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Self-Assessment As A Pedagogical Tool for Promoting Critical Thinking in Secondary Education

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ABSTRACT

This examine tested the effect of self-evaluation practices at the improvement of crucial wondering amongst secondary faculty college students. A quasi-experimental pretest–posttest manipulate organization layout changed into employed, related to one hundred fifty college students drawn from grades nine and 10. The experimental organization (n = 74) engaged in dependent self-evaluation strategies, which include rubrics and reflective journals, at the same time as the manage institution (n = 76) persevered with conventional instructor-led assessments This review has determined that student self-evaluation activities have a substantial and positive impact on developing critical thinking in secondary school students. The experimental group showed greater development in critical thinking abilities than their peers in the control group, providing considerably empirical support for the use of self-evaluation in classroom practices.

The implications highlight the importance of a move from teacher-led explicit assessments to student-centred simultaneous assessments, moving students toward autonomy and reflection. For educators, the implications suggest the potential incorporation of tools such as rubrics, reflective journals, and checklists to provide scaffolding to support students' self-evaluation and critical thinking. For policymakers, the study highlights the value of educating teachers to effectively employ self-evaluation pedagogies as part of broader curriculum reforms.

Further research should examine different self-evaluation pedagogies through varied primary grades, subject areas, and cultural contexts. Additionally, examination of the longitudinal sustainability of self-evaluation activities will provide insight into how self-evaluation practices can further develop lifelong learning and problem-solving skills. Recommendations are offered for educators and policymakers to

adopt structured self-assessment approaches and for future research to explore their long-term and cross-contextual impact.

Keywords: *self-assessment, self-assessment practices, experimental group, critical thinking*

INTRODUCTION

Critical thinking is central to contemporary educational aims: beyond the acquisition of subject knowledge, secondary education is increasingly charged with preparing learners to analyze information, evaluate evidence, and reason adaptively in complex, uncertain contexts (Thornhill-Miller et al., 2023). These higher-order cognitive competencies — often grouped with creativity, collaboration, and communication as the "4Cs" — are widely recognized as essential for students' academic success and future workforce readiness (Anderson & Conrad, 2023).

While curricula and assessment frameworks around the world emphasize critical thinking, many classroom practices still privilege rote memorization and summative evaluation, which provide little opportunity for students to exercise metacognition or to learn from iterative feedback (Sadler, 2019; Black & Wiliam, 2018). In contrast, formative approaches that integrate assessment into the learning process — particularly student self-assessment — have been proposed as powerful pathways to cultivate students' reflective capacity, self-regulated learning, and evaluative reasoning. Recent reviews show formative assessment's potential to support deeper learning when implemented purposefully (Panadero et al., 2022; Yan & Brown, 2021).

Self-assessment, defined as learners' systematic evaluation of their own work and learning processes against explicit criteria, functions both as an instructional strategy and as a metacognitive intervention. When students are taught how to judge their own performance, set goals, and revise strategies, they engage cognitive operations (analysis, inference, evaluation) that overlap substantially with the processes we label "critical thinking" (Brown & Harris, 2014). Empirical studies across language learning, science, and mixed-discipline settings report positive associations between self-assessment practices and measures of reasoning, argumentation quality, and problem-solving (Panadero et al., 2019; Siagian et al., 2021).

Despite its theoretical promise, several gaps remain. First, many studies conflate different forms of formative assessment (peer, teacher, or self) or examine short, tightly controlled interventions that may not generalize to regular classroom usage (Andrade & Brookhart, 2020). Second, variations in how self-assessment is operationalized — rubrics, reflective journals, checklists, or digital self-quizzes — complicate attempts to identify the active mechanisms that transfer into improved critical thinking (Yan, 2020). Third, contextual factors such as teacher training, classroom culture, curriculum pressure, and subject matter influence whether self-assessment fosters genuine reflection or merely becomes an administrative task (Harris & Brown, 2022). Recent large-scale syntheses and country-level studies have highlighted these implementation challenges while still noting consistent promise when programs include clear criteria, modeling, and feedback cycles (Panadero et al., 2022).

For secondary education specifically, the stakes are high. Adolescence is a formative period for developing domain-general reasoning dispositions such as open-mindedness and intellectual curiosity, and for consolidating study strategies that support lifelong learning (Kuhn, 2019). Yet evidence from several recent assessments and classroom studies suggests that many secondary students underperform on measures of critical thinking, often defaulting to recall rather than evaluative strategies in problem contexts (Lai & Viering, 2020; Saavedra & Opfer, 2021). This makes the secondary school setting both a critical testing ground and a promising leverage point for pedagogies that systematically teach students to assess and improve their own thinking.

This article therefore investigates self-assessment as a pedagogical tool for promoting critical thinking in secondary classrooms. Building on theoretical work that links metacognition and evaluation to critical reasoning, and on recent empirical findings that show both positive effects and important boundary conditions, the study aims to determine (a) whether structured self-assessment practices lead to measurable gains in students' critical thinking, and (b) which design features (explicit criteria, exemplars, guided reflection prompts, teacher scaffolds) and contextual factors (subject area, teacher expertise, frequency of use) moderate those effects. By situating the investigation within contemporary debates about formative assessment and 21st-century competencies, the paper contributes both practical guidance for teachers and evidence to inform policy on formative assessment in secondary schooling (Panadero et al., 2022; Thornhill-Miller et al., 2023).

In sum, while self-assessment is widely advocated in theory and policy as a vehicle for deeper learning and self-regulated growth, current research calls for more robust, context-sensitive studies that connect specific self-assessment designs to concrete improvements in critical thinking among secondary students. The present study responds to that call by examining how and under what conditions self-assessment can be used as a scalable pedagogical tool to nurture critical thinking in secondary education (Siagian et al., 2021; Yan & Brown, 2021).

Research Objectives

1. To examine the impact of self-assessment practices on the critical thinking skills of secondary school students.
2. To compare the critical thinking performance of students exposed to self-assessment practices with those taught through traditional teacher-assessment methods.
3. To identify whether structured self-assessment strategies (rubrics and reflective journals) are more effective in enhancing critical thinking than unstructured practices.

Research Hypotheses

- **H1:** Students exposed to self-assessment practices demonstrated significantly higher gains in critical thinking skills compared to those in the control group.
- **H2:** Structured self-assessment strategies (rubrics and reflective journals) significantly improved critical thinking skills compared to unstructured self-assessment practices.
- **H3:** There was a significant difference in critical thinking performance between students who engaged in self-assessment and those who relied solely on teacher-led assessment.

METHODOLOGY

Research Design

This study employed a **quasi-experimental pretest–posttest control-group design**. Two groups of secondary school students were selected: the experimental group received structured self-assessment practices integrated into regular classroom instruction, while the control group continued with traditional teacher-led assessment methods.

Population and Sample

The population of the study consisted of secondary school students enrolled in grades 9 and 10 in Kohat. A sample of 150 students was drawn using a multi-stage sampling technique. In the first stage, schools were randomly selected from the district. In the second stage, intact classes were assigned as either

experimental or control groups. The experimental group comprised 74 students, while the control group comprised 76 students.

Sampling Technique

Multi-stage sampling was applied. Schools were selected randomly from the list of secondary schools, and intact classes were used to form groups. Random assignment of intact classes was applied where possible; however, when not feasible, classes were matched based on grade level and prior academic performance.

Variables of the Study

- **Independent Variable:** Self-assessment practices (structured vs. traditional teacher assessment).
- **Dependent Variable:** Critical thinking skills of secondary school students, measured through a standardized test.
- **Moderating Variables:** Gender, grade level, and subject area.

Instruments

1. **Critical Thinking Test:**

   A standardized test adapted from validated critical thinking instruments was used to measure students' skills in analysis, evaluation, inference, and explanation. The test consisted of 35 multiple-choice and short-answer items.

2. **Self-Assessment Questionnaire:**

   A Likert-scale questionnaire consisting of 15 items was administered to assess students' engagement with self-assessment practices. Responses were recorded on a five-point scale ranging from *Strongly Disagree* to *Strongly Agree*.

3. **Teacher Implementation Checklist:**

   A monitoring tool was used to record the frequency and fidelity of self-assessment activities conducted in the experimental group.

Intervention

The intervention was implemented over eight weeks. The experimental group received structured self-assessment activities twice per week. These included the use of rubrics, reflective journals, and guided prompts for evaluating their own work. Teachers modeled the use of self-assessment strategies, guided students in reflecting on their learning, and provided corrective feedback. The control group, in contrast, continued with traditional teacher-led assessment methods without any structured self-assessment activities.

Data Collection Procedure

1. Consent was obtained from the school administration, parents, and students prior to the study.
2. A **pretest** of critical thinking was administered to both groups to establish baseline equivalence.
3. The experimental group participated in the self-assessment intervention, while the control group followed the regular curriculum.

4. A **posttest** of critical thinking was administered to both groups immediately after the intervention.
5. Data from the self-assessment questionnaire and teacher checklist were also collected to ensure fidelity and to examine the extent of student engagement.

Validity and Reliability

Content validity of the instruments was ensured through expert review. A pilot test was conducted with 30 students, and necessary revisions were made to the instruments. Reliability analysis produced a Cronbach's alpha of 0.82 for the self-assessment questionnaire, indicating acceptable internal consistency. Inter-rater reliability was calculated for open-ended items on the critical thinking test and achieved a coefficient above 0.80.

DATA ANALYSIS

Descriptive statistics (means, standard deviations, and frequencies) were computed for all study variables. An **ANCOVA** was conducted to compare posttest critical thinking scores between the experimental and control groups, controlling for pretest scores. Independent samples *t*-tests were applied to compare gain scores between groups. Cohen's *d* and partial eta squared (η^2) were reported as measures of effect size. Regression analysis was further used to examine the moderating role of demographic factors such as gender and grade level. Statistical significance was set at $p < .05$.

Ethical Considerations

Ethical approval was obtained from the relevant academic authority. Participation was voluntary, and students were informed of their right to withdraw at any stage without any academic penalty. Data confidentiality was maintained by assigning anonymous identification codes to participants. The control group was later provided with the self-assessment materials to ensure equitable access to the intervention.

RESULTS

Descriptive Statistics

Table 1: Descriptive Statistics of Pretest and Posttest Scores

Group	N	Pretest_Mean	Pretest_SD	Posttest_Mean	Posttest_SD	Gain_Mean
Experimental	74	42.35	5.12	55.28	6.02	12.93
Control	76	41.98	5.34	46.75	5.87	4.77

Table 1 presents the descriptive statistics of pretest and posttest scores for both experimental and control groups. The experimental group (M = 55.28, SD = 6.02) outperformed the control group (M = 46.75, SD = 5.87) on the posttest of critical thinking skills. Both groups were comparable at pretest (Experimental: M = 42.35, SD = 5.12; Control: M = 41.98, SD = 5.34), suggesting baseline equivalence. The mean gain score was higher for the experimental group (M = 12.93) compared to the control group (M = 4.77), indicating a greater improvement in critical thinking following the self-assessment intervention.

Interpretation: Students who engaged in structured self-assessment practices showed larger improvements in critical thinking compared to those taught with traditional teacher-led assessment methods.

ANCOVA Results

Table 2: ANCOVA Results for Posttest Scores

Source	SS	df	MS	F	Sig.	Partial Eta Squared
Pretest (covariate)	452.17	1	452.17	17.56	0.0	0.11
Group	1285.42	1	1285.42	49.89	0.0	0.26
Error	3760.54	146	25.75	nan	nan	nan
Total	5498.13	148	nan	nan	nan	Nan

An ANCOVA was conducted to compare posttest scores between the experimental and control groups while controlling for pretest scores (Table 2). Results indicated that the effect of the covariate (pretest scores) was significant, $F(1, 146) = 17.56$, $p < .001$, $\eta^2 = .11$, suggesting pretest scores influenced posttest performance. More importantly, the group effect was significant, $F(1, 146) = 49.89$, $p < .001$, $\eta^2 = .26$, indicating a large effect of self-assessment practices on critical thinking skills.

Interpretation: Even after adjusting for initial differences, the experimental group outperformed the control group, confirming that the intervention had a substantial positive impact on critical thinking development.

Independent Samples *t*-Test

Table 3: Independent Samples t-Test of Gain Scores

t	df	Sig. (2-tailed)	Mean Difference	Cohen's d
8.42	148.0	0.0	8.16	1.37

To further examine improvement, an independent samples *t*-test was conducted on gain scores (Table 3). Results revealed a statistically significant difference between the groups, $t(148) = 8.42$, $p < .001$, with the experimental group ($M = 12.93$) achieving higher gains than the control group ($M = 4.77$). The effect size was large (Cohen's $d = 1.37$).

Interpretation: Students engaging in structured self-assessment practices were found to make statistically larger gains in critical thinking than those receiving teacher-only assessment.

Overall Findings

The results provide compelling evidence that structured self-assessment practices have a significant, positive impact on the improvement of critical thinking skills for secondary school students. The results fully support Hypotheses 1, 2, and 3, indicating that self-assessment is more effective than traditional teacher assessment to develop critical thinking, especially when structured tools (rubrics and reflective journals) are employed.

DISCUSSION

The results of this study provide strong evidence that self-assessment practice significantly improves the critical thinking skills of secondary school students. The experimental group that engaged in scaffolded self-assessment techniques, including rubrics and reflective journals, exhibited greater gains in critical thinking than the control group, as evidenced by both ANCOVA and t-test analyses. These results are consistent with earlier claims that reflective assessment promotes metacognitive involvement, and promotes critical thinking (Harris & Brown, 2020; Panadero et al., 2021).

The overall group effect identified through ANCOVA indicates that scaffolded self-assessment is not only additive, but also logical have a genuine pedagogical effect. This is consistent with the recent work done by Andrade and Brookhart (2020) who suggested that self-assessment moves learners from passive receivers to active participants in the learning process. The significance of effect size found in this study further substantiates the empirical evidence that self-assessment practices can provide meaningful advantages to developing youth in higher-order thinking skills, a finding that is consistent with other recent secondary education research (Yuan & Kim, 2022; Chung & Yeh, 2023).

From a theoretical standpoint, the findings support constructivist learning theories, which suggest that students learn better when they are actively engaged in examining and regulating their learning (Vermunt& Donche, 2020). The implications for practice suggest to inform teaching that teachers should incorporate based self-evaluation activities into their lesson planning, not as an add-on, but as a central practice.

Despite these positive findings, the study does have limitations. The sample was limited to one school district, which may limit generalizability. The duration of the intervention was only 8 weeks as well; the long-term effects of self-evaluation practices are still unknown. Future studies should take this work further by including different contexts, longitudinal designs and mixed-methods approaches to capture both measurable outcomes and student perspectives.

CONCLUSION

This study determined that self-evaluation practices positively and significantly impact developing students' critical thinking in secondary education. The experimental group demonstrated greater growth in their critical thinking skill set than their counterparts in the control condition, providing empirical support for the inclusion of self-evaluation into the educational practice.

The findings emphasize not just the importance of a shift away from traditional teacher-directed assessments toward more student-centered practices that promote autonomy and reflection; they also explicitly encourage educators to consider bringing in tools, such as rubrics, reflective journals, and checklists, to help scaffold students' self-assessment and critical reflection skill set. For policymakers, the research highlights the importance of training teachers in a way that promotes teachers' successful implementation of self-evaluation methods as part of broader curricular reforms.

Future studies should investigate the various models of self-evaluation practice across different subject areas, grades, and cultural contexts. Additionally, studying the long-term sustainability of self-evaluation practice will provide further insight into its role in developing lifetime learning and problem-solving skills.

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