ASSESSMENT OF CRITICAL THINKING SKILLS AMONG FORM FOUR PHYSICS STUDENTS IN MIRI

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ABSTRACT

Purpose – This study aims to assess the level of Critical Thinking Skills (CTS) among Form Four Physics students in Miri, Sarawak and to examine the influence of gender and socioeconomic status.

Methodology – A quantitative descriptive research design was employed with 131 students from three secondary schools in Senadin Zone, Miri. Data were collected using the Malaysian Critical Thinking Skills Instrument (MyCT) and analysed using IBM SPSS 25.0. Descriptive statistics, Mann-Whitney U test, and Kruskal-Wallis test were conducted.

Findings – Students' overall CTS was at a moderate level (M = 51.77, SD = 11.55). Reasoning (M = 54.53, SD = 14.84) and assumption (M = 56.87, SD = 22.16) were moderate, while analytical and logical skills were weak (M = 36.73, SD = 15.81). No significant difference was found across gender. However, socioeconomic status significantly influenced CTS, particularly in reasoning, with M40 and T20 students outperforming those from the B40 group.

Significance – Findings highlight the importance of strengthening Higher Order Thinking Skills (HOTS) in Physics classrooms, ensuring equity for students from lower socioeconomic backgrounds, and preparing students to meet the demands of the Fourth Industrial Revolution.

Keywords: Critical Thinking Skills, Physics Education, Gender, Socioeconomic Status, Form Four Students, HOTS, Malaysia

INTRODUCTION

Critical thinking is widely recognised as a vital 21st-century competency. It enables learners to analyse, evaluate, and synthesise information, moving beyond rote memorisation to deeper cognitive engagement. Within STEM education, particularly Physics, critical thinking facilitates problem-solving, hypothesis testing, and conceptual understanding.

In Malaysia, the Ministry of Education's Education Blueprint 2013–2025 positions Higher Order Thinking Skills (HOTS) as a priority. Yet evidence from international benchmarks such as TIMSS and PISA indicates that Malaysian students underperform in science literacy and critical reasoning. Locally, SPM Physics results reveal that many students achieve only surface-level understanding, struggling with tasks requiring analytical reasoning.

Several factors may contribute to this trend. Classrooms often remain examination-driven, limiting opportunities for inquiry, exploration, and application. Teachers may face curriculum overload, lack of resources, or insufficient training in HOTS pedagogy. Moreover, socioeconomic disparities exacerbate differences in learning outcomes, with students from

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wealthier families often having access to additional tutoring, digital resources, and conducive learning environments.

Against this backdrop, this study focuses on the critical thinking skills of Form Four Physics students in Miri, Sarawak. The specific objectives are:

1. To determine the overall level of CTS among Form Four Physics students in Miri.
2. To examine whether CTS differs significantly by gender.
3. To analyse the effect of socioeconomic status (SES) on students' CTS.

LITERATURE REVIEW

Defining Critical Thinking

Ennis (1985) defined critical thinking as "reasonable reflective thinking focused on deciding what to believe or do." Facione (1990) identified six core dimensions: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Bloom's taxonomy places CTS at higher cognitive levels, requiring application, analysis and synthesis.

Critical Thinking in Science and Physics Education

Research consistently highlights the centrality of CTS in science education. Wang (2022) demonstrated that project-based learning significantly improved students' ability to reason scientifically. Saleh et al. (2020) found that Physics misconceptions often stem from limited critical analysis and overreliance on rote learning. In Malaysia, policy reforms have stressed HOTS, but practical classroom adoption remains inconsistent (Partono et al., 2021).

Gender and Critical Thinking

Studies on gender differences in CTS report mixed findings. Some indicate females outperform males in certain cognitive domains, while others find no significant differences. Cognitive psychology perspectives argue that critical thinking is not inherently gendered, and observed differences often relate to sociocultural and environmental factors rather than innate ability.

Socioeconomic Status and Learning Outcomes

SES is consistently linked to educational attainment. Students from higher-income families often benefit from greater access to resources, parental support, and enriched learning environments. OECD (2018) findings suggest that socioeconomic background strongly predicts performance in PISA assessments. Within Malaysia, disparities between B40, M40, and T20 groups remain a persistent challenge.

METHODOLOGY

Research Design

This study employed a quantitative descriptive research design to provide a comprehensive profile of students' CTS and explore group differences.

Population and Sampling

The study involved 131 Form Four Physics students from three secondary schools in the Senadin Zone, Miri. Purposive sampling ensured representation from diverse SES backgrounds (B40, M40, T20).

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Instrumentation

The Malaysian Critical Thinking Skills Instrument (MyCT) was used, comprising 30 items across three constructs: reasoning, analytical & logical, and assumption. Responses were rated on a Likert scale, with higher scores reflecting stronger CTS. Previous studies validated the instrument, reporting Cronbach's alpha values above 0.80.

Data Collection Procedure

Approval was obtained from relevant authorities. Consent was sought from participants. The questionnaire was administered in classroom settings, taking approximately 40 minutes.

Data Analysis

Descriptive statistics (mean, SD) were used to summarise CTS levels. Inferential tests included the Mann–Whitney U test to examine gender differences and the Kruskal–Wallis test to compare SES groups. IBM SPSS version 25.0 was used for analysis.

RESULTS

Findings revealed that students' overall CTS level was moderate ($M = 51.77$, $SD = 11.55$). Reasoning ($M = 54.53$, $SD = 14.84$) and assumption ($M = 56.87$, $SD = 22.16$) were at moderate levels, while analytical & logical skills were poor ($M = 36.73$, $SD = 15.81$). No significant difference was found between genders. However, socioeconomic status significantly influenced CTS ($p < 0.05$), with students from M40 and T20 backgrounds performing better in reasoning than those from B40 families.

DISCUSSION

The study highlights several important findings. First, students' CTS levels were only moderate, with weaknesses in analytical and logical thinking. This suggests that classroom instruction may still overemphasise memorisation and exam preparation. Teachers may lack time or resources to implement HOTS strategies effectively.

Second, the absence of gender differences aligns with previous studies, supporting the view that CTS is not inherently gender-dependent. This is a positive finding, suggesting that interventions need not be gender-specific. Third, SES significantly influenced CTS. Students from higher-income families likely benefit from supportive home environments, digital access, and supplementary tutoring, enabling stronger reasoning. Conversely, B40 students may face challenges such as limited resources and fewer enrichment opportunities.

These results reinforce the importance of equitable educational practices. Schools must implement targeted strategies to support disadvantaged students, such as inquiry-based projects, collaborative problem-solving, and scaffolding to build analytical reasoning.

CONCLUSION

This study concludes that Form Four Physics students in Miri demonstrate moderate levels of CTS overall, with marked weaknesses in analytical and logical thinking. While gender was not a significant factor, socioeconomic status strongly influenced performance. Recommendations include:

a) Pedagogical Strategies – Incorporating project-based and problem-based learning to foster reasoning and problem-solving.
b) Teacher Training – Professional development focused on designing lessons that embed HOTS and critical inquiry.

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c) Policy Implications – Targeted support for B40 students through resource provision, enrichment programmes, and digital learning initiatives.
d) Future Research – Longitudinal studies and experimental interventions to further evaluate the impact of pedagogical innovations on CTS.

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