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KIDDO LEARN: DEVELOPMENT OF AN INTERACTIVE MULTIMEDIA LEARNING APPLICATION FOR CHILDREN'S LEARNING IN ENGLISH, MATHEMATICS AND SCIENCE

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Abstract:

The integration of multimedia technology into early childhood education has gained increasing attention due to its potential to create engaging and meaningful learning experiences for preschool children. However, many preschool classrooms continue to rely on teacher-centred instructional methods, such as worksheets and flashcards, which often fail to sustain children's attention, motivation, and active participation. In addition, existing educational applications frequently focus on a single learning domain and provide limited interactivity, restricting opportunities for holistic learning across multiple subjects. This study presents the design, development, and evaluation of Kiddo Learn, an interactive multimedia learning application that integrates English, Mathematics, and Science into a single curriculum-aligned platform for preschool education. The application was developed based on the *I LEAP K2 Coursebooks* to ensure alignment with preschool learning objectives and incorporates multimedia elements, including 2D animations, audio narration, colourful graphics, interactive games, quizzes, and immediate feedback to promote active learning. The application was developed using the ADDIE instructional design model, comprising the Analysis, Design, Development, Implementation, and Evaluation phases. Formative evaluation was conducted with three experts in multimedia and early childhood education to assess content accuracy, interface design, and usability, while summative evaluation involved fourteen kindergarten children aged five to six years to examine user engagement, ease of use, and learning experience. The evaluation results indicated that both experts and children responded positively to the application, highlighting its effectiveness in enhancing

learner engagement, motivation, usability, and interactive learning experiences. The findings suggest that integrating multiple learning domains within a curriculum-aligned multimedia application can support more meaningful preschool learning while complementing conventional classroom instruction. This study contributes to the growing body of knowledge on multimedia-assisted early childhood education by demonstrating the potential of interactive, child-centred learning applications to improve engagement and support holistic learning in preschool environments.

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Keyword:

ADDIE Model, Early Childhood Education, Interactive Multimedia Application, Preschool Children



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Introduction

The rapid development of information and communication technology has significantly transformed educational practices, particularly in the field of early childhood education. Multimedia technology has become an essential component of modern teaching and learning because it integrates various media elements, including text, graphics, animation, audio, video, and user interaction, to create engaging learning environments (Mayer, 2002). Compared with traditional teaching approaches, multimedia learning encourages active participation, improves learners' understanding, and enhances knowledge retention by presenting information through multiple sensory channels (Genoguin, 2025). As digital technologies continue to evolve, educational institutions are increasingly incorporating multimedia applications into classroom activities to provide meaningful learning experiences that support children's cognitive and academic development. Early childhood education is widely recognised as a crucial stage in children's overall development because fundamental literacy, numeracy, language, communication, and problem-solving skills are developed during the preschool years (Nisa et al., 2026). Learning experiences at this stage significantly influence children's future academic achievement and lifelong learning abilities. Therefore, educational materials should be carefully designed to suit children's cognitive development, maintain their attention, and encourage active exploration. Research has shown that young children respond more positively to colourful visuals, animations, sounds, and interactive activities than to conventional teaching materials, making multimedia learning an effective instructional approach for preschool education (Adi et al., 2026).

Despite the rapid growth of educational technology, many preschool classrooms continue to depend on traditional teaching methods such as worksheets, printed flashcards, teacher-centred instruction, and verbal explanations. Although these teaching approaches remain valuable, they often provide limited opportunities for children to actively participate in the learning process

(Zin et al., 2020). Preschool children generally have shorter attention spans and learn more effectively through play, exploration, and interaction rather than passive observation (Baikulova et al., 2026). Consequently, conventional classroom activities may not always sustain children's motivation and engagement throughout the learning session. This situation highlights the importance of developing interactive multimedia learning environments that encourage children to learn through exploration, immediate feedback, and enjoyable educational activities. In recent years, numerous educational applications have been developed to support preschool learning. However, many existing applications focus primarily on a single learning subject, such as alphabet recognition, vocabulary learning, or basic mathematics, without integrating multiple learning domains within a single platform (Sun et al., 2024). Furthermore, some applications provide only limited multimedia interaction by relying mainly on videos, static images, or digital flashcards, resulting in passive learning experiences (Haryanti et al., 2026). Other applications lack gamification elements such as quizzes, rewards, progress tracking, and interactive challenges that can increase children's motivation and encourage continuous learning (Lim & Wardrip, 2026). In addition, several applications are not fully aligned with preschool curriculum requirements, making them less suitable for classroom implementation (Windarsih et al., 2026).

To overcome these limitations, this study developed Kiddo Learn, an interactive multimedia learning application specifically designed for preschool children aged five to six years old. Unlike many existing educational applications, Kiddo Learn integrates three core preschool learning subjects such as English, Mathematics, and Science within a single learning platform. The educational content is aligned with the I LEAP K2 Coursebooks (Pelangi Publishing, 2024) to ensure that all learning activities correspond with preschool curriculum objectives and classroom requirements. The application combines multimedia elements such as 2D animations, colourful illustrations, audio narration, educational games, flashcards, drag-and-drop activities, quizzes, and immediate feedback to create an engaging and child-friendly learning environment. Through these multimedia components, children are encouraged to actively interact with educational content while developing their understanding of fundamental concepts across different subjects. The development of Kiddo Learn was guided by the ADDIE instructional design model, which consists of five systematic phases: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model provides a structured framework for identifying user requirements, designing instructional materials, developing multimedia components, implementing educational applications, and evaluating their effectiveness. This systematic approach ensures that the application is developed according to users' educational needs while continuously improving its quality through evaluation and feedback. The novelty of Kiddo Learn lies in three key contributions. First, the application integrates multimodal learning by combining visual, auditory, and interactive learning experiences to support children's cognitive development and knowledge retention (Wyse et al., 2026). Second, it combines gamification with multimedia learning through educational games, quizzes, scoreboards, and reward systems that increase children's motivation and engagement during learning activities (Lee et al., 2018). Third, Kiddo Learn provides adaptive learning activities across English, Mathematics, and Science modules, enabling preschool children to experience different types of interaction that suit their developmental needs and learning abilities (Chen, 2026; Yani et al., 2026).

To evaluate the effectiveness of the application, both formative and summative evaluations were conducted. The formative evaluation involved three experts from the fields of early childhood education, user experience, and multimedia design to assess the application's multimedia quality, usability, educational content, and overall effectiveness. Subsequently, summative evaluation was conducted with fourteen preschool children from Tadika Saintifik Melodi, Sungai Petani, to evaluate user engagement, usability, learning experience, and overall satisfaction after interacting with the completed application. Therefore, the objectives of this study are to develop Kiddo Learn as an interactive multimedia learning application for preschool children, evaluate its effectiveness and usability through expert review, and assess children's engagement and satisfaction through user evaluation. The findings of this study are expected to contribute to the development of curriculum-aligned multimedia learning applications and provide educators, researchers, and multimedia developers with valuable insights into designing effective educational technologies for early childhood education.

Literature Review

Interactive multimedia learning has become an increasingly important approach in early childhood education because it combines text, graphics, audio, animations, videos, and interactive activities to create engaging learning experiences. Compared with traditional teaching methods, multimedia learning enables children to receive information through multiple sensory channels, improving attention, motivation, and knowledge retention (Yani et al., 2026). According to the Cognitive Theory of Multimedia Learning, learners achieve better understanding when verbal and visual information are presented simultaneously through well-designed multimedia materials (Mayer & Moreno, 2020). As a result, many researchers have developed interactive multimedia learning applications to improve preschool children's learning experiences.

In recent years, numerous educational multimedia applications have been introduced to support preschool learning. Most applications integrate multimedia elements such as colourful illustrations, animations, narration, educational games, and quizzes to encourage children's active participation during learning activities. Previous studies have demonstrated that interactive multimedia applications improve children's cognitive development, learning motivation, language acquisition, and problem-solving abilities while providing enjoyable learning experiences (Goldenberg et al., 1992). Furthermore, multimedia learning environments allow children to explore educational content independently while receiving immediate feedback through interactive learning activities. Several researchers have developed multimedia learning applications that focus on different educational objectives. Fun English Learning, developed by Studycat, provides interactive vocabulary learning through games, songs, animations, and pronunciation exercises. The application effectively supports English language acquisition but focuses only on language learning. Similarly, Marbel Belajar TK introduces preschool concepts such as letters, numbers, colours, and simple mathematics through educational games and animations. Although the application provides various learning topics, science-related learning activities remain limited. Khan Academy Kids offers a comprehensive collection of educational stories, mathematics activities, reading exercises, and creative learning experiences supported by animations and interactive activities. However, its educational content follows an international curriculum rather than the Malaysian preschool curriculum. ABC Kids Tracing & Phonics focuses primarily on alphabet recognition and handwriting through tracing activities and pronunciation exercises, making it suitable for early

literacy development but limited to English alphabet learning. Another application, PBS Kids Games, provides numerous educational games that encourage creativity and problem-solving through interactive play. Nevertheless, its activities are designed mainly as supplementary learning resources instead of following structured preschool curriculum objectives. Although these applications successfully incorporate multimedia technology into children's education, several limitations remain. Most existing applications concentrate on one or two learning subjects rather than providing an integrated learning environment covering multiple preschool subjects.

Kiddo Learn addresses these limitations by integrating English, Mathematics, and Science into a single interactive multimedia learning application aligned with the I LEAP K2 Coursebooks (Pelangi Publishing, 2024). First, the application adopts a multimodal learning approach by combining text, colourful illustrations, 2D animations, audio narration, flashcards, and interactive activities to enhance children's understanding through multiple sensory channels. Second, Kiddo Learn incorporates gamification elements, including educational games, quizzes, scoreboards, immediate feedback, and reward-based activities that encourage children's motivation, engagement, and active participation throughout the learning process. Third, the application provides adaptive learning activities across different subjects, allowing preschool children to experience various interaction methods such as flashcard learning, drag-and-drop games, object matching, counting activities, and multiple-choice quizzes that accommodate different learning preferences and developmental abilities. Additionally, the application features a simple and child-friendly interface with intuitive navigation, making it suitable for independent learning as well as classroom instruction under teacher supervision. By integrating curriculum-aligned educational content with interactive multimedia and gamification, Kiddo Learn provides a comprehensive learning environment that supports children's cognitive development, learning motivation, and overall educational experience. Table 1 presents a comparison between Kiddo Learn and existing interactive multimedia learning applications, highlighting their educational features, strengths, and limitations.

Table 1: Related Works

No.	Features	ABC Kids	Khan Academy Kids	Lingokids	Marbel Belajar TK	PBS Kids Games	Kiddo Learn
1	English Module	/	/	/	/		/
2	Mathematics Module		/			/	/
3	Science Module					/	/
4	Audio Narration	/	/	/	/	/	/
5	2D Animation	/	/	/	/	/	/
6	Flashcards						/
7	Drag and drop function						
8	Educational Games		/	/	/	/	/
9	Quizzes		/	/			/
10	Scoreboard/Rewards						//
		3	6	5	4	5	10

Methodology

This study employed the ADDIE instructional design model to guide the development of Kiddo Learn, an interactive educational multimedia application for preschool children. The ADDIE model consists of five systematic phases: Analysis, Design, Development, Implementation, and Evaluation (Martatiyana et al., 2023). It is widely recognised as one of the most effective instructional design models because it provides a structured and learner-centred framework for designing, developing, implementing, and evaluating educational materials. The systematic nature of the ADDIE model ensures that educational applications are developed based on users' learning needs while allowing continuous improvements through iterative evaluation and refinement (Azhar M, 2019). The ADDIE model was selected because it aligns with the objectives of this study, which aim to develop an interactive multimedia learning application that enhances preschool children's learning experiences through curriculum-aligned multimedia content. Furthermore, the model emphasises continuous evaluation throughout the development process, ensuring that the final application meets both educational and usability requirements. Figure 1 illustrates the five phases of the ADDIE model adopted in this study.



Figure 1: The Phase of the ADDIE Methodology

Analysis

The analysis phase focused on identifying the educational problems, user requirements, and learning objectives to ensure that Kiddo Learn addressed the learning needs of preschool children while supporting teachers in delivering engaging classroom instruction. A needs analysis was conducted to examine existing teaching practices, classroom challenges, and the potential of multimedia technology to enhance learning experiences. Data were collected through interviews with teachers from Tadika Saintifik Melodi (TSM), Sungai Petani, who served as the project client. The interviews explored current teaching practices, classroom challenges, children's learning behaviours, preferred teaching materials, and recommendations for suitable learning content and multimedia features. The findings revealed that conventional teaching materials, such as worksheets and printed flashcards, were insufficient to sustain children's attention and motivation during learning activities. In addition, surveys and questionnaires were administered to preschool teachers and children to identify user preferences, learning interests, interface design, navigation simplicity, and preferred

multimedia elements. The collected data were analysed to establish the functional and non-functional requirements that guided the development of the proposed application.

Design

The design phase focused on translating the requirements identified during the analysis phase into a structured multimedia learning application for preschool children aged five to six years. Based on the findings from the interviews, questionnaires, and literature review, the overall application structure, learning modules, navigation flow, interface layout, multimedia elements, and interaction methods of Kiddo Learn were designed before development commenced. A storyboard was then developed to serve as a visual blueprint, illustrating the sequence of learning activities, screen transitions, navigation flow, user interactions, and the placement of multimedia components such as text, images, animations, audio narration, buttons, and interactive quizzes. This process ensured a logical learning progression and enabled the development team to visualise the overall user experience prior to implementation. To promote engagement and effective learning, the application incorporated colourful 2D illustrations, character animations, narration, background music, sound effects, and interactive buttons. These multimedia elements were designed in accordance with multimedia learning principles to provide balanced visual and auditory information while avoiding cognitive overload.

Development

During the development phase, Adobe Animate was used to develop Kiddo Learn, with ActionScript 3.0 serving as the primary scripting language to implement the application's interactive features. ActionScript 3.0 was utilised to control object behaviours, scene navigation, animations, audio playback, quizzes, and user interactions. It also enabled the development of interactive buttons, drag-and-drop activities, quiz scoring, animation control, and audio synchronization, creating an engaging and responsive learning environment for preschool children. Furthermore, the scripting managed user events, including mouse clicks, timeline control, object visibility, and navigation across the English, Mathematics, and Science learning modules. Additional functions included background music, narration playback, score calculation, quiz validation, and immediate feedback to enhance user engagement and learning effectiveness. The implementation of the ActionScript code for the landing page and classroom tutorial page is presented in Figures 2.

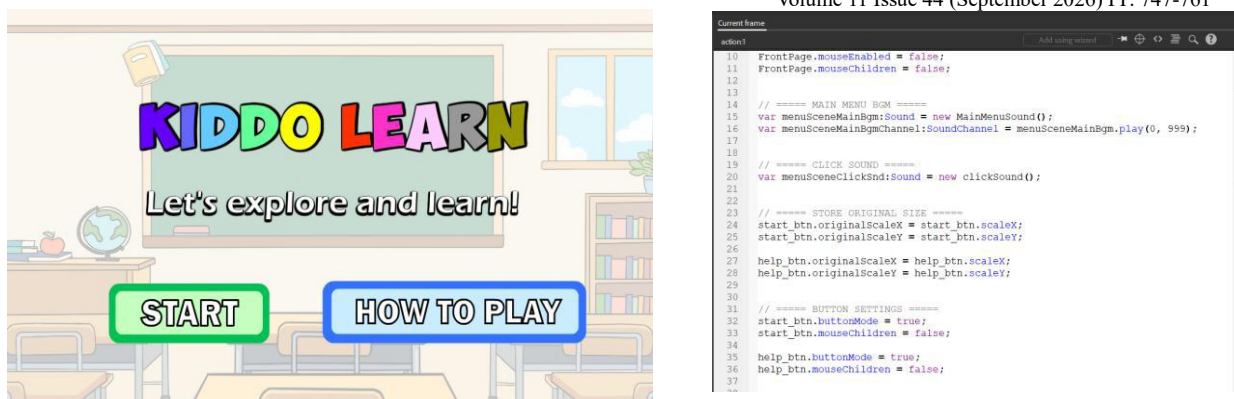


Figure 2: Example 'Start' button and 'How to Play' button in the Starting Page

Source: Screenshot from Kiddo Learn Application

In addition, all graphical assets used in Kiddo Learn, including characters, classroom backgrounds, learning objects, icons, buttons, and educational illustrations, were designed using Adobe Illustrator before being imported into Adobe Animate for animation and interactivity. The use of vector-based graphics ensured high visual quality, scalability, and consistency throughout the application. After the assets were imported, animations, audio narration, interactive buttons, quizzes, and educational games were developed and integrated using timeline animation and ActionScript 3.0. This workflow improved asset management streamlined the development process, and enhanced application performance by reducing redundant graphic processing. Consequently, the integration of Adobe Illustrator and Adobe Animate provided an efficient environment for developing a visually appealing, responsive, and interactive multimedia learning application for preschool children.

Implementation

The implementation phase focused on deploying Kiddo Learn as a fully functional interactive multimedia learning application for preschool children. The completed application was developed using Adobe Animate and exported in SWF (Small Web Format), allowing it to be executed using Adobe Flash Player 32. Before deployment, comprehensive testing was conducted to ensure that all multimedia components, including animations, audio narration, navigation buttons, quizzes, and interactive activities, functioned correctly without technical issues. This phase also ensured that the application provided a smooth and user-friendly learning experience suitable for preschool children aged five to six years old. Overall, Kiddo Learn integrates multimedia learning principles with interactive educational activities to provide an engaging and child-friendly learning environment for preschool children. By combining animations, audio narration, educational games, quizzes, and immediate feedback, the application promotes active participation, independent exploration, and meaningful learning experiences. It's simple navigation and intuitive interface enable preschool learners to use the application with minimal assistance from teachers or parents.

Evaluation

The evaluation phase assessed the effectiveness and usability of Kiddo Learn through two stages: formative and summative evaluation. Formative evaluation was conducted during the development process to obtain expert feedback on the application's multimedia design,

usability, and educational content prior to final implementation. Following the recommended improvements, summative evaluation was carried out with the target users to examine children's engagement, learning experience, and overall satisfaction. The formative evaluation involved three experts in preschool education, multimedia, and user experience. Semi-structured interviews were conducted to evaluate four key aspects: multimedia design, visual design and readability, navigation, and educational content quality. The feedback obtained was analysed and incorporated into the application to enhance its overall quality before user testing. The summative evaluation involved five preschool children aged five to six years from Tadika Saintifik Melodi, Sungai Petani. The children independently explored the English, Mathematics, and Science learning modules, while observations and child-friendly response forms were used to assess their engagement, interaction, satisfaction, and learning experience. The combination of expert review and user evaluation provided comprehensive evidence of the application's usability and educational effectiveness.

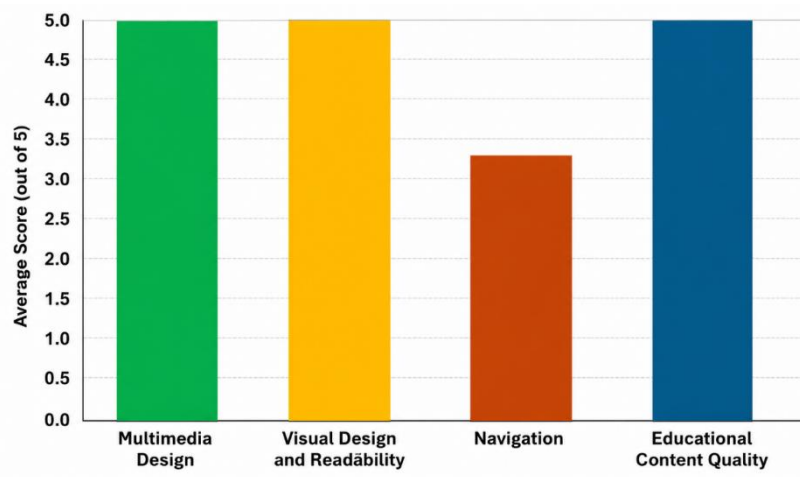


Figure 3: Result of Formative Evaluation

Figure 3 presents the overall results of the formative evaluation conducted by three experts. The findings show that Multimedia Design, Visual Design and Readability, and Educational Content Quality received highly positive evaluations, indicating that Kiddo Learn effectively integrates engaging multimedia elements with curriculum-appropriate educational content for preschool children. The experts agreed that the colourful interface, animations, audio narration, and child-friendly design enhanced children's learning experiences. Navigation received a comparatively lower score, with experts recommending improvements to button visibility, typography consistency, and several visual components to facilitate clearer navigation for young learners. These recommendations were implemented before the summative evaluation. Figure 4 illustrates the formative evaluation process and the overall evaluation results obtained from three experts in preschool education, multimedia, and user experience. Overall, the formative evaluation confirmed the application's suitability as an interactive multimedia learning application while identifying minor enhancements to improve its usability and visual presentation. Following these refinements, the application was considered ready for summative evaluation with the target users to further assess its effectiveness, engagement, and overall learning experience. The detailed findings of the summative evaluation are presented and discussed in the following section.



Figure 4: Expert Evaluation Process

Result and Discussion

The summative evaluation of Kiddo Learn: A 2D Interactive Multimedia Learning Application for Children in English, Mathematics, and Science was conducted to assess the application's effectiveness, usability, and overall user satisfaction among preschool children. Five participants interacted with the English, Mathematics, and Science learning modules before completing a child-friendly evaluation questionnaire. The evaluation examined three key dimensions: usability, learning experience, and user satisfaction. The findings provide evidence of the application's ability to deliver an engaging, interactive, and child-friendly multimedia learning environment.

Table 2: Results of Effectiveness

No.	Questions	Student 1	Student 2	Student 3	Student 4	Student 5
1	Did the application help you learn English, Science and Mathematics?	Yes	Yes	Yes	Yes	Yes
2	Can you use KIDDO LEARN without help from a teacher?	Yes	Yes	Yes	Yes	Yes
3	Do you remember what you learned?	Yes	Yes	Yes	Yes	Yes

The findings presented in Table 2 indicate that Kiddo Learn effectively supports children's learning in English, Mathematics, and Science. All five participants responded positively to every question under this dimension. Every participant agreed that the application helped them learn educational content from the three learning modules, demonstrating that the multimedia elements successfully supported knowledge acquisition. Furthermore, all participants indicated that they were able to use the application without assistance from a teacher, suggesting that the interface and learning activities were easy to understand. The participants also confirmed that

they remembered what they had learned after completing the activities, indicating that the combination of colourful visuals, audio narration, animations, and interactive quizzes contributed to better knowledge retention. Overall, these findings demonstrate that Kiddo Learn successfully achieves its educational objectives by providing an engaging and effective multimedia learning experience.

Table 3: Results of Ease of Use

No.	Questions	Student 1	Student 2	Student 3	Student 4	Student 5
1	Do you like the cartoons and animations?	Yes	Yes	Yes	Yes	Yes
2	Are the buttons easy to use?	Yes	Yes	Yes	Yes	Yes
3	Can u follow the tutorials in the game?	Yes	Yes	Yes	Yes	Yes

The results presented in Table 3 demonstrate that Kiddo Learn is easy to use and provides a user-friendly learning environment for children. All five participants agreed that the cartoons and animations were attractive and enjoyable, indicating that the visual design successfully captured their attention throughout the learning session. In addition, every participant responded positively that the navigation buttons were easy to use, allowing them to move between learning activities without difficulty. The participants also agreed that the classroom tutorials provided sufficient guidance before using the application, making the learning process straightforward and easy to follow. These findings indicate that the application's interface design, navigation structure, and instructional content are suitable for young learners and support an enjoyable user experience.

Table 4: Results of Overall Satisfaction

No.	Questions	Student 1	Student 2	Student 3	Student 4	Student 5
1	Do you like the sounds and narration?	Yes	Yes	Yes	Yes	Yes
2	Do you enjoy the quizzes and games?	Yes	Yes	Yes	Yes	Yes
3	Would you introduce your friend about this application?	Yes	Yes	Yes	Yes	Yes

The results presented in Table 4 indicate a high level of user satisfaction with Kiddo Learn. All participants responded positively to the application's audio elements, including the sound effects and narration, suggesting that these multimedia components enhanced both engagement and comprehension during the learning activities. Similarly, all participants reported enjoying the quizzes and educational games, demonstrating that the interactive features successfully maintained their interest and motivation throughout the learning process. Furthermore, every participant expressed a willingness to recommend the application to their friends, reflecting a high level of satisfaction and acceptance of the application. Overall, these findings indicate that Kiddo Learn provides an engaging, enjoyable, and effective multimedia learning experience for preschool children.

Overall, the user satisfaction results demonstrate that the integration of interactive multimedia elements, including animations, audio narration, quizzes, and educational games, contributes positively to children's learning experiences. The consistently positive responses across all evaluation items suggest that the application is both usable and well accepted by its target users. These findings further support the effectiveness of Kiddo Learn as an interactive multimedia learning application for preschool education and are consistent with the formative evaluation results, which confirmed its multimedia quality, usability, and educational suitability.

Conclusion

This study presented the development and evaluation of Kiddo Learn: 2D Interactive Multimedia Learning Application for Children in English, Mathematics and Science, an interactive multimedia application designed to support preschool children's learning through the integration of educational content and multimedia technologies. The application was developed using the ADDIE instructional design model, which provided a systematic framework for analysing user needs, designing multimedia components, developing interactive learning modules, implementing the application, and evaluating its overall effectiveness. The learning content was aligned with the I LEAP K2 Coursebooks (Pelangi, 2024) to ensure that the application supports the preschool curriculum while providing an engaging and meaningful learning experience. Kiddo Learn incorporates various multimedia elements, including colourful illustrations, 2D animations, audio narration, interactive quizzes, educational games, and immediate feedback, to create an enjoyable learning environment for preschool children. These features encourage active participation, improve children's motivation, and promote better understanding of English, Mathematics, and Science concepts through multimodal learning experiences. Furthermore, the integration of gamification elements such as quizzes, scoreboards, and rewards enhances children's interest and encourages continuous engagement throughout the learning activities.

The findings from both the formative and summative evaluations demonstrate that Kiddo Learn successfully achieved the objectives of this study. The formative evaluation conducted with experts provided valuable feedback regarding the application's multimedia design, navigation, interface usability, and educational content, leading to several improvements before the final implementation. Subsequently, the summative evaluation involving preschool children showed positive responses across all evaluation dimensions, including effectiveness, ease of use, and overall user satisfaction. The results indicate that the application is visually appealing, user-friendly, educationally effective, and capable of supporting independent learning among preschool children. Despite these encouraging findings, several limitations remain. The current

version of the application covers only selected learning topics, is primarily designed for laptop use, and was evaluated using a relatively small group of participants. Future research should focus on expanding the educational content, increasing the variety of interactive learning activities, developing cross-platform compatibility for mobile devices, and incorporating learner progress tracking features. In addition, larger-scale evaluations involving multiple preschools should be conducted to further validate the effectiveness and generalisability of the application. Overall, Kiddo Learn demonstrates strong potential as an interactive multimedia learning application that supports early childhood education by combining curriculum-aligned learning content, multimedia learning principles, and gamification in a child-friendly environment.

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Author Contribution Statement: All authors contributed significantly to the development of this manuscript. [Author A] was responsible for the conceptualization, literature review and methodology. [Author B] handled data collection, analysis, interpretation of results, critical revision of the manuscript and overall supervision of the study. All authors read and approved the final version of the manuscript prior to submission.

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