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Need Analysis of B-CompThinkT for the Basic Computational Thinking Concepts in Computer Science Basics

Norhashimah Matulidi
Faculty of Educational Studies, Universiti Putra Malaysia
Email: gs63511@student.upm.edu.my

Maizura Yasin
Faculty of Educational Studies, Universiti Putra Malaysia
Corresponding Author Email: y_maizura@upm.edu.my

Ahmad Fauzi Mohd Ayub
Faculty of Educational Studies, Universiti Putra Malaysia, Institute for Mathematical Research
Email: afmy@upm.edu.my

Jazihan Mahat
Faculty of Educational Studies, Universiti Putra Malaysia
Email: jazihan@upm.edu.my

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Abstract

The shift from the Integrated Secondary School Curriculum (KBSM) to the Secondary School Standard Curriculum (KSSM) curriculum in 2017 aims to equip students with 21st-century skills and knowledge. One newly introduced subject is Computer Science Basic for junior high school students. This study investigates expert perspectives on developing a technology-integrated B-CompThink module in the initial phase using the Design and Development Research (DDR) approach. Data collection involved structured interviews and document analysis with three experienced CSB teachers selected through targeted sampling. The study highlights four themes of module development needs from teachers' perspectives. The first theme addresses teachers' competence, noting a lack of exposure to Computer Science Basics topics and limited training. The second theme concerns the complexity of Computer Science Basics textbook content, which challenges new teachers and hinders effective classroom support. The third theme highlights limited teaching and learning materials available for classroom and lab use. Finally, the fourth theme emphasizes the importance of technology integration in learning, especially for real-world applications. Computational thinking is essential for 21st-century skills in technology and engineering.

Keywords: Need Analysis, Module, Computer Science Basic, Computational Thinking, Module

The Fourth Industrial Revolution (IR 4.0) has considerably impacted the economic, political, social, and education sectors, as evidenced by the integration of computational thinking into global educational systems. Computational Thinking is a fundamental skill not limited to computer programming experts but is a foundational skill that every individual should develop to navigate complex, technology-driven environments (Chakraborty, 2024; Bayeck,2023; Zhong et al., 2016). Bilbao et al. (2021) define computational thinking as thought processes that use basic computer science ideas to address complicated problems autonomously, with the assistance of computers, or both, making it useful in addressing complex problems quickly and efficiently. These abilities enable people to solve complicated problems efficiently, which is especially important given the digital challenges of the twenty-first century (Vazquez-Uscanga et al., 2025).

In response to the importance of computational thinking, the Malaysian Ministry of Education (MOE) introduced basic computational thinking concepts in 2017 as part of a new subject, Basic Computer Science, targeted at Form One students. This subject aims to enhance students' computational thinking skills to enable them to make informed decisions and solve problems effectively. This subject seeks to equip students with computational thinking skills for better decision-making and problem-solving capabilities. The computational thinking concepts taught, such as decomposition, pattern recognition, abstraction, and generalization, provide students with the foundational knowledge they need to succeed in computer science subjects like programming (Harimurti et al., 2019; Kassan et al., 2016).

Many countries have begun incorporating computational thinking into their curricula, whether at the primary or secondary school levels, by integrating it into computing, information and communication technology, computer science, or programming subjects (Baharin & Osman, 2021). However, introducing computational thinking in classroom settings has proven challenging. Wang et al. (2022) note that teachers have major obstacles in effectively imparting computational thinking subject. Research shows that introducing these skills in educational settings requires systematic teaching aids that match students' capabilities and are easily accessible to educators. Malaysia's Curriculum Development Division has promoted using modular approaches in the classroom to enable teachers to plan and implement teaching and learning systematically (Curriculum Development Division, 2016). Previous research has shown that modular classroom approaches effectively improve student-centered learning and academic outcomes (Razali & Ayob, 2018). However, no specialized modules for integrating computational thinking principles into Malaysian educational contexts exist, particularly those considering instructors' technological and pedagogical restrictions, resulting in a practical resource deficit.

To ensure that every student masters computational thinking skills, teachers must thoroughly understand Computer Science disciplines before using them in teaching and learning (Puganesri & Puteh, 2019). However, a recent study finds that teachers frequently lack adequate training in computational thinking, limiting their capacity to teach it successfully (Saltali et al., 2023). Teachers also need practical training in computational thinking and problem-solving techniques, yet only some receive this support before starting instruction. This ensures that students can apply computational thinking skills before entering the workforce. According to a study by Puganesri and Puteh (2019), even teachers with computer science experience fail to impart computational thinking concepts due to the lack of specialized modules on computational thinking. Moreover, most teachers teaching Computer Science subjects need a background in this field, making the teaching and learning process in the classroom difficult. Compounding the challenge, most computer science professors need more training in the discipline, making it difficult to integrate computational thinking techniques while remaining focused on the subject's purpose of teaching problem-solving skills through programming.

Therefore, developing a module is essential for the Basic Computational Thinking Concepts topic for Form One to assist teachers, especially in facilitating the teaching and learning process in the classroom. A deep understanding of this topic is required for teachers to include it in their pedagogy (Syafril et al., 2022). This is because the capacity to handle problems efficiently and systematically enables successful problem resolution, facilitating classroom teaching and learning. This is congruent with a study conducted by Yadav et al. (2017), which emphasized the necessity of strengthening teachers' grasp of computational thinking, particularly in each teaching profession. As a result, every teacher should be prepared with excellent computational thinking skills to foster computational thinking in their students.

Problem Statement and Research Objectives

The first stage of this study, a need analysis, is critical for determining the specific requirements and obstacles teachers experience when teaching computational thinking ideas. The needs analysis phase is a crucial stage in educational planning; it allows researchers to grasp the topic to be studied and serves as the beginning point in Design and Development Research (DDR).). This phase aims to identify the fundamental research questions before researchers develop a module (Siraj, 2013) by examining issues in the teaching and learning of Basic Computer Science for Form One students. A detailed requirements analysis shows what educators need to teach computational thinking effectively. It enables the development of specialized resources relevant to teachers' professional contexts and students' learning needs (Sönmez, 2019).

The Ministry of Education Malaysia (MOE) introduced the Basic Computer Science subject to Form One students to equip them with fundamental computational thinking skills to solve complex digital problems. Introducing this subject primarily aims to educate pupils with computational thinking skills capable of solving future difficulties. (Curriculum Development Division, 2016). Furthermore, this course seeks to inform students of the fundamental knowledge and skills of programming while also developing higher-order thinking skills (Talib et al., 2016). To achieve this objective, the development of computational thinking skills among teachers must be prioritized to prepare students to meet the demands of the 21st century.

Computational thinking has recently emerged as a critical component in promoting creativity to address issues (Puteh et al., 2017) in the IR 4.0 revolution, which requires students to think computationally to solve problems and generate new ideas in everyday life. However, teachers encounter many challenges and obstacles connected to computational thinking. A study conducted by Saidin et al. (2021) discovered numerous issues that teachers face, including a lack of infrastructure, time constraints for implementing computational thinking skills in teaching and learning, a lack of teaching materials and assessment strategies, a lack of computer knowledge, and gaps in their computational thinking knowledge. Hence, introducing module-based learning for the Basic Computer Science subject for form one in Malaysia is necessary.

According to a study by Ling et al. (2017), many teachers need a firm knowledge of computational thinking ideas, and most have yet to have formal computational thinking training. The findings revealed that, out of 159 respondents, 83.6% had never attended training related to computational thinking, 54% were unsure about computational thinking, and 31.4% were unaware of computational thinking. As a result, researchers have turned their attention to finding new ways to support these teachers, such as establishing the B-CompThink module to assist teachers in developing a strong computational thinking foundation and improving classroom instruction.

In this phase, McKillip's Discrepancy Model (1987) assesses gaps between teachers' current and desired skill levels in computational thinking. McKillip's model allows for a systematic evaluation of performance discrepancies, setting clear goals, measuring teachers' current competencies, and identifying areas for improvement. Based on this model, researchers can observe the current situation and the needs of teachers. This model has been effectively used in various educational contexts to identify needs (Chang et al., 2022; Yasin et al., 2021; Dinoy et al., 2020; Ling et al., 2017; Chedi, 2017; and Mattaon, 1992), as it enables researchers to pinpoint gaps that the B-CompThink module can address. Therefore, the development of the B-CompThink module integrated with technology for teaching Basic Computational Thinking Concepts deserves significant attention. This study aims to explore the specific needs for developing the B-CompThink module to support Form One educators in teaching computational thinking, with the research question:

Q1: What are the requirements for developing a B-CompThink module to teach Basic Computational Thinking concepts to Form One students?

The rationale for this study is rooted in the need for effective teaching aids to support the successful implementation of computational thinking in Malaysian classrooms. Given the global push toward equipping students with essential computational thinking skills, this study addresses an urgent need for structured, technology-integrated resources. Such resources are expected to help teachers overcome instructional challenges, meet the MOE's curriculum goals, and enhance student engagement and understanding of computational thinking concepts. The primary audience for this study includes secondary school educators, curriculum developers, and policymakers within Malaysia's Ministry of Education. For educators, the B-CompThink module offers a practical, structured tool to simplify computational thinking instruction, thus improving classroom delivery and supporting student comprehension of complex topics. Policymakers and curriculum developers will find valuable insights into implementing a standardized computational thinking teaching approach in this study. This will help raise educational standards and promote a more uniform understanding of computational thinking across Malaysia.

Computational Thinking (CT)

Computational thinking is an essential competency skill for today's generation, deeply integrated into various fields due to its problem-solving potential. The term 'computational thinking' was first introduced by Papert (1980), who posited that computers could revolutionize thought processes and alter knowledge accessibility. Later, Wing (2008) expanded on this, emphasizing that computational thinking should be a fundamental skill for everyone. It encompasses problem-solving, system design, and understanding human behavior based on fundamental computing concepts (Deng et al., 2022 Dolgopolovas et al., 2019). In other words, understanding this concept is crucial for tackling diverse problems, and it can be integrated across various domains, especially education and computer science (Kamha & Chookhampaeng, 2023). In education, computational thinking has been embedded into curricula to enhance analytical and problem-solving abilities. Saidin et al. (2021) demonstrated that integrating computational thinking into Computer Science subjects promotes student engagement and comprehension. Effective teaching of these concepts necessitates diverse classroom strategies and activities (Mohmad & Maat, 2024). For instance, Yadav et al. (2017) highlighted activities like problem decomposition and abstraction exercises that help students grasp complex ideas by breaking them down into more straightforward, manageable tasks.

Computational thinking comprises cognitive skills that enable individuals to identify patterns, break down complex problems into manageable components, and create solutions through modeling or simulation (Sholihah & Firdaus, 2023). Furthermore, computational thinking is seen as a problem-solving skill that involves understanding complex problems holistically, analyzing them, and breaking them down into manageable steps for effective solutions (Hanid et al., 2022). This skill helps students solve problems and stimulates other skills, such as creative thinking, critical thinking, and collaboration, which are essential in the 21st century (Richardo et al., 2023). This study underscores the need to equip teachers with robust knowledge of computational thinking to better prepare students for future challenges in an ever-evolving technological landscape.

Module Development

The development of teaching modules is a vital aspect of modern educational strategies, particularly with the increasing integration of technology in the learning process. The use of modules has gained significant attention as a pedagogical approach that offers a structured and segmented method for delivering educational content to students. Modules provide a structured, segmented approach to curriculum delivery, making learning more organized and interactive (Bao, 2020). By breaking the curriculum into focused units, teachers can better facilitate student engagement and foster deeper understanding (Qiu et al., 2024). This method demonstrates that organizing module content into manageable and comprehensive segments, including daily instruction, activities, and teaching aids (Aris & Mansor, 2023), can significantly benefit teachers by enhancing their preparation in terms of both knowledge and communication skills.

Padzil et al. (2021) have noted that in the realm of technology integration, the use of Design and Development Research (DDR) can lead to practical teaching modules. The DDR approach provides a systematic method that tailors the module to fit educational needs, enhancing its applicability and effectiveness. Therefore, the development of technology-integrated modules offers interactive and engaging learning experiences that meet the demands of the digital age. Furthermore, developing modules for computational thinking can equip teachers with the tools necessary to enhance problem-solving and analytical skills, which align with current educational needs. In conclusion, module development is vital for creating structured, engaging, and effective student learning experiences.

Integrating technology into teaching modules has yielded promising results. Innovative approaches, such as incorporating augmented reality or interactive digital platforms, have improved learning environments by making them more immersive and engaging (Angraini et al., 2023; Harjanto et al., 2024). For example, Wang (2018) showed that virtual reality can transform traditional lessons into interactive experiences, increasing student participation and retention. Additionally, modular learning platforms that utilize these advanced technologies have proven more effective than conventional methods, enhancing students' cognitive skills and adaptability (Llanillo et al., 2023). Developing technology-integrated modules for computational thinking is crucial to meet modern educational needs. Such modules provide teachers with tools to foster analytical and problem-solving skills among students. Ultimately, structured and interactive module development is vital for creating effective, engaging learning experiences that align with the competencies required in today's digital age.

Method

The DDR approach by Richey and Klein (2007) is structured and systematic, consisting of three phases: the needs analysis phase, the design and development phase, and the evaluation phase to assess the module's effectiveness. According to Siraj et al. (2021), the DDR approach allows researchers to demonstrate their knowledge base and creativity by designing and developing products through each phase. Figure 1 illustrates the phases and methodology used in this study below.

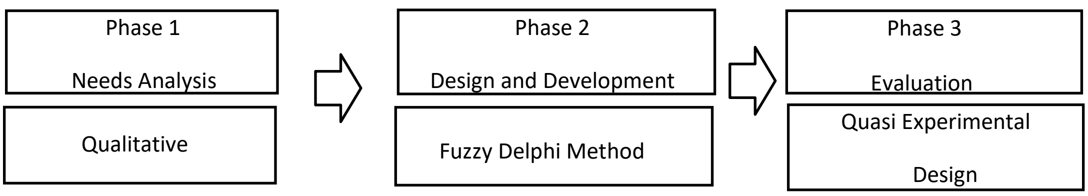

Figure 1 1: Phases and Methodologies Used in the DDR Approach

Needs Analysis Phase

The needs analysis is a crucial phase in educational research. This phase aims to identify teaching and learning needs when designing an effective curriculum (Sönmez, 2019). This study employed a qualitative case study approach to understand the specific needs in the teaching and learning Basic Computational Thinking Concepts for Form One students. A qualitative design was chosen because it provides a holistic view of complex educational issues (Simons, 2009). The case study method was particularly suitable as it allowed for an in-depth exploration of teachers' experiences and challenges in integrating computational thinking into the curriculum (Baškarada, 2014; Liamputtong, 2014). This approach aligns with the study's objective of developing a targeted educational module.

This study divided the semi-structured interview protocol into respondent demographics and questions that addressed the research questions. The face-to-face interviews were conducted twice, recorded with permission, and lasted 45 to 60 minutes. The interviews were recorded with the informant's consent and transcribed from oral to written text (Liamputtong, 2014). The transcript was then returned to the respondents for review, and they signed a consent form to confirm the interview information. The interview protocol was developed based on McKillip's (1987) Discrepancy Model or Gap Model and validated by experts in content, qualitative design, and language. To enhance the study's credibility, the researcher used triangulation, collecting data using multiple techniques. The researcher chose a combination of document analysis and interviews. Table 1 shows the demographics of the teacher respondents.

Table 1
Demographics Respondent

Code	Experience (years)	Primary ASK Teacher	Experience (years)
G1	6	Yes	Bachelor's
G2	6	Yes	Master's
G3	6	Yes	Bachelor's
G1	6	Yes	Bachelor's

To ensure the ethical integrity of this research, approval was sought and obtained from the Ethics Committee University and the Malaysian Ministry of Education (MOE). The study adhered to ethical guidelines safeguarding participants' privacy, safety, and confidentiality. Informed consent was obtained from each participant before the study commenced, including their agreement to record the interviews. The researcher followed strict data storage and handling protocols, ensuring all information was kept confidential and secure. As the primary researcher, I have a background in computer science education, which has informed my interest in this study. My professional experience as a teacher gave me insights into the challenges of teaching computational thinking. This personal connection to the subject allowed for a more informed and empathetic approach to data collection and analysis, contributing to the study's depth and relevance.

Participants for this study were selected using purposive sampling to ensure that only those with relevant expertise contributed to the data. The sample included three expert teachers (coded as G1, G2, and G3) with more than five years of experience teaching Basic Computer Science and who were principal trainers for the subject. These participants were chosen based on their extensive knowledge and practical experience, ensuring the credibility and depth of the findings. Observations of classroom teaching provided additional insights into practical teaching methods and challenges. At the same time, document analysis included the examination of the Curriculum and Assessment Standard Document (DSKP) for Form 1 Computer Science, teacher logbooks, and other relevant teaching materials. Triangulation of data sources—interviews, observations, and documents—enhanced the study's credibility (Liamputtong, 2014).

Data analysis followed a systematic process of coding and thematic analysis. Transcripts were first reviewed and coded to identify initial themes using inductive and deductive approaches. Conceptual analysis involved identifying recurring themes related to the teaching and integration of computational thinking, while operational analysis entailed organizing these themes into coherent categories supported by data excerpts. For example, codes were developed for challenges faced, teaching strategies, and resource needs. These steps ensured the findings were grounded in the data and provided clear insights into the participants' experiences (Baškarada, 2014).

Several measures were used to ensure the study's rigor. Triangulation was utilised to cross-check information from interviews, observations, and document analysis. Member checking involved sharing preliminary findings with participants for validation. An audit trail was maintained to increase transparency, documenting the research process from data collection to analysis. These measures, supported by literature on qualitative research validity (Liamputtong, 2014), ensured the study's findings were trustworthy and credible. The results were organized thematically, following the progression of identified challenges, effective teaching strategies, and resource requirements. Each theme was supported by data excerpts and linked to the research questions, providing a clear and logical flow from data collection to the final analysis.

Findings and Discussion

Data triangulation from observations, interviews, and document analysis underscores the need for a dedicated module on Basic Computational Thinking Concepts. Four primary themes emerged: teacher competence, textbook content, limitations of teaching and learning resources, and the use of technology in education. Each theme is discussed with a focus on the quality being examined, supporting data evidence, and an analysis that connects the data to broader research.

Theme 1: Teacher Competence

Teacher competence refers to teachers' skills, knowledge, and preparedness to deliver the Basic Computational Thinking Concepts content effectively. This includes their professional development and the level of institutional support they receive, particularly in structured training programs. A prominent finding within the data was the lack of guidance and formal support that teachers experienced while transitioning to the new KSSM curriculum, which introduced computational thinking concepts. Informant G2 expressed frustration with this transition, sharing, "*Honestly, when we switched to KSSM, we didn't get early exposure to this subject. At that time, I was teaching ICTL, and when ICTL ended. KSSM Basic Computer Science started in 2017. I just taught using the textbook, and we had to study and learn on our own how to teach the ASK students.*" G2's experience was not unique; this sentiment was echoed by Informant G1, who reflected on the minimal institutional support provided, saying, "...*we were ready, but in terms of knowledge, teachers were only given a little exposure, so teachers had to dissect on their own, explore what was in the textbook*." G1 elaborated that, rather than receiving structured training, teachers were left to explore and interpret the new content independently. Both informants highlighted a reliance on self-directed learning and expressed the challenge of mastering and delivering complex content without proper training or resources. This lack of structured guidance suggests that teachers were expected to adapt to the new curriculum without adequate institutional support, placing additional strain on their professional capacity to teach computational thinking concepts effectively.

The data illustrates a critical gap in the support provided to teachers as they transitioned to the new computational thinking curriculum. G1 and G2's accounts highlight a reliance on self-directed learning due to insufficient training, impacting their teaching effectiveness. This discovery is congruent with Mansor and Mohd Yassin's (2019) study, which found that poor training can limit successful teaching, especially when new curricula are presented without sufficient preparation resources. Moreover, Chookhampaeng et al. (2023) and Hobbs and Porsch (2021) emphasizes that targeted professional development is essential for enhancing teacher competence, mainly when the subject matter is complex and requires specialized knowledge. The findings from G1 and G2 indicate an urgent need for formal training programs that equip teachers (Ahmed et al., 2021) with the theoretical and practical knowledge necessary to teach computational thinking effectively. Such programs would reduce the load of self-directed learning while also ensuring that teachers are adequately equipped to deliver the material in a way that encourages student understanding and participation.

The evidence underscores the pressing need for comprehensive professional development programs tailored to computational thinking. Addressing this gap would enhance teachers' preparedness and improve the overall instruction quality, creating a more supportive learning environment for students. Aside from the importance of teacher support, the quality and appropriateness of instructional materials, particularly textbooks, has a significant impact on effective computational thinking education.

Theme 2: Textbook Content

Textbook content quality refers to the appropriateness, clarity, and accessibility of instructional materials for students. This theme focuses on whether the textbook content meets students' developmental and learning needs.

Participants highlighted significant concerns about the complexity of the textbook content, noting that it needed to be more advanced for students. Informant G3 described this challenge by saying, "*Actually, this subject seems very advanced in its syllabus. I used to learn it during my diploma, but now it is taught in secondary school. All the topics in Form One are hard for students to grasp*." This perception was reinforced by Informant G1, who specifically pointed out difficulties students faced with Chapter 1, stating, "*...the topic that is most difficult for students to master is Chapter 1, Basic Concepts of Computational Thinking, because the examples given in the textbook are too advanced and hard to understand, needing multiple readings."* Teachers reported that these complicated examples made comprehension challenging, especially for students with lower competence levels, forcing them to supplement the textbook with extra resources.

The statistics show discrepancies between the textbook's content complexity and the student's learning capacity. Teachers noted that the examples in the textbook were not adequately accessible, compelling them to seek or create supplementary resources to aid student understanding. This finding aligns with research by Rusek and Vosyková (2021)those who argue that overly complex instructional materials can hinder student learning, especially for those with less experience or lower proficiency in the subject. The insights from G1 and G3 suggest a need for a more accessible and developmentally appropriate module that includes relatable examples and simplified explanations to support student comprehension.

Educators can close the learning gap by personalising content to each student's developmental level, making computational thinking concepts more accessible and enjoyable for all. While the content of the textbooks presented challenges, teachers also reported a lack of additional resources necessary to support comprehensive instruction in computational thinking.

Theme 3: Limitations of Teaching and Learning Resources

Resource limitations refer to the inadequacy of supplementary materials, such as reference books, practice exercises, and other teaching aids, which support the effective delivery of computational thinking instruction.

Teachers highlighted the lack of supplementary resources as a significant barrier to effective teaching. Informant G1 mentioned, "*...there are no additional materials provided by KPM to support teacher instruction and student learning, only the textbooks. Teaching aids are insufficient...*" Echoing this sentiment, Informant G2 emphasized the need for a structured module, saying, *"...there needs to be a module as well because the textbooks are too advanced for students to understand. The module should include notes and examples, explaining concepts and solutions, and activities..*." This lack of additional resources left teachers without the tools to fully support their students, requiring them to adapt and find resources independently.

The data suggests that the absence of structured supplementary resources places undue pressure on teachers to find or create materials to support student learning independently. This reliance on textbooks alone does not address the diverse needs of students, particularly those who require varied and interactive approaches to grasp computational thinking concepts. The need for additional resources is supported by studies from Cornejo (2022) and Mohamad and Karim (2023), who highlight that diverse, accessible materials enhance student engagement and comprehension. The data points to a need for a well-designed module that includes structured notes, relevant examples, and practice exercises to help bridge the gap left by limited resources, ultimately aiding teachers and promoting a more inclusive learning environment. In addition to the resource limitations, teachers highlighted the potential of integrating technology further to enhance engagement and accessibility in computational thinking instruction.

Theme 4: Use of Technology in Teaching and Learning

The use of technology in this context refers to incorporating digital tools and platforms into teaching practices to improve student engagement and comprehension in computational thinking.

Participants strongly supported integrating technology to make computational thinking more accessible and engaging. Informant G1 suggested that *"... there needs to be the use of technology in teaching and learning besides printed modules,"* while Informant G2 proposed a dual approach, stating, *"... it is better to have two methods, namely printed modules and technology-based modules in the form of applications."* Informant G3 also emphasized the relevance of interactive technology in assisting comprehension, stating that pupils benefit from technology-driven tools that make abstract concepts concrete.

The data illustrates that integrating technology into computational thinking instruction can create a more dynamic and interactive learning environment. Teachers believe technology offers a valuable complement to traditional printed materials by providing interactive tools that cater to diverse learning styles and make complex concepts more accessible. This finding is consistent with research by Omorkulov et al. (2021) and Lin and Chen (2020), who argue that technology integration enhances learning experiences, particularly in complex subjects that benefit from visualization and interaction. Digital resources, such as educational applications and video tutorials, can provide students with multiple representations of abstract concepts, improving engagement and understanding. The insights from G1, G2, and G3 suggest that a technology-enhanced module could help bridge gaps in comprehension, preparing students to engage with computational thinking in a way that aligns with their digital literacy and learning preferences.

These findings highlight four critical areas for improvement in computational thinking instruction: comprehensive teacher training, simplified and relatable textbook content, enhanced teaching resources, and technology integration. Addressing these needs through a well-structured module will improve teachers' ability to effectively teach computational thinking, enhance student comprehension, and better align with contemporary educational standards. Such a module would empower teachers and students to navigate computational thinking concepts confidently, fostering improved learning outcomes and engagement.

Discussion

The findings of this study underscore several key challenges in teaching Basic Computational Thinking for Form One in Malaysian schools. This section explores how these findings align or contrast with existing research, acknowledges study limitations, considers unexpected results, discusses the generalizability of the findings, and highlights the implications for stakeholders.

The findings from this study resonate with previous research on computational thinking and teacher support, highlighting the challenges of introducing a new curriculum without adequate resources and training. Like (Arnaiz-Sánchez et al., 2023), who emphasised that a lack of structured teacher training impedes successful teaching, this study discovered that teachers frequently depended on self-directed learning due to limited institutional support. The finding that textbook content was too advanced for students echoes Rusek and Vosyková's (2021) observations on how overly complex instructional materials can obstruct learning. However, this study contributes a unique perspective by providing insights specific to the Malaysian context, where teachers also face limitations in supplementary resources and technology integration. While previous studies by Omorkulov et al. (2021) and Lin and Chen (2020) have suggested that technology integration can enhance engagement in computational thinking, this study finds that technology is underutilized, indicating a gap in Malaysian schools' capacity to adopt digital tools effectively.

Limitations of the Study

This study was conducted with three experienced teachers from different states, which provides a range of insights but also limits the generalizability of the findings. The sample size was small, and the study focused on Form One teachers in Malaysia, meaning that the findings may not fully represent teachers across different educational levels or regions. Additionally, as the study relied on interviews and observations without a quantitative component, the findings are qualitative and capture perceptions rather than quantifiable outcomes. To address potential biases and limitations, the study employed data triangulation (interviews, observations, and document analysis), which helped improve the credibility of the findings. Future studies could expand the sample size or include teachers from other grade levels to provide a broader perspective on the challenges faced in teaching computational thinking. An unexpected finding in this study was the extent to which teachers obtained their supplementary resources, often at their own expense and without institutional support. Although beneficial for students, this self-directed approach to resource acquisition points to an underlying issue in the education system where teachers are not provided with adequate resources to meet curriculum demands. The initiative teachers demonstrate reflects a commitment to student learning but also highlights a systemic gap in support, which may not have been as prominent in studies from other contexts where institutional support structures are more robust. This finding emphasizes the importance of creating a module that provides comprehensive resources for teachers, reducing their reliance on external materials.

While the findings of this study are specific to the Form One Basic Computational Thinking curriculum in Malaysia, the issues identified may be relevant to other educational contexts facing similar challenges with new curricula and resource constraints. However, as a qualitative study, the intent is not to generalize but to provide an in-depth exploration of specific challenges. The results are thus most applicable to educators, policymakers, and researchers involved in similar curricular contexts. Other settings with different educational structures or levels of institutional support may not experience these issues the same way.

The implications of this study are significant for various stakeholders. For educators, the findings underscore the need for comprehensive modules that include teaching strategies, clear examples, and structured assessments tailored to different student proficiency levels. Administrators and policymakers should recognize the importance of adequate training and resources, as unsupported curricular changes can burden teachers and negatively impact learning outcomes. Integrating technology is essential not only for student engagement but also for aligning with the needs of today's digitally literate students. Future research could explore ways to systematically implement these modules and measure their impact on teaching effectiveness and student outcomes, particularly in Science, Technology, Engineering, and Mathematics (STEM) subjects.

Implications of the Findings

The findings from the needs analysis highlight the necessity of developing a comprehensive module for the Basic Concepts of Computational Thinking in Form One Basic Science Computer subjects. The module should address teachers' issues, ensuring that it is clear, meets the target audience's needs, and alleviates teaching and learning challenges. Below is a summary of the critical implications and recommendations drawn from the needs analysis phase (Table 1).

Lack of Teacher Training and Support

Teachers reported inadequate exposure to Basic Science Computer subject content and a need for more guidance for effective instruction. A module that includes content notes, teaching strategies, classroom activities, and assessment tools should be developed to address this. This will equip teachers with practical methods for implementing computational thinking in the classroom.

Complexity of Textbook Content

The textbook content was found to be too advanced, particularly for students at intermediate and lower levels, due to complex language and limited, confusing examples. The proposed module should use accessible language and provide simplified, relatable examples suitable for varying student abilities. This approach would ensure teachers and students find the content understandable and relevant.

Lack of Supplementary Teaching and Learning Materials

The absence of supplementary materials complicates teaching and learning in the classroom. Creating a thorough module with structured notes, examples, and exercises would give teachers with valuable tools and eliminate the need for them to seek out supplemental information on their own.

Technology Integration

The findings suggest a need for incorporating technology into the module, providing teachers and students with an engaging, varied learning experience. Technology-enhanced learning resources such as interactive applications and digital simulations could support diverse learning styles and make abstract concepts more accessible.

Table 1
Recommendations Based on Findings from the Needs Analysis

Item	Findings from Respondents	Recommendations
1	Lack of exposure, guidance, and methods for teaching the ASK subject	Develop a comprehensive module with notes, teaching strategies, activities, and assessments.
2	Textbook content is too advanced, with high-level language, limited and confusing examples	Create a module with simplified language suitable for all teachers and students based on their ability and include easy-to-understand examples.
3	Lack of teaching and learning materials	Develop a module for instructors and students to improve classroom teaching and learning.
4	Technology resources	Teachers and students benefit from a diverse educational experience when technology is included into the program.

The development of the Basic Computational Thinking (B-CompThink) module, which integrates technology, is based on the findings of the identified needs analysis. The module will feature notes, teaching strategies, activities, and evaluations to help teachers learn and utilize computational thinking concepts in the classroom. Additionally, the module will feature accessible language and relevant examples tailored to diverse student abilities, addressing textbook limitations by providing supplementary resources. Finally, a technology-integrated approach will offer teachers a varied teaching experience and enhance students' engagement and comprehension in computational thinking.

Conclusion

This study identified key challenges and needs in teaching Basic Computational Thinking concepts for form one students in Malaysia. The findings revealed that teachers lack sufficient training and guidance, relying heavily on self-directed learning to understand and deliver the curriculum effectively. Additionally, the content in existing textbooks was found to be too advanced for students, with complex examples and high-level language that hinder comprehension. Teachers also face a shortage of supplementary teaching and learning materials, which forces them to seek or create additional resources independently. Furthermore, limited integration of technology in teaching computational thinking reduces opportunities for interactive and engaging learning experiences.

To address these challenges, the *B-CompThink* module has been developed as a targeted intervention. This module provides simplified and structured teaching materials with accessible language and relatable examples tailored to students' varying abilities. It also includes comprehensive teaching strategies, classroom activities and assessment tools to enhance teacher competence and improve instructional delivery. Additionally, the module integrates technology to create engaging and interactive learning experiences, aligning with modern educational needs and students' digital literacy.

The implications of this study highlight the importance of systematic teacher training, accessible teaching resources and technology integration to support the successful implementation of computational thinking in classrooms. The B-CompThink module not only addresses these gaps but also has the potential to be adapted for use across other STEM-related subjects. Future research should focus on evaluating the module's effectiveness on a broader scale and examining its long-term impact on teaching practices and student learning outcomes in computational thinking.

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