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USER ACCEPTANCE OF MATH PEAK: A GAME-BASED MATHEMATICS LEARNING TOOL FOR YEAR 2 CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

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ABSTRACT

This study investigates the user acceptance of MATH PEAK, a game-based mathematics learning application designed for Year 2 children with special educational needs. MATH PEAK integrates computational thinking principles and inclusive design to support mathematics learning for diverse learners. The application features accessible interfaces, role-playing game elements, adaptive difficulty, and curriculum-aligned content mapped to the Malaysian Special Education syllabus. A quantitative research design was employed with a purposive sample of 20 Year 2 special education students from a government primary school. The adapted Usefulness, Satisfaction, and Ease of Use (USE) Questionnaire was reconstructed for young learners using a smiley-based Likert scale (happy = 3, neutral = 2, sad = 1) to assess four constructs: perceived usefulness, ease of use, ease of learning, and satisfaction. Data collection included a two-week classroom integration phase, with teachers facilitating hands-on exploration of the app before survey administration. Findings revealed consistently high mean scores across constructs: usefulness (2.92), ease of use (2.90), ease of learning (2.94), and satisfaction (2.90). Students reported that MATH PEAK improved mathematics comprehension, enhanced numerical skills, and was enjoyable to use. The application's simplicity, personalized learning pace, and engaging game-based activities contributed to positive user experiences. The study's results highlight MATH PEAK's potential as an inclusive educational technology tool that promotes engagement, autonomy, and skill development for special educational needs learners. While the small sample size limits generalizability, the findings provide evidence to guide further development and wider implementation. Recommendations include extending MATH PEAK's use to home learning environments, enhancing adaptive features for varied learner profiles, and integrating broader accessibility options. This research underscores the value of user-centred, game-based applications in improving educational equity for early special education.

Keywords: user acceptance, game-based learning, special education, mathematics, computational

thinking.

INTRODUCTION

In recent years, the integration of educational technology into mainstream classrooms has revolutionized the way students engage with learning materials (Pendy, 2023). This technological evolution is especially pertinent in addressing the diverse learning needs of special children, ensuring their inclusive participation in education (Pradeep, 2023). Game-based learning applications have emerged as promising tools for inclusive education for enhancing engagement and educational outcomes (Gallud et al., 2023).

Recent findings support this shift. Alrefaei (2025) reported that a 25-session game-based math intervention significantly improved mathematical problem-solving skills in students with learning disabilities, compared to traditional methods. Similarly, a study by Wu et al. (2025) emphasized how integrating computational thinking, design-thinking, and game elements fosters strong cognitive and emotional outcomes among children with diverse learning profiles. These innovations not only engage learners but also personalize the experience to suit unique developmental needs (Weng et al., 2024).

This paper introduces a study that focuses on investigating the user acceptance of "MATH PEAK," a game-based mathematics learning computer application designed specifically for Year 2 special children. By focusing on this often-overlooked demographic, this study contributes to the broader conversation on equitable technology integration in education.

BACKGROUND OF THE STUDY

Educators and researchers have long recognized that special children, often characterized by a range of disabilities or developmental differences, require tailored learning approaches that accommodate their unique cognitive, emotional, and developmental profiles (Sanger, 2020). Conventional teaching methods might not effectively resonate with these learners, necessitating innovative solutions that foster their engagement and understanding (Pradeep, 2023; Gallud et al., 2023). This is particularly evident in the domain of mathematics education, where the abstract nature of mathematical concepts can pose significant challenges for special children (Bagger et al., 2020).

Game-based learning (GBL), an instructional approach that leverages the principles of game design to engage learners, has gained significant attention in recent years for its potential to enhance the educational experience. For special children, GBL offers a pathway to overcome challenges such as attention difficulties, abstract reasoning limitations, and ineffective assessment methods (Goodwin et al., 2012). Recent evidence reinforces this view. Alrefaei (2025) demonstrated that game-based mathematics interventions significantly improved problem-solving skills among primary students with learning disabilities. Likewise, Wu et al. (2025) highlighted that combining computational thinking, game mechanics, and human-centred design delivers notable cognitive and affective benefits for children with diverse needs. Weng et al. (2024) further observed that such tools boost self-efficacy and learner motivation, even when skill gains vary.

These findings suggest that GBL is more than a motivational tool, it is a powerful medium for inclusive, differentiated instruction. However, for optimal impact, such applications must be grounded in pedagogical and developmental theory, and evaluated with rigorous, user-centred methods.

This paper addresses the research gap by focusing on the user acceptance of MATH PEAK, an application explicitly tailored for Year 2 special children's mathematics learning. Understanding the user acceptance of such applications is paramount in ensuring that they effectively contribute to the educational experiences of special children. To evaluate this potential, a structured investigation into MATH PEAK's usability and acceptance was conducted, as detailed in the Methodology section below.

MATH PEAK – A GAME-BASED APPLICATION FOR LEARNING MATHEMATICS FOR SPECIAL CHILDREN

In the realm of educational technology, MATH PEAK stands as an innovative game-based mathematics learning application tailored to address the distinctive needs and learning challenges of Year 2 special children. This section explores the features and design principles that make MATH PEAK a promising tool for enhancing engagement and learning outcomes in this specific demographic.

MATH PEAK's development revolves around the recognition that special children require individualized approaches to education. Designed to cater to the unique cognitive and developmental profiles of Year 2 special children, MATH PEAK employs a pedagogical framework that ensures accessibility and inclusivity. Its content, interactive activities, and user interface are thoughtfully crafted to align with the learning preferences and abilities of this demographic (Ilyas, 2023). At the heart of MATH PEAK's effectiveness is its incorporation of game-based learning principles. By leveraging the intrinsic appeal of games, MATH PEAK transforms mathematics learning into an immersive and interactive experience. The application features diverse game mechanics, challenges, and rewards that capture the attention and motivation of special children. This engagement serves as a catalyst for active participation and sustained interest in mathematical concepts.

A key innovation is MATH PEAK's integration of computational thinking principles within its educational framework. Computational thinking, emphasizing logical sequencing, pattern recognition, and problem decomposition, has been shown to support deeper cognitive development among students with learning differences (Wu et al., 2025). Through interactive activities that nurture these cognitive strategies, MATH PEAK supports both mathematics mastery and broader cognitive growth. The application's interface supports a personalized learning journey, enabling students to progress at their own pace. Real-time feedback and adaptive difficulty levels provide support and challenge in equal measure, ensuring a balance that promotes confidence and competence. These elements are especially critical for special children, who may need additional scaffolding to maintain motivation and understanding (Weng et al., 2024).

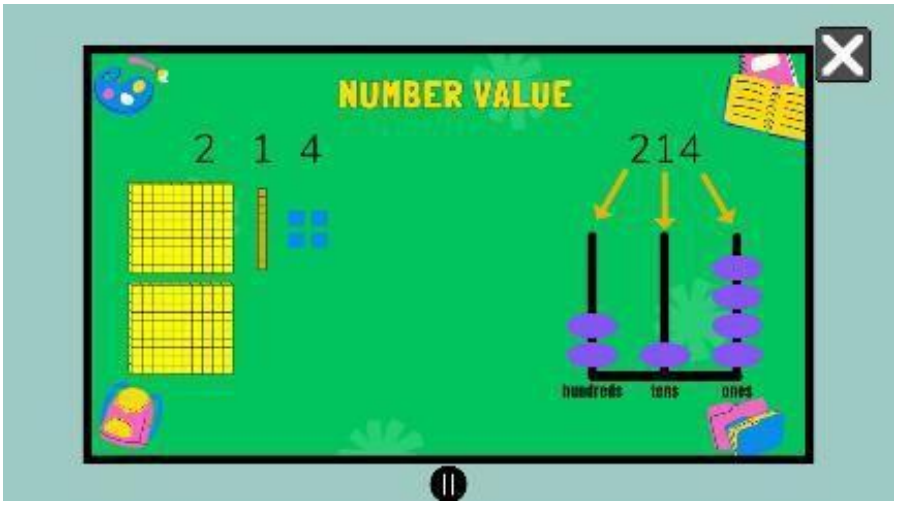
MATH PEAK also employs vibrant visuals, clear iconography, and intuitive navigation to meet the sensory and processing needs of diverse learners. These features align with universal design principles and are grounded in evidence-based practices in special education (Gallud et al., 2023). Furthermore, MATH PEAK incorporates the structure of role-playing games (RPG), where students are guided by avatars through problem-solving quests. This gamified journey adds narrative, purpose, and context to abstract mathematical content, turning practice into adventure. As students answer questions and navigate tasks, they build not just skills but also agency and confidence in their abilities.

Technically, MATH PEAK was developed using Unity as the primary development framework. The team implemented all game components from scratch: gameplay mechanics, user interface, art assets, and curriculum-aligned educational content. The mathematical modules were closely mapped to the Malaysian Special Education syllabus, ensuring curricular relevance while supporting differentiated instruction. Figures 1(a), 1(b), and 1(c) showcase different aspects of the game interface, including the title screen, learning video module, and gameplay components.

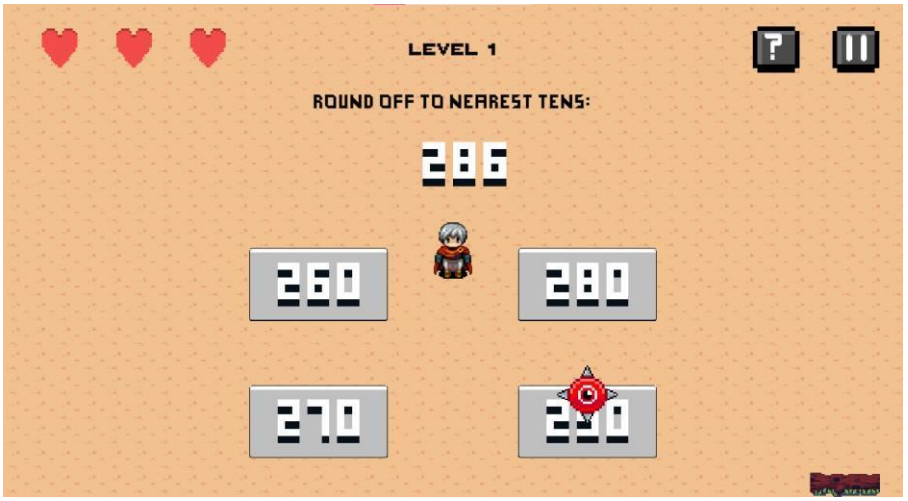
Figure 1

MATH PEAK Game Interface

(a) Title page



(b) Learning video



(c) Game play components

This integration of pedagogy, accessibility, game mechanics, and personalization positions MATH PEAK as a meaningful innovation in inclusive mathematics education. The following section presents the methodology used to evaluate its user acceptance among the target population.

METHODOLOGY

This study employed a quantitative research design to examine the user acceptance of MATH PEAK among Year 2 special education students. The approach was selected for its ability to provide empirical insights into user perceptions based on structured, measurable variables. A total of 20 students from a government primary school were selected through purposive sampling. These students were enrolled in a Year 2 special education class and demonstrated basic familiarity with digital devices. Prior to the study, ethical clearance was obtained, and parental consent was secured for all participants.

The main data collection instrument was an adapted version of the Usefulness, Satisfaction, and Ease of Use (USE) Questionnaire (Lund, 2001). The questionnaire was reconstructed to suit the cognitive and developmental levels of young special needs learners. It consisted of 30 items covering four core constructs: perceived usefulness, ease of use, ease of learning, and user satisfaction. To facilitate understanding, a smiley-based Likert scale was implemented. Each response option was visually represented by expressive icons ranging from happy (agree = 3), neutral (2), to sad (disagree = 1), as validated in previous studies involving young children (Alismail & Zhang, 2018; Massey, 2022).

The small sample size (n=20) is consistent with exploratory studies in special education technology research, where participant recruitment is often constrained by the availability of learners within specific educational settings (Lubas et al., 2014; Koumpouros & Toulias, 2020). Such targeted sampling allows for in-depth observation, personalised instrument adaptation, and higher control over environmental variables, ensuring that the findings, while not statistically generalisable to all populations, are highly relevant to the studied demographic. This approach aligns with best practices in early-stage usability testing for inclusive educational tools. The class teacher and research team provided real-time assistance during questionnaire administration to avoid misinterpretation and ensure the reliability of responses.

The data collection process involved five main stages as follows:

i. Participant Briefing and Consent: Before the study commenced, a detailed briefing session was conducted with the guardians of all selected participants. The session explained the purpose of the research, its benefits, and how MATH PEAK would be used in the classroom. Simultaneously, students were introduced to the idea of participating in a research study in age-appropriate language. Written informed consent was obtained from all guardians, while verbal assent was secured from the children. This stage was essential to ensure ethical compliance and to build trust among participants and their caregivers (Weng et al., 2024).
ii. Exploratory Phase: In this phase, students were introduced to the MATH PEAK application in a guided environment. Teachers and researchers walked them through the interface, explaining how to navigate the menus, interact with game elements, and progress through tasks. Students were given time to explore the app hands-on, with support provided as needed. This phase aimed to reduce cognitive load and anxiety by familiarizing them with the digital tool in a non-assessed, playful setting. It also ensured that each student had equitable exposure to the application before formal data collection.

    Engagement Phase: Over a period of two weeks, students used MATH PEAK as part of their regular mathematics sessions in class. Teachers incorporated the app into their daily lessons, allowing students to explore its features freely and interact at their own pace. This extended exposure allowed students to build routine and comfort with the app, making their later responses in the survey more authentic and informed. Importantly, no formal test or grades were attached to the app usage, which helped maintain a stress-free learning environment conducive to intrinsic motivation (Alrefaei, 2025).
iii. Survey Administration: At the end of the engagement period, the smiley-based Likert questionnaire was administered in class. Each student completed the questionnaire with support from the teacher and research assistant when needed. For students with limited literacy skills, items were read aloud and explained. This personalized administration method helped reduce response bias and ensured that students understood the meaning behind each question. The use of expressive icons (happy/neutral/sad) provided a child-friendly interface for emotional and cognitive expression (Massey, 2022).
iv. Data Analysis: All completed responses were encoded into SPSS version 26 for statistical analysis. Descriptive statistics such as mean, mode, and standard deviation were calculated to summarize user perceptions across the four key constructs. The quantitative findings were complemented by classroom observations noted during the two-week interaction phase. This combination of numeric analysis and contextual interpretation provided a more nuanced understanding of the application's usability and acceptance. The overall instrument reliability, measured via Cronbach's alpha ($\alpha = 0.86$), confirmed strong internal consistency.

To ensure content validity, the adapted questionnaire was reviewed by two instructional design experts and one special education teacher. A pilot test involving five non-participant students was conducted to refine ambiguous items and assess question clarity. Based on feedback, minor wording changes were made to improve comprehension. The final instrument demonstrated high internal consistency, as reflected in a Cronbach's alpha coefficient, indicating strong reliability across constructs.

The methodology aligns with current best practices in inclusive educational research, particularly in adapting instruments to suit the cognitive needs and communication styles of young learners with diverse abilities (Weng et al., 2024; Wu et al., 2025). This approach enabled a meaningful and ethical evaluation of user acceptance, rooted in both rigor and empathy. This structured evaluation allowed for an evidence-based analysis of the MATH PEAK application's usability and learner satisfaction.

FINDINGS

This section presents the findings of the study's quantitative analysis focusing on the user acceptance of the MATH PEAK application among Year 2 special children. The study assessed the usability of the MATH PEAK application based on respondents' responses to user acceptance related Likert-scale items. The data analysis of this study was carried out through descriptive analysis. The decision to utilize descriptive analysis for the data analysis in this study aligns harmoniously with the study's focus on special children. By prioritizing accessibility, central tendencies, individualized learning, contextual interpretation, and cognitive load management, descriptive analysis emerges as the optimal method to reveal meaningful insights that resonate with the unique attributes and requirements of special students. Among the aspects that were examined were the usefulness, ease of use, ease of learning and satisfaction from the perspective of 20 respondents who are special need students ranging from mild to moderate spectrum. The data analysis represents the scores from the adapted USE questionnaire used in this research which indicated 1(☹) as disagree, 2 (😐) as neutral/not sure and 3(☺) as agree.

The first construct of the user acceptance evaluation is the usefulness aspect. Table 1 outlines the findings of the descriptive analysis for this construct. The participants acknowledged that the MATH PEAK application significantly contributes to their learning of Mathematics and enhancement of numeric skills. It is also regarded as beneficial due to its alignment with their requirements. Furthermore, the application empowers them by affording greater control over learning activities and seamlessly fulfils their expectations. The participants reported that MATH PEAK notably aids in more effective Mathematics learning ($\bar{x}$ = 2.95), fostering improved numerical skills ($\bar{x}$ = 3.00), and serving as a valuable tool ($\bar{x}$ = 3.00). They expressed that it enhances autonomy over activities ($\bar{x}$ = 2.80), streamlines the achievement of learning objectives (mean score, $\bar{x}$ = 2.90), optimizes time utilization ($\bar{x}$ = 2.80), and adeptly adapts to their learning pace ($\bar{x}$ = 3.00). The participants also highlighted that the MATH PEAK application consistently meets their expectations ($\bar{x}$ = 2.90). Overall, the participants emphasized the utility of the MATH PEAK application, supported by the construct's mean score of 2.92. The notably high mean scores, exceeding 2.60 and closely approaching 3.00 for the initial construct, underscore the MATH PEAK application's efficacy in facilitating effective Mathematics learning and enhancing numerical skills for dyscalculic children.

Table 1

Questionnaire findings for Usefulness Construct

Construct	Statement	Agree ☺	Neutral 😐	Disagree ☹	Mean	Construct Mean
	MATH PEAK helps me to learn Mathematics more effectively.	19	1		2.95	
	MATH PEAK helps me be improve my numerical skills.	20			3.00	
	MATH PEAK is useful for the me.	20			3.00	
Usefulness (USE)	MATH PEAK gives me more control over the Mathematics activities.	17	2	1	2.80	
	MATH PEAK makes me accomplish the					2.92

	learning goal easier	18	2		2.90	
	MATH PEAK saves my time when I use it.	16	4		2.80	
	MATH PEAK meets my learning pace.	20			3.00	
	MATH PEAK does everything that I xpect it to do.	18	2		2.90	

Table 2 describe the findings for the second construct which is the ease of use aspect. The participants have indicated that the MATH PEAK application is notably user-friendly due to its simplicity. It excels in requiring minimal steps to accomplish desired tasks, thereby streamlining the user experience. The respondents' affinity for the mobile game-based learning application is evident, consistently demonstrating successful utilization. The aggregate mean score for this category is 2.94. Analysis highlights the user-friendly nature of MATH PEAK ($\bar{x}$ = 2.90), underscored by its simplicity (mean score, $\bar{x}$ = 3.00), efficiency in operation ($\bar{x}$ = 2.85), flexibility ($\bar{x}$ = 2.95), and overall ease ($\bar{x}$ = 2.80). Additionally, participants have noted their ability to navigate MATH PEAK without the need for written instructions ($\bar{x}$ = 2.90) and have attested to the application's consistency in operation ($\bar{x}$ = 2.95). They also express a quick and facile recovery from errors ($\bar{x}$ = 2.85) and a consistent record of successful interactions with the application ($\bar{x}$ = 2.95). Overall, the respondents unequivocally express their favourability towards the MATH PEAK application ($\bar{x}$ = 2.90).

Table 2

Questionnaire findings for Ease of Use Construct

Construct	Statement	Agree ☺	Neutral 😐	Disagree ☹	Mean	Construct Mean
	MATH PEAK is easy to use.	17	3		2.85	
	MATH PEAK is simple to use.	20			3.00	
	MATH PEAK is user friendly.	18	2		2.90	
	MATH PEAK requires the fewest steps possible to accomplish what I want to do with it.	18	1	1	2.85	
	MATH PEAK is flexible.	19	1		2.95	
Ease of Use (EOU)	Using MATH PEAK is effortless.	16	4		2.80	
	I can use MATH PEAK without written instructions.	18	2		2.90	2.90
	I don't notice any inconsistencies as I use MATH PEAK.	19	1		2.95	
	I like MATH PEAK.	17	3		2.85	
	I can recover from mistakes quickly and easily.	19	1		2.95	
	I can use MATH PEAK successfully every time	18	2		2.90	

Participants also affirmed that recalling how to use the MATH PEAK application is a straightforward process. The ease of learning facet exhibited an aggregate mean score of 2.94. Analysing the data pertaining

to this construct's components, it becomes evident that the respondents swiftly acquire the skills to operate the MATH PEAK application ($\bar{x}$ = 2.90). They express a perception that remembering how to use MATH PEAK is comfortable ($\bar{x}$ = 2.85), coupled with the application's ease of learnability ($\bar{x}$ = 3.00). Moreover, they convey a sense of rapid skill acquisition, swiftly becoming proficient in operating MATH PEAK ($\bar{x}$ = 3.00). The findings as reported in Table 3, suggest that the MATH PEAK application adeptly addresses the ease of learning aspect, allowing children to swiftly acquire proficiency in using the mobile app.

Table 3

Questionnaire findings for Ease of Learning Constructs

Construct	Statement	Agree ☺	Neutral 😐	Disagree ☹	Mean	Construct Mean
	I learned to use MATH PEAK quickly.	18	2	2.		
Ease of Learnin g (EOL)	I can easily remember how to use MATH PEAK.	17	3	2.		2.94
	It is easy to learn to use MATH PEAK.	20		3.		
	I can quickly became skilful with MATH PEAK.	20		3.		

Table 4 represents the findings for the satisfaction constructs. Regarding the satisfaction component, participants uniformly affirmed their contentment with MATH PEAK and their willingness to recommend it to others. Their feedback also underscored the application's enjoyment factor and its adherence to intended functionalities. The composite mean score for this construct rests at 2.90, indicating their satisfaction with MATH PEAK ($\bar{x}$ = 2.95) and their inclination to advocate for its use among peers ($\bar{x}$ = 2.90). Moreover, they highlighted the application's enjoyable nature ($\bar{x}$ = 2.90), its seamless alignment with expectations ($\bar{x}$ = 2.85), and its perceived value ($\bar{x}$ = 2.85). The data analysis further revealed that participants view the MATH PEAK application as impressive ($\bar{x}$ = 2.90), pleasurable to utilize ($\bar{x}$ = 2.85), and an essential tool for all students ($\bar{x}$ = 2.85). Collectively, the participants' responses exhibited mean scores that surpass 2.60 and approach 3.00 for the satisfaction construct, indicative of their robust satisfaction with MATH PEAK and their enthusiastic desire to integrate it.

Table 4

Questionnaire findings for Satisfaction Constructs

Construct	Statement	Agree ☺	Neutral 😐	Disagree ☹	Mean	Construct Mean
	I am satisfied with the MATH PEAK application.	19	1		2.95	
	I would recommend MATH PEAK to a friend.	18	2		2.90	
Ease of	The MATH PEAK application is fun to use.	18	2		2.90	
						2.90

Learning (EOL)	MATH PEAK works the way it supposed to.	18	1	1	2.85	
	MATH PEAK is wonderful.	18	2		2.90	
	I feel all students need to have the MATH PEAK application.	17	3		2.85	
	MATH PEAK is pleasant to use.	19	1		2.95	

This consistency in high mean scores across all four constructs: perceived usefulness, ease of use, ease of learning, and user satisfaction, indicates that MATH PEAK not only meets but often exceeds the expectations of its intended users. For Year 2 special students, who often face cognitive and attentional challenges, achieving such uniformly positive feedback across usability dimensions underscores the application's success in delivering both functionality and engagement.

The narrow range of scores ($2.60 < \bar{x} < 3.00$) further suggests minimal disagreement among users, highlighting a strong consensus about the tool's effectiveness. In inclusive educational design, such convergence in user perception is particularly significant, it implies that the tool was accessible to a variety of learners across different points on the special needs spectrum (from mild to moderate), thereby affirming its versatility and adaptability in a real-world classroom setting.

Moreover, the fact that students found the application enjoyable and easy to learn increases the likelihood of continued use, which is crucial for reinforcing learning over time. When children are both engaged and empowered by technology, they are more likely to take ownership of their learning journey, making tools like MATH PEAK essential in reducing educational barriers and promoting equity.

DISCUSSION

The discussion section provides the interpretation of the quantitative findings related to the user acceptance of the MATH PEAK application among Year 2 special children. The positive user acceptance ratings received for the MATH PEAK application underscore its significance in meeting the needs of this demographic. The mean scores obtained for various dimensions of user acceptance – usefulness, ease of use, ease of learning, and satisfaction, shed light on the application's effectiveness in enhancing the learning experience for this specific group. These findings align with the literature emphasizing the importance of user-centred design in enhancing the usability of educational applications for special children (Dick., 2023; Gallud et al., 2023; Hussin et al., 2020; Noor et al., 2019; Zabidi et al., 2020).

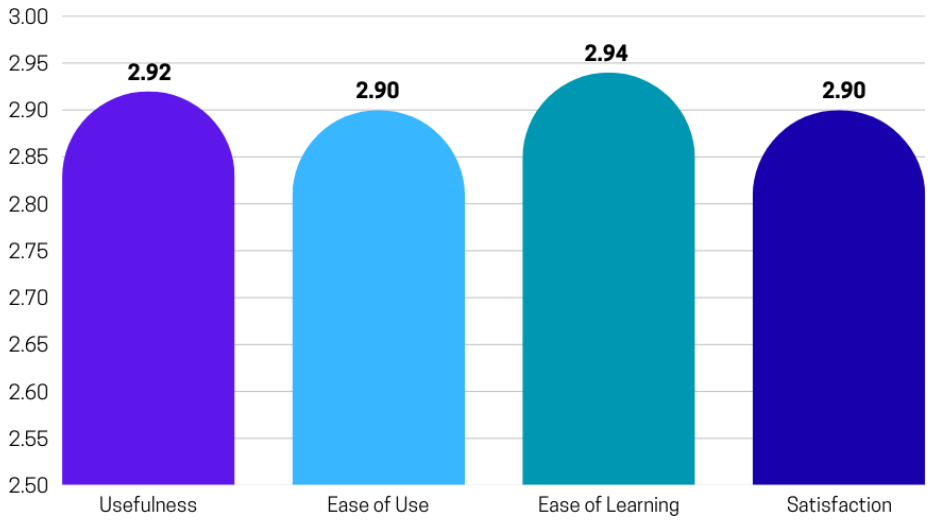
When compared to similar studies, MATH PEAK's performance is particularly notable. For example, Alrefaei (2025) reported significant improvements in problem-solving skills among students using a game-based mathematics intervention, yet did not report uniform satisfaction scores across all usability constructs. Wu et al. (2025) highlighted cognitive and affective gains from integrating computational thinking into gamified learning, echoing MATH PEAK's design philosophy. Moreover, Cayang and Ursabia (2024) emphasized the need for adaptive digital tools that align with learners' individual developmental trajectories, underscoring the value of personalization in inclusive education. The convergence of high ratings across constructs in this study suggests that MATH PEAK effectively combines these strategies in a balanced, learner-friendly manner.

To aid visual interpretation of these findings, Figure 2 presents a comparative bar chart of the mean scores for all four constructs. The narrow score range (2.90–2.94) indicates strong consensus among participants, which is uncommon in heterogeneous special needs cohorts and reflects MATH PEAK's inclusive

adaptability.

Figure 2

Mean scores for user acceptance constructs of MATH PEAK (n = 20).



**Note: *Scores are based on a 3-point smiley Likert scale (1 = disagree, 2 = neutral, 3 = agree).*

The mean scores for usefulness (2.92), ease of use (2.90), ease of learning (2.94), and satisfaction (2.90) indicate that respondents found the application helpful, easy to use, simple to learn, and satisfying to interact with. The usefulness dimension confirms that MATH PEAK was perceived as a valuable learning tool that enhanced mathematics comprehension and numerical skills. This dimension evaluates how effectively the product fulfilled its intended purpose and how much benefit it provided to the learners.

The ease of use construct, with a mean of 2.90, reflects participants' perceptions that the app was intuitive and simple to navigate. This reinforces the significance of designing educational tools with clear, accessible interfaces, especially for special children who may experience cognitive challenges. Participants' ability to interact independently with the app fostered a sense of accomplishment and autonomy.

Ease of learning received the highest mean score (2.94), showing that students found the learning process with MATH PEAK accessible and comprehensible. This demonstrates that the application's structure, guidance, and interactivity supported the students' learning journey, enabling them to become quickly proficient in using the app.

Satisfaction, with a mean of 2.90, indicates that users enjoyed the app and were emotionally engaged. The positive emotional responses suggest that MATH PEAK provided an environment that was not only educational but also enjoyable and motivating, contributing to stronger engagement and willingness to continue learning.

All constructs consistently demonstrated mean scores exceeding 2.60 ($2.60 < \bar{x} < 3.00$), signifying general agreement among respondents that MATH PEAK effectively caters to Year 2 special students. This consistency underscores the app's success in fostering numerical skill improvement, ease of use, learnability, and satisfaction. The narrow range of high scores also implies that children with different levels of abilities experienced similar benefits, highlighting MATH PEAK's potential for inclusivity and adaptability.

The findings of this study emphasize the potential of the MATH PEAK application in facilitating mathematics learning for special children. To optimize its impact, future iterations could focus on enhancing engagement strategies and refining content alignment with diverse learner profiles. However, it's important to acknowledge the limitations of the study. The sample size of 20 respondents and the short interaction period limit the generalizability of the results and do not capture long-term usability trends. Furthermore, findings were based primarily on self-reported measures via questionnaires; observational triangulation was minimal, which may influence the depth of insights into actual user interaction behaviours. Future studies should include broader sample sizes and longitudinal data collection to better understand retention and sustained engagement.

Overall, the study's findings contribute valuable insights into the design and implementation of educational technology tools for special education contexts. The positive user acceptance of MATH PEAK supports the viability of game-based learning as an effective method for engaging special children in mathematics. Developers and educators are encouraged to prioritize user-centred design principles that foster accessibility, enjoyment, and pedagogical value.

CONCLUSION

This study provides compelling evidence of MATH PEAK's positive user acceptance among Year 2 students with special educational needs. High ratings across all four constructs; usefulness, ease of use, ease of learning, and satisfaction, demonstrate the application's strong alignment with the cognitive, emotional, and developmental needs of its intended users. By combining inclusive design, curriculum-aligned content, and engaging game-based mechanics, MATH PEAK effectively fosters mathematics learning while promoting learner autonomy and enjoyment.

The findings highlight MATH PEAK's potential not only as an effective classroom tool but also as a scalable solution for diverse learning environments. To maximise its impact, educators are encouraged to integrate MATH PEAK alongside traditional teaching approaches in both classroom and home-based learning, using it to reinforce core numerical concepts and computational thinking strategies. Developers should consider enhancing the application's adaptive learning algorithms to better match task difficulty with learner progress, while also expanding accessibility features such as adjustable visual contrast, text-to-speech functionality, and multi-language options to cater to a wider range of learners. In terms of scalability, introducing an offline mode and designing parent-assisted modules could extend the application's reach to low-connectivity or rural contexts, enabling more equitable access. Continued refinement, informed by user feedback and inclusive design principles, will further strengthen MATH PEAK's role in bridging learning gaps, increasing engagement, and promoting equitable educational outcomes for children with special educational needs.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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