped by classroom cultures of dialogue and repeated opportunities for (Darcie et al., 2024; Indrašienė et al., 2023) reflection (Darcie et al., 2024; Indrašienė et al., 2023).

The slower development of the fifth indicator also helps clarify the contribution of scaffolding. PBL is sometimes treated as if student-centeredness means reducing teacher guidance. The present study suggests the opposite: productive independence emerged through carefully designed support. In Cycle I, students needed explicit directions for source searching and presentation. Reflection did not lead to abandoning PBL but to improving the structure of participation and evidence use. In Cycle II, direct assistance was reduced only after roles, criteria, and response procedures had been clarified. This pattern is consistent with recent reviews indicating that PBL implementation depends heavily on facilitation quality, time management, task design, and students' prior familiarity with inquiry-oriented learning (Sarnoko et al., 2024; Ssali et al., 2025). The pedagogical implication is that scaffolding should be adaptive: strong enough to make reasoning visible, but gradually withdrawn as students become

more capable of self-regulation.

The study also contributes to the implementation of critical thinking within the Merdeka Curriculum. Critical reasoning is often described as a curriculum aspiration, yet classroom practice can remain dominated by explanation and recall. The present action cycles translate that aspiration into observable student behaviors: identifying facts, formulating investigable questions, searching for and comparing data, constructing evidence-based inferences, and evaluating peer arguments. This operationalization is compatible with studies showing that Merdeka Curriculum learning becomes more critical when tasks are contextual, inquiry-based, and linked to the Pancasila Student Profile (Rohali & Hamimi, 2024; Sadiyah et al., 2024). It also connects the 4Cs, collaboration occurs through group inquiry, communication through presentation and peer response, creativity through solution development, and critical thinking through the evaluation of evidence and arguments.

From a state-of-the-art perspective, the results support a move from technology integration as media substitution toward technology as part of the reasoning architecture of a lesson. Recent studies on digital PBL highlight interactive media, digital modules, and animated resources as effective when they are synchronized with problem orientation, inquiry, and higher-order tasks (Jihanifa et al., 2025; Lafifa & Rosana, 2023; Mamonto et al., 2024). The present study adds that the same media can serve different cognitive functions across cycles: a video can initially support fact recognition, later anchor causal analysis, and, in a historical context, become a stimulus for source comparison and argument evaluation. This functional view of media is more analytically useful than attributing improvement to 'interesting videos' in general.

A further implication concerns assessment alignment. The five-indicator rubric made it possible to distinguish visible participation from substantive critical thinking. A student who spoke frequently did not automatically receive a high communication/evaluation score; the highest level required coherent explanation, response to alternative views, and evaluation of evidence or solutions. Similarly, information searching was not equated with opening a website: students had to choose relevant data, record evidence, and verify information. This alignment between task, rubric, and reflection is important because recent assessment literature warns that critical thinking can be overstated when measurement captures only general achievement or decontextualized multiple-choice performance (Braun et al., 2020; Van Damme et al., 2023). In this study, the analytic rubric served both as a measurement device and as a pedagogical map for feedback. It helped the teacher see that the class needed less support in noticing facts and much more structured practice in evidence literacy and evaluative communication. For teachers, this suggests that critical-thinking rubrics are most useful when they inform the next instructional decision rather than merely classify the final product (Butler, 2024).

The cross-domain structure of the two action cycles also deserves attention. Cycle I used environmental and natural-resource issues, whereas Cycle II used historical evidence. These topics are not directly equivalent in difficulty, yet they require different forms of the same higher-order reasoning. Environmental problems invite causal analysis, prediction of consequences, and evaluation of proposed solutions; historical problems invite source comparison, chronological interpretation, and judgment among competing explanations. The fact that the same indicator framework could be applied to both domains suggests that the intervention focused on reasoning practices rather than on memorization of one topic. At the same time, the change of content is a methodological caution, higher scores in Cycle II may partly reflect topic familiarity, task design, or cumulative practice. A stronger future design could counterbalance topics across classes or use parallel tasks with comparable cognitive demand. For classroom practice, however, the cross-domain use is valuable because Social Studies teachers rarely teach critical thinking in only one content strand. They need routines that can travel from geography to history while allowing the evidence and questions to change. The present study suggests that the transferable routine consists of making the problem visible, asking students to identify what must be explained, requiring evidence from more than one source, structuring claim-reason links, and creating

an accountable space for peers to challenge and refine conclusions.

The contribution should nevertheless be interpreted within the limits of CAR. The study involved one class, no control group, and only two action cycles after baseline. The topics differed between the cycles, so task difficulty and domain knowledge may have contributed to the observed pattern. Scoring consistency was strengthened through a common rubric and teacher verification, but no independent inter-rater reliability coefficient was calculated. These limitations reduce generalizability and prevent a strong causal claim. The evidence is best understood as a documented classroom-development trajectory in which quantitative trends, student work, observation, interviews, and reflection converged. Future studies should test the revised instructional package with comparative or quasi-experimental designs, identical or counterbalanced content, independent scoring, and longer follow-up periods to examine whether communication and evaluation remain stable over time.

4. CONCLUSION

Animation-assisted PBL improved students' critical thinking in this Grade VII Social Studies classroom by linking visual problem stimuli with inquiry, evidence comparison, argument construction, presentation, peer evaluation, and reflection. The strongest practical lesson is that improvement was not produced by video exposure alone: progress became more substantial when cycle reflection led to explicit source-comparison requirements, rotating participation, peer-response criteria, and written reflection. Theoretically, the findings support a multidimensional view of critical thinking in which observation, problem formulation, information literacy, inference, and evaluative communication develop at different rates and therefore require differentiated scaffolding. For practice, Social Studies teachers can use the five-indicator rubric diagnostically to identify which reasoning processes need additional support. The study is limited by its single-class CAR design, changing content across cycles, short duration, absence of a control group, and lack of an independent inter-rater reliability coefficient. Future research should conduct comparative quasi-experiments across schools, use matched or counterbalanced Social Studies topics, calculate inter-rater reliability, and develop interactive animated-video environments that require students to make evidence-based decisions and receive immediate feedback.

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