

# Exploring the Integration of M-Kids Mobile Apps in Preschool Education: Assessing Readiness

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## ABSTRACT

*The reality for children today is that their education and all areas of learning demand tech, but many parents (and even educators) worry about the amount of screen time the kids are getting. Digital products become part of education, and it is important that these tools are appropriate for the development stage on which they focus. When the COVID-19 pandemic began, 1.57 billion students were out of school across over 190 countries worldwide driving home a critical need for outside-the-box education solutions. One such solution is the M-Kids Mobile Apps, which use serious games to support Islamic preschool education while adhering to developmentally appropriate practices (DAPs). This study examines the effectiveness of the M-Kids Mobile Apps through two phases: (1) by observing 150 preschool children aged 5 to 6 years during the app's implementation, and (2) through a post-implementation survey assessing usability from the perspectives of teachers and parents. This survey evaluates the app's efficiency in engaging children and supporting their cognitive development and behaviour. Findings from the study revealed that the M-Kids Mobile Apps significantly improved children's understanding of moral and Islamic values, with 82% of parents and teachers expressing satisfaction, particularly with the app's ability to help monitor children's behavioural development and performance. By integrating the Cognitive Theory of Multimedia Design and Islamic Design Principles, the M-Kids Mobile Learning Applications have enriched the learning experience for preschool children, fostering both cognitive and behavioural growth. Still, worries persist about how more time on screens might affect young children. The study can be considered crucial because it investigates the advantages and drawbacks of utilizing digital applications for preschoolers with prominence on moral & cognitive development. Validation of the educational use of screens through this M-Kids app, which tries and ensure a more organized approach with its agenda-oriented driver for consideration. One of the research questions will be discussed on, whether educational screen time can enhance learning without the negative effects typically linked to digital devices.*

**Keywords:** Education, Cognitive development, Behaviour development, Digital solutions, Screen time

## **INTRODUCTION**

Over the past decade, emerging technology has significantly transformed social and communication activities. The Internet and mobile networks have become integral to daily life, transcending age and cultural backgrounds. In education, these technologies have particularly expanded the learning process to be accessible anytime and anywhere, moving beyond the confines of traditional classroom settings. Online learning and mobile learning are now prevalent in schools, universities, and home education, serving either as supplementary resources or as primary educational tools. This trend extends to early childhood education, where young children are growing up in an era rich with advanced technologies used both at home and in preschool settings.

The COVID-19 pandemic has further underscored the necessity of mobile learning in teaching, making it essential for contemporary and future educational practices. Ignoring the importance of these technologies risks creating a curriculum disconnected from children's real lives. However, concerns about the content of these technologies have been raised by several scholars. Therefore, this study aims to provide a comprehensive design and content development guideline, along with a mobile learning prototype tailored for preschool children aged five and six years old.

## **LITERATURE REVIEW**

The idea of exposing children to substantial, portable devices is now quite common. As Grudin (2018, p. 46) notes, technology has become the gold standard in K-12 education, with students and teachers increasingly relying on it due to its accessibility and practicality. In a report by Chin (2018) in *The Star Online*, it was noted that Malaysian public schools began transitioning to digital learning with the introduction of e-textbooks at the start of 2019, as announced by the Deputy Minister of Education. Although this initiative has not yet extended to primary and preschool levels, the Deputy Minister emphasized the need for public schools to adapt to digital learning methods, as private schools have already started integrating new technologies.

UNICEF and Microsoft Corporation have recently expanded a global learning network to support children and adolescents in maintaining their education at home during the COVID-19 pandemic. Thompson (2020) from UNICEF reports that school closures have affected 1.57 billion children across over 190 countries worldwide. This situation has brought to light the rising influence of technology in children's lives, leading parents and educators to question whether these technology-related activities are appropriately designed for young children.

Recent research on screen time and its impact on young children has highlighted the importance of distinguishing between passive and active screen use, particularly in educational contexts. While excessive screen time, especially involving passive activities like watching videos, has been

associated with negative outcomes such as behavioural issues and reduced sleep duration (Guerrero et al., 2019), there is growing evidence that interactive and educational screen time can have beneficial effects when appropriately managed. The American Academy of Paediatrics (AAP, 2016) emphasizes that high-quality educational programming and digital tools, when used in moderation and co-viewed with parents, can promote cognitive and social development. Straker et al. (2018) further argue that the context and content of screen time are crucial, with interactive, educational activities potentially fostering active learning and engagement. Supporting this view, Herodotou (2017) finds that educational apps, particularly those designed to encourage active participation and aligned with developmental principles, can enhance young children's learning outcomes. Mayer's (2005) research on multimedia learning reinforces the idea that well-designed educational content, integrating cognitive principles, can lead to deeper learning and better educational outcomes. These studies collectively suggest that structured, educational screen time, as provided by tools like the M-Kids Mobile Apps, can offer significant educational benefits while minimizing potential risks associated with digital device use in early childhood education.

The Malaysian government has invested in modern early childhood development programs to support children's overall well-being and positive behavioural growth from a young age. However, the rise in juvenile offenses—from 2.7% to 5,294 cases in 2018, as reported by Children's Statistics Malaysia (2019)—suggests that foundational behavioural issues may not be adequately addressed during early childhood. While there was a decrease of 6.7% in first-time offenses to 4,619 cases in 2018, the sharp increase of 37.5% in repeat offenses to 6,075 cases in 2017 points to underlying behavioural challenges that may have roots in early childhood. These trends highlight the need for early intervention and targeted strategies to address factors like inadequate caregiving, unmet expectations from parents and teachers, and negative social and environmental influences, which can significantly shape children's behavioural development and long-term outcomes.

To address these issues, Malaysian authorities emphasize improving children's well-being and mental health. Positive parenting skills, such as anticipating problematic moments and engaging in joint parent-child activities, can help mitigate these problems. Jantan et al. (2015, p. 146) highlighted several challenges faced by preschool children, including lack of progress and motivation. Teachers can enhance children's motivation by incorporating play-based learning strategies. Today, social media and digital games are often used for educational purposes due to their popularity and appeal to young children (Daniels et al., 2019, p. 2418). However, digital games are often developed for entertainment and commercial purposes rather than educational value (Lace-Costigan, 2017, p. 27).

Developing educational digital games, such as serious games, requires more effort and resources, as they necessitate specialized expertise. Current mobile application designs are insufficient for delivering Islamic or moral education. Designing effective Islamic learning mobile applications requires careful consideration of cultural appropriateness. These applications should integrate

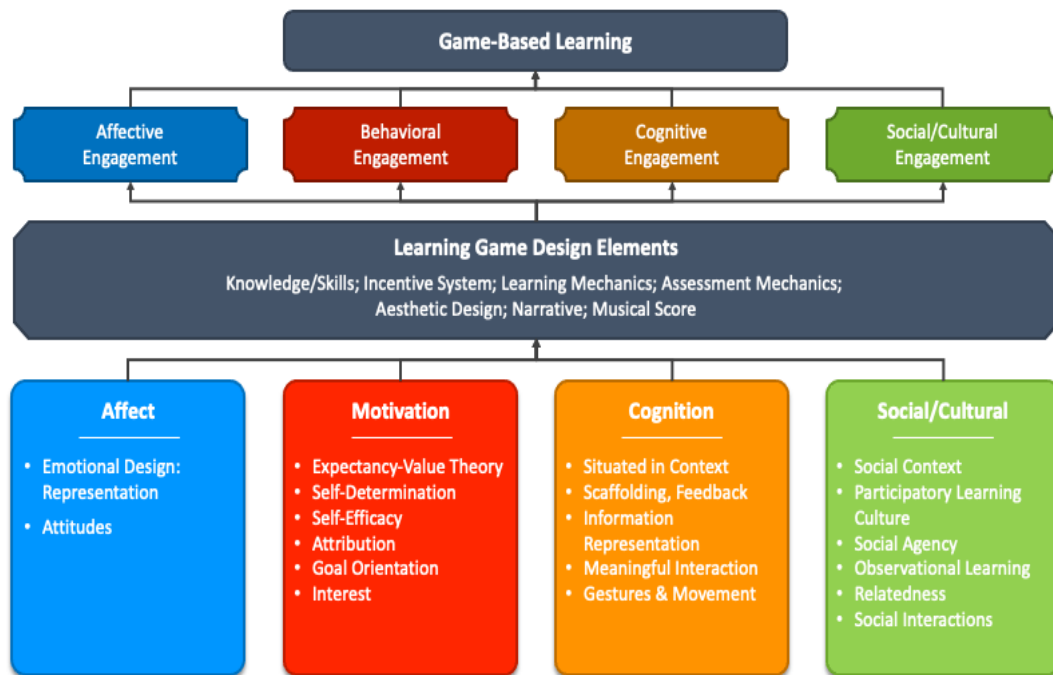
Islamic culture and architectural principles into their frameworks to maintain a distinctive role in design and innovation. This approach is crucial for modern Islamic education, providing tools for contemporary children in an era defined by information, innovation, science, and technology (Purnama, 2018, p. 74). This study aligns with the growing body of literature advocating for the use of developmentally appropriate digital tools. The M-Kids Mobile Apps are designed specifically for preschool-aged children, integrating multimedia elements consistent with the Cognitive Theory of Multimedia Learning (Mayer, 2005) and Islamic Design Principles. The structured and interactive nature of these apps contrasts with passive screen time, potentially fostering better cognitive engagement and behavioural development in young children.

## **RESEARCH METHODOLOGY**

### **Sampling**

Phase 1 of the implementation was gathered from an observation of the children during their usage of M-Kids mobile apps. Thus, all activities were recorded and analysed through the method of observational research, using the instrument of thematic analysis, and steered by the elements from the framework of Game-based and Playful Learning (Plass et al., 2015, p. 269) (refer Fig 1). This phase involves the development and testing of the multimedia application prototype, M-Kids mobile apps, on the target users—Islamic preschoolers. During this phase, the behavioural and cognitive development of Islamic preschoolers aged five to six years old in response to the M-Kids mobile apps prototype was observed and analysed. The study included 150 preschool children from four Islamic preschools around Klang Valley, with ninety-one six-year-olds and fifty-nine five-year-olds. The sample was equally divided by gender, with seventy-five boys and seventy-five girls. The research objective was achieved through observational research, a type of correlational study where the researcher observes ongoing behaviour. The prototype was presented to the children using their parents' devices, with the process monitored by the parents and observed by their class teachers. Additionally, observations were documented through video and image recordings. The children were exposed to the M-Kids Mobile Apps in controlled settings, where their screen time was limited to structured educational activities. On average, each child used the app for 15-20 minutes per session, with a maximum of three sessions per week. This controlled exposure was designed to align with recommendations for screen time in early childhood, ensuring that the digital interactions remained developmentally appropriate and focused on learning objectives.

## GAME BASED LEARNING FRAMEWORK



**Fig 1 Framework of Game-based & Playful Learning (Plass, et al. 2015)**

Phase 2, the feedback and reflection phase, involved gathering post-implementation feedback from parents and teachers regarding children's engagement, influences, and changes in cognitive development and behaviour resulting from the use of the M-Kids mobile apps. This post-survey was conducted after Phase 1, the implementation phase. A total of 150 respondents, consisting of 128 parents and 22 teachers from four Islamic preschools around the Klang Valley area, participated in the survey. The post-survey was designed for parents to complete after their child had used the M-Kids Mobile Learning Apps. However, due to some parents' absenteeism, the remaining teachers volunteered to complete the survey on behalf of the children's parents, given their familiarity with the students. The post-survey questionnaire was divided into seven elements, adapted and refined from the Usability Heuristics of Mobile Applications for Preschoolers (Masood & Thigambaram, 2015, p. 1820) (refer to Table 1.1).

**Table 1 Usability Heuristics of Mobile Application for Pre-schoolers (Masood & Thigambaram, 2015)**

1.	Screen Design	Evaluating the application's screen design whether the menus were simple and easy for the child, the screen layout was pleasant and intuitive, buttons were visible and easy recognised by the child, and the used of animation, sound and graphics makes learning more fun.
2.	Control & Navigation	Assessing the application's navigation and control system whether the menus to choose stories and activities were easy for the child, buttons were always at the same place, activities or questions asked were convenient and easy for the child.
3.	Feedback & Help	Moderating the application's feedback and help functions whether response given was clear and informative, the instruction given to the child was easy to understand, status and results were well informed and indicated for the child, and the child was always clear on what to do in current and next.
4.	Ease of Use	Evaluating the application's ease of use whether the loading time was short, animation could be skipped/ pause/ exit, simple terms were used, the child could easily remember how to use the application, and the child was satisfied to use the apps during his learning process.
5.	Cognitive Input	Assessing the application's cognitive input abilities whether the learning content, animation, sound, and interface design were appropriate for the target age, the materials provided were easy for the child to understand the learning process was fun, and the child managed to answer most of the questions/do the activities required.
6.	Behavioural Input	Reviewing the application's behavioural input abilities whether the content managed to instill moral/Islamic values in the child, managed to practice good behaviour in the child, managed to insert Islamic courtesy and manners values in the animation, design, language, and storyline.
7.	Parents & Teachers Support	Examining the application's abilities in supporting parents' and teachers' communication system; whether the application managed to provide a direct or instant result of the child's activities and learning performance, managed to provide the child's cognitive development and performance report, and managed to provide monitoring on child's behaviour development or performance through parents and teachers in-apps communication.

## FINDINGS

The result for Phase 1 of the implementation was gathered from an observation of the children during their usage of M-Kids mobile apps. Thus, all activities were recorded and analysed through the method of observational research, using the instrument of thematic analysis, and steered by the elements from the framework of Game-based and Playful Learning (Plass et al., 2015, p. 269).

### Affective Engagement

An Affective Engagement in game-based learning highlights on player's experienced attitudes, emotions, and beliefs, and an evaluation of how well the design of the application or the game influences learners' affective state. Refer to Table 1.2 on the elements of Affective Engagement, descriptions, and report of the observation findings.

**Table 2 Affective engagement observation findings**

Elements	Descriptions	Observation Findings
<b>Emotional Design Representation</b>	Representation of information through the visual design of learning materials which may influence learners' emotional state and enhance learning outcomes.  Observation: how well are characters' designs and colours used to induce positive emotions in learners?	More than half (60%) of the participants (the preschool children) cheered, replied, and seemed happy when they saw the two characters 'Hadi' and 'Haya' greet them while others (40%) just bluntly waited for the next animation.
<b>Emotional Design Interaction</b>	Providing learners with specific mechanics that may generate high situational interest and related to positive emotions and improved learning outcomes. Observation: how well is game interactivity used to improve positive emotions in learners and respond to them?	More than half (55%) of the participants (the preschool children) actively listen, read, and click to choose the answer upon the question been asked, though some (45%) were just eager to play with the button.
<b>Attitudes</b>	Offering learners appropriate musical scores and narration may affect learners' attitudes in several ways and motivate learners toward engagement in the learning program.  Observation: how well is the sound design and narration used to motivate positive emotions in learners?	More than half (63%) of the participants (the preschool children) responded to the narration and clapped along upon getting a correct answer, though some (37%) just passively waited for the next animation.

## Behavioural Engagement

A behavioural engagement approach is used in game-based learning to emphasise on engagement and player's motivation by providing experiences that they enjoy and want to continue. Refer to Table 1.3 on the elements of behavioural engagement, descriptions, and report of the observation findings.

**Table 3 Behavioural Engagement Observation Findings**

Elements	Descriptions	Observation Findings
<b>Expectancy Value Theory</b>	<p>Identify learners' different motivational components that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate learners' different motivational components in developing behavioural engagement?</p>	<p>Findings from observation shows that learners are more likely to engage in activities that they personally found interesting and relevant to them. M-Kids Mobile Apps provide stories and tasks that somehow relates to the child's daily activities. Example: how to greet people, how to be grateful, and how to express proper behaviour upon particular action. 100% of the participants (the preschool children), interacted and showed appropriate behaviour as the task given.</p>
<b>Self-determination</b>	<p>Identify learners' strong motivational component that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate learners' strength motivational component in developing behavioural engagement?</p>	<p>More than half (75%) of the participants (the preschool children) can read the text, listen to the narration, understand the animated story, and respond to all the questions asked.</p>
<b>Self-efficacy</b>	<p>Identify learners' ability motivational component that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate learners' ability motivational component in developing behavioural engagement?</p>	<p>There were different results found upon the age-ability motivational component whereby children at the age of six responded and solved the given task faster to compared to children of the age of five when they were given the same program in the application.</p>



<p><b>Attribution</b></p>	<p>Identify learners' acknowledgment of motivational components that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate learners' acknowledgement motivational component in developing behavioural engagement?</p>	<p>By providing self-reward (praising and clapping) for all the questions answered correctly, most of all (90%) of the participants (the preschool children) were happy and enjoyed the program.</p>
<p><b>Goal Orientation</b></p>	<p>Identify learners' achievement orientation motivational component that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate learners' achievement orientation motivational component in developing behavioural engagement?</p>	<p>By providing the final achievement result and learning outcome at the end of the program; let the participants (the preschool children) know their progress and what they have learnt throughout the program. Thus, this motivates them to achieve their goal in learning.</p> <p>70% of the participants were acknowledged and satisfied with the application</p>
<p><b>Interest</b></p>	<p>Identify the level of learners' attention motivational component that can provide value to the learning task and focus on the specific outcomes that learners expect and what value they place on those outcomes.</p> <p>Observation: how well does the content in the application motivate the level of learners' attention motivational component in developing behavioural engagement?</p>	<p>There were different results found in the interest and acceptance behavioural shown by gender. The male was more eager to answer the questions and the task given while the female showed more concentration on the stories presented in the application.</p>

## Cognitive Engagement

A cognitive engagement in game-based learning was mainly concerned with optimising cognitive processing in the development of mental models. Thus, with the cognitive demand of processing, it gave meaning to various game elements in the cognitive load experienced by the learner during gameplay. Refer to Table 1.4 on the elements of cognitive engagement, descriptions, and reports of the observation findings.

**Table 4 Cognitive Engagement Observation Findings**

<b>Elements</b>	<b>Descriptions</b>	<b>Observation Findings</b>
<b>Situated in Context</b>	<p>Presenting information and problems in ways that closely mirror real-life which assists in the transfer of learning</p> <p>Observation: how well does the content in the application relate to learners' daily activities?</p>	<p>The animated stories presented in the application were based on the Prophet's story. Thus, there were lots of good lessons and role models which can be implemented in the children's daily life.</p> <p>Through the observation, all of the participants (100%) able to greet 'Assalamualaikum' and answer 'Walaikum salam', able to recite 'Alhamdulillah', understand the meaning of grateful in life and differentiate good and bad behaviour upon playing the application.</p>
<b>Scaffolding Feedback</b>	<p>Presenting the task/ problems within the learners' zone of proximal development</p> <p>Observation: Is the content in the application suitable for the target age?</p>	<p>Though the content/ module is designed to complement preschool at the age of five to six, there seems to be a bit of a struggle for the five-year-old children to understand the animated story compared with children at the age of six years old.</p> <p>Nonetheless, close monitoring by parents and teachers does help this group (age five years old) to understand and achieve the learning outcome.</p>
<b>Meaningful interactions</b>	<p>Presenting content in visual/ narration that interacts with learners which motivates learners' learning abilities.</p> <p>Observation: how well does the content help in motivating learners' learning abilities?</p>	<p>Providing meaningful interactions through narration and animation (praised and clapped) for all the questions that were answered correctly, most (90%) of the participants (the preschool children) were happy and enjoyed the program. Nevertheless, they even clapped and cheered upon their achievement.</p>

### **Social/ Cultural Engagement**

Social-cultural engagement in game-based learning focuses on the opportunity for social, and cultural aspects and environments that games can offer when social and cultural interactions occur. It examined to what extent these interactions were able to enhance learning. However, though social-cultural factors may influence learning, the goals of the educational game and the targeted population of players relate to the age, gender, education level, and cultural background, thus this engagement may not be suitable. Refer to Table 1.5 on the elements of social-cultural engagement, descriptions, and reports of the observation findings.

**Table 5 Social/ Cultural Engagement Observation Findings**

<b>Elements</b>	<b>Descriptions</b>	<b>Observation Findings</b>
<b>Social Context</b>	Facilitate learning by allowing players to participate in community practice	Not included in the application as it was not suitable for the targeted population
<b>Participatory Learning Culture</b>	Facilitate communicative learning by including user-generated content like blogs, chat sites, and forums which sometimes reside outside the actual game itself.	Not included in the application as it was not suitable for the targeted population
<b>Social Agency</b>	Facilitate social learning by allowing players to become a guided master and leading groups in MMO (Massive Multiplayer Online) games.	Not included in the application as it was not suitable for the targeted population
<b>Observation Learning</b>	Facilitate non-player involvement as observers of play. Observers usually will offer advice and encouragement and may be considered part of the game's social context.  Observation: how well observation learning in the application help in learners' learning process?	As M-Kids Mobile Apps provide in-apps monitoring function for parents and teachers to check, to discuss and to monitor their child learning progress; 100% of parents and teachers were grateful and happy with that option.
<b>Relatedness</b>	Facilitate a sense of connection as a player interact with other players in and out of the gameplay (MMO games)	Not included in the application as it was not suitable for the targeted population
<b>Social Interactions</b>	Facilitate augmented reality games that send players to the field to play in authentic situations that incorporate real-world artefacts.	Not included in the application as it was not suitable for the targeted population

In search of findings for phase 2, Post-Survey Heuristic Analysis was used to gather the data. Consequently, in this phase, the post-survey questionnaire for usability heuristic mobile learning application for pre-schoolers was divided into five elements of evaluation; 1) screen design; 2) navigation and control; 3) feedback and help; 4) ease of use, and 5) appropriate content; using frequency scale of one (1) to five (5) where; one (1) for strongly disagree to five (5) as strongly agree.

The summary of the result on the evaluation of M-Kids mobile apps screen design showed that 77.4% agree to 'strongly agree' that the menus are simple and easy to understand for the children;

79.4% agree to 'strongly agree' that the screen layout is pleasant and intuitive for the children; 76.6% agree to 'strongly agree' the buttons are visible and easy to select; 79.4% agree to 'disagree' that the animation, sound and graphic make the learning more fun while 78% agree to strongly agree that the animation, sound and graphic make the learning easier to understand for the children. Moreover, the findings on navigation and control of M-Kids mobile apps reported; that 69.4% agree to 'strongly agree' that the menus and buttons to go to stories and activities are simple and convenient for the children where the buttons are always in the same position. Reporting on the feedback of the activities in the application, 68.7% agree to 'strongly agree' that the activities and the questions are convenient, easy, and suit the age of the children. The findings also recorded 60% of the feedback agreed to 'strongly agree' that the application provided clear, easy-to-understand, and informative responses upon its usage during the learning process. 72% of the parents and teachers also agree to 'strongly agree' that the application provided a systematic status and results to the children. These managed to keep the children informed of what was going on, and what should they do next. Subsequently, reporting on the appropriateness content of the application; and feedback on cognitive input, 70% of the parents and teachers agree to 'strongly agree' that the contents provided are appropriate for the target age. While 72.6% agree to 'strongly agree' that the application managed to improve the children's cognitive development by making them understand the content, comprehend, and answer the questions given. Reviewing the application appropriateness of the content based on behavioural input; 74.6% agree to 'strongly agree' that the application managed to instil moral/Islamic value in the learning process. Also, 76% of them agree to 'strongly agree' that the application managed to inject Islamic courtesy and manners values in the animation, design, language, and storyline resulting in the children being able to practice good behaviour in the learning process. Moreover, 82% of the parents and teachers agree to 'strongly agree' that by using the application they managed to monitor their children's behaviour development and performance.

The final question was asked to analyse the acceptance from parents and teachers on the usability of the application in providing parent-teacher support function. 77.3% of parents and teachers agree that the application succeeded in providing a communication platform for parents and teachers to communicate about the child's performance. They also highly agree to strongly agree at 82.7 % that this function enables them to keep track of their child's activities and performance instantly.

The study's findings suggest that the structured use of the M-Kids Mobile Apps can positively impact children's cognitive and behavioural development, aligning with the literature on developmentally appropriate digital engagement. While there are valid concerns about screen time, this research highlights that not all screen time is detrimental; rather, its effects depend on the content, context, and amount of time spent. The findings showed significant improvements in children's understanding of moral and Islamic values, cognitive engagement, and behavioural

responses, suggesting that structured educational screen time, when used correctly, can be beneficial.

Parents and educators reported satisfaction with the app's ability to enhance learning and monitor children's progress. This feedback supports the notion that well-designed educational apps can offer meaningful learning experiences without the negative effects often associated with excessive or unstructured screen use. Future studies should explore the long-term effects of such digital tools and optimal screen time durations to maximize benefits while minimizing risks.

## **CONCLUSION**

The goal of this research is to identify improvements in the cognitive and behavioural performance of preschool children in the use of mobile technologies in their learning. This research was therefore conducted to develop an application called M-Kids Mobile Learning Apps based on needs and related hypotheses justified by experts. Development and validation of the application were made obligatory before it was enforced for preschool children; feedback was collected to justify the hypotheses.

As a result, this research established the application of the Cognitive Theory of Multimedia Design Elements and the Islamic Design Principles to the design of M-Kids Mobile Learning Applications to enhance the learning experience of preschool children, especially in the cognitive and behavioural growth of the children. The results of this study provide insight into the nature of the M-Kids mobile learning application that can be used by preschool children to interpret, understand, and adopt the moral/Islamic meaning into their everyday learning activities.

This study raised important questions about the nature of developing and preparing appropriate content for young children on their current and future development. While this research concentrated exclusively on cognitive and behavioural improvements, the results could well influence the continued growth of children's psychomotor and social-emotional responses.

Subsequently, the present study contributes to the increasing body of educational research that suggests the integration of Islamic moral values in children's curriculum activities to improve children's learning experience of behavioural growth. This new insight could help to improve forecasts concerning the negative effects of the latest mobile technology on young children (Herodotou, 2017, p. 8). These results would also enable other scholars, designers, and content creators to create suitable learning resources for children's education. Although the current study is based on a small sample of participants, the findings suggest a highly positive response received from parents and teachers upon the usage of M-Kids Mobile Learning Apps in children's learning. The recognition of having an instant monitoring system in the application was also one of the significant successes of this study.

However certain limits need to be noted concerning validating the methodology. The research was constrained in a variety of ways. First, the study used convenience sampling that concentrated only on four Islamic preschools in the Klang Valley district. Second, the M-Kids Mobile Apps prototype was built only on the Android platform; and thirdly, the M-Kids Mobile Apps prototype module/content was designed for only one level of learning difficulties. However, one of the benefits of this analysis was that it represented a thorough overview of the whole instruction design process, beginning with the recognition of requirements, the design approach, the evaluation of the solution, the iteration, and the execution of the feedback as driven by the design-based research framework by (McKenney & Reeves, 2018, pp. 1–3). Nevertheless, there are a variety of potential future studies using the same techniques developed. Further experiments are required to gain a better understanding of the improvements and effects of psychomotor and social-emotional growth on young children on the usage of mobile learning applications in children’s education.

This study provides crucial insights into the integration of digital learning tools in preschool education. It suggests that, under controlled conditions, structured educational screen time can enhance cognitive and behavioural development in young children. By carefully balancing screen time with educational objectives, digital applications like M-Kids Mobile Apps can offer significant benefits, supporting the continued growth of children in the digital age. These findings contribute to the broader discourse on early childhood education, digital engagement, and the careful design of technology-based learning tools that cater to developmental needs.

## **ETHICS STATEMENTS**

This study was conducted following the ethical standards of the UTAR Scientific and Ethical Review Committee. Informed consent was secured from all respondents involved in the study. Participants were informed about the study’s purpose, procedures, and their rights to confidentiality and withdrawal at any point without penalty.

## **AUTHOR STATEMENTS**

This research paper was authored exclusively by Wan Irma Sabrina bt. Idris.

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## DECLARATION OF INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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