


Understanding the Use of Mobile Ebooks Among Mathematics Postgraduates

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Abstract

Objectives: The main objective of this study is to understand the factors that encourage the use of mobile ebooks among mathematics postgraduate students.

Method: This study employed a qualitative case study approach. Eight mathematics postgraduate students from the algebra research group participated in the study. Data were collected via interview and analyzed by using constant comparative analysis.

Results: Utilitarian, cognitive, affective, social norm, and content qualities were the main factors influencing the use of mobile ebooks among the participants.

Conclusions: Mobile ebooks are easy to use and provide a meaningful platform to find information. In addition, the mobile ebook provides instant access to new information with a single finger click, thus enabling students to extract the needed information and make constructive comparisons on the subject matter.

Theory and/or Practice Implications: Results expand understanding of the factors that motivate the use of mobile ebooks for learning activities among mathematics postgraduate students. In addition, the study also provides support for institutions planning to incorporate mobile ebooks as an important reference material for postgraduate learning and research activities.

Keywords: *utilitarian, cognitive, affective, algebra, e-books*

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Introduction

One of the main advantages of incorporating instructional technology into higher learning is the transformation of the academic environment to one that is student centric. Student-centered learning emphasizes a student's active participation in their learning processes, as well as the importance of students taking responsible steps toward becoming independent learners. This independent learning process helps increase student demand for new educational resources and teaching approaches (Chen & Tsai, 2021).

The mobile ebook is one of the technologies expected to fulfill the needs of digital learners. Mobile ebooks have been a favored tool of tertiary education students from multiple disciplines, including business and management,

education, engineering, and medicine (Farid et al., 2021; Merkle et al., 2022; Oyaid & Alshaya, 2019; Welsen et al., 2020). In these fields, students have found mobile ebooks to be an effective tool for developing new skills and knowledge (Merkle et al., 2022). Furthermore, mobile ebooks transformed the learning culture to result in students being more disciplined, directed, and independent (Sari et al. 2022).

Mathematics graduates responded negatively to the use of mobile ebooks; however, even though mobile ebooks can help trigger and motivate student learning, increase learning achievement, and promote mathematical thinking skills (Letchumanan & Tarmizi, 2011; Littman & Connaway, 2004; Wijaya et al., 2022). Mathematics students found that learning mathematics via mobile ebook was cumbersome and needed favorable features to assist them in mastering mathematical knowledge effectively (Letchumanan & Tarmizi, 2011; Littman & Connaway, 2004).

Limited studies have been carried out to determine the experiences of reading mobile ebooks by mathematics students, especially studies that focused on understanding the factors that motivate the use of mobile ebooks. One aim of the present study is to understand those factors that motivate the use of mobile ebooks among mathematics postgraduate students in Malaysia.

Literature Review

Several factors motivate the use of mobile ebooks. Mobile ebooks are convenient, as they allow faster access to several mobile ebooks at one time with a single finger click. Mobile ebooks also save students time, since there is no need to physically go to libraries to find needed references in printed books (called p-books).

Using mobile ebooks saves students time and energy, as they can find multiple references and key term explanations in their field of study quite easily (Xodabande & Hashemi, 2023). This quick access to information helps students realize positive knowledge growth in their university subject matter (Rafiq & Warraich, 2019).

Simultaneous access to several ebooks at once enables students to extract needed information and make constructive comparisons on their desired subject matter (Sari et al., 2022). As a result, students can quickly explore, in-depth, areas of interest to obtain more comprehensive information, as well as to strengthen their understanding (Alhammad & Ku, 2016).

Mobile ebooks enable learners to save several at once on their lightweight, handheld mobile devices, which are then easily carried (Alexiou-Ray & Wright, 2012; Rafiq & Warraich, 2019). It was found that a mobile ebooks' lightweight nature is one of their most important benefits over p-books; they can lessen the physical burden of students having to carry heavy p-books (Sari et al., 2022).

Technical feasibility and additional features (like highlighting, annotating, and bookmarking) easily play important roles in motivating students to use mobile ebooks. University students need to read literature at analytical and synoptical levels, which is usually highly facilitated by—and dependent on—the creation of annotations and highlights (Inie et al., 2021). According to Witherby and Tauber (2019), students are keen to use highlighting and annotation features to enhance encoding and external storage—both of which could lead to a greater engagement level with the learning materials in the mobile ebook. In Taiwan, students who used highlighting, annotation, and bookmarking features showed significant improvement in self-regulated learning and self-efficacy skills, which assisted them in obtaining positive academic achievement (Chen & Su, 2019).

Other advanced features, such as a built-in dictionary, search engine, and sharing properties, can also influence the use of mobile ebooks. Many graduates reported that using mobile ebooks was convenient for research purposes (Casselden & Pears, 2020), as they provided different styles of surfing and navigating like a table of contents with links, a word or phrase search, and quick navigation through menus and graphics (Lie et al., 2020).

Another important feature of mobile ebooks is their sharing feature. Merkle et al. (2022) confirmed that students prefer mobile ebooks over p-books because mobile ebooks allow students to share their ideas and thoughts immediately with their peers. The sharing feature allows for the immediate exchange of student ideas, which may lead to constructing new knowledge and comprehending complicated concepts (Alhammad & Ku, 2016; Zhang et

al., 2021;). Casselden and Pears (2020) also found that sharing ideas with peers and experts helps learners obtain constructive feedback, which could improve their learning performance.

Ease-of-use of mobile ebooks influences their use; those with minimal technical difficulties tend to encourage more students to use them (Dimitriadis et al., 2019; Al-Suqri, 2014). When a technology product is easy to use, users believe they aren't required to invest extra effort and time to learn to use it, thus increasing the adoption rate (Leonard & Snyman, 2019). Ease-of-use allows students to spend more time reading and understanding the content (Dimitriadis et al., 2019; Al-Suqri, 2014).

The cost of mobile ebooks is also a motivator for their use. It has been reported that mobile ebooks—having the same quality as p-books—are 50%–80% cheaper (Klimova, 2019; Tsai, 2012), enabling students to purchase many mobile ebooks to support their learning activities (Klimova, 2019). Researchers Li et al. (2021) and Rockinson-Szapkiw et al. (2013) further confirmed that learners use mobile ebooks because they are cost-effective and deliver significantly higher perceived psychomotor and affective learning skills than p-books.

Mobile ebooks help increase student learning engagement, as well as helping them produce better learning scores (Martinez-Estrada & Conaway, 2012; Merkle et al., 2022; Tsai, 2012). Rockinson-Szapkiw et al. (2013) found that university graduates who used mobile ebooks achieved the same grades and exhibited similar perceived learning scores as their counterparts who used p-books. Similarly, Xodabande and Hashemi (2023) found that students who used electronic resources, including mobile ebooks, showed significantly greater academic progress compared to students who rarely used them. Such access allows students to comprehend material in detail and from various viewpoints (Bikowski & Casal, 2018). Meanwhile, past studies noted that the ability to recall information after reading from screens had improved and showed no significant difference from reading from paper (Young, 2014). The learning efficacy of the students also showed positive changes, as they were able to find the required information easily and effectively (Biranvand & Khasseh, 2014).

Some studies reported that the contribution of affective factors, including attractive colors, backgrounds, and enjoyable features like background music and audio, moved students towards mobile ebook use (Al-Jarf, 2021; Embong et al., 2012; Park et al., 2015; Sun et al., 2013). Kulviwat et al. (2007) contended that affective factors are important if users need to make the final decision to either use a technology product or not. Besides, Al-Jarf (2021) and Embong et al. (2012) stated that attractive features in mobile ebook platforms can lead to a fun learning environment, which can motivate adoption; these feelings later assist the students to read the mobile ebook faster and understand the content better (Al-Jarf, 2021).

The ability of mobile ebooks to cater to students' academic needs may also determine their use (Park et al., 2015). Most students require immediate access to external resources when engaging in their learning activities, and mobile ebooks can fulfill this requirement as they provide effective access to external resources (Biranvand & Khasseh, 2014; Sun & Pan, 2021). This effective access provides open and timely access to needed information that enhances student learning and comprehension.

Positive mobile ebook interactions may influence their usage (Leong et al., 2019), as well. Sun and Pan (2021) noted that hypertext and multimedia features in mobile ebooks created a favorable two-way interaction and consequently promoted learning motivation and effectiveness. Multimedia features are also believed to increase the learning pleasure of students using mobile ebooks (Ebied & Rahman, 2015).

Recommendations from ebook vendors and academics have also strongly motivated ebook use (Rai & Selnes, 2019; Weisberg, 2011). When academics integrate mobile ebooks into their teaching and learning activities, students are impressed, which promotes mobile ebook usage among students, increases trust in mobile ebooks, and increases continued use (Weisberg, 2011).

Finally, mobile ebooks deliver the same quality information and content to users as p-books (Lai & Chang, 2011). They are created using the same rules of the legality of a book (Rahim et al., 2020), which motivates students to use them; they feel mobile ebooks deliver relevant, clear, precise, and trustworthy information.

Theoretical Framework

This study employed three established theoretical frameworks, namely the technology acceptance model (TAM); pleasure, arousal, and dominance theory (PAD); and diffusion of innovation theory (DIT), to explore the factors that influence the use of mobile ebooks.

Technology Acceptance Model (TAM)

TAM is a model used to explain the acceptance of new technology products (Davis, 1989; Zhu et al., 2010), including constructs like perceived usefulness, perceived ease-of-use, behavior intention, and usage behavior. The two primary constructs of the TAM model are the perception of the usefulness (cognitive factor) and ease of use (utilitarian factor) of mobile ebooks. King and He (2006) found that cognitive and utilitarian factors are significant predictors of technology use.

Ebook usage in a mobile environment is a new approach for the university involved in the present study. Students were encouraged to use the mobile ebook as part of their learning material. Therefore, it was important to identify the extent of the cognitive and utilitarian factors on the student's use of new textbook innovations. Researcher van Schalkwyk (2017) reported that perceived ease-of-use and perceived usefulness contribute significantly to ebook adoption among Generation Y.

Pleasure, Arousal, and Dominance (PAD) Theory

PAD theory was used to capture student responses involving affective factors that play a major role if users are given the choice to adopt a new technology product (Kulviwat et al., 2007). PAD theory consists of constructs, such as pleasure, arousal, and dominance. The pleasure construct allows an individual to determine their own level of satisfaction when using a system (Eroglu et al., 2003). Meanwhile, the arousal dimension explains the level of stimulation that a user feels when using an innovation (Eroglu et al., 2003). The dominance construct explains the degree to which a user feels in control when using an innovation (Russell & Mehrabian, 1977).

Anton et al. (2017), who adopted the PAD theory, found that pleasure had a direct effect on the use of ebook readers. Moreover, Hall et al. (2017) indicated that arousal and dominance factors contribute significantly to the adoption of an innovation. Hence, the usage of the PAD model is appropriate as this study intends to identify whether affective factors influence the adoption of mobile ebooks.

Diffusion of Innovation Theory (DIT)

DIT has been used to explain technology acceptance (Dillon & Morris, 1996) using five main constructs: relative advantage, compatibility, complexity, trialability, and observability. These five constructs explain the adoption of an innovation. Relative advantage refers to the convenience level and portability of mobile ebooks. Jung et al. (2012) stated that the relative advantage factor significantly explains the adoption of ebooks. Both compatibility and relative advantage are treated as utilitarian factors in this study. Studies by Dimitriadis et al. (2019) and Jung et al. (2012) illustrated that compatibility—the look and design of mobile ebooks—is one of the most significant variables in the adoption of ebook readers. DIT guides understanding of the extent compatibility and relative advantage factors influence the use of mobile ebooks.

Method

Research Design

This study employed a qualitative case study approach to understand the factors that influence the use of mobile ebooks among mathematics postgraduate students. Permission was obtained from the university's research ethics board to collect data and conduct the study.

Participants

Eight mathematics postgraduate students from a local public university in Malaysia participated in this study. The researcher approached the head of the department to identify the mathematics courses that use mobile ebooks. The researcher was informed that students from abstract algebra courses actively use mobile ebooks.

The researcher then emailed the potential participants to inquire about their mobile ebook usage and willingness to participate in the study. Purposive sampling was used to select the participants. All participants were from the abstract algebra research group and were active users of mobile ebooks.

Postgraduate students were selected for the study because they are experienced users of mobile ebooks compared with undergraduate students (Nam & Choi, 2011). These participants were mostly using mobile ebooks that were freely provided by the university library. The abstract algebra mobile ebook used by the participants is offered in PDF version and has many built-in features, such as bookmarking, searching, highlighting, underlining, and annotating.

Interview Procedure

Semi-structured, face-to-face interviews were conducted in the researcher's office. The purpose of the interview and the research process were explained to the participants prior to the interview session. They were asked to sign the interview consent form. Each interview session lasted approximately 45–60 minutes. The interviews were audio-recorded and transcribed for analysis. Three to four follow-up interviews were conducted via email to obtain further clarification regarding their responses.

The interview guide is attached in the Appendix. This guide was followed loosely to allow exploration of relevant areas in greater detail. The guide was derived from the research questions and theoretical frameworks. Two experts in the field of education technology were invited to validate the interview questions. The guide was then piloted with three participants.

The interview questions were designed to explore and understand the factors that motivate mobile ebook use and how these factors contribute to the participant's learning activities. Moreover, several demographic and general-use of mobile ebook questions were asked, including age, gender, country of origin, program, field of study, mode of study, working experience, type of mobile device, and years of experience with mobile ebook.

Data Analysis

Data were transcribed immediately after the interview, which allowed the researcher to read through the transcription and understand the responses before interviewing the next participant. This is an important process to understand, as the nature of answers given by the participants enables the researcher to understand the case being studied.

This study adopted a constant comparative method to analyse the data in NVivo 11 software (Merriam, 2009). At first, the researcher checked the transcript of the first interview to find the part of the transcript that answered the research questions. Then, codes that refer to the part of the transcript were created on the NVivo platform for the entire transcript. After that, the researcher grouped the codes with the same meaning into categories. The same coding process was done for the second interview transcript, following the categories formed for the first interview transcript. After that, the first set of categories was compared with the second to ensure they were mutually exclusive. The same process was repeated for the subsequent interview transcripts. Finally, categories were grouped to form broader themes.

Trustworthiness was achieved by meeting the criteria for internal validity, external validity, and reliability. Internal validity was addressed through member checks and expert examination methods. In this study, the researcher approached the participants to validate the transcribed interview transcripts and tentative interpretations. Furthermore, two experts in qualitative studies validated the findings of the study. Meanwhile, external validity was addressed by developing a rich narrative description of the findings. Reliability was ensured through an audit trail describing the research process in detail.

Findings

Demographics

All participants were full-time, graduate-level algebra students. Participants used either smartphones or tablets to read ebooks. Table 1 shows participant details, such as personal information and mobile ebook use.

Table 1. *Biographic Information and Background of Mobile Ebook Use*

	Rina	Rahul	Rita	Hassan	Puteri	Gopi	Lim	Sam
Age	37	24	25	43	36	27	27	26
Gender	Female	Male	Female	Male	Female	Male	Male	Male
Country of origin	Yemen	Malaysia	Malaysia	Nigeria	Iraq	Malaysia	Malaysia	Malaysia
Program	PhD	Master	Master	PhD	PhD	Master	Master	PhD
Type of mobile device	Tablet and Smart phone	Tablet	Smart phone	Smart phone	Smart phone	Tablet	Smart phone	Smart phone
Mobile ebook experience	1 year	1 year	1 year	1 year	1 year	2–3 years	5 years	2 years
Frequency of use of mobile ebook in a week	5–6 times	3–4 times	5 times	5–6 times	3–4 times	3–4 times	2–3 times	2–3 times
Duration of reading mobile ebook	1–3 hours per use	1–3 hours per use	1–3 hours per use	30 minutes–2 hours per use	1–2 hours per use	20–30 minutes per use	2–3 hours per use	30 minutes–1 hour per use

Factors That Motivate Mobile Ebook Use

Five themes emerged from the analysis. These included utilitarian, cognitive, affective, social norm, and content quality factors. Table 2 summarizes the findings.

Table 2. *Themes*

<p>Utilitarian Theme</p> <ul style="list-style-type: none"> • Ebooks are convenient to obtain. • Ebooks can prevent students from forgetting textbooks, as they will always have their mobile devices with them. • Printed textbooks may become wet or damaged, unlike a mobile ebook. • Mobile ebooks can save students time by reducing library trips. • Mobile ebooks allow students to effectively search and highlight points, allowing quick access to other relevant materials. • Mobile ebooks are less costly than printed textbooks. • Mobile ebooks are easy to use.
<p>Cognitive Theme</p> <ul style="list-style-type: none"> • Mobile ebooks may produce positive learning outcomes. • Mobile ebook features may help students recall and remember important points.
<p>Affective Theme</p> <ul style="list-style-type: none"> • Mobile ebooks provide an exciting platform for students. • Students are satisfied with the mobile ebooks contents. • Mobile ebooks feature satisfactory designs, but there is room for improvement. • Students engage with the mobile ebook content, allowing them to feel in control, as well as follow content, due to its functionality. • Mobile ebooks are clear and understandable, allowing students to have a close interaction and confidence in using them.
<p>Social Norms</p> <ul style="list-style-type: none"> • Users tend to accept friends' recommendations to use mobile ebooks.
<p>Content Quality</p> <ul style="list-style-type: none"> • Contents are clear, precise, and understandable. • Users prefer the same content in ebooks as those featured in printed books.

Theme 1: Utilitarian

All participants reported using the mobile ebook mainly because of its convenience. The participants said they access the mobile ebook from everywhere. In addition, they admitted that they can gain access to many mobile ebooks simultaneously. All participants reported bringing their mobile ebooks anywhere they go; hence, they avoided forgetting their books. Rita explained:

I use mobile ebook because I can bring it anywhere, can use it anywhere ... like when I'm having free time or when I'm attending seminar[s] that [is]not so relevant to me. ... I can open the mobile ebook and can read it. I can do two things at one time.

Others shared similar thoughts. Rina said, "The main thing is the convenience. ... I use it everywhere, sometimes if I attend lecture[s], in the bus, while waiting for the bus, while I walk. ... It's easy." Hassan said, "I read it very often, like in [a] restaurant, while I'm waiting for the food; I will open the mobile ebook and scroll

it and read it.” All participants agreed that they could save time by using the mobile ebook by reducing their visits to the library. According to Hassan and Gopi:

I’m not spending much time [going] to [the] library. I have more time to read and query. So it is motivating for someone who [has] experience in using normal book[s] where you take 10 books from the library and spend 10 times [opening] it [to] read it. Instead, just read the mobile ebook [rather] than going to the library. (Hassan)

The main thing is during my undergraduate studies I don’t have my mobile device, so I have to go to the library every day. ... I borrow many books every week ... but now, I just download the book that I need from the website and then I keep it but ... I didn’t borrow many books from the library. (Gopi)

All participants expressed that the built-in features in the mobile ebook encouraged its use. For instance, the search function in the mobile ebook assisted participants in looking for relevant information faster. The search function also helped the participants in the non-linear reading pattern. Meanwhile, the highlight feature assisted participants in emphasizing relevant research information more quickly.

Participants also reported that the mobile ebook features were easy to use, saying it only took a moment to find the relevant information required. Furthermore, all the participants stated they were able to self-learn the features of the mobile ebook, which enabled them to take more time to understand the content of the mobile ebook.

Rina mentioned, “It is easy to use the features in the mobile ebook ... I learn everything by myself.” Similarly, Rahul said, “Features in mobile ebook are easy to use. I can also learn easily on how to use it ... so I can study without any interruption. ... I can learn faster and [it’s] easy to understand.” In addition, Gopi mentioned that “using features, such as highlighting and searching, are very easy.”

Several participants reported that the cheaper cost of mobile ebooks motivated them to use them. Hassan said, “For normal book[s], not all the books are available, and it is expensive; but for mobile ebook[s], you can just go online download it for free. Therefore, it will be easier for any individual to use it.” Lim mentioned that “most of the time, the hard copy book [is] really expensive to buy, and some of them [are] even not available in Malaysia. ... [W]hen it is not available ... I will try to get the ebook.” One participant also highlighted the ease of logistics when he wanted to bring them back to his country. He stated, “Normal book[s] you need to buy it and transport it. Let[s] say if I want to go to Nigeria, just take the mobile ebook, because taking the p-book just will waste my money.”

Theme 2: Cognitive

All participants reported that mobile ebooks assisted them in achieving positive learning outcomes. This is because mobile ebooks can deliver instant and relevant resources to the participants. Hence, the participants can get new ideas, expand their existing knowledge, and comprehend the subject matter effectively. Hassan said, “It is interesting really. You can understand easily. You can easily read.” Similarly, Puteri mentioned, “Mobile ebook provides me [with a] new experience ... makes me understand the content easily.” Mobile ebooks also assisted all participants in easily recalling important points that were related to their research. This encourages the participants to solve their research problems effectively. For instance, Hassan said:

Mobile ebook is closer to you. You are taking [it everywhere] every place you are going, going to restaurant, school, Air Asia, every time it will be with you, and you can access it. But in terms of normal book, you don’t do this, so for mobile ebook it is easier for you to remember and understand it because it gives you more time to interact with it. [The more] you interact, [the] more you remember. But for normal book, since you don’t bring it everywhere so the rate of remembering is low.

Similarly, Rina said, “I forget things easily, since I have mobile ebook, I can recall the points easily too.”

Theme 3: Affective

All the study participants stated that they were excited and enjoyed the experience of using the mobile ebooks. Furthermore, they also stated that they are highly satisfied with the content of the mobile ebooks. For instance, Rina said, “I’m satisfied. Mobile ebook is very important for my learning life. Can read it anytime and anywhere.” In addition, Puteri mentioned, “Yes, I’m satisfied ... because it is easy, and [I] can go to the specific page by searching the content.” In addition, Rina and Rahul pointed out that they were satisfied with the design of the mobile ebook. Rina and Rahul reported that the design was appealing. However, the participants felt that mobile ebook designers should improve the design of mobile ebooks to a more advanced level. Rina shared her thoughts on the design by saying “It is good, but sometimes I think that’s how nice [it would be] if we can highlight in many colours. Very nice for me. I like painting in my books.”

Meanwhile, Rahul said:

The design is ok ... no problem. People may say the design is not good or not beautiful ... but for me no problem. I can accept it because it doesn’t interrupt my learning process ... none of the notes[are] missing or not in order. Design ok. I think [there is] no need to change.

Several participants stated that they could concentrate on the relevant information for their research. This motivates the use of mobile ebook. For instance, Puteri said, “... [B]ecause mobile ebook is interesting and help to focus on the subject and go faster. I also have the feeling of reading more.” Gopi shared his experience as:

Sometimes when we read the physical book, we would read it word by word, but with mobile ebook, we would just go through it, that makes our reading faster ... in a way, it helps in fast reading and would pave [the] path for the reading of more books.

All participants admitted being in control when using the mobile ebook and added that they could easily manipulate the features in the mobile ebook without many technical difficulties. Hence, they could control the use of mobile ebooks without any technical support. In addition, all participants reported that their interaction with the mobile ebook was clear, and they could read and understand the content of the mobile ebook without much hindrance. For instance, Hassan elaborated on his interaction with mobile ebooks:

The features are easy to explore, at first, I face[d] some problems when using it, but I [was] able to solve it ... after that [was] no problem. ... I feel very close, even when I am sleeping, if I think of anything, I will just open the mobile ebook and read it. But if I use the normal book, I have to go there and collect it and turn the pages. It is difficult.

Hassan’s narrative excerpt is the representative interview response for the in-control factor shared by all other participants. Rita also shared her confidence level in using the mobile ebook. She said, “Yes, I feel confident to use it because ... no need to fear of missing saved notes, can highlight, can tick the points, can continue the reading next time from the pages that I have stopped ... so no worries.” Rita’s narrative excerpt is representative of the confidence level shared by all the other participants in the use of mobile ebooks.

Theme 4: Social Norms

Generally, recommendations from trusted parties will motivate any user to use a new product. Hassan and Rita stated that recommendations from peers motivated them to use the mobile ebook. They also claimed that they could achieve fruitful results from the mobile ebook content after using it. For instance, Rita said, “My friends encouraged me to use the mobile ebook. I saw my friends are using it. So I thought why don’t I try to use it. So I try to use it.” Lim shared his experience:

Basically ... if I encountered problem in my research, I will go online and find the solution in the forum ... it will introduce me to those kind[s] of book[s], and I will go and download it to see whether it is very helpful or not. ... I use the mobile ebook because my friend recommend[s] it.

Rahul also stated. “I think someone need[s] to introduce the mobile ebook officially to the students because still there are students who don’t know about mobile ebook[s].”

Theme 5: Content Quality

All participants stated that the content of the mobile ebook is clear, precise, and understandable, which subsequently helped them to use the mobile ebook without much hesitation. Furthermore, all the participants, except Hassan, stressed that they prefer to use the mobile ebook with the same content as the p-book. This will help participants rely on mobile ebooks completely. According to participants, the quality of the information in the mobile ebook enabled them to trust and understand the content better. When Rina was asked whether the mobile ebook can provide precise content, she said:

The content is similar to p-book, it is just more portable than a p-book. It is easier to understand the contents because we can look for other references related to our reading when we are online and compare with the other materials as well.

Meanwhile, Hassan answered whether the contents of the mobile ebook should be the similar to p-book: “No ... because ... I prefer them to create [a] mobile version ... which is more compact and precise ... prefer to be in the form of lecture notes.”

Discussion

Integration Into Current Literature

This study shows that the utilitarian factor (convenience) encourages participants to use the mobile ebook. Participants valued its portability and accessibility, as carrying many p-books is impractical. Also, a handheld mobile device can be a convenient alternative. Findings were consistent with those of Alexiou-Ray and Wright (2012) who observed that the portability and lighter weight of mobile ebooks can lessen physical burdens.

Casseldon and Pears (2020) found that mobile ebook use positively correlates with its around-the-clock accessibility. An aspect noted in this study was the adjustment a participant made when using a mobile ebook in a less conducive atmosphere. The ability to select easy reading materials in noisy environments allowed him to optimize his time, making the mobile ebook a better platform for some even in a busy environment.

Results also showed that the lower cost (utilitarian factor) of mobile ebooks motivates their use. According to Li et al. (2021), price plays an important role in consumer choice of information materials. It is reported that p-books are more expensive, and many students cannot purchase the ones they need (Tsai, 2012). Hence, mobile ebook platforms may be a better option for students with financial difficulties or access issues. Alhammad and Ku (2016) also noted that although mobile ebooks are less expensive, their quality is not compromised.

Participants favored the built-in features (utilitarian factor) of mobile ebooks, such as search and highlight. These features are the top choices among students (Ebied & Rahman, 2015; Merkle et al., 2022; Schomisch et al., 2012). Furthermore, ease of sharing content via social media effectively encouraged the participants to use the mobile ebook, corroborating the results by Alhammad and Ku (2016) and Li et al. (2020). Integrating conservative features of p-books into mobile ebooks, such as highlights and bookmarks, encouraged the use of mobile ebooks. Participants reported no technical expertise required to use the mobile books, as the features

were intuitive. The result is consistent with Dimitriadis et al. (2019) and Al-Suqri (2014) who stated mobile ebooks are user-friendly. Researchers van Schalkwyk (2017) and Zhou et al. (2021) demonstrated that ease-of-use contributed significantly to using ebooks among Generation Y.

We found that factors, such as enjoyment, excitement, and dominance (affective factors), also influenced the adoption of mobile ebooks. This finding is consistent with the findings of others (e.g., Antón et al., 2017; Hussain et al., 2018). Participants felt that mobile ebooks provided a different experience than p-books, where the participants can use the embedded features in the mobile ebook instantly whenever they wish and connect to other information quickly. Students also liked the highlight, bookmark, and search features. Participants can control the operation of the mobile ebook as it is easy to use. This self-control is important, as it can help students navigate the mobile ebook with confidence. Furthermore, affective factors can reduce the technical load of the participants and assist them in becoming more convinced in using the mobile ebook. Similarly, Hall et al. (2017) found that the dominance or ability to control the digital learning environment determines the use of any technology.

Participants felt that using mobile ebooks assisted them in achieving excellent academic results, as they could be readily informed of new content relevant to their learning activities, which corroborates the results by Alshaya and Oyaid (2017). In addition, mobile ebooks help users remember or recall important content relevant to their learning activities. This is in line with Young et al. (2014), who highlighted that the ability to recall information after reading from screens had improved and showed no significant difference from reading from paper. Rockinson-Szapkiw et al. (2013) demonstrated that the ability to recall information leads to enhanced student learning outcomes, as recall ability provides higher stability for understanding the content (Pardede, 2019). In addition, van Schalkwyk (2017) and Zhou et al. (2021) reported that perceived usefulness significantly contributed to ebook adoption in Generation Y. And many studies revealed that reading from screens affected students' recall rate (Sackstein et al., 2015; Stiegler-Balfour et al., 2023), positively affecting achievement. Further studies are needed to understand the recall rate of reading via screens.

Trusted parties can influence students' decision to use mobile ebooks. Researchers found that one reason participants use mobile ebooks is because academics and peers recommended them (social norm factor) or because they received encouragement from other trusted parties who are aware of their benefits. This aligns with Majid et al. (2019), who stated that students will use mobile ebooks if academics and publishers recommend them.

Content quality was also found to motivate the use of mobile ebooks and will likely increase belief in their value. This is in line with Dwivedi et al. (2021) and Lai and Chang's (2011) findings, demonstrating the capability of mobile ebooks and other electronic resources to provide quality material may encourage students to use them.

Limitations and Directions for Future Research

Eight participants were interviewed in this study, thus the results could not be generalized to other mathematics students with different academic and personal backgrounds. Therefore, it is recommended that wider research be carried out on the setting and population to observe for similar or differing conclusions.

Future research on mathematics ebook use could also be conducted among undergraduates—a significantly different population from the focus of the current study. It is also suggested that future research that focuses on mobile ebooks in other courses should be conducted in other universities in Malaysia. Furthermore, it is recommended that future mobile ebook research related to their use be conducted among other stakeholders, such as academics, faculty, libraries, and top university management. These stakeholders have the authority to implement mobile ebook usage in the university in ways that are most appealing to students.

In addition, this study only focused on determining the factors that encourage mobile ebook use among active mobile ebook users. Thus, it is recommended that future research be conducted among non-users to determine the factors that hinder mathematics students from using mobile ebooks.

Implications for Research and Practice

The key contribution of this study is the understanding of affective factors in influencing mobile ebook use. It was noted that very limited studies were conducted to identify the contribution of affective factors regarding mobile ebook use.

Affective factors, such as enjoyment, excitement, and dominance, influence the use of mobile ebooks. For example, participants were motivated to use mobile ebooks when they felt good about accessing information related to their area of expertise quickly with minimum cost. Academics and designers, therefore, should integrate interactive features and colorful images in the mobile ebook design. Also, participants preferred to use mobile ebooks that were easy to use, which means mobile ebook designers should develop mobile ebooks that users can control.

Mathematics postgraduate students were mostly satisfied with the available mobile ebook platforms. Nonetheless, there is room for improvement in the design of mobile ebooks. The students suggested that more interactive and improved annotation features should be incorporated into future mobile ebook design.

The pedagogical implication of the study is that mobile ebooks could be used as a meaningful and valuable resource for mathematics students to obtain good results, as mobile ebooks can deliver information like that of p-books. Hence, students can confidently use the mobile ebook as their reference material.

Conclusion

Results demonstrate that utilitarian, cognitive, affective, social norms, and content quality influenced the use of mobile ebooks. Students reported that mobile ebooks are easy to operate and provide a meaningful platform for finding information. Moreover, mobile ebooks provide instant access to new information.

Results also demonstrate that academics can influence students to use mobile ebooks, as students reported they prefer to use mobile ebooks if trusted parties recommend them. Insight from active mobile ebook users in the mathematics department may also help provide meaningful evidence to non-mobile ebook users that mobile ebooks could deliver similar and improved learning experiences. These recommendations may motivate mathematics students, who hesitate to use mobile ebooks, to use them in the future. Therefore, content developers and academics together can greatly influence mobile ebook adoption.

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Appendix

Interview Protocol

1. Can you tell me about yourself and your experience with mobile ebooks?
2. What motivates you to use mobile ebooks? How do these factors contribute to your learning activities?

Probing Questions

1. How confident are you when using the mobile ebook for learning activities? Why?
2. Do you feel in control of your learning by using the mobile ebook?
3. Can you easily manipulate and use the features in mobile ebooks?
4. Are you immersed in the contents using the mobile ebook? Does it invoke your motivation towards learning?
5. Do you find it easy to interact with mobile ebooks? How does this impact your learning activities?
6. Is the interaction clear and understandable?
7. Are the features in the mobile ebook easy to explore?
8. Do you find it easy to learn to use mobile ebooks?
9. Is the mobile ebook pleasant enough or attractive? Why? How much does this factor contribute to your learning?
10. Do you feel happy about using mobile ebooks?
11. How satisfied are you with your mobile ebook usage for learning purposes?
12. Do you find the mobile ebook environment interesting/exciting/stimulating?
13. How much will you spend owning a mobile ebook?
14. To what extent can you remember the points you learned from the mobile ebook? Can you find/recall the points easily?
15. How far is a mobile ebook better than a printed book for your learning activities?
16. Does anyone recommend that you use the mobile ebook?
17. What do you think about the quality of the mobile ebook content?

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