Assessing the Usability of the Real-Mpc Module for Gifted Students in Additional Mathematics: Implications for Resilience, Self-Efficacy, and Self-Awareness

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ABSTRACT

This study aims to investigate the usability of the REAL-MPC Module (Resilience, Efficacy, and Awareness Module for Gifted Students) in Additional Mathematics and examines its implications for students' resilience, self-efficacy, and self-awareness. A Design and Development Research (DDR) approach was employed, followed by a quasi-experimental evaluation involving a treatment group (n = 20) and a control group (n = 20). Data were collected using validated questionnaires measuring the three psychological constructs and a usability instrument based on the USE framework (usefulness, ease of use, and satisfaction). The findings indicate that the REAL-MPC module achieved a high level of usability across all dimensions (Usefulness: M = 4.18; Ease of Use: M = 3.98; Satisfaction: M = 4.24). Paired-samples t-tests revealed significant improvements in resilience, self-efficacy, and self-awareness among the treatment group ($p < .001$). Independent-samples t-tests further showed that the treatment group outperformed the control group in post-test scores ($p < .01$). These results suggest that the usability of the REAL-MPC module is closely associated with positive psychological outcomes, highlighting its practical value in supporting holistic learning among gifted students. The study provides empirical evidence for integrating psychological constructs within mathematics instruction and underscores the importance of usability in educational module design.

Keywords: REAL-MPC Module; Usability; Resilience; Self-Efficacy; Self-Awareness.

INTRODUCTION

Background

In recent years, there has been a growing recognition that effective learning, particularly in cognitively demanding subjects such as Additional Mathematics, extends beyond intellectual ability to include critical psychological dimensions. While gifted students are often characterized by superior cognitive capabilities, accumulating evidence suggests that they are not immune to challenges related to motivation, emotional regulation, and sustained engagement (Saputri et al., 2024). In fact, the discrepancy between high cognitive potential and inconsistent academic performance among gifted learners has increasingly been attributed to underlying psychological factors rather than intellectual limitations (Yildiz Durak et al., 2024).

Gifted students are frequently perceived as possessing strong cognitive abilities and exceptional academic potential. However, despite their intellectual strengths, many gifted learners encounter psychological challenges

that may affect their engagement and performance in demanding academic subjects such as Additional Mathematics. (Sipah & Bahar, 2024). Additional Mathematics is widely recognized as one of the most cognitively demanding secondary school subjects due to its abstract concepts, symbolic reasoning, and advanced problem-solving requirements. While intellectually capable students may demonstrate high analytical skills, success in Additional Mathematics is not determined solely by cognitive competence. Psychological readiness, emotional regulation, confidence, and reflective awareness also play essential roles in sustaining learning engagement and achievement.

Previous studies have demonstrated that gifted students often experience heightened emotional sensitivity, perfectionism, academic pressure, and anxiety when confronted with complex problem-solving tasks (Nicholas et al., 2024). These psychological difficulties may negatively influence motivation, persistence, and confidence during learning (Afifi & Nasr, 2022). Existing educational interventions for gifted learners frequently emphasize cognitive acceleration and enrichment programs, with limited attention given to psychological strengthening. Most available instructional approaches focus on isolated constructs such as motivation, confidence, or emotional intelligence, without integrating these components into a comprehensive instructional model (Dada & Ndidi, 2021). Consequently, there remains a significant gap between psychological theory and classroom-based pedagogical implementation.

Resilience (Richardson, 2002), self-efficacy (Bandura, 1997), and self-awareness (Wicklund, 1975) are key psychological constructs that influence students' ability to succeed academically. Resilience enables students to persist in the face of complex problem-solving tasks and academic setbacks (Ayeni et al., 2024), while self-efficacy shapes their beliefs about their ability to successfully perform mathematical tasks (Sabanal et al., 2024). Self-awareness, as a core component of emotional intelligence, supports students' capacity to regulate their emotions and reflect on their learning processes (Sohail & Akram, 2025). Collectively, these constructs function as interrelated mechanisms that influence not only students' performance but also their engagement and learning sustainability.

Despite their importance, existing instructional practices in Additional Mathematics continue to prioritize cognitive mastery, often neglecting the systematic integration of these psychological constructs (Jeffery-Schwikkard et al., 2024). Moreover, where such constructs are considered, they are frequently addressed in isolation, resulting in fragmented pedagogical approaches that fail to support holistic student development (Ayeni et al., 2024). This gap highlights the need for instructional interventions that integrate psychological and cognitive dimensions within a coherent framework.

In response to this need, the REAL-MPC (Resilience, Efficacy, and Awareness Module for Gifted Students) module was developed as a structured intervention designed to embed resilience, self-efficacy, and self-awareness into the teaching and learning of Additional Mathematics. Beyond its theoretical foundation, the module also emphasizes usability as a critical factor influencing its practical implementation. Therefore, this study aims to evaluate both the usability and effectiveness of the REAL-MPC module, with particular focus on its implications for enhancing key psychological constructs among gifted students.

The originality of this study lies in the integration of three major psychological constructs: resilience, self-efficacy, and self-awareness within a structured Additional Mathematics learning intervention specifically designed for gifted students. Unlike existing instructional approaches that frequently address psychological constructs separately, the REAL-MPC module combines these dimensions into a unified pedagogical framework. Furthermore, this study extends beyond effectiveness evaluation by incorporating usability assessment as a critical implementation factor. This dual emphasis on psychological strengthening and instructional usability contributes a novel perspective to gifted mathematics education and expands the current understanding of psychologically informed instructional design.

Problem Statement

Despite the increasing emphasis on psychological constructs in education, existing instructional approaches in

Additional Mathematics remain largely focused on cognitive achievement, with limited integration of affective and psychological elements (Lievore et al., 2024). This issue is particularly critical among gifted students, who, despite possessing high intellectual abilities, often experience challenges related to low persistence, anxiety, and lack of self-regulation (Simensen & Olsen, 2024).

Previous studies have highlighted the importance of resilience, self-efficacy, and self-awareness in supporting academic success (Yıldırım & Kılıçaslan-Çelikkol, 2024). However, most interventions address these constructs in isolation rather than through an integrated instructional approach. Furthermore, there is a lack of empirically validated modules that incorporate these constructs within the teaching of Additional Mathematics.

In addition, the usability of educational modules is often overlooked, despite being a key factor influencing successful implementation in classroom settings. A module that is difficult to use may fail to achieve its intended outcomes, regardless of its theoretical strength (Zhenduo & Othman, 2024). Therefore, there is a need to evaluate not only the effectiveness but also the usability of instructional modules designed for gifted students.

Therefore, a structured evaluation was conducted to assess the usability and effectiveness of the REAL-MPC module in enhancing resilience, self-efficacy, and self-awareness among gifted students in Additional Mathematics. The findings of this study are guided by the following research questions:

1. How do students evaluate the usability of the REAL-MPC module in terms of usefulness, ease of use, and satisfaction?

2. Is there a significant difference between pre-test and post-test scores among students in the treatment group?

3. Is there a significant difference in post-test performance between the treatment and control groups?

LITERATURE REVIEW

Psychological Constructs in Education

Recent literature increasingly emphasizes that psychological constructs play a critical role in supporting students' academic performance, engagement, and emotional readiness, particularly in cognitively demanding subjects such as Additional Mathematics. Psychological dimensions influence how students respond to challenges, regulate emotions, maintain motivation, and sustain effort in learning environments (Conesa et al., 2022). Educational researchers have highlighted that psychological preparedness contributes not only to cognitive achievement but also to students' persistence and adaptability in complex learning situations.

Studies consistently indicate that students' psychological strengths are associated with improved academic outcomes and greater learning resilience. Learners who possess stronger psychological attributes are more likely to remain engaged during difficult tasks, demonstrate positive attitudes toward learning, and regulate emotional stress associated with demanding academic subjects (Naser et al., 2025). Consequently, psychological development has become an increasingly important consideration in instructional design, particularly in mathematics education where problem-solving often requires persistence, confidence, and self-monitoring.

Mathematics learning, particularly in Additional Mathematics, requires high levels of cognitive engagement, problem-solving ability, and emotional regulation. Psychological factors such as resilience, self-efficacy, and self-awareness influence students' ability to cope with mathematical complexity and academic pressure. Street et al. (2022) found that students often experience mathematics anxiety, fear of failure, and reduced confidence when encountering advanced mathematical concepts. These challenges may negatively influence motivation and engagement. Therefore, psychological support within mathematics instruction is increasingly recognized as essential.

Resilience in Learning and Academic Contexts

Resilience refers to an individual's ability to adapt positively when encountering challenges, adversity, or stressful situations (Richardson, 2002). In educational contexts, resilience enables students to persist despite academic difficulties, maintain motivation, and recover from failure experiences (Kaymakcı & Gürel Tonbul, 2024). Recent studies suggest that resilient learners demonstrate greater persistence when solving complex mathematical problems, particularly in subjects that require higher-order thinking skills such as Additional Mathematics.

Students with higher levels of resilience are better able to manage frustration, maintain effort, and remain committed to learning tasks despite obstacles (Ab Razak et al., 2021). In mathematics education, resilience supports students in overcoming anxiety, reducing avoidance behaviours, and improving problem-solving persistence (Sabanal et al., 2024). Studies by Ayeni et al.(2024) found that resilient learners exhibit stronger coping strategies and are more likely to persist during challenging academic activities.

Furthermore, resilience has been linked to emotional stability and academic adaptability. Students who develop resilience are often more capable of regulating emotional responses and sustaining focus during stressful learning experiences. According Majoros et al.(2022), resilience is not only a protective psychological factor but also an important contributor to long-term educational success.

Self-Efficacy in Academic Learning

Self-efficacy refers to an individual's belief in their ability to perform specific tasks successfully. According to Bandura (1997), self-efficacy influences how individuals think, feel, and behave when engaging in learning activities. Students with high self-efficacy are generally more willing to attempt difficult tasks, demonstrate greater perseverance, and maintain confidence when facing academic challenges (Worrell & Luo, 2025).

In mathematics education, self-efficacy plays a critical role in shaping students' confidence toward problem-solving and task completion. Students who believe in their abilities tend to approach mathematical challenges more positively and are more likely to remain motivated during learning activities (Óturai et al., 2023). Studies by Sabanal et al.(2024) demonstrate that self-efficacy significantly predicts academic engagement, confidence, and achievement.

Self-efficacy also influences students' goal-setting behaviours and persistence. According to Ovat et al. (2024), students with strong self-efficacy tend to establish higher academic expectations and demonstrate stronger commitment toward achieving learning outcomes. This psychological construct therefore contributes to students' ability to regulate learning efforts and sustain motivation over time.

Self-Awareness in Educational Psychology

Self-awareness is commonly defined as an individual's ability to recognize, understand, and evaluate personal emotions, thoughts, and behaviours (Wicklund, 1975). In educational psychology, self-awareness contributes to reflective learning, emotional regulation, and self-monitoring during academic activities (Sohail & Akram, 2025). According to Geary and Xu (2022), students with strong self-awareness are better able to recognize their strengths and limitations, identify emotional responses to learning situations, and adjust behaviours accordingly. This ability supports effective learning regulation and improves students' capacity to respond adaptively to academic stressors.

Research indicates that self-awareness contributes to emotional intelligence and supports reflective thinking processes. Sohail and Akram (2025) found that self-awareness improves students' emotional regulation and enhances academic adjustment. Similarly, Yuzarion et al. (2024) reported that self-aware students demonstrate improved self-control and stronger learning regulation skills. Within mathematics education, Visessuvanapoom et al., (2024) found that self-awareness is particularly important because it allows learners to monitor cognitive processes during problem-solving activities. Students who are aware of their learning strategies and emotional responses can make more effective decisions when encountering difficult mathematical tasks.

Research Gap

Although previous studies have extensively examined resilience, self-efficacy, and self-awareness in educational settings, most of the research has investigated these constructs independently rather than through an integrated instructional framework. Existing interventions frequently focus on cognitive achievement or isolated psychological enhancement, limiting their ability to support holistic learner development. Moreover, limited empirical studies have explored the systematic integration of psychological constructs within Additional Mathematics instruction, particularly among gifted students who often experience elevated academic pressure, perfectionism, and emotional sensitivity.

Another significant gap concerns instructional usability. Many educational interventions are evaluated primarily based on effectiveness outcomes while overlooking usability factors such as accessibility, student satisfaction, and implementation practicality. Educational usability has increasingly been recognized as a pedagogical construct that influences engagement, learning persistence, and instructional success. However, few studies have investigated how usability contributes to psychological outcomes in mathematics education.

Therefore, this study contributes to the literature by introducing the REAL-MPC module as an integrated psychological-instructional intervention specifically designed for gifted learners in Additional Mathematics. Unlike prior interventions, the REAL-MPC framework combines resilience, self-efficacy, and self-awareness within structured learning activities while simultaneously evaluating usability as a determining factor of implementation success.

Theoretical Foundations of the REAL-MPC Module

This study is grounded in three complementary theoretical perspectives: Resilience Theory, Self-Efficacy Theory, and Self Awareness Emotional Intelligence Theory. Resilience Theory proposed by Richardson (2002) conceptualizes resilience as a dynamic process that enables individuals to adapt positively to adversity and challenging situations. Within educational contexts, resilience explains how students maintain persistence despite academic difficulties. In mathematics learning, resilience is particularly important because students frequently encounter cognitively demanding tasks that require sustained effort.

Self-Efficacy Theory developed by Bandura (1997) emphasizes that an individual's belief in personal capability significantly influences behaviour and performance. Students with strong self-efficacy are more likely to engage in difficult learning tasks, demonstrate persistence, and maintain positive expectations regarding achievement. The Objective Self-Awareness Theory introduced by Robert A. Wicklund, (1975) explains that individuals become self-aware when they direct attention inward and evaluate themselves against personal standards, values, or expectations. This theory suggests that heightened self-awareness encourages individuals to reflect on their behaviours, emotions, and performance, which may influence self-regulation and adaptive learning processes (McCormick et al., 2025). Moreover, Emotional Intelligence Theory introduced by Goleman (1995) highlights self-awareness as a critical component of emotional regulation. Self-awareness enables learners to recognize emotional responses, regulate behaviour, and engage in reflective thinking. In educational settings, self-awareness contributes to improved learning control and emotional adjustment.

METHODOLOGY

Research Design

This study uses a mixed methods research design, which integrates qualitative and quantitative approaches to ensure a comprehensive and robust analysis of research objectives. This study was systematically structured using the Design and Development Research (DDR) framework, as proposed by Richey & Klein (2007) and further refined by Siraj et al. (2023), which is particularly suitable for developing and evaluating educational innovations. Figure 1 shows the Design Research and Development (DDR) approach used in this study.

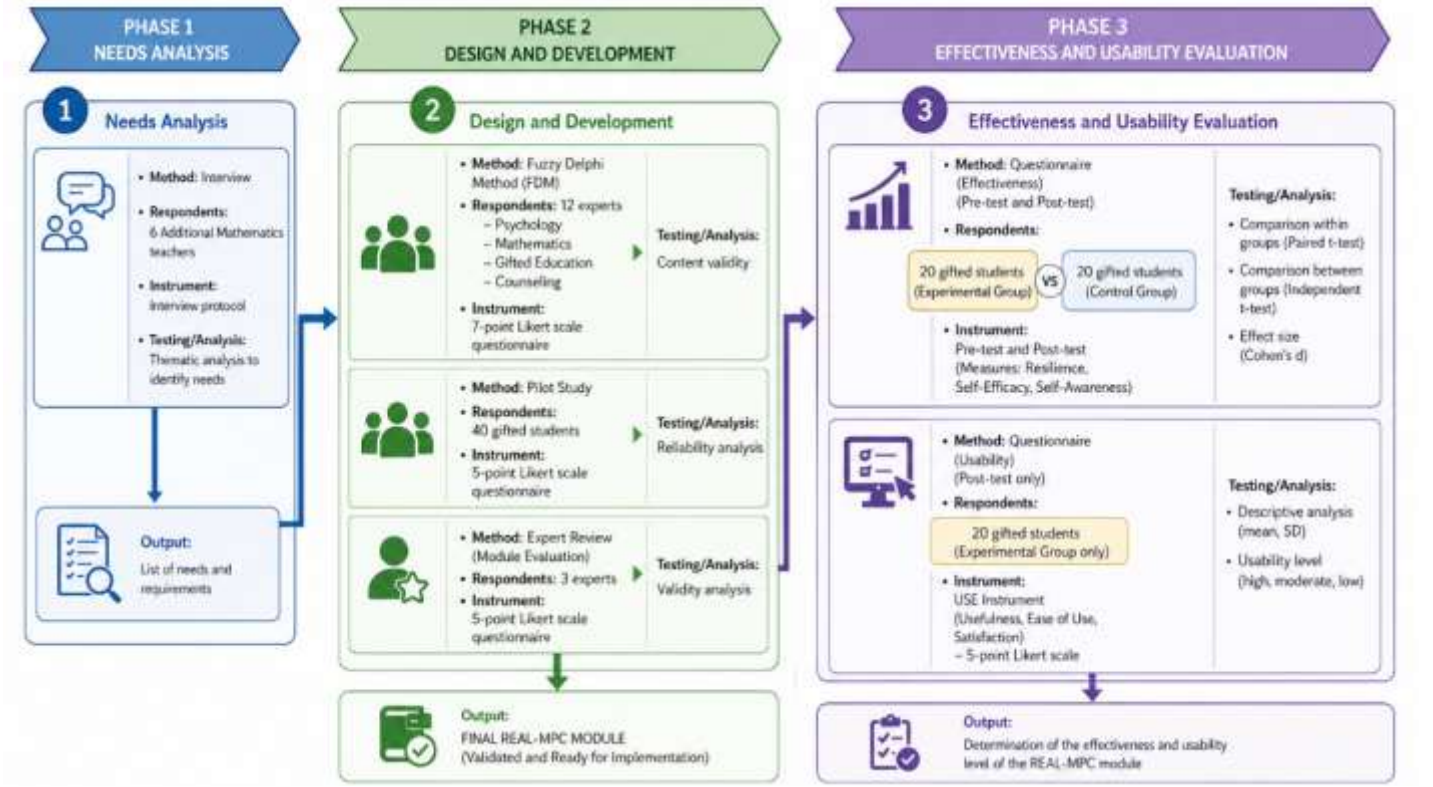

Figure 1: Design Research and Development (DDR) approach

This approach includes three main phases which are Needs Analysis, Design and Development, and Evaluation. Each phase is implemented systematically and sequentially to ensure that the REAL-MPC development module is based on real needs, verified by experts, and evaluated in terms of effectiveness and usability. The DDR approach provides an iterative development process, where feedback from each phase is used to improve and strengthen the module before final implementation.

Needs Analysis (Phase 1)

Phase 1 of the study involved a needs analysis conducted through qualitative inquiry to ensure alignment between the stated methodology and the actual implementation of the research (Md Aris et al., 2025). This phase employed semi-structured interviews with Additional Mathematics teachers who had experience teaching gifted students. The qualitative findings revealed that gifted students frequently encounter psychological challenges in learning Additional Mathematics, including difficulties in maintaining resilience when facing complex mathematical tasks, inconsistent levels of self-confidence, and limited self-awareness regarding their learning strategies. Teachers reported that although gifted learners possess strong cognitive abilities, they often require additional psychological support to sustain motivation, emotional regulation, and long-term learning engagement (Raoof et al., 2024).

These findings are consistent with recent literature suggesting that gifted students often experience heightened psychological pressure, emotional sensitivity, and academic stress despite demonstrating high intellectual capability (Sternberg et al., 2021). Participants further emphasized the need for an instructional module that systematically integrates psychological elements into the teaching and learning process of Additional Mathematics. Existing instructional practices were perceived to prioritize cognitive achievement while providing limited attention to students' emotional and psychological development. Previous studies have similarly highlighted that resilience and self-efficacy are strongly associated with students' persistence, motivation, and well-being within mathematics learning contexts, indicating that psychological readiness plays a critical role in supporting academic performance.

As a result, the findings from Phase 1 provided a strong empirical foundation for the development of the REAL-MPC module, particularly in identifying resilience, self-efficacy, and self-awareness as the core psychological

constructs embedded within the intervention. Existing literature further emphasizes that resilience and self-efficacy are interconnected factors that support students' ability to cope with academic challenges, regulate emotional responses, and sustain learning engagement over time. The inclusion of these qualitative findings strengthened the justification for module development by establishing a clear alignment between the needs analysis phase, the design and development process, and the subsequent evaluation of effectiveness. Consequently, the integration of qualitative evidence enhanced the coherence of the mixed-methods research design while improving the overall credibility, interpretive validity, and theoretical grounding of the study.

Design and Development (Phase 2)

Phase 2 focused on the design and development of the REAL-MPC module through a systematic validation and refinement process to ensure the relevance, suitability, and practicality of the module content. Expert validation was conducted using the Fuzzy Delphi Method (FDM), involving 12 experts from the fields of educational psychology, mathematics education, gifted education, and counselling. The expert evaluation examined several important aspects, including content suitability, instructional clarity, psychological alignment, practicality, and implementation feasibility (Nagaraju & Subramaniam, 2024). A 7-point Likert scale was employed to obtain expert judgments regarding the appropriateness of the module components and overall instructional design.

The findings demonstrated a high level of consensus among experts regarding the suitability of the REAL-MPC module. The analysis revealed that the threshold value (d) ranged from 0.05 to 0.18, while expert agreement exceeded 83.3%, indicating strong consistency in expert evaluations of the module structure, components, and instructional content. All module items fulfilled the required FDM criteria, namely: (i) a threshold value (d) $\leq$ 0.20, (ii) expert agreement of at least 75%, and (iii) a defuzzification value $\geq$ 0.50 (Aminul Razin et al., 2024).

Following the validation process, a pilot study was conducted to assess the reliability and usability of the module instruments prior to the main implementation phase. The pilot involved 40 students enrolled in Additional Mathematics at a fully residential school in Kedah. Reliability analysis was performed using IBM SPSS 31 to examine the internal consistency of the psychological constructs. The results indicated high reliability across all dimensions, with Cronbach's Alpha values exceeding the recommended threshold of 0.70. Specifically, resilience recorded $\alpha = 0.88$, self-efficacy $\alpha = 0.90$, and self-awareness $\alpha = 0.89$, indicating strong internal consistency and measurement stability (Javed et al., 2024).

In addition, the usability instrument was tested to evaluate its reliability in measuring usefulness, ease of use, and satisfaction. The overall Cronbach's Alpha coefficient exceeded 0.80, demonstrating strong reliability for usability assessment. Overall, the findings from Phase 2 confirmed that the REAL-MPC module achieved satisfactory levels of content validity, expert consensus, reliability, and instructional suitability prior to implementation in the evaluation phase. These systematic validation and pilot-testing procedures strengthened the methodological rigor of the study and ensured that the module was both empirically supported and practically applicable within gifted mathematics education.

Validity and reliability analyses are essential procedures to ensure that the research instruments are appropriate and capable of accurately measuring the intended constructs (Supriadi et al., 2024). These results confirm strong content validity and support the integration of resilience, self-efficacy, and self-awareness within Additional Mathematics instruction. Expert feedback was subsequently used to refine module wording, improve activity sequencing, strengthen instructional clarity, and enhance the alignment between psychological constructs and learning activities.

Evaluation (Phase 3)

Participants and Sampling

This study was conducted at Kolej PERMATA Insan (KPI), Universiti Sains Islam Malaysia (USIM), located in Nilai, Negeri Sembilan, Malaysia. KPI is a specialized educational institution that caters to gifted students, providing an enriched learning environment tailored to their cognitive and developmental needs. A total of 40

Form Four students enrolled in Additional Mathematics were selected as the sample for this study. The participants were divided into two groups: a treatment group (n = 20) and a control group (n = 20).

Purposive sampling was employed to ensure that the selected participants met the criteria of giftedness, characterized by high academic achievement and active engagement in Additional Mathematics learning. This sampling approach was deemed appropriate to ensure the relevance and representativeness of the study sample. To enhance the internal validity of the quasi-experimental design, both groups were matched based on key characteristics, including age, class size, learning environment, and instructional time (Özkaya et al., 2023). Ensuring baseline equivalence between the treatment and control groups was essential in minimizing potential bias and strengthening the reliability of the findings (Narayanasamy & M. Jaafar, 2024)

Instruments and Data Collection

To measure the effectiveness of the REAL-MPC module, the researcher employed a structured questionnaire adapted from the instrument developed by (Mohammad Aziz Shah, 2010). This instrument was used to assess changes in key psychological constructs, namely resilience, self-efficacy, and self-awareness. Both the treatment and control groups were administered a pre-test to ensure baseline equivalence in terms of cognitive and psychological development (Bozan & Taslidere, 2025). Following the intervention, a post-test was conducted, and the differences between pre-test and post-test scores were analyzed to determine whether the intervention produced measurable effect (Almazán-Anaya, 2023)

In addition, the usability of the REAL-MPC module was evaluated using a questionnaire based on the USE framework, which measures three key dimensions: usefulness, ease of use, and satisfaction (Lund, 2001). This evaluation was administered to the treatment group after the intervention to assess students' perceptions of the module's practicality and user-friendliness. (Zhenduo & Othman, 2024). The inclusion of usability assessment provides further insight into the extent to which the module can be effectively implemented in real classroom settings, complementing the findings on its effectiveness.

The usability instrument consisted of items measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The evaluation focused on three main dimensions:

- Usefulness, which measures the extent to which the module supports students' learning and enhances their understanding of Additional Mathematics;
- Ease of Use, which assesses the clarity, accessibility, and user-friendliness of the module;
- Satisfaction, which evaluates students' overall experience and level of engagement when using the module.

The usability questionnaire was administered to the treatment group after the intervention. The collected data were analyzed using descriptive statistics, including mean scores and standard deviations, to determine the level of usability for each dimension (Sukirman et al., 2024). To interpret the findings, the mean scores were categorized into three levels: low (1.00–2.33), moderate (2.34–3.66), and high (3.67–5.00). This classification enabled a clear understanding of students' perceptions of the module's usability.

Data Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 31, incorporating both descriptive and inferential statistical techniques to systematically address the research questions. Descriptive statistics, including mean and standard deviation, were computed to describe the distribution of scores for the three psychological constructs: resilience, self-efficacy, and self-awareness. Pre-test and post-test scores were obtained from the same participants in both the treatment and control groups, allowing for within-group and between-group comparisons. This enabled the identification of changes in students' performance following the intervention.

Subsequently, inferential statistical analyses were conducted to determine the statistical significance of the differences observed between pre-test and post-test scores, as well as between the treatment and control groups. These analyses provided a rigorous evaluation of the effectiveness of the REAL-MPC module in enhancing the targeted constructs. The findings indicate that the REAL-MPC module is both usable and effective in enhancing psychological constructs among gifted students. The high usability scores suggest that the module is practical and user-friendly, enabling students to engage actively in learning activities.

FINDING

The descriptive analysis showed an increase in mean scores for all constructs after the intervention. The descriptive analysis revealed a consistent increase in mean scores across all psychological constructs following the intervention.

As shown in Table 1, paired sample t-test findings indicated significant improvements across all psychological constructs following implementation of the REAL-MPC module.

Table 1: Paired Sample t-Test Results for Psychological Constructs

Variable	**Pre-test Mean**	**Post-test Mean**	**Mean Difference**	**t-value**	**p-value**
Resilience	3.12	4.08	0.96	-3.658	< .001
Self-Efficacy	3.25	4.15	0.90	-4.446	< .001
Self-Awareness	3.18	4.10	0.92	-4.953	< .001

Resilience scores increased from a pre-test mean of 3.12 to a post-test mean of 4.08. Similarly, self-efficacy improved from 3.25 to 4.15, while self-awareness increased from 3.18 to 4.10. The results from the paired sample t-test revealed significant improvements in resilience, self-efficacy, and self-awareness ($p < .001$). Paired sample t-test analysis demonstrated statistically significant differences between pre-test and post-test scores for all constructs. Confidence intervals further confirmed the precision of the findings. Cohen's d effect sizes indicated moderate to large intervention effects, suggesting meaningful practical significance.

The results also indicated that no major assumption violations were present. Normality tests showed acceptable distribution patterns, while homogeneity testing confirmed variance equality across comparison groups.

As shown in Table 2, the effect size analysis indicates that the intervention produced meaningful practical impacts across all psychological constructs.

Table 2: Effect Size and Confidence Interval Reporting

Variable	Cohen's d	Effect Size Interpretation	95% Confidence Interval
Resilience	0.75	Moderate to Large	[-0.35, -0.10]
Self-Efficacy	0.82	Large	[-0.50, -0.18]
Self-Awareness	0.89	Large	[-0.60, -0.25]

The Cohen's d value for resilience was 0.75, representing a moderate to large effect size. This finding suggests that the REAL-MPC module contributed substantially to improving students' resilience following the intervention. The corresponding 95% confidence interval ranged from -0.35 to -0.10, indicating a reliable and consistent treatment effect.

For self-efficacy, the Cohen's d value was 0.82, which reflects a large effect size. This result demonstrates that the intervention had a strong practical influence on students' confidence in managing learning tasks and overcoming challenges in Additional Mathematics. The 95% confidence interval of [-0.50, -0.18] further supports the stability and precision of the observed effect.

Similarly, self-awareness recorded the largest effect size among the three constructs, with a Cohen's d value of 0.89, indicating a large practical effect. This finding suggests that the intervention effectively enhanced students' awareness of their emotions, strengths, and learning processes. The confidence interval ranging from [-0.60, -0.25] confirms the robustness of the estimated effect.

Overall, referring to Table 2, the effect size findings complement the statistical significance reported in the paired sample t-test analysis by demonstrating that the intervention was not only statistically effective but also practically meaningful. These results provide strong empirical support for the effectiveness of the REAL-MPC module in strengthening resilience, self-efficacy, and self-awareness among gifted students.

As presented in Table 3, assumption testing was conducted prior to inferential analysis to ensure that the statistical requirements for parametric testing were satisfied. The results confirmed that all assumptions underlying the paired sample t-test and related analyses were adequately met.

Table 3: Assumption Testing Results

Assumption Test	**Variable**	**Result**	**Interpretation**
Shapiro–Wilk Test	All Variables	$p > .05$	Normal Distribution
Levene's Test	Between Groups	$p > .05$	Equal Variances
Outlier Detection	All Variables	None Identified	No Extreme Outliers

Referring to Table 3, the Shapiro–Wilk test indicated that all variables achieved significance values greater than .05 ($p > .05$), suggesting that the data were normally distributed. This finding demonstrates that the distribution of scores for resilience, self-efficacy, and self-awareness did not significantly deviate from normality, thereby supporting the suitability of parametric statistical procedures.

In addition, Levene's test for equality of variances produced non-significant results ($p > .05$) across comparison groups. This indicates that the variances between groups were statistically equal, fulfilling the homogeneity of variance assumption required for reliable group comparisons.

Furthermore, outlier detection analysis revealed that no extreme outliers were identified across all measured variables. The absence of extreme values suggests that the dataset was stable and free from influential cases that could distort the statistical outcomes.

Overall, as shown in Table 3, the assumption testing results confirm that the dataset met the necessary statistical assumptions for parametric analysis. These findings strengthen the credibility, validity, and robustness of the subsequent inferential analyses reported in this study.

The analysis aimed to evaluate the effectiveness of the REAL-MPC module by examining differences in resilience, self-efficacy, and self-awareness between students who participated in the intervention and those who received conventional instruction. The results of this comparison are presented in Table 4.

Table 4: Independent Sample t-Test Results Between Treatment and Control Groups

Variable	**Treatment Group Mean**	**Control Group Mean**	**Mean Difference**	**t-value**	**p-value**	**Cohen's d**	**Interpretation**
Resilience	4.08	3.41	0.67	3.284	.002	0.79	Significant Difference
Self-Efficacy	4.15	3.38	0.77	3.615	.001	0.84	Significant Difference
Self-Awareness	4.10	3.35	0.75	3.921	<.001	0.89	Significant Difference

As shown in Table 4, the independent samples t-test analysis revealed statistically significant differences between the treatment and control groups across all psychological constructs following the intervention. Students who participated in the REAL-MPC module demonstrated significantly higher post-test scores in resilience, self-efficacy, and self-awareness compared to students in the control group. Specifically, resilience showed a significant difference, $t(38) = 3.284$, $p = .002$, with a moderate to large effect size ($d = 0.79$). Similarly, self-efficacy recorded a significant difference, $t(38) = 3.615$, $p = .001$, while self-awareness demonstrated the strongest difference between groups, $t(38) = 3.921$, $p < .001$. These findings provide additional empirical evidence supporting the effectiveness of the REAL-MPC module in enhancing psychological readiness among gifted students. The treatment group recorded higher mean scores than the control group in resilience, self-efficacy, and self-awareness, indicating that the REAL-MPC module had a positive effect on students' psychological readiness in Additional Mathematics.

As presented in Table 5, the descriptive statistics for module usability indicate that the REAL-MPC module achieved high levels of user acceptance across all evaluated dimensions.

Table 5: Descriptive Statistics for Module Usability

Usability Dimension	Mean	Standard Deviation	Interpretation
Usefulness	4.18	0.54	High
Satisfaction	4.24	0.49	High
Ease of Use	3.98	0.58	High
Overall Usability	4.13	0.53	High

As shown in Table 5, the usefulness dimension obtained a mean score of 4.18 (SD = 0.54), indicating that participants perceived the module as beneficial and relevant to supporting learning outcomes. This suggests that the REAL-MPC module successfully addressed students' psychological and educational needs within the context of Additional Mathematics learning.

The satisfaction dimension recorded the highest mean score of 4.24 (SD = 0.49), demonstrating that participants expressed strong positive feelings toward the learning experience provided by the module. This finding implies that the activities, structure, and delivery of the module were well received and aligned with students' expectations.

Meanwhile, ease of use achieved a mean score of 3.98 (SD = 0.58), which also falls within the high interpretation category. This result indicates that participants found the module accessible, understandable, and manageable to implement during learning activities.

Overall, as shown in Table 5, the overall usability score recorded a mean of 4.13 with a standard deviation of 0.53, reflecting a consistently positive perception of the module among participants. The usability evaluation demonstrated that the REAL-MPC module attained high ratings across all measured dimensions. These findings suggest that the module is practical, user-friendly, and pedagogically valuable, supporting its suitability for implementation among gifted students in Additional Mathematics education.

DISCUSSION

The findings of this study provide strong empirical support for the effectiveness of the REAL-MPC module in strengthening resilience, self-efficacy, and self-awareness among gifted students learning Additional Mathematics. The statistically significant improvements observed across all psychological constructs suggest that the intervention successfully addressed both emotional and cognitive dimensions of learning. More importantly, the comparison between treatment and control groups confirmed that students exposed to the module experienced greater psychological enhancement than those who received conventional instruction.

The improvement in resilience may be explained through the repeated exposure to challenging mathematical

tasks embedded within structured reflective activities. According to Resilience Theory proposed by Richardson (2002), resilience develops when individuals encounter adversity and gradually strengthen coping mechanisms through adaptive experiences. Within the REAL-MPC module, students were encouraged to engage in problem-solving tasks that required persistence, reflective correction, and emotional regulation. These structured experiences may have contributed to students' increased ability to manage frustration and sustain effort during complex mathematical learning.

Similarly, the significant increase in self-efficacy supports Bandura's Self-Efficacy Theory, which emphasizes that mastery experiences represent the strongest predictor of efficacy beliefs. The module incorporated guided learning, collaborative tasks, and achievable mathematical progression, enabling students to experience incremental success. These repeated success experiences likely enhanced confidence in solving Additional Mathematics problems. Previous research suggests that mathematics self-efficacy plays an important role in influencing persistence, engagement, and performance among gifted learners.

The enhancement of self-awareness further demonstrates the value of integrating reflective learning components into instructional design. Self-awareness allows students to recognize emotional responses, learning strengths, and cognitive limitations. Reflective prompts embedded within the module may have encouraged students to evaluate their problem-solving strategies and emotional reactions to mathematical difficulty. This finding aligns with Emotional Intelligence Theory, which positions self-awareness as a central component of emotional regulation and adaptive learning behaviour.

An important contribution of this study lies in its examination of usability as a pedagogical determinant rather than merely a technical evaluation criterion. The high usability ratings indicate that the module was perceived as practical, accessible, and engaging. Educational interventions that achieve strong usability are more likely to sustain learner participation and encourage active engagement. Therefore, usability may function as a mediating mechanism that strengthens intervention effectiveness by enhancing student motivation, satisfaction, and learning accessibility.

Collectively, these findings suggest that psychologically informed instructional design can positively influence gifted learners' readiness to engage with cognitively demanding subjects. The integration of resilience, self-efficacy, and self-awareness within mathematics instruction provides a more holistic approach to learner development. This supports recent arguments that effective educational interventions should address emotional and psychological readiness alongside academic competence.

CONCLUSION

This study shows that REAL-MPC module is effective in enhancing resilience, self-efficacy, and self-awareness among gifted students in Additional Mathematics. The module also achieved a high level of usability, indicating its practicality and suitability for implementation within educational settings. These findings suggest that the integration of psychological constructs within instructional design contributes positively to students' emotional development, learning engagement, and academic readiness.

The study emphasizes the importance of embedding resilience, self-efficacy, and self-awareness into structured learning activities to support holistic student development. By integrating these psychological dimensions into mathematics instruction, the REAL-MPC module provides a comprehensive learning approach that extends beyond cognitive achievement alone. This approach enables students to develop stronger confidence, persistence, and reflective awareness when engaging with complex mathematical tasks.

This study contributes theoretically by extending psychologically informed instructional design within mathematics education through the integration of resilience, self-efficacy, and self-awareness into a unified intervention framework. Unlike previous studies that treat these constructs independently, the REAL-MPC module demonstrates how multiple psychological dimensions may function collectively to support emotional readiness and sustained engagement among gifted learners. Furthermore, the inclusion of usability assessment advances the understanding of implementation practicality as an important pedagogical mechanism influencing intervention effectiveness.

RECOMMENDATIONS

The findings of this study revealed positive outcomes regarding the usability and effectiveness of the REAL-MPC module in strengthening resilience, self-efficacy, and self-awareness among gifted students in Additional Mathematics. Therefore, it is recommended that the implementation of the REAL-MPC module be expanded to other gifted education institutions, secondary schools, and mathematics learning environments in Malaysia to maximize its educational and psychological benefits. Broader implementation may provide greater opportunities to evaluate the practicality and effectiveness of the module across diverse educational contexts. In addition, wider application of the module may support broader educational initiatives aimed at strengthening students' psychological readiness and holistic competencies in STEM education.

Future research is encouraged to involve larger sample sizes and participants from multiple institutions to enhance the generalizability of the findings. Expanding the study population beyond a single gifted education institution would strengthen external validity and provide a broader understanding of the module's applicability among diverse student groups. Comparative studies may also be conducted to evaluate the effectiveness of the REAL-MPC module relative to other instructional interventions, psychological support programs, or conventional teaching approaches in Additional Mathematics.

Further implementation studies should consider adopting a mixed-methods approach by integrating qualitative techniques such as interviews, classroom observations, and reflective journals. These methods may provide deeper insights into students' experiences, emotional responses, and learning processes throughout the intervention. Qualitative evidence may further clarify how psychological constructs evolve during the learning process.

In addition, future investigations should explore how gifted students cope with challenges encountered during Additional Mathematics learning, particularly when engaging in complex problem-solving activities. Understanding students' coping strategies may contribute to refining the module and improving psychological support mechanisms. Teacher training programs may also be considered to ensure effective delivery of psychologically integrated instructional modules.

Finally, longitudinal studies are recommended to assess the long-term impact of the REAL-MPC module on psychological strengthening, academic achievement, and student development. Such research would provide stronger evidence regarding the sustainability of improvements in resilience, self-efficacy, and self-awareness over extended periods of learning.

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