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Satisfaction and Perceptions of an Interactive E-Book for Online Learning in an Epidemiology Course Among Nursing Students in Thailand

Pramote Thangkratok[1], Natchaya Palacheewa[1], Arbkhanok Tongtham[1], Bussarin Lhimsoonthon[1]

[1] Department of Community Health Nursing, Srisavarindhira Thai Red Cross Institute of Nursing, Bangkok, Thailand

Background: Interactive e-books, which incorporate multimedia elements, have had a positive impact on students' learning achievements. There has been limited research on the impact of interactive e-books on nursing students' satisfaction and perceptions, particularly in online learning in epidemiology courses.

Objectives: To describe nursing students' satisfaction and perceptions regarding an interactive e-book for online learning in an epidemiology course.

Methods: This study utilized a descriptive research design. Secondary data analysis collected nursing students' satisfaction and perceptions from existing evaluation forms regarding the interactive e-book used in the epidemiology course for the 2020 academic year, completed by 196 second-year nursing students from a nursing institution in Thailand. The quantitative data was analyzed by using descriptive statistics, and qualitative data was analyzed by using content analysis.

Results: The results indicated that the mean satisfaction score for the interactive e-book was at a very high level, with a score of 4.53 out of 5. Furthermore, the mean scores of the content, system, and utility aspects were at very high levels. The content analysis related to the perception of the interactive epidemiology e-book among nursing students was categorized into 5 themes: 1) concise content and easy-to-understand, 2) effective presentation, 3) interactive quizzes to verify correct answers and build understanding, 4) easy use and access anywhere at any time, and 5) increased motivation to study.

Conclusions: This study has demonstrated that interactive e-books positively enhanced nursing students' satisfaction and learning in an epidemiology course during the COVID-19 pandemic, suggesting further research on their effectiveness in various educational outcomes.

Keywords: Interactive e-book, Nursing students, Online learning, Epidemiology

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Corresponding Author:
Pramote Thangkratok
Department of Community Health Nursing, Srisavarindhira Thai Red Cross Institute of Nursing, 1873 Rama IV Road, Pathumwan, Bangkok 10330, Thailand.
Telephone: +668 4376 1058
Email: pramote.t@stin.ac.th

Introduction

The COVID-19 pandemic has not only affected the healthcare system but also has led to an impact on the economy, society, polities, and changes in human behavior.[1-4] The impact of the pandemic was severe and varied in each country, specifically the educational activities around the world that have been significantly affected.[5-7] Most students and youths, approximately 1.5 billion around the world, experienced a lockdown. In 2020, schools and universities in over 188 countries had to be closed due to the COVID-19 pandemic.[8] Teaching and learning processes in higher educational institutions across the world were disrupted. Traditional classroom-based teaching had to be changed to online learning for education to continue during the COVID-19 pandemic.[9-11]

Online learning has been widely accepted and used by various nursing education institutions in developing and developed countries.[12] Online learning is still limited by some students' unequal access in learning, because some students live in remote areas with limited internet access, and some students' internet downloads less quickly, which limits the use of video conferencing, streaming or other technologies that need good quality access. Some students cannot afford necessary equipment (computers or tablets) or lack device capabilities and books or textbooks.[13, 14] Among nursing students, there were limitations to reading text in traditional paper-based books and textbooks due to library closures during the COVID-19 pandemic. Textbooks are an essential part of the teaching and learning material for an epidemiology course.[15, 16] The above factors might be significant factors that transformed students' learning outcomes.

An interactive e-book has various interactive elements. Currently, digital technology allows for informative content integration and preparation through texts, sounds, images, graphics, animations, videos, and hyperlinks. Learners can read books through digital devices (eg, smartphones, tablets, and computers). Interactive e-books have had a positive effect on student learning achievement.[17, 18] The results of a previous study showed that interactive e-books were highly effective. Additionally, learning through interactive e-books has been shown to be more effective for low-achieving students than for high-achieving students.[19] An interactive e-book could also help students to learn complicated concepts more efficiently,[17] because of concise content and easy-to-understand, effective presentation, interactive quizzes to verify correct answers and build understanding, easy use and access anywhere at any time, and increased motivation to study.

Research on the effects of interactive e-books on nursing students' satisfaction and perceptions remains limited.[17] Additionally, there has been a lack of studies examining the application of instructional design in interactive e-books for online learning in epidemiology courses. Given these gaps, the present study aimed to describe nursing students' satisfaction and perceptions regarding the interactive e-book for online learning in an epidemiology course during the COVID-19 pandemic. Interactive e-books, which integrate multimedia elements, have shown a positive impact on students' learning outcomes. However, the specific effects of these resources on nursing students' satisfaction and perceptions, particularly in the context of online learning in epidemiology, have not been thoroughly investigated.

Methods

Design and Setting

This study utilized a descriptive research design. Secondary data analysis collected nursing students' satisfaction and perceptions from existing evaluation forms regarding the interactive e-book used in the epidemiology course during the 2020 academic year at a nursing

institution in Thailand. This institution was the first to provide nursing courses in Thailand and is under the care of the Thai Red Cross Society, overseen by government agencies. Its mission is to facilitate study, research, and training in nursing and related disciplines, provide academic services to the public, and engage in cultural preservation, all while maintaining the good image of the Thai Red Cross Society.

Participants

The study researchers analyzed secondary data from 196 second-year nursing students enrolled in epidemiology courses during the 2020 academic year at a nursing institution in Thailand. The inclusion criteria for the study included all second-year nursing students actively participating in the epidemiology curriculum during that academic year, ensuring a representative sample of the target population. Exclusion criteria comprised students with incomplete data records, those who were not enrolled in the course for the entire academic term, and individuals who withdrew from the program before its completion, thereby maintaining the integrity and reliability of the findings.

Intervention

The interactive e-book for online learning in the epidemiology course was designed and developed based on the ARCS-V model20 by the course instructors. The ARCS-V model of motivational design provides a theoretical framework regarding the motivational needs of learners in face-to-face and online learning. Each component (an acronym for attention, relevance, confidence, satisfaction, and volition) serves as a guide for strategy creation for learning motivation. Then, the ARCS-V model was applied. The motivational strategies for the design are shown (Table 1).

Table 1. The Design of the Interactive E-Book Based on the ARCS-V Model

Component	Motivational Method	Application in the Interactive E-Book
Attention	Active participation	Create interactive quizzes to keep their engagement active.
	Perceptual arousal	Use multimedia (images, graphics, animations, and video) to attract attention.
	Real-world examples	Provide real-life stories, examples, and case studies.
	Variety	Include different colors and interactive functions.
Relevance	Perceived present worth	Show learning objectives.
	Motive matching	Design hyperlinks to be related to the information.
Confidence	Communicate with objectives	Arrange the content in an orderly fashion.
	Facilitate self-growth	Set content that is neither too difficult nor too easy.
	Success opportunities	Add supplemental documents to help students understand complicated concepts.
Satisfaction	Intrinsic reinforcement	Promote student's enjoyment with challenge tests for both basic and advanced levels.
	Praise or rewards	Provide instant feedback when students enter the correct answers.
Volition	Monitoring on learners' attempts	Remind the student about their interactive quizzes via Line messages to help them stay on the interactive e-book.

The contents of the interactive e-book comprised 9 sessions as follows: concept of epidemiology, natural history of diseases, health index, epidemiological study, screening for risk factors, epidemiological surveillance, epidemiological investigation, and prevention and infection control for health care and community settings. Nine sessions were set by the study researchers (Table 2). The interactive e-book included a title page, author information, table of contents, learning objectives, contents, supplementary learning materials, interactive quizzes, and references. At the end of each unit, students could engage with interactive quizzes that allowed for self-evaluation and provided instant feedback with pop-up messages when correct answers were entered, reinforcing their knowledge of the subject. After completion, course instructors evaluated the e-book. Five course instructors assessed it based on 6 domains: learning content and structure, learning design, assisted learning design, multimedia and interface design, motivational strategies, interactivity, and additional comments. Their feedback indicated substantial approval of the content's validity.

This interactive e-book was utilized in a 4-week epidemiology course worth 1 credit. Nursing students attended online lectures and used the e-book. All materials were uploaded to the FlipHTML5 website (https://fliphtml5.com) and Microsoft Teams, allowing students to access the e-books online, practice quizzes, and download them to computers, tablets, or smartphones. This enabled learning to take place anywhere and at any time.

Instruments and Data Collection

Demographic Characteristics of Respondents

Demographic characteristics of the respondents' questionnaire included gender, age, and previous experience using the interactive e-book. This part of the questionnaire was developed by the course instructors.

Satisfaction of Nursing Students on the Interactive E-Book

The course instructors developed a questionnaire to measure the satisfaction of nursing students on the interactive e-book after a literature review. The questionnaire consisted of 3 aspects, including content, system, and utility aspects. The questionnaire consisted of 17 items, and each answer was given a point based on a 5-point Likert scale (strongly disagree = 1, disagree = 2, unsure = 3, agree = 4, and strongly agree = 5). The interpretation of the satisfaction of nursing students on the interactive e-book questionnaire was interpreted by

Table 2. The Contents of the Interactive E-Book

Session	Content	Time, min
1	Concept of epidemiology	60
2	Natural history of disease	120
3	Health index	120
4	Epidemiological study	120
5	Screening for risk factors	60
6	Epidemiology surveillance	90
7	Epidemiology investigation	90
8	Prevention and infection control for health care settings	60
9	Prevention and infection control for community settings	120

the means scores as follows: 4.21 - 5.00, very high level of satisfaction; 3.41 - 4.20, high level of satisfaction; 2.61 - 3.40, average; 1.81 - 2.60, below average; 1.00 - 1.80, low level of satisfaction.

Perception of Nursing Students on the Interactive E-Book

Open-ended questions were used to collect nursing students' perceptions on the interactive e-book. Nursing students were asked to describe the experience using the interactive e-book.

Content validity was verified by 5 epidemiology course instructors. Cronbach's alpha coefficient was used to determine its reliability (determination of internal consistency), and the total reliability of the questionnaire was 0.96. After students finished the epidemiology course, online questionnaires were sent to all of the students.

Data Analysis

The secondary data analysis focused on nursing students' satisfaction and perceptions of the interactive e-book used for online learning in the epidemiology course. This analysis was conducted with permission from the institute. The quantitative data were analyzed by using descriptive statistics (frequency, percentage, mean, and standard deviation [SD]). The analysis in this study was performed by using SPSS version 23.0 (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp; 2015). The qualitative data were analyzed by using content analysis by Miles et al[21] to describe the major phases of data analysis: data condensation or data reduction, data display, and conclusion drawing and verification.

Results

Demographic Characteristics of Respondents

Nursing students who participated in this study were second-year nursing students studying in their epidemiology course for the 2020 academic year. The majority of the subjects of the study were females (177 [90.31%]). The mean (SD) age of the participants was 20.37 (0.70) years (range, 19 - 24 years). Only half of the subjects (101 [51.53%]) of the study had experience using the interactive e-book (Table 3).

Satisfaction of Nursing Students on the Interactive E-Book

The results showed that the mean score of satisfaction on the interactive e-book was at the very high level (mean [SD], 4.53 [0.47]). The mean scores of the content (mean [SD], 4.49 [0.50]), system (mean [SD], 4.56, [0.47]), and utility aspects (mean [SD], 4.54 [0.52]) were also at the very high level (Table 4).

Perception of Nursing Students on the Interactive E-Book

The initial codes were classified into themes based on their meaning and conceptual similarity. As a result, 5 themes emerged from the data (Table 5). The content analysis resulted in 5 themes related to the perception of the interactive epidemiology e-book among nursing students: 1) concise content and easy-to-understand, 2) effective presentation, 3) interactive quizzes to verify and build understanding, 4) easy use and access at any time and everywhere, and 5) increased motivation.

Table 3. Demographic Characteristics of Respondents

Characteristic	No. (%)
Age, mean (SD) [range], y	20.37 (0.70) [19 - 24]
Gender	
Female	177 (90.31)
Male	19 (9.69)
Experience using interactive e-book	
Yes	101 (51.53)
No	95 (48.47)

Table 4. The Satisfaction of Nursing Students on the Interactive E-Book

Satisfaction	Mean (SD)	Interpretation
Content aspect	4.49 (0.50)	Very high
Providing clear and concise learning objectives	4.65 (0.52)	Very high
Learning objectives are consistent with the content	4.53 (0.57)	Very high
Content that encourages active learning	4.42 (0.63)	Very high
Concise content and easy-to-understand	4.31 (0.69)	Very high
Up-to-date content in accordance with the current situation	4.55 (0.58)	Very high
System aspect	4.56 (0.47)	Very high
Accessibility everywhere at any time	4.63 (0.55)	Very high
Clear and easy to read fonts with proper colors	4.65 (0.52)	Very high
Include different colors and interactive functions	4.65 (0.51)	Very high
Picture relates with the content	4.56 (0.60)	Very high
Content was arranged in an orderly fashion	4.47 (0.64)	Very high
Quizzes with immediate interactive feedback to keep their engagement active	4.37 (0.66)	Very high
Utility aspect	4.54 (0.52)	Very high
Students can understand the content much better	4.48 (0.64)	Very high
Promote self-directed learning	4.61 (0.58)	Very high
Students can review their lesson everywhere at any time	4.69 (0.51)	Very high
Promote students learning enjoyment	4.36 (0.68)	Very high
Promote students learning motivation	4.42 (0.67)	Very high
Promote students independent learning	4.64 (0.53)	Very high
Overall	4.53 (0.47)	Very high

Table 5. Perception of Nursing Students on the Interactive E-Book

Theme	Quote
Concise content and easy-to-understand	“Produce content that is easy to understand, clear, and concise.”
	“Use plain and clear language, not complicated or difficult to understand.”
	“Encourage independent learning and self-studying.”
	“Explain in great detail clearly and easy to understand by an example.”
Effective presentation	“This structure makes it easier to read comfortably.”
	“It is colorful and that makes it interesting to read.”
	“Text presentation is easy to understand.”
	“It is interesting and colorful without boredom.”
	“There are pictures and diagrams to make it more understandable.”

Table 5. Perception of Nursing Students on the Interactive E-Book (Continued)

Theme	Quote
Interactive quizzes to verify and build understanding	"Interactive quizzes at the end of the learning session to build understanding." "Interactive quizzes to build a better understanding." "I can remember things that I could not remember during quizzes." "Interactive quizzes can be used to verify understanding."
Easy to use and access at any time and everywhere	"Easily to access interactive e-books at any time and everywhere." "Portable and lightweight. It is easy to carry around." "Fonts in an interactive e-book can be resized, making it easier to read on small screens."
Increase motivation	"Improve motivation to learn." "There were real-life stories or case studies that make them more interesting." "Get motivated and interested to read more and shows an increased motivation to read."

Discussion

This study aimed to analyze the satisfaction and perception of nursing students on the interactive e-book for online learning in their epidemiology course during the COVID-19 pandemic. The results showed that the interactive e-book enhanced the satisfaction of nursing students. Regarding the three aspects of the satisfaction of nursing students on the interactive e-book questionnaire, the results showed that all these aspects were at the very high level. Therefore, the present findings showed that the perception of nursing students on the interactive e-book was highly effective in improving learning outcomes and building satisfaction.

This study's findings align closely with previous research, reinforcing the effectiveness of interactive e-books in teaching and enhancing learner satisfaction.[22,23] This alignment adds credibility to the observed positive impact of interactive e-books in educational contexts. In contrast to broader studies, the current research brings a focused perspective by concentrating specifically on epidemiology within nursing education. This targeted approach enhanced the applicability of the findings for nursing course instructors navigating online learning environments, especially in the intricate field of epidemiology.

It is essential to recognize that, despite consistent outcomes, subtle variations in instructional contexts and subject matter may influence applicability. While prior studies have established the general efficacy of interactive e-books, the present study goes further by emphasizing their strategic integration in nursing education, particularly in courses related to epidemiology. Scholarly discourse on this research has not only validated existing evidence on the positive impact of interactive e-books on teaching and learner satisfaction, but also contributes by offering a specialized lens for nursing educators. This comparative analysis enriches scholarly discussions, providing a nuanced understanding of how interactive e-books can be thoughtfully incorporated into the unique landscape of nursing education, and specifically within the realm of epidemiology.[22, 23] Therefore, the results suggest and support nursing course instructors in using an interactive e-book in epidemiology or other courses for online learning environments.

The study has aligned with previous research on the effectiveness of interactive e-books in nursing education,

particularly in epidemiology.[22, 23] In a comparative analysis with video-based learning, interactive e-books stand out for their unique strength in fostering active engagement through features like quizzes, and enhancing knowledge retention. While video-based learning is recognized for its visual and auditory appeal, the participatory dimension of interactive e-books adds value, making learners active participants. This dimension is especially beneficial for complex subjects such as epidemiology. This study has also highlighted the accessibility and flexibility of interactive e-books, allowing learners to access content at any time and location, catering to diverse schedules. The choice between these methods requires careful consideration of factors like learning objectives, content complexity, and learner preferences. In summary, the study has contributed insights into the ongoing discourse on effective pedagogical approaches, emphasizing the distinctive advantages of interactive e-books in nursing education.[24, 25]

Five themes were generated from the perception of nursing students on an interactive e-book, comprising concise content and easy-to-understand, effective presentation, interactive quizzes to verify and build understanding, easy to use and access at any time and everywhere, and increased motivation.

Concise Content and Easy-to-Understand

The findings of this study and the previous studies indicated that the interactive e-books had easy-to-understand content. The interactive e-books were more effective for low-achieving students than for high-achieving students.[19] The application of information technology to e-books led to a deeper understanding of students' learning conditions.[26] We also found that interactive e-books provided clear and concise learning objectives. The learning objectives were consistent with the content and were up to date, concise and corresponded with the current situation.

Effective Presentation

The presentation of the interactive e-book used multimedia (images, graphics, animations, diagrams, and video clips) to attract attention, including different colors and interactive functions, and hyperlinks that linked to the related information. This was in line with the study of Morris et al,[27] who stated that multimedia and interactive components were incorporated into the design of each e-book, because they were considered to support conceptual understanding and improved knowledge retention. The integration of multimedia material caused the interactive e-book to increase the effectiveness of the information presentation.[17]

Interactive Quizzes to Verify and Build Understanding

At the end of each session, students completed interactive quizzes to perform a self-assessment for understanding. The scores, incorrect answers, and correct answers were displayed at the end of the test. They could go back and directly see the page related to their problems that helped them strengthen their knowledge.[17] This finding was consistent with the study by Liu et al,[17] which showed that an interactive e-book could help students learn complicated concepts more efficiently. This indicated that the interactive quizzes could build better understanding and recall memories of the test.

Easy to Use and Access at Any Time and Everywhere

The results also indicated that students perceived the interactive e-book to be easy to use and that it could be accessed everywhere at any time. Similarly, Ebied et al[28] found that an e-book provided opportunities to view content everywhere at any time without restrictions so that some students might download an e-book on their mobile phones to review the information and study at any time. In this regard, it could be said that interactive e-books can help students access knowledge through digital technology that provides more varied and higher

quality digital learning. This study confirmed that the interactive e-book was easy to use and could be accessed at any time and everywhere.

Increased Motivation

Nursing students encountered limitations in accessing books and textbooks due to library closures during the COVID-19 pandemic. In this study, the ARCS-V model motivational strategies were applied in the interactive e-book development. The content structure was arranged in a theoretical framework regarding the motivational needs of learners in online learning with interactive features. This study's findings supported the previous evidence that interactive e-books had a positive impact on promoting students' learning motivation.[17] Similarly, Sun et al[26] found that e-books enhanced enjoyment in learning and promoted higher motivation. This meant that the ARCS-V model of motivational design served as a guide for the creation of different learning motivational strategies.

This study had several limitations that should be acknowledged. The data utilized were exclusively secondary data from a single nursing school, which limits the generalizability of the findings. Additionally, the focus on nursing students' satisfaction and perceptions of the interactive e-book presents another constraint. The evaluation was conducted by current students, potentially introducing social desirability bias, as participants might have given responses they deemed more acceptable rather than their true feelings. Furthermore, self-serving bias may have led students to rate their experiences more positively to reflect favorably on their choices or the institution. Acquiescence bias could also have influenced results, with some students inclined to agree with statements regardless of their actual opinions, potentially skewing satisfaction scores. These biases may have affected the reliability and validity of the findings, and it is important to consider them when interpreting the results. Future research should explore the effectiveness of interactive e-books on academic achievements, learning motivation, self-directed learning, and other outcomes for nursing students.

Conclusions

Nursing course instructors can effectively utilize interactive e-books in online learning environments. This study offers valuable insights into nursing students' satisfaction and perceptions of the interactive e-book employed in their epidemiology course during the COVID-19 pandemic. The findings reveal that the interactive e-book had a positive impact on students' learning experiences, enhancing their engagement and comprehension of complex concepts. The data indicates that integrating interactive elements into educational resources can significantly boost satisfaction levels among nursing students, especially during disruptions to traditional learning methods. Future research should focus on evaluating the effectiveness of interactive e-books concerning academic achievement, learning motivation, self-directed learning, and other educational outcomes for nursing students.

Article Information

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Ethics Approval

This study was approved by the Research Ethics Committee of Srisavarindhira Thai Red Cross Institute of Nursing (Approval code: IRB-STIN: Srisavarindhira Thai Red Cross Institute of Nursing 2564/16.08.10). The researchers initially gave the participants a full explanation of the research and its aims and obtained verbal informed consent from the participants. All data remained confidential, and the data were kept as encrypted files in computers and available to the study researchers only. Study researchers asked for permission to use the secondary data before conducting the research. Additionally, the study was conducted in accordance with the Declaration of Helsinki.

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No financial support was provided for the study.

Conflict of Interest

The authors declare no conflict of interest.

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