Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

LEARNING THAT STICKS: EXPERT TEACHERS' PERSPECTIVES ON DEVELOPING AN INSTRUCTIONAL BRAIN-BASED MODULE FOR ADDITIONAL MATHEMATICS

Nuur Diyana Ab Sattar[1*]
Ahmad Fauzi Mohd Ayub [2]
Riyan Hidayat [3]

[1] [2] Institute of Mathematical Research, Universiti Putra Malaysia, Serdang 43400, Selangor Darul Ehsan, Malaysia (E-mail: gs70729@student.upm.edu.my)
[2] Department of Foundation Education, Faculty of Educational Studies, Universiti Putra Malaysia, Serdang 43400, Selangor Darul Ehsan, Malaysia (E-mail: afmy@upm.edu.my)
[3] Department of Science and Technical Education, Faculty of Educational Studies, Universiti Putra Malaysia, Selangor Darul Ehsan, Malaysia (E-mail: riyan@upm.edu.my)
* Corresponding author: gs70729@siswa.upm.edu.my

Article history
Received date : 7-2-2026
Revised date : 8-2-2026
Accepted date : 25-3-2026
Published date : 31-3-2026

To cite this document:
Ab Sattar, N. D., Mohd Ayub, A. F., & Hidayat, R. (2026). Learning that sticks: Expert teachers' perspectives on developing an instructional brain-based module for additional mathematics in secondary school. *Journal of Islamic, Social, Economics and Development (JISED),* 11 (81), 382 – 399

Abstract: *Developing teaching and learning materials that focus on neuroscientific and holistic approaches at the Additional Mathematics secondary level aligns with the 2027 School Curriculum Design, which promotes active learning and classroom engagement. This study aims to explore the perspectives of expert teachers in the Additional Mathematics subject to identify the need for a brain-based instructional module to develop cognitive mastery skills among secondary school students in the subject. The study employed a Design and Developmental Research (DDR) strategy, emphasizing the needs analysis method in the initial phase. The study collected data through semi-structured interviews with five field experts, and the interview data were analyzed using thematic analysis facilitated by the Atlas.ti software. The key finding was a strong consensus among experts on the importance of developing an instructional Brain-Based Learning (BBL) module, particularly for cognitive mastery skills. Furthermore, the study highlighted a need for more teaching and learning materials that support active learning, positive learning environments, and multi-sensory engagement in Additional Mathematics classes, despite the acknowledged potential of this approach. The results emphasize the need to create and implement a BBL module to fill this void and equip teachers with the essential resources and expert guidance to incorporate it into Additional Mathematics lessons successfully.*

Keywords: *Additional Mathematics, Brain-Based Learning (BBL), Design and Developmental Research (DDR), Need Analysis*

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

Introduction

The National Science, Technology, and Innovation Policy (DSTIN) 2021- 2030 explains the crucial role of Science, Technology, Engineering, and Mathematics (STEM) subjects in driving national development, highlighting the need to strengthen academic performance (MOSTI, 2021). STEM subjects are also recognized in Malaysian education for their contribution to economic growth, global competition, and the demand for a workforce equipped with critical thinking, problem-solving, and technological skills (Apin et al., 2022). As the country prepares to meet future demands, it is crucial to prepare students with the competencies and skills needed to thrive in a knowledge-based economy (Nagari et al., 2023). Therefore, fostering cognitive mastery skills tailored to global competitiveness among STEM students is crucial to ensuring Malaysia remains competitive on the world stage.

Additional Mathematics is one of the STEM subjects designed to prepare students for employment in STEM fields. It is a subject that requires a solid foundation in mathematics and analytical thinking, and focuses on problem-solving and collaboration skills (Curriculum Development Division, 2018).

However, it is often regarded as the most challenging elective subject in the science stream (Mohd et al., 2022). Teaching characterized by inadequate instructional resources and inefficient, traditional methods has led most students to view Additional Mathematics as a challenging subject (Yakubu & Jungudo, 2023). Although the Ministry of Education of Malaysia has provided guidelines and exposure to teaching and learning approaches in Additional Mathematics for Additional Mathematics teachers, they still prefer the conventional method that has long been practiced (Mohd, 2022).

The methods and strategies teachers use in teaching and learning Additional Mathematics require a precise and comprehensive understanding, as well as the ability to help students solve problems that involve high levels of thinking. The ability to solve mathematical problems is crucial in mathematics and underpins students'abilities to solve unforeseen challenges (Wahyuni et al., 2025). Therefore, strategies in the daily lesson plan should be appropriate, and engaging teaching aids can positively impact the implementation of the Mathematics teaching and learning process for students (Sharpe & Marsh, 2022).

For three consecutive years, the Malaysia Certificate Education (SPM) achievement in Additional Mathematics has declined. Analysis of SPM results demonstrates that students can answer basic questions but struggle with Higher Order Thinking Skills (HOTS) questions. Research revealed that less than 80% of students achieve only the minimum level in HOTS (Fuzi et al., 2020; Khali & Rosli, 2022; MoE, 2023). This indicates that cognitive mastery skills remain inadequate. However, despite HOTS questions rising to 50% starting in 2021, many students still fail Additional Mathematics. This may be attributed to teachers' perspective and readiness to practice cognitive mastery skills without interfering with curriculum requirements (Xueting & Ismail, 2024). Nonetheless, students who take Additional Mathematics as an elective subject in the science stream in secondary school appear to have only average problem-solving and critical thinking skills, while teachers use traditional teaching methods. Among the fundamental mathematical topics in the Additional Mathematics curriculum that are challenging are Integration, Probability Distributions, Progression, Indices, Surds and Logarithms, and Quadratic Functions (Bakar & Samah, 2021).

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

Therefore, there must be efforts from teachers and students to improve the teaching and learning process, align with the goals of shaping individuals who are mathematically minded, creative and innovative, as well as skilled in applying problem-solving effectively (Roorda et al., 2024). To realize this aspiration and these goals, the teaching and learning process in Additional Mathematics requires transformation and adaptation in the aspects of teaching approach, teaching strategies, teaching environment content, and assessment. All these aspects need to be organized and evaluated to integrate content delivery with contextual relevance, involving critical thinking, creativity, and innovation, as well as effective application of cognitive mastery skills.

Moreover, the approach grounded in neuroscience and cognitive science that focuses on how the brain learns is crucial in learning Additional Mathematics because it can foster critical thinking and increase attention, understanding, meaning, and memory. Learning that is 'authentic', meaning it provides more opportunities for students to solve real-world problems in lessons and creates a conducive classroom environment, is required (Korisky et al., 2024). In particular, the foundation for developing cognitive mastery skills begins with creating a high-quality learning environment that promotes curiosity and analytical thinking and nurtures open-mindedness.

Recent studies have focused on how brain research supports meaningful and impactful teaching and learning in mathematics (Binyameen et al., 2022; Olaoluwa, 2024). An understanding of brain function and its impact on learning can transform teaching and learning. Moreover, the introduction of a new curriculum in 2027, focused on cognitive mastery skills such as problem-solving and critical thinking, promotes active learning and classroom engagement.

Literature Review

Brain-Based Learning (BBL) is an instructional strategy grounded in the 12 principles of BBL (Caine et al., 2005; Caine & Caine, 1990). The concepts of BBL, grounded in neuroscience, serve as the foundation of brain-based teaching. It is a learning method that supports students' cognitive, emotional, and social development, ensuring they learn at an optimal level. Caine et al. (2005) asserted that great teaching and learning include three fundamental elements:

i) Relaxed alertness
ii) Orchestrated immersion in complex experiences
iii) Active processing of experiences

Conversely, E. Jensen (2008) stated that BBL can be encapsulated through three terms: engagement, strategy, and principle. The learning approach aligns with the optimal functioning principles of the brain's inherent processes, aiming to achieve attention, understanding, meaning, and retention (Jensen, 1998). Given that brain development and growth are reliant on individual experiences, the challenge for teachers is to diversify teaching methods and shift from an approach that "fits all" to an "enriched environment" suited to all students (John, 2005). Teachers need to provide a safe and enriched environment, promote active learning, integrate emotion and cognition, and accommodate the brain's natural processes (Korkmaz, 2024).

Authentic learning, which addresses real-world challenges, can enhance students' learning effectiveness (Sato, 2025). Numerous studies have suggested that brain-based instruction has

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

a more favourable effect than the traditional instruction method (Amjad & Tabbasam, 2024; Yatim et al., 2022). However, the current literature shows significant limitations that require the development of brain-based learning module. Empirical evidences indicate there is a correlation between BBL and other various factors related to learning, including conceptual understanding (Yatim et al., 2022); engagement (Badri & Saleh, 2021; Heal & Goodwin, 2023); critical thinking skills (Nasution et al., 2021); and achievement (Shanta & Wells, 2022). These findings indicate that learning environment congruent with the brain's naturally process and can simultaneously support meaningful learning experiences.

However, an extensive review reveals that majority of previous BBL studies focussing on isolated instructional approach compared to a systematic and oriented designed framework. Many studies implement selected elements of BBL, such as collaborative learning, active learning or emotional engagement independently. Most of the research not integrating all three elements which proposed by Caine et al. (2005). As a result, teachers are uncertain to use brain-based learning in practical settings to enhance students' cognitive mastery skills. Therefore, it is necessary to examine whether the BBL approach can effectively foster students' cognitive mastery.

Furthermore, there are concerns about misinformation arising from the rapid spread of knowledge about BBL. There is a lack of awareness among Mathematics teachers regarding the BBL approach (Binyameen et al., 2022; Shanta & Wells, 2022; Susanti et al., 2019; Telussa et al., 2024). Teachers remain uncertain about the practical implementation of the BBL approach in the classroom. Even though many empirical research have demonstrated the effectiveness of BBL, but there is scarcity with materials that can provide teachers with instructional guidance and teaching materials that implement brain-based principles. This gap indicate that the empirical evidences of effectiveness alone is not enough to provide support and guidance to develop students' cognitive mastery skills unless supported by well-designed instructional material.

The Potential of Brain-based Learning Approaches in Additional Mathematics

In the context of Additional Mathematics, persistence need of structured BBL module become more prominence. Previous studies have identified the challenge of understanding the Additional Mathematics concept, which results in difficulties with cognitive mastery skills such as critical thinking, problem-solving, and analytical thinking (Malik & Saddiq, 2024). Students struggle to grasp these skills in Additional Mathematics because most teachers still use antiquated instructional strategies. The teaching and learning of Additional Mathematics are predominantly teacher-centred, leading to a lack of engagement and difficulty in understanding its concept (Olaoluwa, 2024; Yatim et al., 2022; Zakaria et al., 2021). Despite Secondary School Standard Curriculum (KSSM) Additional Mathematics emphasizing that effective teaching and learning in the classroom occur when teachers carefully plan activities and use diverse methods and resources to help students understand concepts and develop cognitive skills, these outdated approaches remain prevalent. Given this issue, the learning process requires instructional practices that helps students, supports engagement and encourages collaboration.

Additional Mathematics' students benefit from actively constructing knowledge, collaborating in group settings, and solving real-world problems (Basari & Siew, 2022). By engaging in these

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

activities, students can connect mathematical concepts to real-life situations, fostering active learning and deeper understanding (Fatima et al., 2020; Otieno & Povey, 2023). Moreover, utilizing effective teaching and learning methods and holistic instructional resources can enhance students' engagement and promotes active learning (Korkmaz, 2024; Malik & Saddiq, 2024).

Given that brain growth is influenced by enriched and meaningful learning experience (Jensen, 1998), there is a clear need for instructional resources that can help students acquire the skills needed (Okudan & Yeşilyurt, 2024). Therefore, BBL module can give meaningful means of transforming theoretical principles to classroom practice by organising teaching techniques that foster an emotional climate, enriching experiences, and active learning in Additional mathematics (Yatim et al., 2022). Meaningful learning resources and a conducive environment are required so that these students can develop skills and subject matter knowledge (Visnovska & Cortina, 2022).

Research Objectives

Generally, the objective of this study is to explore the needs in developing a BBL approach module for teaching and learning of Additional Mathematics based on the perspectives of expert teachers in the Additional Mathematics subject.

Methodology

The research aims to design and develop a teaching and learning module by adopting the Design and Development research (DDR) approach. In DDR, the first phase in developing a teaching and learning module is the needs analysis. The needs analysis phase is an important step in determining the main research issues before developing modules (Saedah et al., 2013).

A qualitative approach using semi structured interview was conducted in needs analysis phase to identify whether there is a need to develop the BBL module in Additional Mathematics. Moreover, the data acquired in this phase are used to determine requirements for prior module development and to evaluate them in the next phase (Padzil et al., 2021). Unlike a purely qualitative approach, DDR provides a comprehensive framework that integrates needs analysis, design development, expert validation and testing effectiveness, making it particularly suitable for establishing an empirical foundation for instructional module development (Jamil & Noh, 2024).

McKillip's discrepancy model serves as a reference for the needs analysis phase in developing a teaching and learning module. According to McKillip (1987), the analysis phase involves identifying and evaluating the needs that will determine the results to be achieved. According to Jamil and Noh (2021), the only element highlighted in this model is the first expectation the process of setting goals and specifying what must be accomplished. Afterwards, a performance measurement process involves identifying the necessary actions. Finally, it involves identifying the irregularity that should occur and the exact cause of the issue. In this study, the section that can be identified is the need to develop the module and the content requirements for developing it. The DDR research approach, as illustrated in Figure 1, as described by Richey and Klein (2007), is used to guide the investigation.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

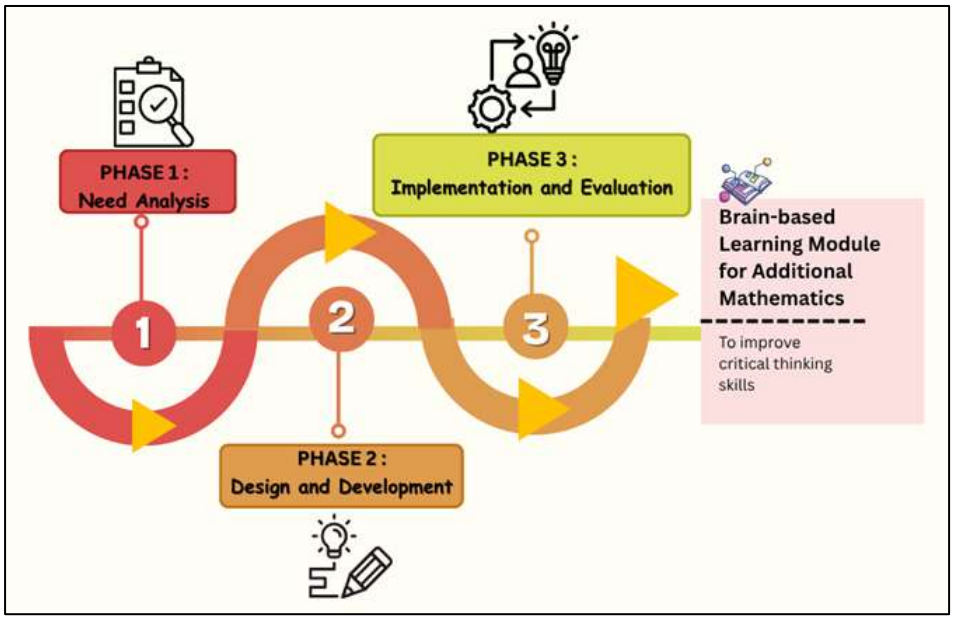

Figure 1: Phases of Design and Developmental Research (DDR)
Source: Author's own work

The iterative structure of the DDR approach facilitates ongoing enhancement. It aligns with the study, which focuses on developing a teaching and learning module using a brain-based approach in the context of the Additional Mathematics subject.

Participants and Procedures of the Research

A qualitative approach using semi-structured interviews was used in this study to obtain information from five expert teachers' perspectives on the need to develop a brain-based module to measure the effectiveness of cognitive mastery skills. The selection of these experts was through purposive sampling to choose five teachers in the Additional Mathematics subject. These five teachers were selected based on their extensive experience (over 10 years) and their extensive knowledge in the field of teaching and learning of Additional Mathematics.

Selecting study participants can provide data until saturation, where no new or overlapping information is obtained. Patton (2002) recommended a small number of informants. In this study, saturation occur after five interviews with no new data, codes or opinion to refine the concepts. This methodology offers an advantage in obtaining a comprehensive understanding of the situation being studied (Galletta, 2013). It allows research participants to voice their genuine thoughts and to understand their perspectives and experiences (Mohd Awang et al., 2018). According to Patton (2002), collecting qualitative data enables researchers to examine and observe issues and problems in the real world. A semi-structured interview protocol is used as a research instrument to answer the research question. It was finalized by the author and two other experts in qualitative research for review and improvement.

Collecting and Analyzing Data

The face and content validity of the interview protocol questions were verified before the interviews occurred. All the informants were contacted virtually to invite them to participate in the study. After the participants agreed to be interviewed, the official invitation letter and

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

consent form were sent to informants who agreed to participate in the research. All scheduled interviews were conducted as individual sessions so that informants could communicate and express their experiences and opinions. The interview sessions lasted from twenty to forty minutes and were conducted in a semi-formal manner to facilitate the process and ensure the comfort of all participants. The interviews were conducted in 6 stages as follows:

1. Introduction
2. Confirming the interviewee's experience
3. Outlining the purpose of the interview
4. Obtaining permission to record the conversation
5. Executing the interview session
6. Conclusion and gratitude of the interviewee

After completing the interviews with the expert teachers, the researcher analyzed the interview data using the steps suggested by Creswell and Poth (2016) to understand the meaning and feedback of the study participants. The audio recordings were transcribed verbatim. The data were analyzed using a deductive coding approach with ATLAS.ti software. All experts verified the transcripts to refine and clarify the overview of the presented information. Thematic analysis can identify, analyze, and report patterns in data (Braun et al., 2015). Data analysis was performed by carefully reading the transcriptions to investigate emerging issues, generating initial coding, searching for subthemes and categories, and defining possible themes relevant to this study. Interviews were conducted until data saturation was reached, as determined by the established stopping criterion. Therefore, when no new codes are identified, or a code frequency in the data recurs three to five times, the stopping criteria for this study are met (Baker & Edwards, 2012). Figure 2 summarizes the flow of the research data collection and data analysis.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

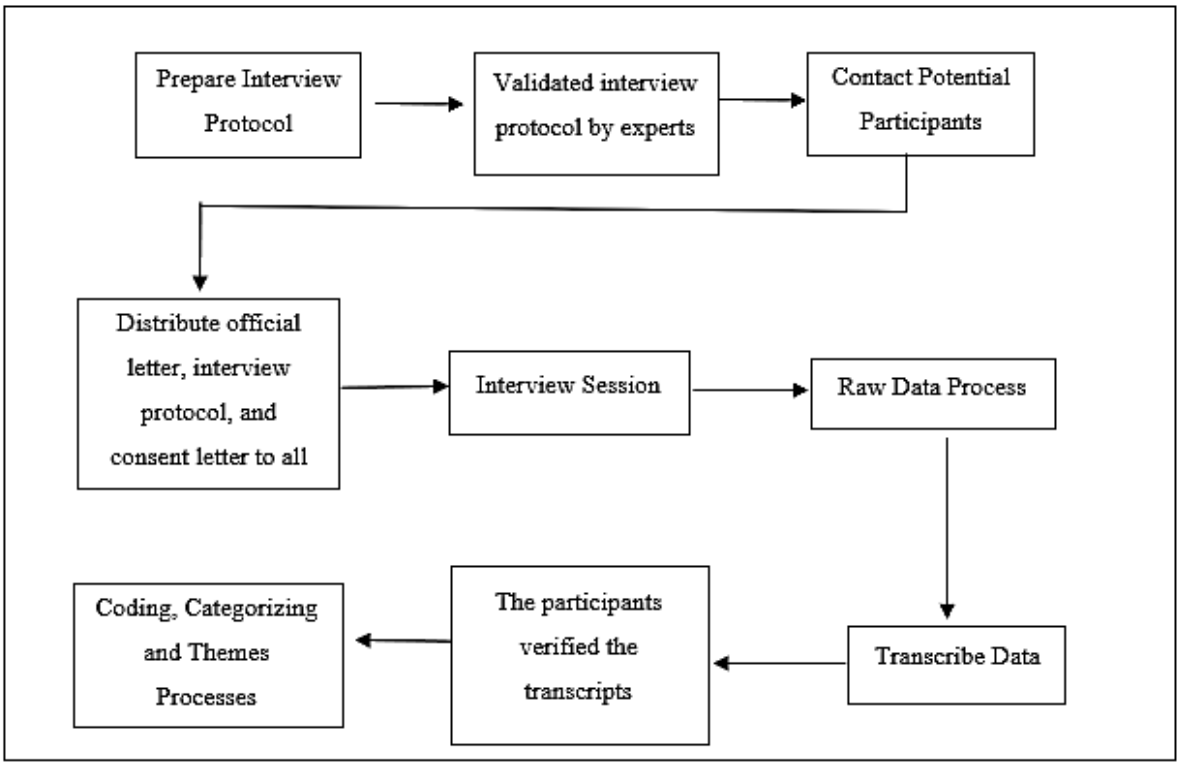

Figure 1: The flow of data collection and data analysis

Source:Author's own work

Results

The objective of the analysis was to identify the needs for developing a brain-based approach module in Additional Mathematics education, based on expert views. This study conducted face-to-face interviews with five experienced Additional Mathematics teachers to gain their insights and opinions on the requirements and criteria for developing a brain-based module for high school Additional Mathematics students. The questions asked during the interview sessions were intended to address the research question: What are expert teachers' views on the needs in developing a brain-based approach module for teaching and learning Additional Mathematics? Three broad themes emerged from the needs analysis, which are: 1) Teachers need inclusive modules; 2) Challenges and problems in teaching Additional Mathematics; and 3) Innovative content.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

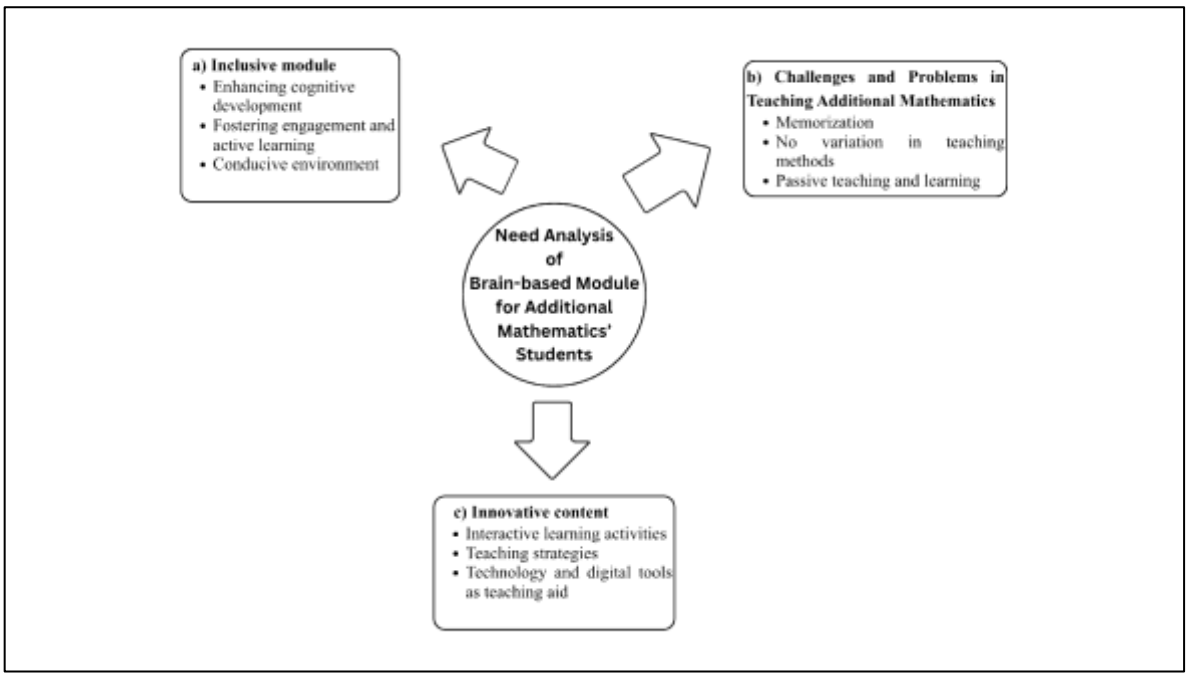

Figure 3: Summary of themes

Source: Author's own work

Theme 1: Inclusive Module

Based on the analysis, the feedback under the inclusive module has been categorized into three categories:

Category 1: Enhancing cognitive Development

In this study, participants provided feedback on the need to include HOTS questions. Moreover, participants mentioned that students lack critical thinking skills. However, teachers can train them by posing "why" questions.

> '……*we include the HOTS questions, using those questions and analysing them using Bloom's taxonomy…*' (SSI201)

The participant observed that students are absent from deep, reflective questioning, and there is a need to foster conceptual curiosity.

> *'...Because critical thinking will look at something. And they should think about it. But the problem is, the kids in Malaysia lack critical thinking. For example, why is our handphone rectangular? Why not triangular? Why not round? why not a cylinder? That is how we develop critical thinking in students' (SSI101)*

Category 2: Fostering engagement and motivation

The participants also explained that students need engaging activities to understand the content better.

> *"the most important thing is that the way to solve the problem must engage the students and then help them understand'* (SSI205)

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

By developing a structured and engaging module, the participant agrees that it can increase interest in Additional Mathematics, support affective and cognitive growth in Additional Mathematics learning, and develop essential problem-solving skills.

> *"..with a well-designed module ..students will see their relevance to real life. In addition, they will enhance their confidence, interest, and problem-solving skills, which are important for the Additional Mathematics subject."* (SSI301)

Category 3: Conducive environment
Participants noted that a collaborative approach can enhance critical and creative thinking by allowing students to exchange opinions with peers.

> "*This collaborative approach encourages critical and creative thinking. Where students can exchange opinions, meaning that when they share, they can see more clearly, understand a concept more deeply and create a conducive learning environment*." (SSI305)

In addition, teachers need to play an essential role in creating a learning environment that encourages students to engage in problem-solving.

Theme 2: Challenges and Problems in Teaching Additional Mathematics
Students face numerous problems when learning Additional Mathematics. All five experts' teachers expressed different perspectives regarding the problems students faced during lessons. Under this theme, the feedback of participants has been categorized into three categories:

Category 1: Memorization
The participants also expressed challenges in teaching due to students' preference for memorization. They struggle to connect long, complex questions to algebraic expressions or formulas for solving. Hence, students prefer memorizing the problem-solving steps and following the procedure.

> "*…the main challenge is when students encounter questions in the form of sentences, complex sentences. So, when students get a long, complex question, they find it difficult to determine the steps to solve that question. The reason is that if the question is complex, students need a deep understanding to grasp the situation, then identify the topics involved, and finally know the correct formulas*". (SSI202)

The experts acknowledge that they primarily used traditional teaching methods. The limitations of those teaching approaches are that students memorize without understanding.

> "*..Which they can't make the connection between what has been shown and what they need to do*." (SSI501)

Category 2: No variation in teaching methods
Participants discussed the problems that exist in the teaching of Additional Mathematics. Among them is the rare utilization of interactive teaching methods.

> "*So far, honestly, I am really only used to chalk and talk, because of time constraints. So, I don't use other activities much…this method still not satisfactory*" (SSI203)

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

The expert admits that they rely on the traditional "chalk and talk" method due to time constraints. Although the method has demonstrated that students' performance was unsatisfactory, the teachers still rely on a single, structured method and are not exposed to alternative teaching strategies. Among the feedback, they said they only used a minimal implementation of problem-based learning.

> "*..I never use interactive activities…Rarely. That one, the teacher has to guide*." (SSI204)

Category 3: Passive teaching and learning resources
The experts acknowledged that they used the current teaching and learning module, but the learning resources are passive.

> " … *The module we use is just an ordinary module. The module with just questions and answer*. (SSI102).

Moreover, they perceive existing modules as monotonous and desire more engaging learning content and activities.

> "*There needs to be something different. Even though there are modules now, they follow topical questions, it's the same, boring*" (SSI103)

According to participants, prioritizing completing the syllabus over interactive learning leads to passive teaching and learning.

> "*I rarely used the presentation. Time constraints. So, we want to catch up with the syllabus again. I'm not really into it*." (SSI206)

Moreover, one participant provided feedback that there is a need for a structured module with progressively more difficult tasks and scaffolding that builds from simple to complex. It is important to gradually develop skills in module design.

> "*It means, a clear and easily understandable explanation of the concept, starting with the basic idea or definition for each topic. After that, it is accompanied by graph examples or visuals or illustrations that help explain the concept…*" (SSI302)

Theme 3: Innovative content
Based on the analysis, the feedback under innovative content has been categorized into three categories:

Category 1: Interactive learning activities
The impediment to altering Additional Mathematics teaching approaches lies in the imperative to provide students with direct experience through hands-on activities for a comprehensive understanding of Additional Mathematics concepts.

Learning activities should relate to real-world challenges:

> "*For real-life applications, we briefly explain how this concept is used in actual situations, such as using indices in interest calculations, and using logarithms in earthquake magnitudes or pH in chemistry*" (SSI303)

The experts also value collaborative approaches in teaching modules, as they foster critical thinking and deepen understanding through peer discussion.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

"*yes.. presentations can also be done..*"(SSI107)
"*I involve the students in the activity section. During the activity section, I will give questions and they will solve problems in groups, then a representative will explain the solution to the other classmates, so at that time we will open up space for the students to ask each other questions*." (SSI207)

Category 2: Teaching strategies
The participants discussed suitable methods for teachers to address effective teaching strategies. One participant chose exploration as a strategy to understand the concept better.
"*..if the topic has such exploration, it will make the students understand better what they are learning. It will strengthen their understanding*." (SSI106)

Moreover, another participant valued the use of videos to introduce the lesson in the early phase.
"*Show a video or, if available, a movie... we call it set induction*." (SSI105)

Experts also encouraged collaborative and discussion-based activities in the Additional Mathematics class. The ability of students to collaborate and communicate effectively in problem-solving activities can positively affect students by fostering interaction with their peers, sharing ideas, and creating an interactive environment.
"*This collaborative approach is very effective. Because it encourages students to interact, discuss, and understand the concept of a topic more deeply, maybe through sharing ideas with friends in a group*." (SSI208)

The experts also value graphical representations and charts to help understand the content.
"*For example, graphics, charts, or animations to help students understand the content*" (SSI304)

The expert encourages activities, such as games, to boost learning and supports active learning sessions.
"*They fond of activities like games where we form groups, then we give questions, and they play with their friends. So, it keeps them from dozing off, so they stay active*." (SSI401)

Category 3: Technology and digital tools as teaching aids
The participant agreed that digital tools, when integrated with learning modules, can enhance students' understanding.

Moreover, the experts emphasize the importance of integrating digital tools and collaborative approaches to enhance students' understanding, as well as the potential of interactive and problem-based activities.
"*..You can use a digital method...using an app to demonstrate the application of a topic*". (SSI104)

Moreover, the expert believes students are attracted to sophisticated digital tools.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

> "*I think so because students nowadays are more exposed to technology, and when a technology is considered advanced, it can attract their interest and help them understand*" (SSI402).

The experts expressed a need for more engaging teaching resources, including structured modules that provide teaching strategies to address the problems. Although the teachers are aware of the need for variety in teaching methods to enhance cognitive mastery skills, the main hurdle experts face is the lack of interactive and engaging teaching and learning resources to integrate into Additional Mathematics education.

Discussion

The findings of needs analysis emphasize that Additional Mathematics requires an intervention through an inclusive and engaging module to foster students' cognitive and affective development. Several of results during semi structured interview enlightened the module design.

Firstly, teachers highlighted the importance of integrating a BBL approach, which includes elements of relaxed alertness, orchestrated immersion in complex experiences, and active processing of experiences to stimulate critical thinking and inquiry. To enhance cognitive development, the module structured activities that highlight critical thinking and problem solving and conceptual understanding through guided inquiry tasks. This result is supported by the statement by Khali and Rosli (2022) that teachers need to practice a variety of teaching strategies and enhance the quality of teachers' instruction through student-centred teaching strategies that are oriented towards problem-based learning in teaching and learning of Additional Mathematics. To address the need for increased engagement and motivation, interactive collaborative learning activities and solving real-world application were embedded within the module to sustain students' participation. According to Korhonen et al. (2023), students interact verbally and engage in conversations with and through materials as they share goals, directly or indirectly.

Secondly, there were several challenges faced by teachers and students in understanding abstract concepts of Additional Mathematics. The current learning resources which unattractive and low cognitive engagement, lead to students rely on memorization. Moroever, the teachers were lacked of variation in teaching methods. To overcome these issues, the module need to have interactive and student-centred materials such as dicussion-based tasks, guided worksheets and hands on activities to encourage students in meaningful learning of Additional Mathematics. This is supported by Nsuworks and Williams (2024), who stated that engaging materials and activities can hold students' interest in learning mathematics, which they may find a difficult subject and also support by Oktaviyanthi & Agus (2023) that learning through visual media can assist students' conceptual understanding in mathematics.

Thirdly, the teachers highlight the need for developing the module which systematically can create an engaging, dynamic and brain compatible learning environment that supports effective teaching and learning practices

Conclusion

This study explores experienced teachers' perceptions of current teaching and learning resources in Additional Mathematics and the need to develop a brain-based approach module

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

in Additional Mathematics education. Based on the findings, teachers highlighted that a brain-based teaching and learning approach can positively affect student learning, particularly by strengthening cognitive skills such as critical thinking, problem-solving, and analytical thinking. The experts reflected on the importance of understanding concepts and solving problems. They suggested that comprehensive modules based on active learning, a positive learning environment, and multi-sensory engagement should be developed to improve students' understanding and performance in Additional Mathematics.

The suggestions of teaching module development by experts are;
1. Clear explanations of concepts that are easy to understand
2. Integration of basic mathematical foundations
3. A structured and tiered approach to the topic
4. Real-life applications of mathematical concepts
5. Structures exercises ranging in difficulty

Thus, the elements related to the analysed themes were suggested for integration into the module development. The lack of a module to guide Additional Mathematics teachers in integrating cognitive development, conducive environments, and active participation further reinforces the need for a BBL approach module. The limitation of this study is that it was conducted with a sample of only five teachers and did not consider students' views. Therefore, the study's sample is a limitation. Hence, it would be a good idea for future research to conduct interviews with students to gain insights from both teachers' and students' perspectives.

Acknowledgements
The author would also like to thank the Ministry of Education (Sponsorship Division, KPM, Malaysia) for providing funding throughout the PhD journey.

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

References

Amjad, A. I., & Tabbasam, U. (2024). Effect of Brain-Based Learning on Students' Extrinsic Motivation to Learn Mathematics: Introducing Neuroscience to Schools. In *Journal of Sustainable Education* (Vol. 1, Issue 1, pp. 14–21).

Apin, S. H., Ali, M., & Bunyamin, M. A. H. (2022). *STEM Education in Malaysia: A Review*. http://www.recsam.edu.my/sub_lsmjournalhttp://www.recsam.edu.my/sub_lsmjournal

Badri, M. M., & Saleh, S. (2021). Effects of Brain Based Teaching Approach on Students' Engagement Among Secondary School Students. In *Turkish Online Journal of Qualitative Inquiry (TOJQI)* (Vol. 12, Issue 6, pp. 4811–4823).

Bakar, S. N. A., & Samah, N. A. (2021). Masalah pengajaran dan pembelajaran Matematik Tambahan tingkatan 4. *Proceeding of the 8th International Conference on Management and Muamalah 2021*.

Baker, S. E., & Edwards, R. (2012). *How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research*.

Basari, J., & Siew, N. M. (2022). Kerangka Pemupukan Kemahiran Berfikir Aras Tinggi dalam Pengajaran dan Pembelajaran Matematik Tambahan. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, *7*(3), e001348. https://doi.org/10.47405/mjssh.v7i3.1348

Binyameen, S. M., Din, M. N. U., & Khan, F. (2022). Impact of brain-based teaching practices on students learning achievements in mathematics at secondary level. *Global Educational Studies Review*, *VII*(I), 526–533. https://doi.org/10.31703/gesr.2022(vii-i).50

Braun, V., Clarke, V., & Rance, N. (2015). *How to use thematic analysis with interview data In The Counselling and Psychotherapy Research Handbook*. SAGE Publications Ltd.

Caine, R. N., & Caine, G. (1990). Understanding a brain-based approach to learning and teaching. *Educational Leadership*, *(2)*(48), 66–70.

Caine, R. N., Caine, G., McClintic, C., & Klimek, K. J. (2005). *12 Brain/Mind learning principles in action: The field book for making connections making connections, teaching, and the human brain.* . Corwin Press.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Curriculum Development Division. (2018). *Matematik Tambahan Tingkatan 4 dan 5: Dokumen Standard Kurikulum dan Pentaksiran*.

Fatima, H. G., Quraishi, U., & Khanam, A. (2020). Applying brain-based learning modules for learning acceleration of 6th grade Science students. *Sjesr*, *3*(1), 27–34. https://doi.org/10.36902/sjesr-vol3-iss1-2020(27-34)

Fuzi, S. F., Hassan, W. H. W., Zainudin, S. N., Jama, S. R., Zahidi, N. E., & Halim, B. A. (2020). Moderating effects of additional mathematics' achievement during SPM on the relationship between performance in modern mathematics and mathematical errors occurrences: A case study of MDAB students in UiTM Melaka. *ASM Science Journal*, *13*, 1–7. https://doi.org/10.32802/ASMSCJ.2020.SM26(2.17)

Galletta, A. (2013). Mastering the semi-structured interview and beyond : from research design to analysis and publication. In *Qualitative Studies in Psychology*. NYU Press. https://research.ebsco.com/linkprocessor/plink?id=44add29e-94ca-3735-9c52-fcf52475799d

Heal, J., & Goodwin, B. (2023). Moving From Engagement to Deeper Thinking. *Educational Leadership*, *80*(7), 27–31. www.ascd.org

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

Jamil, M., & Noh, N. (2021). *Kepelbagaian Metodologi dalam Penyelidikan Reka Bentuk dan Pembangunan*. Qaisar Prestige.

Jamil, M., & Noh, N. (2024). *Penyelidikan Reka Bentuk & Pembangunan: Teori dan Aplikasi* (R. Nur Ridhuan, Ed.). Qaisar Prestige.

Jensen, A. R. (1998). *The g factor : the science of mental ability*. Praeger.

Jensen, E. (2008). *Brain-based learning: The new paradigm of teaching.* Corwin Press.

John, H. (2005). Neuroscience and Education. *Education Journal*, *1*(84), 27–29.

Khali, Z. K., & Rosli, R. (2022). Amalan pengajaran guru Matematik Tambahan dari perspektif murid: Satu kajian kes. *Jurnal Kepimpinan Pendidikan*, *3*, 15–35.

Korhonen, T., Kangas, K., & Salo, L. (2023). *InventionPedagogy–The Finnish Approach to Maker Education*. Routledge.

Korisky, A., Davidesco, I., Ben-Abu, O., Levy, O., Abrahami, K., Geri, O., & Zion Golumbic, E. (2024). Me, My Brain, and I: A Framework for Neuroscience Curriculum Fostering Research-Practice Partnership Between Scientists and Educators. *Mind, Brain, and Education*, *18*(4), 449–460. https://doi.org/10.1111/mbe.12432

Korkmaz, B. C. (2024). An investigation of brain-based learning principles in today's changing conditions. *Anadolu Üniversitesi Eğitim Fakültesi Dergisi*, *8*(2), 801–825. https://doi.org/10.34056/aujef.1331728

Malik, N. A., & Saddiq, K. (2024). Instructional Material: A Tool For Achievement In Mensuration at Senior Secondary School in Nigeria. *Journal Eduscience (JES)*, *11*(2), 394–403.

MoE, M. of E. (2023). *Matematik Tambahan 3472/2 0 Kupasan Mutu Jawapan SPM 2023* (pp. 1–83).

Mohd Awang, I., Haslina, M., & R Zirwatul Aida, R. I. (2018). *Metodologi Penyelidikan Sains Sosial*. Penerbit Universiti Malaya.

Mohd, S. S. K. (2022). *Pembangunan dan keberkesanan modul B-geo untuk topik Pembezaan dalam kalangan pelajar tingkatan empat di Kedah*. Universiti Sains Malaysia.

Mohd, S. S. K., Saleh, S., Zulnaidi, H., Yew, W. T., & Yatim, S. A. M. (2022). Effects of brain-based teaching approach integrated with geogebra (b-geo module) on students conceptual understanding. *International Journal of Instruction*, *15*(1), 327–346. https://doi.org/10.29333/iji.2022.15119a

MOSTI. (2021). *Dasar Sains, Teknologi dan Inovasi Negara 2021-2030*. https://www.mosti.gov.my/wp-content/uploads/2020/12/MOSTI-DSTIN-2021-2030-1.pdf

Nagari, P. M., Sahid, S., & Hussin, M. (2023). Let's Explore! The Factor, Reliability, and Validity Analyses of Readiness for a Knowledge-Based Economy Among Undergraduate Students. *International Journal of Educational Methodology*, *9*(4), 697–710. https://doi.org/10.12973/ijem.9.4.697

Nasution, A. R., Rafli, Z., & Zulela, M. S. (2021). Islamic Education Subject Teaching Design Based on Brain Based Learning to Improve the Critical Thinking Ability of Students' Elementary School. In *Turkish Online Journal of Qualitative Inquiry (TOJQI)* (Vol. 12, Issue 10, pp. 2106–2118).

Nsuworks, N., & Williams, L. (2024). *Perceptions of secondary school mathematics teachers regarding teaching mathematics with conceptual understanding* [Nova Southeastern Univeristy]. https://nsuworks.nova.edu/fse_etd

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

Oktaviyanthi, R., & Agus, R. N. (2023). Evaluating graphing quadratic worksheet on visual thinking classification: a confirmatory analysis. *Infinity Journal*, *12*(2), 207–224. https://doi.org/10.22460/infinity.v12i2.p207-224

Okudan, Ü., & Yeşilyurt, E. (2024). Learning Needs, General Teaching Principles, and Learning Strategies as Predictors of Mathematics Academic Achievement. *Asia-Pacific Education Researcher*, *33*(1), 143–156. https://doi.org/10.1007/s40299-023-00715-3

Olaoluwa, S. A. (2024). Application of Brain-Based Learning Strategy for Students' Optimal Learning Outcomes in Mathematics. *Creative Education*, *15*(10), 2037–2052. https://doi.org/10.4236/ce.2024.1510126

Otieno, H., & Povey, H. (2023). Mathematics textbooks and self-regulated learning: responses from students in three Kenyan secondary schools. *Research in Mathematics Education*, *25*(3), 342–358. https://doi.org/10.1080/14794802.2022.2089907

Padzil, M. R., Abd Karim, A., & Husnin, H. (2021). Employing DDR to Design and Develop a Flipped Classroom and Project based Learning Module to Applying Design Thinking in Design and Technology. In *IJACSA) International Journal of Advanced Computer Science and Applications* (Vol. 12, Issue 9). www.ijacsa.thesai.org

Patton, M. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA:Sage.

Richey, R. C., & Klein, J. D. (2007). *Design and Development Research: Methods, Stategies and Issues*.

Roorda, G., de Vries, S., & Smale-Jacobse, A. E. (2024). Using lesson study to help mathematics teachers enhance students' problem-solving skills with teaching through problem solving. *Frontiers in Education*, *9*. https://doi.org/10.3389/feduc.2024.1331674

Saedah, S., Norlidah, A., Dewitt, D., & Zaharah, H. (2013). *Design and Developmental Research: Emergent Trends in educational research*. Kuala Lumpur: Pearson Malaysia Sdn Bhd.

Sato, A. (2025). Effective ways for engaging students in real-world challenges and authentic experiences. *International Conference" Actual Economy: Local Solutions for Global Challenges"*, 119–122.

Shanta, S., & Wells, J. G. (2022). T/E design based learning: assessing student critical thinking and problem solving abilities. *International Journal of Technology and Design Education*, *32*(1), 267–285. https://doi.org/10.1007/s10798-020-09608-8

Sharpe, S. T., & Marsh, D. D. (2022). A systematic review of factors associated with high schoolers' algebra achievement according to HSLS:09 results. *Educational Studies in Mathematics*, *110*(3), 457–480. https://doi.org/10.1007/s10649-021-10130-4

Susanti, V. D., Adamura, F., Lusiana, R., & Andari, T. (2019). Development of learning devices: Brain-based learning and mathematics critical thinking. *Journal of Physics: Conference Series*, *1254*(1). https://doi.org/10.1088/1742-6596/1254/1/012082

Telussa, R. P., Kaihatu, J., & Arjanto, P. (2024). Fostering critical and creative thinking in Mathematics: A study on brain-based and problem-based learning. *Pedagogik Journal of Islamic Elementary School*, *7*(1), 53–68. https://doi.org/10.24256/pijies.v7i2.4764

Visnovska, J., & Cortina, J. L. (2022). Teaching, teachers, and teaching resources in mathematics education research. *Asia-Pacific Journal of Teacher Education*, *50*(2), 156–164. https://doi.org/10.1080/1359866X.2022.2045567

Wahyuni, R., Suwanto, F. R., Sthephani, A., & Ahyan, S. (2025). Students' obstacles in solving algebra form problems viewed from mathematical problem-solving ability. *Infinity Journal*, *14*(3), 587–606. https://doi.org/10.22460/infinity.v14i3.p587-606

Volume: 11 Issues: 81 [March, 2026] pp. 382 – 399
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118129

Yakubu, B., & Jungudo, B. (2023). Constructivist approach as a gateway to improving students' performance in Indices and Logarithms. *International Journal of Nature and Science Advance*, *2*, 251–264.

Yatim, S., Saleh, S., Zulnaidi, H., & Yatim, S. A. M. (2022). Effects of integrating a brain-based teaching approach with GeoGebra on problem-solving abilities. *International Journal of Evaluation and Research in Education*, *11*(4), 2078–2086. https://doi.org/10.11591/ijere.v11i4.22873

Zakaria, M. A., Ahmad, M. F., & Rahman, M. K. A. (2021). Higher Order Thinking Skills (HOTs): Acting Method as Approach of Critical Pedagogy in Education Culture. *International Journal of Academic Research in Progressive Education and Development*, *10*(2). https://doi.org/10.6007/ijarped/v10-i2/10132