RESEARCH ARTICLE

Exploring students' perceptions of using interactive E-books for math learning

Khaled Ahmed Aqeel Alzoubi

Department of Basic Science Support, Faculty of Science, Hashemite University, Zarqa 13133, Jordan

Correspondence to: Khaled Ahmad Aqeel Alzoubi, Department of Basic Science Support, Faculty of Science, Hashemite University, Zarqa 13133, Jordan; Email: khaledaa@hu.edu.jo

Abstract: The study explored students' perceptions of using interactive E-books in math learning. The study sample included 50 male and female students who were randomly selected. The researcher prepared a questionnaire for the students according to the study questions, objectives, and problems. The questionnaire focused on the students' perceptions of four areas: motivation, attractiveness, relevance, and effectiveness. The data collected from the students were collected and analysed using the statistical package for the social sciences (SPSS) data processing program. The data were analysed descriptively by calculating the frequencies of each variable. The results of the study indicate that 77% of students were attracted to E-book in learning math, 70% of students were effective in using E-book in learning math, 81% of students were relevant to using E-book in learning math, the student's perceptions about the use of E-books in mathematics in its four aspects: effectiveness, attractiveness, motivation, and importance were positive, which led to improving and developing students' learning.

Keywords: students' perception, E-books, math learning

1 Introduction

E-books provide development in the learning process (Akaku et al., 2000) and reduce the difficulties of distance learning (Papadakis et al., 2020). Therefore, considering that many educational institutions do not use E-books in the learning process, this study aims to explore the use of E-books in learning at a university in Jordan. Students are consumers of images, videos and graphics (Charoenwong et al., 2018), so it is necessary to explore the use of interactive E-books in online learning, e-learning and mobile learning.

1.1 E-book

the e-book refers to using digital media to deliver printed book content through an electronic medium (Tranet et al., 2023; Tawafak et al., 2023) noted that E-books enhance students' motivation to learn using multiple media (such as images, audio, and video). Al Farsi et al., 2020; 2022 highlighted that visual information in E-books helps students to understand the content individually. (Ahmad et al., 2022) Educational E-books have been shown to exist in nursing, mathematics, and physiology (Vaiopoulou et al., 2021). Previous studies have focused on e-book use at school and university levels but have been limited to small sample sizes of participants. For example, a study (Allam et al., 2022) included two classrooms with a sample size of 38 students. Students use E-books primarily through computers and smartphones (Drolia et al., 2020), and there is an urgent need for more research to determine the impact of e-book use on student perceptions (Chatzopoulos et al., 2023). Studies have shown that E-books are effective in teaching mathematics, such as those by Aalberg et al. (2017), which confirmed the positive effects of E-books on students' achievement in mathematics (Watcharapat, 2018). The effectiveness of electronic applications on iPads such as GeoGebra has been shown, indicating that E-books enhance understanding in mathematics (Papadakis & Kalogiannakis, 2019a; 2019b). As for the challenges facing E-books, E-books may only provide a good level of usability if they are well-designed (Keereerat, 2019). If the student is not equipped to use E-books well, there is no improvement in academic achievement (Jagustet, 2019). It was also concluded (Gunawan et al., 2018) that the student prefers the traditional printed book more than the electronic one. Five reviews (Yannakakis et al., 2017) and four meta-analyses (Baiyere et al., 2013) were conducted to explore the effect of E-books on children's reading acquisition. Their results concluded that E-books effectively teach reading and emerging writing.

1.2　Students' perceptions

Many studies have focused on students' perceptions of the educational process and its role in acquiring academic content knowledge correctly. Scholars have varied opinions about students' perceptions, as they classified them into a binary classification that includes two basic categories: quantitative perceptions, which include obtaining information, memorising it, reproducing it, and applying it (Papadakis et al., 2022). Qualitative perceptions include understanding, finding new meanings, and developing personality (Hongkhunthod et al., 2015).

Perception is considered a form of perception and mental images that are formed because of that interaction with the external environment within the framework of situations determined by personal experience and previous experience, meaning that the individual's responses and perceptions are defined in his mental formation, the content of which is linked to a topic or situation in the concrete world in which the self-lives, Perceptions serve as a framework that guides students' behaviour and classroom practices (Anzoátegui et al., 2017),

One of the recent studies conducted in this field is a study (Charoenwong. et al., 2018) entitled Students' perceptions of learning and teaching in Singapore. The study investigated Singaporean students' perceptions of learning and teaching and the effects of program, gender, race, age, and academic specialisation on their views of education. A questionnaire was applied to the study sample, which included 110 students studying in Singapore. The study results showed that students had perceptions about learning and teaching, but their perceptions were more like constructivism. The results also showed statistically significant differences in their perceptions due to academic specialisation and race.

A study (Ikhsan et al., 2020) focused on identifying the perceptions of students/teachers in the classroom teacher speciality towards learning and teaching in several public and private Jordanian universities. The study sample included (224) male and female students, and a questionnaire consisting of (02) items was used to collect information and answer questions. Study Questions: The results of the study showed that students/teachers have a mixture of perceptions about learning and teaching between constructivist and traditional perceptions, and the results also showed a change in their perceptions as they progressed in their studies.

The study (Aljojo et al., 2018) aimed to identify classroom teachers' perceptions of integration between mathematics and science and teachers' attitudes towards integration between mathematics and science. The study was conducted on a sample of 16 teachers, and the results showed that teachers' perceptions of integration were less than average.

The study (Gros et al., 2007) showed that the teacher's perceptions of the educational process dictate that he behaves differently in the classroom. Some of them do the same thing, exerting their efforts to create the appropriate atmosphere that enables them to give the required knowledge, and based on this, they carry out the evaluation and evaluation process. The evaluation process is completed, and success depends on how much the learner recovers what he has memorised. This type of teacher is only concerned with conveying information without paying attention to it by developing the emotional side, raising the level of motivation, and developing the spirit of responsibility among the learners. There is a type of teacher who can make little effort to control the classroom because the learners are interested and willing to acquire knowledge and develop (Xezonaki, 2023). Their personalities, so the teacher devotes his effort to enhancing and developing the sense of responsibility among the learners to achieve good learning that focuses on understanding, assimilation, and the ability to analyse, criticise, and reorganise their thoughts and not memorise separate facts.

1.3　Study problem

Teaching mathematics to keep pace with the age of technology and its uses in education and the emergence of the need for a simplified and precise teaching method and learning techniques for students (Petousi & Sifaki, 2020). Considering previous literature, the problem of the study can be defined as follows: What are students' perceptions of using E-books to learn math for the academic year 2023/2024?

1.4　Study importance

The importance of this study stems from keeping up with the times by focusing on modern technologies and E-books. Using E-books may help students gain positive perceptions and skills. This study aims to discover the extent of improvement in students' level when they use E-books. To bridge the research gap in the study of E-books and the need for further research

on using E-books in learning mathematics. This paper explores students' perceptions of using interactive E-books in mathematics. This study came about due to the need for randomised trials in Jordan.

2   Methodology

The study explored students' perceptions of using E-books in math. The researcher prepared a questionnaire for the students to consider the study's questions, objectives, and problems. After reviewing the literature on students' perceptions of using E-books in learning math, the questionnaire was. This study began by recording observations about the use of E-books in teaching mathematics for the mathematics1 course and revealed that the Mathematics1 course mainly uses videos and graphics. The current study was designed to investigate how interactive E-books affect students' perceptions in the second semester of the academic year 2023/2024. All students were first-year students to ensure no significant differences in prior knowledge, and the same teacher taught Mathematics 1. Data collected from students were analysed using the Statistical Package for Social Sciences (SPSS) data processing program. The data were analysed descriptively by calculating the frequencies of each variable.

Divided into four aspects: effectiveness, attractiveness, motivation, and suitability (Motivation, Attractiveness, Relevance, and Effectiveness) that we experience during e-learning because they significantly affect the overall effectiveness of the student. The validity and reliability of the questionnaire as a research tool was confirmed. The questionnaire was presented to educational expert arbitrators to evaluate the expressions' clarity, linguistic integrity, and suitability for the study. Reliability was confirmed using Cronbach's alpha coefficient, where the reliability coefficient reached (alpha, $\alpha = 0.85$), which indicates high reliability. The study sample consisted of 50 math (1) students in the first semester of 2023/2024. The questionnaire was distributed after the students spent two months learning two topics: functions and limits. The researcher used SPSS to determine the averages and percentages that were evaluated. The Likert scale was used to explore students' perceptions of using E-books in learning math. (see in Table 1)

Table 1   Likert scale scores

Statement	Score
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Mean Likert scale scores were categorised. (see in Table 2)

Table 2   Interpretation of mean scores

Mean Value	Level
1.00 – 2.33	Low
2.34 – 3.66	Moderate
3.67 – 5.00	High

3   Results and discussion

Study findings within the theoretical framework in the introduction, we begin to acknowledge technological challenges in education, such as infrastructure and internet availability. In line with (Allam et al., 2022), the challenge of change is resistance (Drolia et al., 2020); the data were analysed descriptively by calculating the frequencies of each variable. The results of the study indicate that 77% of students were attracted to E-book in learning math, 70% of students were effective in using E-book in learning math,81% of students were relevant to using E-books in learning math, the student's perceptions about the use of E-books in mathematics in its four aspects: effectiveness, attractiveness, motivation, and importance were positive, which led to improving and developing students' learning. The data were analysed, and averages and percentages were calculated. The study sample consisted of 30 male and 20 female students from the Mathematics 1 course (see in Table 3)

80% of students agreed that "Dictionary" E-books are attractive for learning math, with an average score of 4, and 67% agreed that "Expert" E-books are attractive for students, with an

Table 3   Gender

Gender	Frequency	Percent
Male	30	60%
Female	20	40%
Total	50	100%

average Score of 3.9. In addition, 77% of students were attracted to the "Astuces" E-book in learning math, with a mean score of 4.03, and 77% were attracted to the "Photo" E-book in learning math, with an average score of 4.03. These results clearly show how attractive it is to learn math with this Android app. This can attract students to learn math. (see in Table 4)

Table 4   Attractiveness

E-book	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Level
Dictionary	0.0%	8%	30%	37%	43%	4.0	High
Expertise	0.0%	5%	29%	30%	37%	3.9	High
Astuces	0.0%	3%	20%	45%	32%	4.03	High
Photo	0.0%	6%	17%	47%	30%	4.01	High

71% of students agreed that "Dictionary" E-books are effective in learning math, with an average score of 4.3, and 74% agreed that "Experte" E-books are effective for students, with an average score of 4. In addition, 70% of students were effective in using the E-book "Astuces" in learning math, with an average score of 3.8, and 71% of students were also attracted to the E-book "Photo" that are effective in learning math with an average grade of 3.9. These results clearly show how attractive it is to learn math with this Android app. This can be effective for students to learn math. (see in Table 5)

Table 5   Effectiveness

E-book	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Level
Dictionary	0.0%	6%	23%	36%	35%	4.3	High
Expertise	0.0%	0%	26%	41%	33%	4.0	High
Astuces	0.0%	12%	18%	40%	30%	3.8	High
Photo	0.0%	12%	17%	40%	31%	3.8	High

72% of students agreed that "Dictionary" E-books are relevant to learning math, with an average score of 4, and 85% agreed that "Expert" E-books are relevant, with an average score of 4.2. In addition, 81% of students were relevant to using the E-book "Astuces" in Learning Math, with an average score of 4.1, and 79% were also relevant to the E-book "Photo" in Learning Math, with an average Score of 3.9. (see in Table 6)

Table 6   Relevance

E-book	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Level
Dictionary	0.0%	5%	23%	35%	37%	4.0	High
Expertise	0.0%	7%	8%	39%	46%	4.2	High
Astuces	0.0%	4%	15%	39%	43%	4.1	High
Photo	0.0%	6%	15%	39%	40%	3.9	High

Motivation is the last aspect 78% of students agreed that "Dictionary" E-books motivate them to learn math, with an average score of 4, and 64% of students agreed that "Experte" E-books can stimulate their relationship with the students—an average score of 3.9. In addition, 80% of students were able to be motivated to use the E-book "Astuces" in learning math, with an average score of 4, and 80% of students were also able to be motivated to use the E-book "Photo" could motivate them to learn Math, with an average score of 3.9. (see in Table 7)

Table 7   Motivation aspect

E-book	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Level
Dictionary	0.0%	4%	18%	30%	48%	4.0	High
Expertise	0.0%	7%	29%	34%	30%	3.9	High
Astuces	0.0%	8%	12%	48%	32%	4.0	High
Photo	0.0%	8%	12%	48%	32%	3.9	High

In general, by analysing all the student responses given in the questionnaire, four aspects: motivation, effectiveness, relevance, and attractiveness were positive.

4 Limitations

The small size of the study sample may affect the ability to generalise the results. E-books also require content development. Costs are limited for some students because they need advanced mobile devices that receive modern programs. Some students are too slow to understand how to deal with E-books to be able to use them, and the biggest challenge is technical problems such as network problems and software glitches.

5 Conclusion

Students who used the interactive e-book showed improvement in the four dimensions of perception in learning, consistent with the results (Tranet et al., 2023; Tawafak et al., 2023). Previous research has yet to explore the four dimensions of students' perceptions. This study explored the four dimensions in depth and effectively.

Students confirmed their attraction towards studying using E-books and felt motivated, which led to improved academic performance. This aligns with Ikhsan et al., 2020. The positive perceptions of students and increased student engagement confirm that using E-books with interactive features creates an attractive learning environment (Gunawan, 2018). This is consistent with the results of previous studies by Charoenwong. et al., (2018). The study confirmed the existence of challenges that deserve attention, such as distraction and the digital gap (Keereerat, 2019). There is a need for more training on designing E-books that are appropriate to students' needs and cover the subject matter, paving the way for further improvement in the use of E-books (Louka, 2023). The positive results obtained from using E-books and recognising the challenges draw a road map for teachers and educators to navigate using E-books thoughtfully. Addressing the challenges and enhancing the positives facilitates learning and increases overall attractiveness.

The study indicates that students' perceptions of using E-books in math in its four aspects: effectiveness, attractiveness, motivation, and importance were positive, improving and developing students' learning. However, there are challenges facing using Android applications: cost, availability of devices, and training for students to use applications in general. Using E-books in teaching math increases students' ability to learn mathematics and improves their perceptions of mathematics (Antoniadi, 2023; Tsoukala, 2021). Universities can improve education in mathematics by Using E-books in math. This is consistent with the results of studies (Hongkhunthod et al., 2015). The importance of the results of this study is determined in two aspects:

Theoretical significance: This study presents literature on using E-Books in math. The researcher hopes to enhance students' perceptions about studying mathematics (Hongkhunthod et al., 2015). Practical importance:

(1) It may contribute to developing mathematics teaching methods.

(2) Improving students' perceptions of mathematics in universities, and this study could stimulate future studies on new E-books. According to the data, students prefer to use printed textbooks for easy access to information. On the other hand, extending the results to groups outside the study area is complex and uncertain. The researcher recommends publishing more research in different learning areas in mathematics, such as measurement, algebra, and geometry.

Conflicts of interest

The authors declare that they have no conflict of interest.

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