APPLIED INFORMATION TECHNOLOGY AND COMPUTER SCIENCE
e-ISSN: 2773-5141

AITCS

Vol. 6 No. 2 (2025) 2092-2111
https://publisher.uthm.edu.my/periodicals/index.php/aitcs

Development of Mobile Learning Application for Science in Children's Daily Lives

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DOI: https://doi.org/10.30880/aitcs.2025.06.02.111

Article Info

Received: 21 July 2025
Accepted: 18 November 2025
Available online: 30 November 2025

Keywords

Science, Mobile Learning, Children, Daily life science concepts

Abstract

Science is an important subject that helps children become curious, think critically, and understand how the world works. Learning science at an early age builds a strong foundation and encourages kids to ask questions about everyday things. However, existing science learning apps often rely heavily on text or simple visuals and are mostly in English making them less suitable for children who prefer learning in Malay. To address these gaps, mobile learning application called *Celik Sains* was developed to help children explore and learn science in their daily lives. The target users for this project are children aged 7 to 12 years old. The Multimedia Mobile Content Development (MMCD) approach is used to develop the Celik Sains application. The usabilty testing has resulted in an average 81.83 which is within the range of "Acceptable" in the Acceptability Ranges Score Scale, graded "B" on the Grade Scale, and rated "Excellent" based on the System Usability Scale (SUS).

1. Introduction

Science is a way for us to understand the world around us through observation, experimentation, and learning how things work. For children, this is an important process, as science helps them develop curiosity and critical thinking. Children naturally want to explore the world, and early exposure to science gives them the chance to learn about their surroundings and understand the cause and effect of everyday phenomena [1]. This early exposure to science builds a strong foundation for future learning and encourages them to explore and ask more questions. Science-related subjects are frequently the focus of children's basic interest [2]. They frequently ask questions about the world, like how things happen and why certain things work the way they do [3]. For example, they may wonder why it rains, how bubbles form, or how fish breathe. These simple questions are their way of trying to understand the world around them.

In today's digital age, the application of technology in education provides a new shift in education. It is also one of the factors that support learning activities and can deliver effective learning to children. The transformation in the education system caused by this technology provides fun learning and can improve the learning process and improve children's understanding. Self-learning through phone devices encourages children's creativity. Accordingly, it is important to use alternative methods that are more creative and fun such as learning games that are included in mobile learning applications. However, while several mobile learning applications focused on science for children have been developed, they have their own limitations when it comes to providing a well-rounded and interactive science learning experience for children.

Therefore, this project aims to design and develop a user friendly mobile learning application, *called Celik Sains* on Android platform, and evaluate the usability and user acceptance of the developed application. The developed application was designed for children aged 7 to 12 to explore and understand basic scientific concepts. *Celik Sains* application has three modules: *Teroka dunia sains*, *Aktiviti* and *Kuiz*. The content of this application is delivered in Bahasa Malaysia. The development of *Celik Sains* follows the Multimedia Mobile Content Development (MMCD) model [4]. *Celik Sains* application uses animated videos to show real-life science concepts, making it easier for kids to understand how things work in their everyday environment. Children can become more interested in studying and spark their innate curiosity by recognising how science relates to their everyday life.

The rest of the paper is arranged as follows: Section 2 covers the domain of study, the technology used and the results of the comparative analysis. Section 3 describes the Multimedia Mobile Content Development (MMCD) methodology that has been chosen for this project with the output of the analysis and design phases of this project. Additionally, the result and discussion are covered in Section 4 and the conclusion of the current progress is stated in Section 5.

2. Related Work

This section discusses the background of the study, the technology used, and the result of the comparative analysis.

2.1 Science Education for Primary School Children

Science education for children plays a crucial role in helping young children develop skills to think in an organized, critical, and logical way [5]. At this stage, children are introduced to basic science concepts that not only spark curiosity but also lay the foundation for their understanding of the world. Early science exposure helps children develop their problem-solving abilities, use scientific information in everyday situations, and develop a realistic perspective on the world, all of which contribute to cognitive development [6]. Teaching methods and what they are taught during this time are very important because they can affect how well children learn and develop later in life. Research indicates that children exposed to science at a young age are more likely to perform well in STEM (Science, Technology, Engineering, and Mathematics) fields later in life [7]. Through the integration of these four fields, STEM is an interdisciplinary approach to education that fosters practical learning and problem-solving abilities. Teaching kids' science concepts fosters their curiosity and help 5them develop cognitive skills that are essential to STEM fields, such as pattern recognition, logical reasoning, and problem-solving [8]. Therefore, science education for primary school children is essential for laying the foundation of critical thinking, problem-solving, and cognitive skills. It not only ignites curiosity but also prepares children for future success in STEM fields, fostering a lifelong love for learning and equipping them with the tools needed to navigate and thrive in an increasingly complex and technological world.

2.2 Mobile Learning Application

An application is defined as performing something in a practical or hands-on way [9]. In the context of information technology, an application refers to a computer program designed to carry out specific tasks or activities. Learning, on the other hand, is the process of gaining knowledge, while "mobile" refers to something that can be carried or moved from one place to another. It complements the traditional classroom with one that is more interactive and engaging [10]. A mobile learning application is a modern and flexible way to study using devices like smartphones and tablets, allowing users to access educational content virtually anytime and anywhere. These apps are not restricted by fixed schedules, making them highly convenient for individuals with busy routines or children who prefer learning at their own pace. By offering interactive and engaging content, mobile learning applications provide a fun and practical alternative to traditional learning methods. Parents can use these tools to support their children's education at home, helping them explore a wide range of topics, develop new skills, and gain valuable knowledge in an enjoyable way. These apps also make it possible for children to turn their free time into productive learning experiences and promoting curiosity.

2.3 Comparative Analysis

Comparative analyses were conducted on three related applications to the developed application. The three applications are Play and Learn Science [11], Basic Science Primary [12] and STEM Buddies: Science for Kids [13], as shown in Fig. 1(a), (b) and (c). Table 1 shows the result of the comparative analysis.

The discussion is based on ten different features of the application. The first feature that is being discussed is the language used, followed by the platform used, content, module, syllabus, animation, Activity module, user

interface design, strength and limitation. In comparison, *Celik Sains* uses interactive 2D animations that are triggered through exploration in a 3D environment, providing a more immersive and engaging way for children to learn science concepts. Unlike other applications that rely only on 2D animations or static text-based content, Celik Sains combines gameplay with learning, allowing children to actively discover and interact with science topics. *Celik Sains* uniquely delivers its content in Bahasa Malaysia, making it more accessible and relatable for local primary school students.

(a)

(c)

(b)

Fig. 1 (a) *Play and Learn Science* [11]; (b) *Basic Science Primary* [12]; (c) *STEM Buddies: Science for Kids* [13]

Table 1 *Applications Comparison*

Features/ Applications	Play and Learn Science	Basic Science Primary	STEM Buddies: Science for Kids	*Celik Sains*
Language	English	English	English	Bahasa Malaysia
Platform used	Android, IOS	Android	Android, IOS	Android
Content	Interactive games focusing on real-world science topics like weather, water, light, and motion.	Interactive games focusing on real-world science topics like weather, water, light, and motion.	Animated storytelling, science videos, and quizzes for 7 STEM topics like gravity, water cycle, and sound.	Interactive 3D and 2D science modules with everyday life topics and activities.
Module	Multiple mini games	Learning, quizzes, and simple activities	Animated episodes grouped by STEM themes and quiz.	*Teroka Dunia Sains, Aktiviti* and *Kuiz*
Syllabus	General STEM	Aligned with school syllabus	General STEM	Primary school syllabus (Year 4)
Animation	2D animations for scientific experiments	Not provided	2D animated videos for concepts like gravity	2D animations for video explanations.

Table 1: (*Cont)*

Activity module	Yes (puzzles, matching)	Not provided	Yes (quizzes, colouring sheets)	Yes (Activities and quizzes about science)
User interface design	Colourful, child-friendly interface, with easy navigation for young learners.	Simple interface with text and images only	Vibrant and interactive, with animated characters guiding the user.	Colourful, child-friendly interface, with easy navigation for young learners.
Strength	Engaging content with interactive learning, encourages parent involvement.	Easy-to-use notes for teachers, aligned to school syllabus.	Certified quality education, focuses on creativity and storytelling.	Uses 2D animations for explanations
Limitations	Limited to predefined games and activities	Lacks interactive and practical modules	Requires active parental guidance for younger kids	Might not cover all science topics

3. Methodology

The Multimedia Mobile Content Development (MMCD) was chosen for this project because it is specifically designed for projects that involved multimedia elements [4]. MMCD provided a structured framework that facilitated the integration of various multimedia components such as graphics, animations and interactivity, which are essential for creating engaging and effective learning experiences. The MMCD methodology, it contains five main phases: application idea creation stage, structure analysis stage, process design stage, main function development stage, and testing stage.

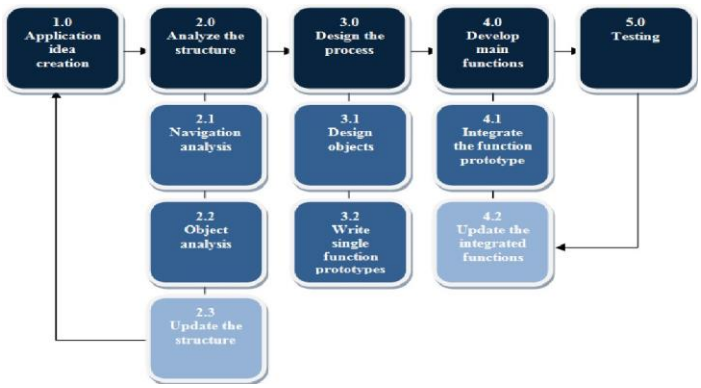


Fig.2 *MMCD Methodology [4]*

3.1 Application Idea Creation

The first stage of MMCD methodology is the application idea creation stage. During this phase, several information for the content requirements, interview questions were prepared, and a session was held with Subject Matter Expert (SME) to identify the appropriate and accurate content to be included in the application. An interview session has been conducted with Mrs. Sapinas binti Che Mat, who is teaching Science at Sekolah Kebangsaan Pintas Puding. As a result, an application idea check list has been created in Table2. Table 3 shows the user analysis extracted from an interview with SME. Meanwhile, Table 9 in Appendix A shows the interview transcribed with SME

Table 2 *Application Idea Creation Check List*

Item	Note
Type of application	Mobile Learning application
Target device	Tablet
Target users	Children aged 7-12
FPS and application settings	• Unity Engine 6000.0.25f1 • FPS:30 • Minimum API Level: Android 7.0 (API Level 24)
GUI	Background for each module
Video	Short animations for science concepts
Audio	Voice over narrations for instructions and learning video
Application synopsis	*Celik Sains* is a mobile learning application developed to teach children science topics through an immersive 3D environment, interactive 2D animations video, and engaging activities. The application allows students to explore real-life science concepts by guiding a 3D character within themed environments. As users interact with objects such as books, educational animations are triggered, providing visual explanations of each topic. In addition to exploration, *Celik Sains* includes interactive quizzes and drag-and-drop activities that reinforce understanding and encourage active learning.

Table 3 *User requirement analysis*

Stakeholder category	Role in product	Design implication	Action needed
SME Mrs. Sapinas binti Che Mat	Science teacher	User-friendly interface	The design of the user interface such as color should be suitable for kids and consistent with clearly labelled buttons
		Provide content in Bahasa Malaysia	The application should in Bahasa follow the science words that have been set in the learning syllabus
		Multimedia content	Put audio, music background, images and animations.
		Content, based on primary school syllabus	Follow the KSSR syllabus. The content must use Year 4 textbook.

3.2 Structure Analysis Stage

The second phase of MMCD methodology is the structure analysis stage. A content structure checklist will be created to keep track of various elements and ensure nothing overlooked during the development process, as shown in Table 4. Meanwhile, Table 5 and Table 6 show the Functional and non-functional requirements of the developed application. The user flow and navigation structure are shown in Appendix B to G.

Table 4 *Content Structure Check List*

Item	Note
Layer design	Layer 3: C# Scripting in Unity Layer 2: Content Layer 1: Background images
Frame design	Frame 1: Homepage interface Frame 2: Main menu module selection Frame 3: *Teroka Dunia Sains* module Frame 4: *Aktiviti* module Frame 5: K*uiz* module
Menu and Navigation	• Start button • Back button • Next button • Sound button • Information button • Exit button • Module button • Submodule button • Close button • Character movement button • Play button • Pause button
Number of Main GUI	Application logo
Images	Background images
Video	Short animations for explaining science concepts.
Audio	Voice-over narrations for instructions and explanations.
3D	3D objects for environment
2D	2D animation for video
ActionScript Draft	• Stop(); in each frame • Interaction button to trigger scenes

Table 5 *Functional requirements*

Functional requirements	Module	Descriptions
User interaction	Main Menu	The application should allow users to select the *Teroka Dunia Sains* Module, Activity Module and Quiz Module.
	Teroka Dunia Sains	• The application allows users to explore a 3D environment in the *Teroka Dunia Sains* module. In this environment, children must find a book. Once they find the book, they can press the 'Read Book' button to watch a 2D animation video related to the topic. • The application should allow users to move the 3D character toward the arrow using a touch joystick interface. • The application should allow users to play, pause, and replay a 2D animation video that explains the science topic when the 3D character reaches the book.
	Aktiviti	The application should allow users to select 5 topics activity they want.
	Kuiz	• The application should allow users to select one topic from 5 quiz topics. • The application should allow users to answer all the questions. If the answer is correct, user will earn 1 star and can proceed to the next question. If the answer is incorrect, user must retry the same question. • The application should allow user to select one of the 3 answer options provided.
Autonomous system activities	Main Menu	The application should play background music as soon as the user enters the application.
	Teroka Dunia Sains Module	The application should play the 2D animation video smoothly.
	Aktiviti Module	The applications should display instructions for users on how to proceed with the activity
	Kuiz Module	• The application should record the time taken by the user to answer the questions. • The application should display 5 questions each topic.

Table 6 *Non-functional requirements*

Non-functional requirements	Descriptions
Performance	The application shall run smoothly and fast without lagging or crashing on user's mobile devices to allow users to complete tasks effectively and efficiently.
Availability	The application and its data should be able accessed without the internet.
Ease of Use	The developer shall provide an application that is easy to navigate.
Language	The application should be displayed in Bahasa Malaysia.

3.3 Process Design Stage

The third stage of the MMCD methodology is the process design stage. It focuses on preparing all the components planned in the second phase of the MMCD methodology. This section contains the design objects and the single-function prototype scripting subphases. The prototype for the module will be completed at the end of this process. Authoring tools like Canva and Vyond are used to create the contents of the application and the storyboard. The design of the interfaces for the developed application, *Celik Sains* attached in Appendix H. Unity software is used to compile the assets with scripting. Table 7 shows each of the button design that are planned to be utilised for this application.

Table 7 *Button design*

Buttons	Description	Buttons	Description
	This is a home button.		This is labelled button in *Manusia* topic activity.
	This is a back button.		This is labelled button in *Manusia* topic activity.
	This is a next button.		This is labelled button in *Manusia* topic activity.
	This is a sound button.		This is labelled button in *Kemahiran Saintifik* topic activity.
	This is an exit button.		This is labelled button in *Kemahiran Saintifik* topic activity.

Table 7: (*Cont*)

	This is a close button.		This is labelled button in *Kemahiran Saintifik* topic activity.
	This is a play button.		This is labelled button in *Kemahiran Saintifik* topic activity.
	This is a forward and backward button.		This is labelled button in *Teroka Dunia Sains* module.
	This is a replay button.		This is labelled buttons for the *Teroka Dunia Sains* module.
	This is a pause button.		This is buttons allows the user to make the character jump.

3.4 Main Function Development Stage

At this phase, the main function of *Celik Sains* application was developed. The integration of C# script of the application improved throughout the development phase until all the methods were integrated perfectly as shown in Table 9.

Table 8 *Development of assets*

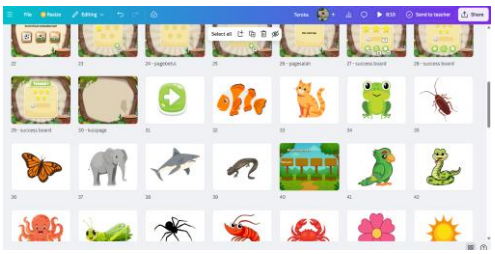
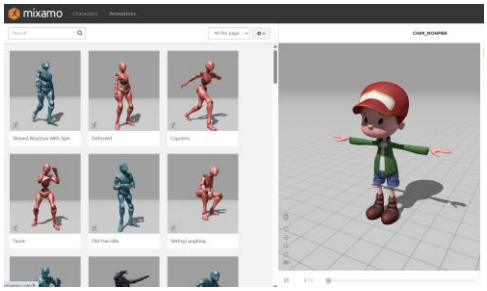
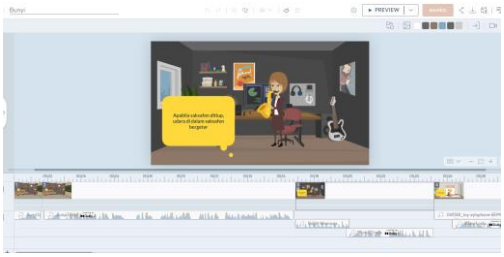
Assets	Development	Description
Graphics		CanvaPro platforms are utilised to design the elements inside them. Then the designs are exported without background for further use in unity
3D Character		Blender was utilized to model the 3D character, providing a custom design that fits the visual style of the application.

Table 8: *(Cont)*

3D Animations		Mixamo was utilized to rig and animate the 3D character, providing movement animations such as idle, walking, and jumping, which were later implemented in Unity for smooth character motion.
2D Animations		Vyond was utilized to develop 2D educational animation videos based on the 10 science topics from the Year 4 syllabus

This stage involves developing the assets for the application such as graphics, 3D character, 3D animation and 2D animation as shown in Table 8. In addition, functional scripts are integrated into *Celik Sains* application to ensure all the buttons perform as designed and every gameplay is functioning as expected. Table 9 shows the code segment of scripts.

Table 9 *Integration in Unity with Scripting*

Functions	Code Segment	Description

Move player based on joystick input	`float horizontal = joystick.Horizontal;`
	`float vertical = joystick.Vertical;`
	`Vector3 move = camForward * vertical + camRight * horizontal;`
		Read input from the Fixed Joystick to move the player based on camera direction. Normalize movement and apply to character controller.

Smoothly follow and look at the player	`Vector3 desiredPosition = target.position + offset;`
	`Vector3 smoothedPosition = Vector3.Lerp(transform.position, desiredPosition, smoothSpeed);`
	`transform.position = smoothedPosition;`
	`transform.LookAt(target);`
		Make the camera follow the target (player) smoothly with an offset and always look at the target. Uses Lerp for smooth movement.

Trigger book reading UI and set video	`if (other.CompareTag("Player")) {`
	`bacaBukuButton.SetActive(true);`
	`videoController.clipToPlay = videoClipForThisBook;`
	`videoController.currentBookIndex = bookIndexInUI;`
	`}`
		When the player enters the trigger zone, show the "Read Book" button and assign the correct video and book index to the video controller.

Mark book as complete after video ends	`private void OnVideoFinished(VideoPlayer vp) {`
	`canvasVideo.SetActive(false);`
	`MissionUIManager.Instance.CompleteBook(currentBookIndex);`
	`}`
		Triggered when the video finishes playing. It hides the video panel and marks the current book as completed in the mission UI system.

Table 9: *(Cont)*

Exit the application	`public void ExitApplication() { Debug.Log("Keluar aplikasi..."); Application.Quit(); #if UNITY_EDITOR UnityEditor.EditorApplication.isPlaying = false; #endif }`	Exits the application when running on a device. If running in the Unity Editor, it stops play mode for testing purposes.
Handle drag-and-drop category checking	`public void OnDrop(PointerEventData eventData) { if (dropped.tag == acceptedTag) { dropped.transform.SetParent(this.transform); PlayCorrect(); } else { SetOutlineColor(Color.red); PlayWrong(); ResetToOriginalPosition(); } }`	Called when an object is dropped on this zone. If the dropped object's tag matches the expected tag, it's accepted and turns green. Otherwise, it's rejected and reset.
Check if the answer is correct	`public void OnAnswerSelected(bool isCorrect) { if (isCorrect) { ShowBetulPanel(); } else { ShowSalahPanel(); } }`	Call when an answer is selected. If correct, shows the correct panel and plays a correct sound.
Show final results and time taken	`void ShowFinalPanel() { StopTimer(); DisplayTimeInTahniahPanel(); tahniahPanel.SetActive(true); AudioManager.instance.PlayYeaySound(); }`	When the last question is answered, this function stops the timer, displays the final time, activates the congrats panel, and plays a celebratory sound.
Pause or resume background music based on scene	`void OnSceneLoaded(Scene scene, LoadSceneMode mode) { foreach (string sceneName in scenesToPause) { if (scene.name == sceneName) shouldPause = true; } if (shouldPause) musicSource.Pause(); else musicSource.UnPause(); }`	When a new scene is loaded, this function checks if the scene name is in the list. If yes, it pauses the music; otherwise, it resumes the music.

3.5 Testing Stage

Testing is the final stage of the MMCD model, and this phase will be conducted when the application is fully completed. It will involves both alpha and beta testing to ensure the application is functional, user-friendly, and as error-free as possible before its official release. The alpha testing includes functional testing conducted throughout the development. Once bugs are discovered in this phase, the project will return to the previous phase to modify and update the integrated functions to solve bugs. The result of functional testing is tabulated in Table 10. For beta testing, which involved usability testing, so respondent answered the questionnaire. The questionnaire uses the System Usability Scale (SUS), which includes ten questions rated on a five point scale to access how users feel about the usability of the application [14]. The beta testing was conducted at Sekolah Kebangsaan Pintas Raya, Parit Raja.

Table 10 *Functional Testing*

Test	Expected Result	Actual Result	Corrective Action
Home Button	Navigate to the Main Menu interface	Work well as planned	Not required

Table 10: *(Cont)*

Start Button	Sart the *Teroka Dunia Sains* module	Work well as planned	Not required
Exit Button	Exit the application	Work well as planned	Not required
Sound Button	Mute or unmute the background sound	Work well as planned	Not required
Jump Button	Allow the user to make the character jump.	Work well as planned	Not required
Play Button	Play the video in *Teroka Dunia Sains* module	Work well as planned	Not required
Pause Button	Pause the video in *Teroka Dunia Sains* module	Work well as planned	Not required
Next Button	Navigate to the next interface	Work well as planned	Not required
Back Button	Navigate to the previous interface	Work well as planned	Not required
Replay and Retry Button	Replay video or retry the quiz question	Work well as planned	Not required
Teroka Dunia Sains Module Button	Navigate to the 3D environment	Work well as planned	Not required
Activity Module Button	Navigate to the activity module	Work well as planned	Not required
Quiz Module Button	Navigate to the quiz module	Work well as planned	Not required
Release Button	Release the car in activity module	Work well as planned	Not required
Scared Button	Change the character situation to scared	Work well as planned	Not required
Run Button	Change the character situation to run	Work well as planned	Not required
Idle Button	Change the character situation to idle	Work well as planned	Not required
Drag and Drop	All the drag-and-drop interactions run smoothly	Work well as planned	Not required

4. Results and Discussion

The result of alpha testing indicates that all the buttons as well as the modules' performance are functioning well as expected. The result of the beta testing is shown in Fig. 3 and 4 and the outcomes are analyzed.

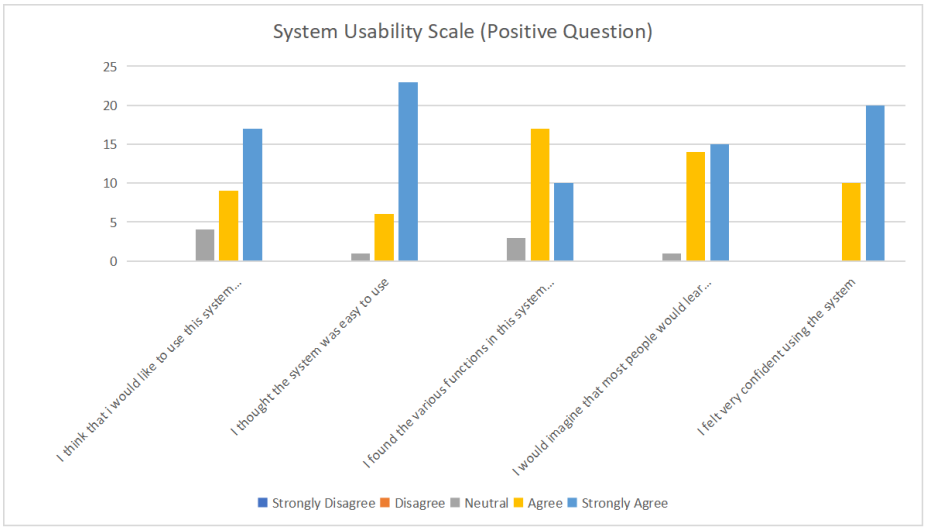


Fig.3 *SUS Positive Question Result*

Based on Fig. 3, almost all respondents gave a score of 3 and above, for the positive items in System Usability Scale (SUS), indicating a highly favorable user experience. The positive items included statements such as: "I would like to use this system frequently," "The system is easy to use," "The functions are well integrated," and "I feel confident using the system." The majority of participants selected “Agree” or “Strongly Agree” for all items, with the highest number of positive responses recorded for the statement about feature integration. This suggests that users found the system intuitive, well-designed, and reliable. The strong positive responses across these questions reflect high levels of satisfaction, confidence, and user acceptance towards the developed application.

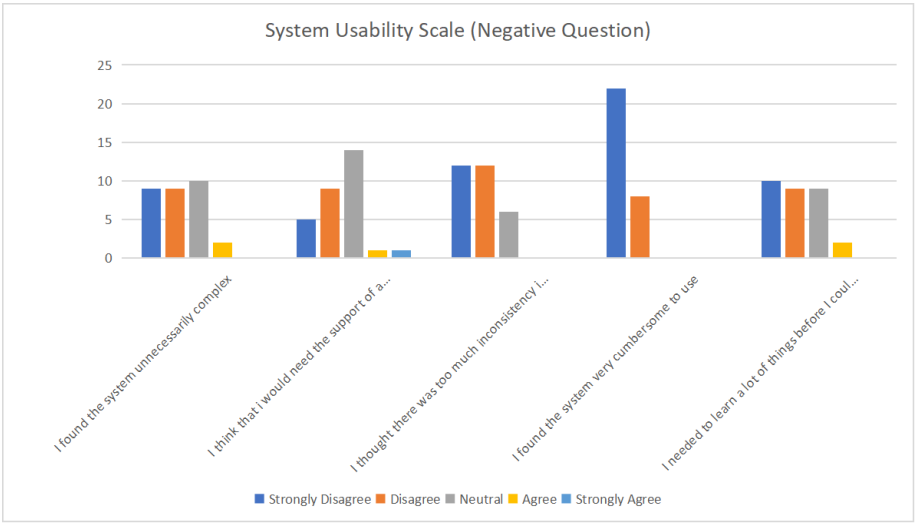


Fig.4 *SUS Negative Question Result*

Based on Fig. 4, all respondents gave consistently low scores for the negative SUS items, which included statements like: "The system is unnecessarily complex," "I would need technical support to use this system," "The system is inconsistent," and "The system is cumbersome to use." Most responses were “Disagree” or “Strongly Disagree,” with the strongest disagreement seen for the statement about requiring technical support, indicating that users felt capable of using the system independently. These low scores suggest minimal usability issues. Overall, the system is perceived as straightforward, coherent, and user-friendly, as reflected in the overwhelmingly negative (disagreeing) responses to the negatively worded questions.

Responden	Skor Item										Odd	Even	Total Scor
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
R01	5	4	3	3	4	2	4	2	5	3	16	11	67.5
R02	5	2	5	3	5	2	4	2	5	3	19	13	80
R03	5	2	5	3	5	2	4	2	5	1	19	15	85
R04	4	3	5	3	4	1	4	2	5	1	17	15	80
R05	4	4	5	2	5	1	4	1	5	4	18	13	77.5
R06	3	3	5	3	3	1	5	1	5	1	16	16	80
R07	5	1	5	1	5	2	4	1	5	4	19	16	87.5
R08	4	1	5	3	5	1	5	1	5	1	19	18	92.5
R09	5	1	5	3	5	1	5	1	5	1	20	18	95
R10	5	2	4	3	4	1	4	2	4	2	16	15	77.5
R11	5	3	5	2	4	1	5	1	5	3	19	15	85
R12	5	1	4	3	4	1	5	1	5	2	18	17	87.5
R13	4	2	5	4	3	3	5	1	5	1	17	14	77.5
R14	5	1	5	3	5	1	5	1	5	2	20	17	92.5
R15	4	3	5	3	5	2	3	1	5	1	17	15	80
R16	4	1	5	3	5	2	5	1	5	3	19	15	85
R17	4	2	5	1	4	1	5	1	5	1	18	19	92.5
R18	3	1	4	1	4	1	5	1	5	1	16	20	90
R19	3	2	4	3	4	2	4	2	4	2	14	14	70
R20	5	3	4	2	4	3	5	2	4	2	17	13	75
R21	5	3	5	2	4	3	4	1	4	3	17	13	75
R22	5	3	5	2	4	3	5	1	4	3	18	13	77.5
R23	5	2	4	1	5	3	5	1	4	3	18	15	82.5
R24	5	1	5	3	4	3	4	1	4	3	17	14	77.5
R25	5	2	5	2	3	2	5	1	5	3	18	15	82.5
R26	5	1	5	2	4	2	4	1	5	2	18	17	87.5
R27	4	3	5	1	4	2	4	1	4	1	16	17	82.5
R28	3	3	5	2	4	2	4	1	4	2	15	15	75
R29	5	3	5	2	4	2	4	2	4	2	17	14	77.5
R30	4	2	5	5	4	1	5	1	5	2	18	14	80
													81.83

Fig.5 *Respondent's Score*

The formula used to obtain usability results based on the SUS is:

Total score = (odd items + even items) x 2.5

$$\text{Average score} = \frac{\text{Total score}}{\text{Total respondents}}$$

Where:

Odd items (Q1, Q3, Q5, Q7, Q9) = contribution – 1
Even items (Q2, Q4, Q6, Q8, Q10) = 5 – contribution

Fig.6 *Formula to calculate the SUS scores [14]*

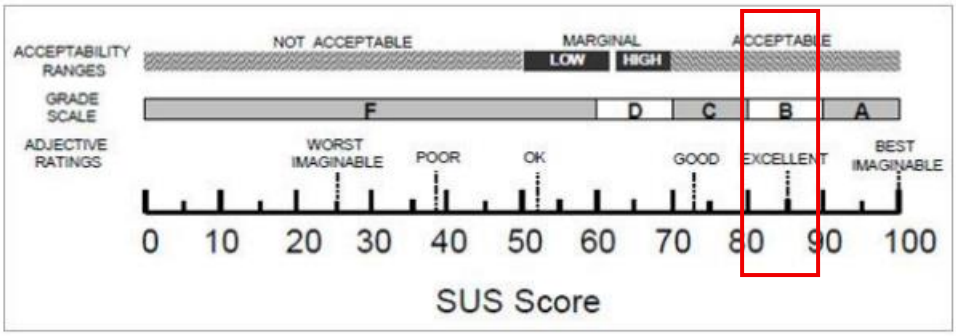


Fig.7 *Grade rankings of SUS scores [14]*

Based on Fig. 5, the total scores for each questionnaire item were calculated by determining the average score using the formula shown in Fig. 6. The resulting average score is 81.83, which falls within the "Acceptable" range on the Acceptability Scale shown in Fig.7. According to the Grade Scale, this corresponds to a grade of "B", with an Adjective Rating of "Excellent". In conclusion, the developed application has successfully met the needs and expectations of its target users.

5. Conclusion

In conclusion, the *Celik Sains* application has successfully developed three main modules, which are *Teroka Dunia Sains* module, *Aktiviti* and *Kuiz*.

All three objectives set for the developed application have been met by designing a user-friendly, with a visually appealing interface and intuitive navigation, making it suitable for children. The design phase in the MMCD methodology consists of the navigational structure, flowchart, storyboard, interface design and button design. Second, *Celik Sains* app was developed with engaging and interactive content including 3D exploration, 2D animated videos, quizzes, and drag-and-drop activities. These modules are aligned with 10 topics from the Year 4 Science textbook. The application was successfully built for the Android platform using the Unity engine and packaged as an APK. The alpha testing was carried out throughout the development phase and the beta testing obtained The SUS score of 81.83 which is "Acceptable"within the range on the Acceptability Scale, grade "B" for the Grade Scale and rated "Excellent".

Overall, Celik Sains stands out for its combination of 3D exploration and interactive 2D animations, making science learning more engaging for primary school students. The application currently features five activity topics and five quiz topics. For future development, it is recommended to expand the activity bank with more science topics, increase the variety of quiz questions, and enhance interactivity within the 3D world to further personalize the learning experience for different learning speeds and styles.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support.

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Nurul Syazwani Ayob, Mohd Farhan Md Fudzee;* ***data collection:*** *Nurul Syazwani Ayob, Mohd Farhan Md Fudzee;* ***analysis and interpretation of results:*** *Nurul Syazwani Ayob, Mohd Farhan Md Fudzee; draft* ***manuscript preparation:*** *Nurul Syazwani Ayob, Mohd Farhan Md Fudzee. All authors reviewed the results and approved the final version of the manuscript.*

References

[1] M. Musa, "Kepentingan Sains Bagi Kanak," SlideShare, [Online]. Available: https://www.scribd.com/doc/77110513/Kepentingan-Sains-Bagi-Kanak. [Accessed: Nov. 5, 2024]

[2] I. Skalstad and E. Munkebye, "How to support young children's interest development during exploratory natural science activities in outdoor environments," Teaching and Teacher Education, vol. 114, p. 103687, Mar. 2022, doi: 10.1016/j.tate.2022.103687.

[3] Paul L Harris and Melissa A Koenig, "Trust in Testimony: How Children Learn About Science and Religion," ResearchGate, [Online]. Available: https://www.researchgate.net/publication/7094106_Trust_in_Testimony_How_Children_Learn_About_Science_and_Religion. [Accessed: Nov. 5, 2024].

[4] S S. S. Salam, M. H. L. Abdullah and W. S. N. S. Saifuddin, "Multimedia Mobile Content Development Framework and Methodology for Developing M-Learning Applications," Journal Technical Education and Training, vol. 4, no. 1, 2012.

[5] Bahagian Pembangunan Kurikulum (2014). Kurikulum Standard SekolahRendahDokumen Standard Kurikulum Dan PentaksiranSains Tahun Lima. Putrajaya: Kementerian Pendidikan Malaysia.

[6] O. Spektor-Levy, Y. K. Baruch, and Z. Mevarech, "Science and Scientific Curiosity in Pre-school—The teacher's point of view," International Journal of Science Education, vol. 35, no. 13, pp. 2226–2253, Nov. 2011, doi: 10.1080/09500693.2011.631608.

[7] STEM Education Resource Center, "STEM in Schools: The Future of Education," Purdue University, 2019. [Online]. Available:

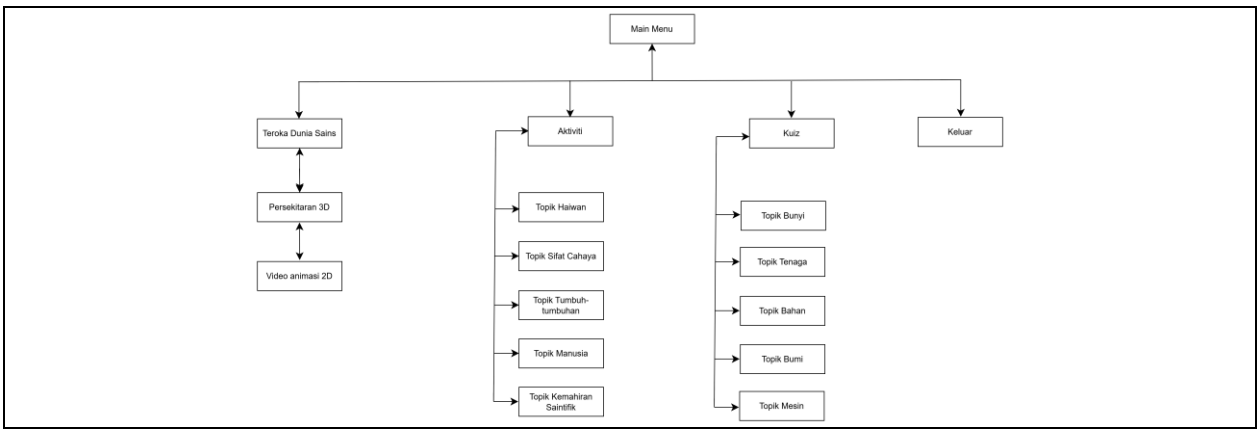
https://gems.education.purdue.edu/wpcontent/uploads/2019/02/STEM_in_Schools_v1-2.pdf. [Accessed: Dec. 30, 2024].
[8] T. Milford and C. Tippett, “The design and validation of an early childhood STEM classroom observational protocol,” Early Childhood Education, vol. 6, no. 1, pp. 24–37, Jan. 2015, doi: 10.4225/03/5817cdcd6b1e8.
[9] Kamus Dewan Edisi Keempat, 4th ed. Kuala Lumpur: Dewan Bahasa dan Pustaka, 2007.
[10] R. Shen, M. Wang, and X. Pan, “Increasing interactivity in blended classrooms through a cutting-edge mobile learning system,” British Journal of Educational Technology, vol. 39, no. 6, pp. 1073–1086, Oct. 2007, doi: 10.1111/j.1467-8535.2007.00778. x.
[11] PBS KIDS, Play and Learn Science. Accessed: Dec. 24, 2024. [Online]. Available: https://play.google.com/store/apps/details?id=org.pbskids.playandlearnscience&hl=en
[12] A. MX, Basic Science Primary. Accessed: Dec. 24, 2024. [Online]. Available:https://play.google.com/store/apps/details?id=com.arnmxaaron.basicscienceprimary&hl=en
[13] STEM Buddies, STEM Buddies: Science for Kids. Accessed: Dec. 24, 2024. [Online].Available:https://play.google.com/store/apps/details?id=com.stem_buddies.ar&hl=en
[14] J. Brooke, "SUS: A quick and dirty usability scale," Usability Eval. Ind., vol. 1, pp. 89-194, 1995.

Appendix A : An Interview transcribed with Subject Matter Expert

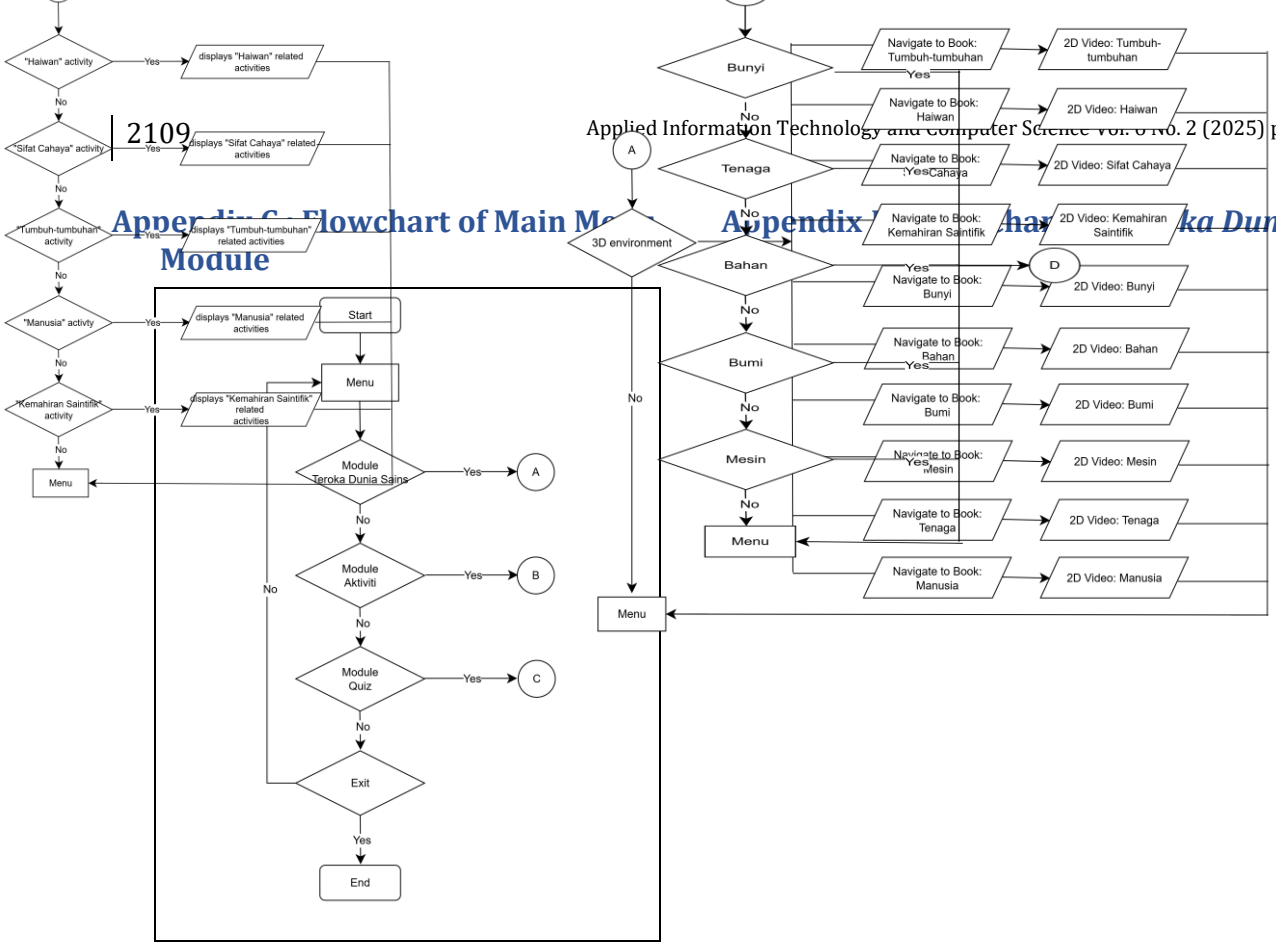
Table 9 *Interview transcribed with SME*

Questions	Results
How are students interested in the subject Science?	Many students are curious about science when it relates to things they see in their daily lives.
What challenges do students typically face when learning science concepts?	Students often find it hard to understand abstract ideas or things they cannot see directly.
How do you currently teach science in an engaging and interactive way	I use hands-on experiments.
Is the use if applications in learning an appropriate method? Why?	Yes, because students nowadays are more interested in the use of devices portable. Therefore, this opportunity can take to make their interests that more useful.
What topics in science do you think are most important to introduce at the primary school level?	Since you want to develop a general science application that is not focused on a specific school year, I suggest choosing topics related to children's daily lives that are found in Year 1 to Year 6 textbooks. For example, topics like magnets, buoyancy, light, matter, photosynthesis and others.
Are there specific science activities you think should be included in the app?	Yes, activities like drag and drop tasks. Adding some quizzes with multiple-choice can also make learning more engaging.
Would you prefer detailed scientific explanations or simplified concepts for primary school students?	Simple explanations are better for kids. They should be easy to understand.
Do you have any additional suggestions or ideas for features that would make the *Celik Sains* app impactful for students?	Add rewards like to motivate kids. Include voice to read things out load. Make sure the application follows the school syllabus and use the science words that have been set in the learning syllabus.

Appendix B : Navigation Structure



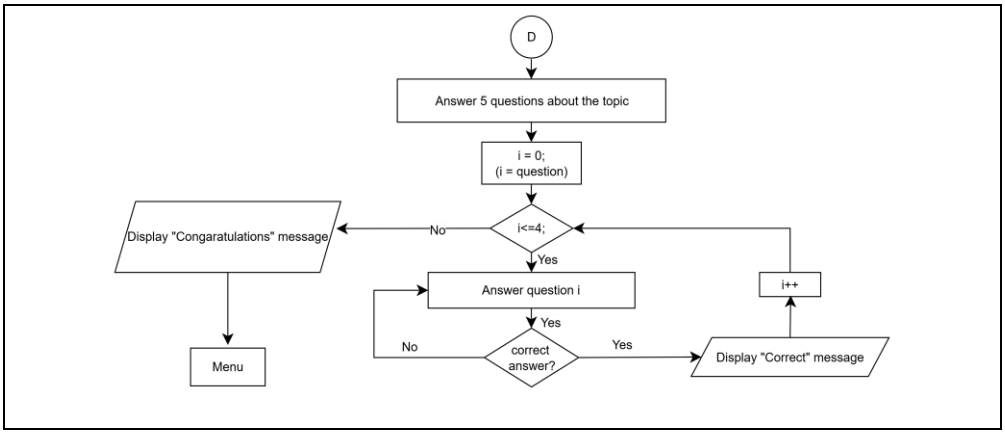
Applied Information Technology and Computer Science Vol. 6 No. 2 (2025) p. 2092-2111



Appendix C : Flowchart of Main Menu **Appendix D : Flowchart of *Teroka Dunia Sains* Module**

Appendix E : Flowchart of Activity Module. **Appendix F : Flowchart of Quiz Selection**

Appendix G : Flowchart of Quiz Module



Appendix H : Interface Design

	When the user enters the application, the first thing they will see is the Main Menu pages. There are 3 options which are *Teroka Dunia Sains, Aktiviti* and *Kuiz.*
  	This is the *Teroka Dunia Sains* module, which serves as the learning module in the application. When users enter this module, they are presented with instructions and a 'Start' button. After starting, they are placed in a 3D environment where they must control a 3D character using a joystick to explore and find a book. Once the book is found, a 'Read Book' button will appear. When clicked, a 2D animation video related to the science topic will play.
 	This is the activities interface, which features five topics. Each topic includes drag-and-drop activities or quiz-style questions. The topics covered are Animals, Plants, Properties of Light, Humans, and Scientific Skills.

Applied Information Technology and Computer Science Vol. 6 No. 2 (2025) p. 2092-2111

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<td>This is the quiz interface where each question is presented with answer buttons. When the user selects the correct answer, they earn one star and proceed to the next question. If the answer is incorrect, they must try again. After completing all questions, a 'Congratulations' board will appear, displaying the total time taken and the number of stars earned.</td>
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