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Effect of Multimedia E-Book Use on the Information Literacy of Nursing Students and Health Communication in Student-Led Large- and Small-Group Community Health Education Sessions

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Abstract: The integration of digital technology into healthcare is critical for health communication. This study analyzed a group of nursing students who applied multimedia health education e-books to different groups of varying sizes to explore the efficiency of implementing health communication and nursing information literacy in the nursing industry. If medical personnel can make appropriate use of technology, combine medical operations with information systems, and disseminate the purpose of health to groups of different sizes properly, the quality of patient care will improve. Thirty-two junior nursing students at the college level were divided into three groups, each subject to a 3-week internship. After the internship, a questionnaire survey was conducted. Additionally, nine nursing students were interviewed in a 45-min semistructured format. Regarding the effectiveness of nursing students using multimedia e-books to implement health communication and the development of nursing information literacy, the statistical analysis results demonstrated no significant differences between large groups and small groups. However, their 5-point Likert scale average values were all greater than 4, indicating that regardless of group size, their feedback on using e-books was positive. This means multimedia e-books can effectively help nursing students practice health communication application effectiveness and develop nursing information literacy.

Keywords: multimedia e-book; health communication; nursing informatics; health care education; community health nursing

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1. Introduction

With advancements in information technology (IT), IT-assisted instruction has been gradually introduced into nursing education courses, and IT has become a key component of health care [1]. The spread of Internet-connection technologies such as smartphones and tablets and the increasing popularity of social media platforms have led to the development of new educational strategies for disseminating information [2]. Effectively integrating digital technology into education is crucial to promoting student success, and the creation of digital teaching materials that effectively attract the attention of the target audience has become a major goal of education and training departments. E-book systems can attract the attention and interest of nursing students [3]. Science and technology are reshaping educational patterns [4]. Since late 2019, the COVID-19 pandemic has transformed human behavior, particularly in aspects related to global public health [5].

Despite scientific developments, COVID-19 misinformation remains widespread [6]. Health communication is a field of constant development, and the COVID-19 pandemic has made the effective transmission of health information even more urgent. Individuals are becoming increasingly health-conscious, and the focus of health communication has shifted

from health education to behavioral and social change. Through careful planning and integrated strategies, communication technologies can serve as effective tools for influencing individuals' health behaviors [7]. The main social determinants of health communication are effective crisis management and risk communication. Different countries have adopted distinct communication strategies during the COVID-19 pandemic, and effective crisis management and risk communication strategies have helped establish public trust in the credibility, honesty, transparency, and accountability of the health authorities in each country [5].

In any field, the number of group members affects the depth of interaction involved in and the implementation of group activities [8]. According to the Encyclopedia of Social Work [9], a small group and a large group usually comprise from 2 to 15 and 20 to 50 members, respectively. In this study, we used these numbers as a reference for determining the number of individuals to be assigned to each group in our experiment. Each of the small and large groups comprised fewer than 15 individuals and 20 or more individuals, respectively. The aim of this study was to identify differences in the objectives of health education and to analyze the results of a nursing internship to identify the most effective health communication strategy for public health education [5].

The effective transmission of health information is not only a key social determinant of health in the context of the COVID-19 pandemic [5] but also a fundamental element of health communication. In this study, we used multimedia e-books as an aid and medium to disseminate health information. We recruited nursing students to collaboratively create multimedia teaching materials using multimedia e-books, which were used to solve practical problems related to health communication and education through multiple practice models and methods.

2. Background

In April 2020, public discussions about health inequality as related to the COVID-19 pandemic began to reveal the failure of both public health and information transmission policies [10]. IT has gradually become a key component of healthcare as an increasing number of medical professionals have assumed the responsibility of managing medical information, including the records of symptoms, medical histories, medical reports, X-ray results, inspection results, and diagnoses of numerous patients [1].

The integration of medical operations and information systems has become more diverse. The field of nursing informatics has adapted continuously to the rapidly changing healthcare industry.

2.1. Role of Health Communication in Nursing

Communication technology has developed considerably over the past few decades. Since the invention of digital computers, the Internet and social media have become globally widespread [11]. The digitalization of health literacy has been accompanied by an increasing emphasis on patient-centered care and a shift in focus from curative to preventive care [12]. Communication is the core of health care [13].

Rogers [14] defined health communication as a process in which people use various media and channels to create and share health information to help others maintain and improve their health. Rogers further stated that all transmission channels of health-related content can be categorized as health communication.

Processed health messages spread among the public through effective channels can inspire individuals to maintain healthy lifestyles, thereby promoting preventive health care as well as personal and public health and high living standards. According to the US Centers for Disease Control and Prevention, "Health communication encompasses the study and use of communication strategies to inform and influence individual and community decisions that enhance health [15]." Successful social interactions integrate verbal and nonverbal communication, and these interactions are essential to fulfilling individuals' needs, conveying the appropriate message, expressing appreciation for the feelings and

opinions of others, and facilitating reproduction and survival [16]. Therefore, the process of disseminating information requires trust in the credibility, honesty, transparency, and accountability of the source of the information [5].

2.2. Development of Nursing Information Literacy

The goal of nursing education is to cultivate the core literacy of nursing students as well as to cultivate strong exploration, critical thinking, and professional skills among them to help them develop into nurses who can function effectively in the workplace.

Graves and Corcoran defined nursing informatics as a science discipline that combines nursing science, information science, and computer science [17]. We posited that the real-time interactions, convenience, flexibility, multimodal interfaces, and automated information processing provided by interactive digital media and other recent technological advancements can extend the range and flexibility of intervention options in preventive medicine [18].

The ability to effectively select and evaluate multimedia and other technological learning tools, such as resources on conventional or applied networks, and apply these tools to the management of nursing materials and information to provide high-quality care is crucial for nurses. Bowman-Hayes asserted that information skills are necessary for informatics nurse specialists and are transferred from such specialists to clinical care staff [19].

The main goal of integrating IT into nursing is to encourage students to engage in skills training or on-the-job training [20]. Pedagogy supported by science and technology can effectively help students develop their professional core competencies and enable them to construct self-learning models, learn problem-solving and critical thinking skills, and successfully apply their acquired knowledge in practice. Technology has transformed the clinical healthcare environment and has made nursing more effective and efficient [19]. Recently, advances in information and communication technology have significantly changed healthcare services [21]. Many scholars have asserted that smartphones and tablets can be used as innovative teaching tools for nursing education, and this assertion warrants further investigation [22].

3. Methods

3.1. Participants

The study was conducted at a national university in Taiwan with 32 third-year students (21 males, 11 females) enrolled in the nursing program, with an average of 22 years of age. All participants completed a Community Health Nursing course and practicum with an associate professor of nursing with over 10 years of experience, who also coordinated the practicum. During the course, participants learned multimedia e-book editing and production, which they applied during an internship. For the study, the participants were divided into four groups of eight.

3.2. Design

During the internship process, the participants followed conventional practices (e.g., using paper, PPT) and used innovative integrated technologies (e.g., tablet computers, e-books, multimedia devices) to lead large- and small-group health education sessions. The participants cooperatively developed multimedia e-books on health-related topics and used a tablet computer to display their e-books when leading the sessions.

The participants led community health education sessions for large groups (more than 20 individuals) and small groups (fewer than 15 individuals) of individuals in local communities and nursing homes. Each participant led health education sessions for both small and large groups. The participants modified the multimedia e-books they had designed and edited to make them more suitable for each group session. The participants also uploaded the teaching materials they created onto tablet computers to help them present the materials during the health education sessions. The themes of the health

education sessions were discussed in advance between each participant and a senior nurse or directly designated by the senior nurse.

3.3. Instruments

3.3.1. Questionnaire

We employed a revised version of the evaluation feedback questionnaire designed by Miller [23] et al. to evaluate the usability of multimedia e-books by nursing students for health communication and group education during the community nursing internship. The validity of the revised questionnaire was evaluated by experts.

The questionnaire comprised 15 items, each of which was rated on a 5-point Likert scale. The usability of multimedia e-books for health communication was analyzed as two constructs. The first construct, which encompassed the first seven questions on the questionnaire, was related to the efficiency of using multimedia e-books for health communication in large-group and small-group health education sessions. The second construct, which encompassed the last eight questions, was related to the development of the nursing information literacy of the nursing students while using multimedia e-books to lead the large-group and small-group health education sessions.

3.3.2. Semistructured Interview

After the participants completed the internship, we conducted a 45-min semistructured interview with some of the participants. The entire interview process was recorded, and the respondents were continually questioned and asked for clarification depending on their responses. No theoretical or conceptual categories were imposed to guide the participants to respond or direct the direction of the interview. Stratified sampling was used to randomly select three nursing students from each internship, with a total of nine students selected.

The content of the interview was closely related to "the effectiveness of multimedia e-books for health communication and the development of nursing information literacy by creating multimedia e-books for health education" and had three major goals:

1. Understand the practical applications of multimedia e-books created by nursing students for health communication;
2. Compare the two scenarios of health communication for large and small groups implemented through multimedia e-books, as well as the advantages and disadvantages of and differences between the scenarios; and
3. Identify the difficulties encountered in using multimedia e-books for health communication and how to overcome them, as well as the benefits of using multimedia e-books for health communication.

3.3.3. Multimedia E-Book System

This study used the interactive e-book editing software SimMAGIC (Hamaster Technology, Kaohsiung City, Taiwan). This software enables users, including individuals without a design background, to create modules; interactive program features, such as connect-the-dots, jigsaw puzzles, sticky notes, popup messages, and hyperlinks; and multimedia materials, such as audio, video, text, and image files, without using a programming language. The integration of multimedia files into the reading process can provide an enhanced reading experience. In addition to their direct presentation, image files can be manipulated, such as through 360° image rotation and dynamic rotation, on the platform [24].

According to Hsiao et al. [25], the SimMAGIC platform enables readers to read and interact with SimMAGIC e-books and complete practice tests to promote reading and learning participation. The various interactive functions and designs of the platform can increase users' attention, thereby enhancing the effectiveness of health communication. In addition to the aforementioned activities, in the present study, the nursing students used the cloud bookcase to examine the e-book materials designed by other nursing students, thus facilitating a positive collaborative learning experience. Figure 1 presents a health education webpage of a multimedia e-book created by some of the nursing students.

Figure 1. Communication and health education webpage of a multimedia e-book.

3.4. Experimental Process

The experimental process was divided into three groups, each with a duration of 3 weeks. Because the nursing students were required to complete the community health nursing internship during the summer, the third group comprised two groups of 16 internship nursing students led by 2 nursing professors. The 15-day internship started on any day from week 1 to week 5, from 8 am to 4 pm, with a 1 h lunch break.

In week 1, the nursing students became accustomed to the local health bureau's various operations, the internship environment, and the related equipment. They familiarized themselves with the types and targets of the community health service and the roles and routines of members of the nursing staff, and they considered how to properly integrate their multimedia e-books into the health education and communication process and revise their books to meet the needs of their target audience. In week 2, the nursing students used the basic skills they acquired in week 1 to advance their practice, and they began to practice health education in large groups to help them identify and solve problems, modify their multimedia e-books, and apply them as health communication tools. In week 3, the students practiced health education in small groups, and we expected that creating complete multimedia education e-books would help the students improve their nursing information literacy. After the internship, the nursing students completed the questionnaire and participated in semistructured interviews in which they discussed their internship experiences. The experimental procedure is illustrated in Figure 2.

During the study, none of the participants' fundamental human rights were violated, and ethical criteria were followed. All the participants signed informed consent documents. The confidentiality of the participants' data was ensured, and the privacy of the participants was ensured.

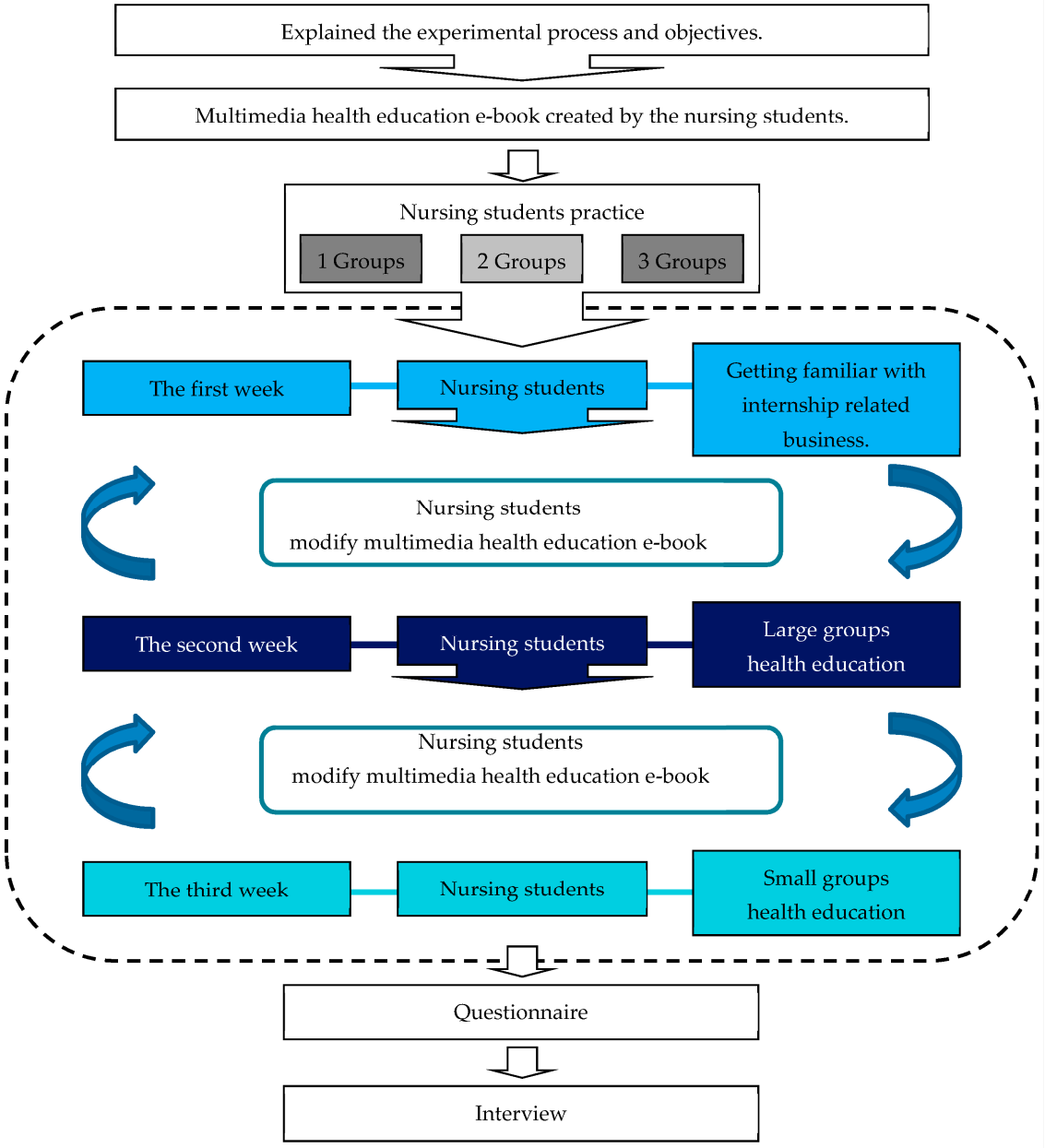

Figure 2. Experimental process.

3.5. Ethical Considerations

4. Data analysis and Results

4.1. Effectiveness of E-Books for Health Communication in Large- and Small-Group Health Education Sessions

The scores for each item related to health communication were analyzed using a dependent-samples *t*-test. A significant difference was observed in the participants' responses to Question 8 (Table 1). No significant differences were observed in the participants' responses to the other questions. The nursing students believed that the large numbers of individuals in large groups made conducting in-depth large-group health education sessions more difficult than conducting small-group health education sessions.

Table 1. Analysis result of comparing application effectiveness dimensions of health communication in large groups and small groups.

Dimension	M (SD)		*df*	*t*	*p*
	Large Group	Small Group			
3. The use of e-books to disseminate the subject matter of health education can present my professionalism on the subject.	4.21 (0.42)	4.34 (0.48)	31	−1.67	0.103
4. The use of e-books for health education is applicable to my teaching theme and helps me to pass on the teaching content.	4.43 (0.50)	4.370 (0.49)	31	0.626	0.536
8. E-book health education effectively meets my needs for promoting health education.	4.09 (0.46)	4.21 (0.55)	31	−2.10	0.044 *
10. I can apply the acquired knowledge from health education via e-books to practice.	4.15 (0.62)	4.31 (0.53)	31	−1.30	0.201
13. I can provide interventions with the acquired knowledge/skills in the process of e-book health education.	4.31 (0.64)	4.28 (0.63)	31	0.571	0.572
14. I can use the method of e-book health education to improve the effectiveness of dissemination of health education knowledge.	4.37 (0.49)	4.31 (0.47)	31	1.00	0.325
15. I can overcome the difficulties encountered in the process of e-book health education and communication.	3.96 (0.69)	4 (0.71)	31	−0.57	0.572

* $p < 0.05$.

No significant difference was observed between the small and large groups for any of the questions, except for Question 15, for which the average score was 3.96. The average item scores were all ≥4 points for the large and small groups, indicating that most of the nursing students were satisfied with and adopted a positive attitude toward using multimedia e-books to communicate health information in both the large- and small-group sessions.

The data were further analyzed using a dependent-samples *t*-test (Table 2). No significant difference was observed in the average performance of health communication between the large and small groups (t(31) = −1.17, $p = 0.247$, d = −0.097). No significant between-group differences in health communication application effectiveness were observed among the large groups (M = 4.22, SD = 0.38) or among the small groups (M = 4.26, SD = 0.44). The average questionnaire scores of both the large and small groups were ≥4 points, indicating that most of the nursing students believed that the results of using multimedia e-books for health communication in both the large- and small-group sessions were satisfactory, although the e-books were slightly more effective for the small groups than for the large groups.

Table 2. Analysis result of comparing application effectiveness of health communication in large groups and small groups.

Dimension	M (SD)		*df*	*t*	*p*	*d*
	Large Group	Small Group				
Health communication	4.22 (0.38)	4.26 (0.44)	31	−1.17	0.247	−0.097

4.2. Development of Nursing Information Literacy during Large- and Small-Group Sessions

A dependent-samples *t*-test was used to analyze the scores for each item related to nursing information literacy (Table 3). No significant differences were observed for any of

the questions except for Question 5. The nursing students believed that controlling sudden situations in class was easier when teaching small groups than when teaching large groups because they could demonstrate the function of each e-book feature to the group members and more thoroughly understand their responses, which helped the students improve their nursing information literacy.

Table 3. Analysis result of development of nursing information literacy dimensions in large groups and small groups.

Dimension	M (SD)		*df*	*t*	*p*
	Large Group	Small Group			
1. The difficulty of using e-books for health education is appropriate for me.	4.15 (0.57)	4.21 (0.49)	31	−6.26	0.536
2. The content and materials of the e-book provide the skills I need to spread the knowledge of health education.	4.06 (0.56)	4.12 (0.42)	31	−7.01	0.488
5. The content and materials of the e-book reduce my knowledge gap in my knowledge of health education.	4.03 (0.73)	4.40 (0.55)	31	−2.54	0.016 *
6. The interactive functions of e-books (notes, videos, sticky notes), etc., help me to clearly convey the content of the health education.	4.50 (0.56)	4.31 (0.47)	31	1.98	0.056
7. It is difficult for me to use e-books for health education.	4.15 (0.36)	4.18 (0.39)	31	−5.71	0.572
9. I can use the method of e-book communication to increase or maintain my professional ability.	4.06 (0.50)	4.25 (0.56)	31	−1.98	0.056
11. The process of using e-books for health education has enabled me to improve my problem-solving skills.	4.09 (0.73)	4.21 (0.60)	31	−1.27	0.211
12. I can apply the e-book health education process to further develop strategies for the acquired knowledge/skills.	4.06 (0.71)	4.21 (0.60)	31	−1.04	0.305

* $p < 0.05$.

According to the data presented in Table 3, the mean score for the questions related to nursing information literacy was ≥4 points, indicating that the nursing information literacy of the students significantly improved in the process of using multimedia e-books for health communication.

Our analysis of the data in Table 4 revealed no significant differences between the average scores of the large and small groups for the questions related to nursing information literacy (t (31) = −1.829, $p = 0.077$, d = −0.184). Additionally, no significant differences were observed in nursing information literacy among the students leading the large groups (M = 4.15, SD = 0.39) and small groups (M = 4.22, SD = 0.37). The average scores of the large and small groups were both ≥4 points, indicating that the nursing students believed that their nursing information literacy improved considerably in the process of using multimedia e-books to lead both large- and small-group health education sessions, although they reported greater improvement when leading the small-group sessions.

Table 4. Analysis result of comparing development of nursing information literacy in large groups and small groups.

Dimension	M (SD)		*df*	*t*	*p*	*d*
	Large Group	Large Group				
Information literacy	4.15 (0.39)	4.22 (0.37)	31	−1.829	0.077	−0.184

5. Discussion

Social participation is key to promoting active, healthy aging [26]. The main experience related to the COVID-19 pandemic is the uncertainty of the disease [27]. Disease uncertainty refers to the feeling that "there is too little, too much or inconsistent information about a person's health threats [28]." In the context of the COVID-19 pandemic, interoperability is a crucial consideration. Individuals use trusted sources, intermediaries, and hybrid channels to seek out health information to help them manage the effects of health crises on their daily lives [29]. In this study, we aimed to cultivate nursing information literacy and promote the use of multimedia e-books for health education and health communication among nursing students.

Presented through a tablet computer, the multimedia e-books were used as mobile vehicles to help the nursing students provide community health education and distinguish between different fields to improve their health communication skills and nursing information literacy.

5.1. Nursing Students' Perspectives on the Effectiveness of E-Books for Health Communication

Most of the nursing students believed that using e-books to communicate health information to large or small groups made the content of the sessions more interesting and memorable and helped them to communicate with the group members more effectively (Table 1). Many studies on interactive photo e-books have suggested that content-related interactive design can effectively improve reading motivation and achievement [30]. Nursing students can transform their audiences' perceptions of the topic of a health education session by using multimedia e-books to promote positive interactions and effectively communicate health information. In this study, student N1 stated that "The e-book has more pictures and special effects compared with paper, and the older adults don't feel that we are talking to ourselves." Student N2 said, "E-books make the older adults feel different from before, and they are willing to listen" and described that the e-books provided a new experience for older adults, increasing their confidence in the health communication process.

Wu [31] asserted that convenient and practical mobile vehicles can ameliorate the shortcomings of the conventional learning environment and increase students' confidence and active participation in the learning process. Students N2, N4, N5, N6, N7, and N8 expressed that the lightness and portability of the e-books enabled them to easily present an e-book to their audience, which created an intimate atmosphere when they were teaching older adults.

Misinformation is information "contrary to the consensus of the scientific community," and false information is the deliberate dissemination of false information for political purposes [32]. As the COVID-19 pandemic continues, individuals' health information needs may change [28]. Richter and Courage [33] asserted that e-book readers benefit from the built-in reading aids on mobile devices, which help them pay attention to story details that support their understanding. This attracts the interest of children and motivates them to read more content, encouraging them to comprehensively explore each book and pay close attention throughout the reading process. Students N2, N4, N6, N7, and N9 reported that the interactive functions of e-books (e.g., connect the dots, jigsaw, and scratchers) promoted interaction and feedback during health education, and that the timely arrangement of special effects in the e-book helped the students refocus on the objective of a health education session.

Using conventional PowerPoints for communication creates a divide between the lecturer and their audience; thus, gaining an appropriate understanding of the audience's reactions is challenging. Students N5 and N9 reported that using the e-books to teach required them to make the content more concise and accurate. Therefore, compared with using PowerPoints for health education, the students believed that using e-books as health communication tools enabled the large groups to understand the topics and information involved in the sessions.

Most of the nursing students reported that the process of using multimedia e-books for health communication did not differ considerably between the large-group and small-group education sessions. The main difference was the amount of time that could be spent on each task and on each group member, given the limited duration of each session. Although no significant differences were observed in the efficacy of health communication between the large and small groups, the participants felt that using the multimedia e-books for health communication was more effective in the small-group sessions than in the large-group sessions (Table 2). The students explained that the use of multimedia e-books in the large-group sessions promoted the target audience's interaction with and interest in the topic of each session; however, because the groups were so large, the students encountered more sudden situations and uncontrollable factors than they did when leading the small-group sessions. During the small-group health education sessions, the students could communicate and interact with each other to cultivate an atmosphere conducive to health education and could ensure that all the group members understood the information that they presented.

The interactive functions of the multimedia e-book platform enhanced the emotional communication and trust among the students, thereby helping them communicate effectively. Some students reported that the use of too many interactive functions resulted in the main topic of the education session being forgotten (N3, N5), and the nursing students also easily neglected the essence of knowledge transfer (N1, N5), which produced negative effects. Individuals tend to experience more cognitive absorption when watching an animation than when reaching brochures [2]. Cognitive engagement helps members of the public without scientific training to absorb large amounts of scientific information [6].

The popularization and convenience of mobile devices promote multiple modes of communication. Health communication frameworks should integrate numerous strategies and methods. Each party involved in the health communication process is required to organize and process large amounts of information [34]. In this study, according to the teachers' observations, the nursing students effectively promoted positive interactions during the group health education sessions by drawing on the multifunctional auxiliary tools on the multimedia e-book platform, thus enhancing their professionalism and knowledge. Providing health education by using the multimedia e-books helped the nurses hone their professional skills and refocus the attention of their audience on the topic of each health education session, resulting in a positive response from the audience.

5.2. Nursing Students' Perspectives on Development of Nursing Information Literacy

The expectations and needs of the public for reliable health information during the COVID-19 pandemic have resulted in increased attention paid to science and its internal processes [35]. The nursing information literacy that the nursing students developed in the process of using multimedia e-books to lead both large- and small-group health education sessions was satisfactory (Table 3). No significant difference was observed between the large and small groups, but the average scores indicated that the nursing information literacy of the students improved more while the students were leading the small-group sessions than when they were leading the large-group sessions (Table 4). The nursing students stated that managing the number of members in a group and time restrictions was more difficult when leading the large-group sessions than when leading the small-group sessions, especially because the features of the multimedia e-books could not be displayed to each member of the large groups individually. In addition, managing the interactions among the members of the small groups was relatively straightforward, and the content of multimedia e-books could be more easily displayed to all the group members simultaneously. When leading the small-group health education sessions, the students attempted to engage each group member in complete interactions as frequently as possible to increase the likelihood of the group member retaining knowledge on the topic of the session. This required substantial effort, and some of the students mentioned that they often subconsciously complicated the communication process and the information transmitted to the group members.

As demonstrated by Jeffries [36], the introduction of emerging technologies in a clinical practice environment can provide students with additional learning opportunities and improve the accuracy of data acquisition [31]. Because of the introduction of such technologies, nursing students must adopt innovative learning and interaction methods for health education. In the present study, the students' familiarity with the e-books was related to the effectiveness of their health communication methods, and the students were therefore required to enhance the informational content of their e-books, which required considerable nursing information literacy. The students were eager to use the functions of the e-book platform, and they actively attempted to apply them in the sessions they led.

Some of the students believed that if they did not apply the add-on functions of the e-book platform, the sessions they led would be similar to PowerPoint presentations. Student N1 commented, "If you are not familiar with the functions, you will waste the characteristics of the e-book." Potnis et al. [37] postulated that the combination of the basic and advanced functions of e-book platforms would encourage students to use e-books. In the present study, the nursing students reported that the built-in functions of the e-book platform were useful because they helped make the health education sessions more fun and because the feedback and responses the students received from the group members were enthusiastic.

The multimedia e-book platform provided various functions, such as the ability to add annotations, hyperlinks, and bookmarks to an e-book. These functions helped the learners easily retrieve information [22]. The combined features and advantages of the multimedia e-books improved the quality of learning during the internship and enabled the students and group members to engage in innovative communication and interaction by using mobile devices. By using the multimedia e-books to communicate information on the topics of the health education sessions, the nursing students strengthened their information-handling abilities and information literacy.

As observed by the instructor, the nursing students drew on the features and advantages of the multimedia e-books as well as other resources and their expertise to provide high-quality group health education sessions to promote interactions and cultivate a positive relationship between their peers and the group members.

5.3. Effect of Multimedia E-Books on Nursing Students' Internships

The rise of e-books has led many researchers to explore the effects and applicability of e-books in education. Most researchers agree that in terms of real-time help and feedback, the benefits of e-books exceed those of conventional paper books. In addition, e-books are lightweight and portable [38].

E-books can be used as contemporary resources for learning and teaching [39]. Mobile devices are characterized by portability and real-time interactivity, and they can help overcome the limitations of traditional teaching methods and have various applications in education [40]. In the present study, the use of multimedia e-books for health education promoted cognitive engagement and creative self-learning and facilitated various modes of health communication.

According to the cognitive theory of multimedia learning proposed by Clark and Mayer [41], when learners are provided with words and pictures, they start establishing a psychological representation, which promotes meaningful learning. Learners actively learn through dynamic media such as pictures, maps, charts, videos, and simulations.

Professional courses require considerable reading and learning. In the present study, during the internship, the multimedia e-books effectively helped nursing students practice health communication and improved their nursing information literacy.

Digital learning enables greater flexibility in terms of time and use, thus promoting time management and accessibility. The advantages of digital learning make students more willing to use digital learning tools [39]. In the present study, using multimedia e-books to lead health education sessions helped the nursing students to design learning resources appropriate for different contexts (large- and small-group health education sessions) and

adopt a multidimensional approach to health communication. Digital learning has led to various innovations in nursing services in the healthcare industry and has increased public interest in and demand for explanations of health issues. The results of the present study indicate that multimedia e-books facilitate the provision of community health education by nursing students.

6. Conclusions and Recommendations

Advances in information and communication technology are providing new channels for health communication in an increasing number of healthcare sectors [42]. Learning is realized through social and collective means, including dialogue, knowledge dissemination, and social networking. In addition to their common use in hospitals, mobile devices are gradually being introduced into nursing practice courses (including clinical nursing courses) on the management of drugs, outpatient clinics, and nursing homes [31]. In today's rapidly changing world, nursing students must practice independent learning and educational self-reflection.

This study examined the use of mobile devices by medical staff for health communication, and the results may serve as a reference for the development of training programs for new nurses. The nursing students used the interactive features of multimedia e-books to establish relationships with their target audiences, and the health education sessions they led increased the health literacy of their audiences, thus helping them understand how to make conscious joint decisions with their relatives regarding their health and lifestyles.

Using multimedia technologies such as tablet computers for health communication not only helps nursing students acquire and transmit health information but also ensures that their expectations and attitudes reflect the relevant social context. The application and development of information technologies in the future should be oriented toward integrating patient-centered systems, cultivating health literacy, and preventing the waste of medical resources. Although mistrust and misinformation are not new public health concerns, the proliferation of social media platforms has been conducive to the spread of false information [43]. Regarding the COVID-19 pandemic, Viswanath et al. [6] proposed that research on inequality in health literacy may serve as the basis for alleviating current offline and online pandemics. Therefore, accurate public health information, effective health communication, and health education are crucial.

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