Investigating the Perception of Engagement the Interactive Game-Comics Mobile App for Primary Education in Malaysia

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Abstract-Contemporary education demands interactive approaches that align with students' digital lifestyles. This study aims to explore the perception of usability of a mobile interactive comic-game application, *Hang Tuah: Laksamana Melaka*, among primary school students, focusing on student engagement. The research is guided by current literature in edutainment, game-based learning, and mobile learning, which highlight the importance of integrating enjoyable and user-friendly applications into the learning environment. Data were collected from interviews and video observations involving ten Year 4 students and analysed using Reflexive Thematic Analysis (RTA) as introduced by Braun and Clarke. Two main themes emerged: (1) Positive Engagement and Content Attraction, which includes appreciation of historical elements, interest in comic visuals, and enjoyment of local game features; and (2) Challenges in Interface and Interaction, which covers technical constraints in controls and confusion in narrative flow. Findings suggest that most students showed positive emotional and behavioural engagement, such as smiling, laughing, and maintaining focus, indicating the potential of interactive comic games in enhancing motivation and understanding in learning. However, identified usability issues highlight the need for design improvements. This study demonstrates that interactive comic games can serve as an effective digital learning tool, particularly in teaching historical content to young learners.

Keywords: Interactive Comic Game; Usability; Student Engagement; Mobile Learning; Game-Based Learning; Primary Education; Reflexive Thematic Analysis

1. INTRODUCTION

The Ministry of Education (MOE) introduced the Malaysian Education Development Plan (PPPN) 2013 to 2025. The plan was developed with three specific objectives and followed by 11 revisions designed to enhance the country's aspirations in preparing young people to meet the needs of the 21st century (Ministry of Education Malaysia [MOE], **2023**). By recognizing the needs and challenges of current performance, education focuses on improving standards (quality) and bridging achievement gaps (equity). However, after the first phase, the level of ICT use in schools has not yet reached a satisfactory level, either in terms of quality or quantity where only 80% of teachers use ICT less than one hour a week (Mohd Salleh & Ibrahim, 2021). Recent studies indicate that digital transformation in Malaysian education continues to face challenges and opportunities in the post-pandemic era (Ahmad, & Khalid, 2022).

Therefore, the Ministry of Education hopes that students have access to a wider range of interesting and interactive content. ICT facilities will also be a part of student life in schools, without gaps. The plan is driving the transformation of the 2nd wave (MOE, 2023). One of the approaches is to use blended learning which refers to the integration of face-to-face teaching approaches and technology-assisted teaching. This approach typically gives students some element of control according to time, place, pace or learning style. In addition, technology is introducing new ways of interactive communication using multimedia. According to this can be directly linked to entertainment and education known as edutainment (Rizvic, Boskovic, Okanovic, Sljivo, & Zukic, 2019).

Interactive digital storytelling is becoming a popular choice for information presentation in many fields such as serious games, education, and visual arts (Nascimento & Oliveira, 2022). In education, recent research highlights the ongoing technical challenges concerning what could be achieved and what is expected for teaching and learning in digital environments (Nikolopoulou, Gialamas, & Lavidas, 2020). Next, contemporary studies emphasize the need to integrate mobile learning in today's classroom, particularly focusing on user acceptance and effectiveness (Nikolopoulou, Gialamas, dan Lavidas, 2020) . In a study focusing on Malaysian context, recent research indicates there is also a gap and urgency to design and develop quality and effective mobile learning applications especially for children (Mohd Salleh, & Ibrahim, 2021).

Current literature shows that there is also limited research in interactive game comics, especially in primary education contexts (Nascimento, & Oliveira, 2022). Taking all this into consideration and the benefits of a hybrid form of mobile interactive comic-games, the researcher investigates how these adaptations may benefit education, especially history education. According to recent research in child-computer interaction, usability testing methods for children should encourage the role of children as experts and careful consideration should be given to evaluation methods suitable for young users (Barendregt & Börjesson, 2019). The objective of this study is to examine the perception of usability of the interactive comic game mobile application, namely Hang Tuah: Laksamana Melaka, based on student engagement among primary school students.

2. METODE RESEARCH

This study uses a qualitative case study design to explore in depth students' perceptions of the usability of a mobile application based on interactive comic games in the classroom context. The qualitative approach was chosen because it

provides researchers with the opportunity to understand the user experience subjectively, in depth, and in a natural setting. According to Kumar et al. (2024), a qualitative design is particularly appropriate when the study objective involves exploring the narrative and behaviours of users towards technology in a real context, specifically looking at students' perceptions of the usability of a mobile interactive comic game application in the classroom context. This approach was chosen because it allows researchers to gain a deep understanding of the user experience in a real learning environment (Kumar et al., 2024). Usability assessment is carried out through user testing methods as recommended by Umar et al. (2020), which emphasizes the effectiveness of observing real user interactions with the system or application.

In line with the methodological reviews by Nouri et al. (2023) and Kim et al. (2022), qualitative usability assessment methods can generally be categorized into three main forms:
a. Introspection, which is the researcher's internal reflection on the data and analysis process.
b. Direct observation, including video recordings and think-aloud techniques.
c. Open-ended or semi-structured interviews.

In this study, the introspection method was not used because it did not involve the researcher's direct internal reflection on the use of the application. Instead, two main methods were used, direct observation was replaced with video recordings of student interaction sessions with the application, and semi-structured interviews were conducted after the application use session to obtain students' reflective feedback. This approach is supported by the Reflexive Thematic Analysis (RTA) framework by Braun and Clarke (2006; 2021) which is used to systematically analyse data through a process of codification and theme development based on the meanings that emerge from the data.

2.1 Research Question

Therefore, the research questions are as below:
RQ1: Positive Engagement and Content Attraction.
"How do primary school students perceive their engagement with the interactive comic game Hang Tuah: Laksamana Melaka*, particularly in terms of interest, enjoyment, and historical content?"*
RQ2: Challenges in Interface and Interaction
"What are the perceived difficulties faced by students when interacting with the interface and gameplay features of the Hang Tuah *comic game application?"*

2.2 Population and Sampling

This study we used 10 students, from the fourth year taking the history subject from Sekolah Kebangsaan Pauh, Perlis. Permission to conduct testing was obtained from parents as all students are currently studying from home under the supervision of their parents to eliminate ethical issues.

2.3 Video observation

The video observation was conducted was by screen recording the use of the app using Super Screen Recorder–No Root REC & Screenshot app which is available through Google Play Store. It allows screen recording for the use of the Hang Tuah: Laksamana Melaka mobile app when the participants are interacting with the app and record their facial changes (Figure 1).
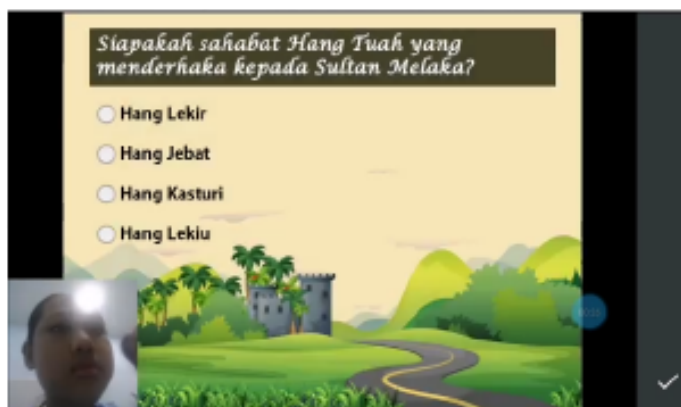

Figure 1. Interface video recording

2.4 Research Procedure

10 participants indicated their willingness to be involved in the interviews, and they were invited to participate in a semi-structured interview. All parents were brief on the nature of the study 1 week prior to the interview and the researcher obtain verbal consent of the parents before the interview commencement. A pseudonym was given to all the participants. Two criteria for selecting students to participate in the study were considered. Selected students must be good at reading and not have any visual impairment. They must be interested and willing to participate in this research, as well as interested in completing all levels of this game. Every movement of students in the game will be recorded through the

'Screen recorder' software. This includes student facial expressions. Upon completion of the playing the game, students will be interviewed.

The interviews were conducted in person or via phone and was voice recorded. It took approximately 10-20 minutes for each participant. Students were interviewed informally using everyday language, this is to facilitate the communication process so that students are closer to researcher to share their perception of this comic game. The researcher also collected the screen video recording after the interview. The audio / video recording will be transcribed using otranscribe.com and thematic analysis will be used to identifying patterns or themes within qualitative data. The research methodology was discussed in relation to research design, population and sampling, validity and reliability of the questions and research procedures. As this study relates to usability, the main focus relates to contextual inquiry methodology.

3. RESULTS AND DISCUSSION

There are two methods of finding carried out, namely through Findings from video observations and Findings from interviews to obtain an analysis of perceptions of an interactive game comic mobile application namely Hang Tuah: Laksamana Melaka based on engagement on students among primary school students. While the themes that have been set to obtain the results of the study are Emotional Engagement. That is by looking at the perceptions of students Showing interest, fun and excitement of students while interacting with the game. This observation is supported by facial reactions and expressions such as smiles, laughter, or staying focused. The thematic analysis used to study the perceptions of students towards the interactive comic games "Hang Tuah" is focused on the likes and dislikes aspects.

Where 2 qualitative research themes and sub-themes are set to obtain student, perceptions based on likes and dislikes responses. The objective of this study is to examine the perception of usability of the interactive comic game mobile application, namely Hang Tuah: Laksamana Melaka, based on student engagement among primary school students. Sub-themes for theme 1 are Appreciation of historical elements, Interest in comic and visual settings, and Love for local game elements. Sub-themes for theme 2 are technical constraints in game control and Confusion in narrative flow. The results of this finding are as shown in the diagram below:

Table 1. Themes, Sub-Themes, and Codes in Theme 1.

Theme 1: Positive Engagement and Content Attraction		
Sub theme	*Quote Answer*	*Code*
Appreciation of historical elements	*"I know about the history of Melaka" (Case 9)*	*History of Melaka New Knowledge*
Interest in comic and visual settings	*"Hang Tuah comic background" (Case 7)*	*Comic Background Interesting Visuals*
Love for local game elements	*"I like about the ship games near Melaka" (Case 2)*	*Ship Games Local Elements*

(Themes, Sub-Themes, and Codes of Students' Positive Engagement and Content Attraction in the Hang Tuah Interactive Comic Game)

Table 2. Themes, Sub-Themes, and Codes in Theme 2

Theme 2: Challenges in Interface and Interaction		
Sub-Theme	**Quote Answer**	**Code**
Technical constraints in game controls	"I do not like to press the opponent's time button" (Case 2)	*Attack Button Difficult Control*
	"I don't like the attacking part" (Case 9)	*Unresponsive*
Confusion in the flow of the narrative	"I don't like it when part of the story is rebellious" (Case 4)	*Confusing Story Inconsistent Storyline*

(Themes, Sub-Themes, and Codes of Students' Perceptions of Challenges in Interface and Interaction in the Hang Tuah Interactive Comic Game). This study presents a thematic analysis based on qualitative data obtained from interviews with Year 4 students regarding their perceptions of Hang Tuah interactive comic games. This thematic analysis approach was introduced by Virginia Braun and Victoria Clarke which involves the codification process, development of sub-themes and main themes. The theme map is very meaningful and provides practical guidance for the consistent implementation of RTA (Reflexive Thematic Analysis) Byrne, D. (2021). All students answered demographic questionnaire ask by the researcher (age, gender, grade). All students were aged 10 years old as that was the targeted sample. Majority of the respondents were female (male students $n = 3$, female students $n = 7$). Their grades from past historical test results are A = 3, B = 4, C = 3. Overall, most of students showed positive perceptions towards the Hang Tuah interactive comic games, especially in terms of historical content and interesting visuals. However, there were several weaknesses identified, especially regarding game controls and story flow, which could be improved to enhance the user experience.

3.1 Findings from the video observation

Observation methods are divided into two, namely direct observation and participant observation. This study conducted data collection with direct observation method. Where the researcher looks at the interactions and behaviours observed by the students while playing the game based on the video recording. In this study, the observation method of interaction is seen interaction through how the student navigate the application and interact. The second observation is to assess student behaviour to reflect on user experience. Their findings from interviews and video observations found that children found the comics easy to learn, interesting and easy to use, indicating that it is an appropriate educational format for children. The facial expressions and responses to the words spoken showed fun, proving that the learning was interesting. Like the best!!, wahh!!, yeyy!! this proves that children are going through an interesting and focused exploration.

4. CONCLUSION

As a result of these interview findings, students can perceive the involvement of interactive games-comics provide value added in their teaching and learning. They are willing to share experiences and fun explore that application. The educational process, in line with the rapid technological and social evolution, seeks to adapt new educational methods smoothly without abandoning traditional teaching and deviating from its main purpose. Engagement is defined as an element of simultaneous focus, interest and enjoyment while using an application. This study reflects the students to the extent that this comic game attracts students' interest, i.e. the act of repeating the game has shown students to be interested and focused in the game, thus their involvement.

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