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Factors affecting the adoption of technology on the use of online lessons in medical care courses

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ABSTRACT

This research aimed to examine the factors affecting the acceptance of technology in the use of the online learning media system at Lampang Boromrajonani College of Nursing, Lampang, Thailand. The researcher designed and developed an online learning media system based on the principles of software development life cycle (SDLC) and applied it to 116 fourth-year nursing students, divided into 4 males and 112 females, evaluated using a questionnaire on its utilization and technology acceptance regarding the theory of technology acceptance model (TAM). The independent variables were perceived usefulness and perceived ease of use, and the dependent variable was the intention to use. Data on satisfaction were analyzed using descriptive statistics, while data on technology adoption were analyzed using multiple regression analysis. Results indicated that the parameter on suitability of the media had an average of 4.56 $\pm$ 0.56, indicating the highest satisfaction based on a 5-point scale. Moreover, the parameter on media efficiency had an average of 4.50 $\pm$ 0.61, indicating high satisfaction based on a 5-point scale. For technology adoption, it could be summarized as the equation: $Yt = 0.697 + 0.573X_1 + 0.277X_2$ where Yt = technology adoption, X_1 = perceived usefulness, and X_2 = perceived ease of use with P-value = 0.000, and $R^2 = 0.567$, indicating fair technology adoption among users.

Keywords: technology acceptance model, TAM, online lesson, medical care course

INTRODUCTION

Boromrajonani College of Nursing, under the Royal Institution Krathong Public Health, plays crucial role in producing competent nurses who adhere to the standard framework for nursing degrees and serve the Thai community in northern Thailand. In this regard, the college has designed and provided both theoretical and practical processes in teaching and learning to simultaneously develop learners' cognitive, psychomotor, and affective learning to equip them with appropriate 21st-century skills. These include 1) morality and ethics, 2) knowledge, 3) intellectual skills, 4) interpersonal skills and responsibility, 5) numerical analysis skills, and 6) professional practical skills. In past pedagogy, nursing students' learning before practicing at the hospital required them to use the search method for self-study to gain additional knowledge from the library. However, the information provided was only in terms of texts and images, which made it impossible to acquire as much knowledge as it should, especially in basic medical care courses for nursing students.

Media integration in the learning process is gaining recognition for its role in enhancing educational experiences and outcomes. It not only boosts engagement, understanding, and accessibility but also caters to diverse learning styles and promotes digital literacy. This approach creates a dynamic and interactive learning environment, equipping students to tackle the challenges of the modern world and developing students' knowledge and skills to be suitable for learning in the 21st century while students can easily access and learn effectively from electronic online learning materials (Gerdruang et al., 2021). However, effective electronic online learning materials in medical care courses are still limited. Developing learning materials through multimedia technology for nursing students of the Boromrajonani College of Nursing in basic medical care courses is a challenge to support those students with easy access and the ability to learn at their places through the internet network.

This research aimed to develop learning materials through multimedia technology via an online website for introductory medical care courses and examine the factors affecting their acceptance

and use at Lampang Boromrajonani College of Nursing, Lampang, Thailand.

MATERIALS AND METHODS

Research Process

The research developed learning materials through multimedia technology and an online website in the basic medical care course according to the Information System Development Life Cycle (SDLC) in the brief Radack (2009) and conducted a study on factors affecting the adoption of technology in the use of online lessons in medical care courses. The SDLC method is shown in Figure 1, and the research process in Figure 2.

From Figure 1, SDLC is separated into 5 phases: initiation, development and acquisition, implementation, operations and maintenance, and disposal. This research was about developing the system according to this SDLC by the following steps: First, researchers collected user requirements and important data from users, students, and lecturers. Second, the system was analyzed and designed physically and logically. Third, the system was created using the PHP, HTML, JavaScript, and Bootstrap frameworks. Fourth, the system checked the errors for corrections. Finally, the new system was used in the medical care classroom. After using the system, researchers collected the satisfaction data of the online lesson system from 116 fourth-year nursing students. Then, the Technology Acceptance Model (TAM) of Davis (1989), as explained by Luenam (2011) was applied by following the concept framework. The research hypothesizes that there were two factors (Figure 2) affecting adoption of technology utilization as follows:

Factor 1: Perceived usefulness: This might affect the user's acceptance of technology and intention to use the online lesson system for primary medical care courses.

Factor 2: Perceived ease of use: This might affect and relate to users' acceptance of technology.

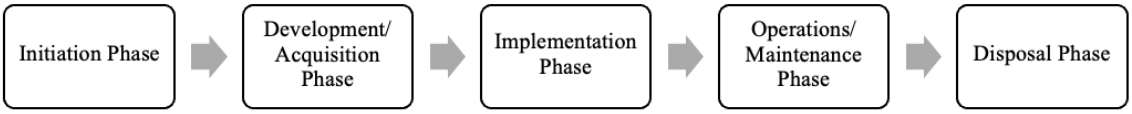

Figure 1. Software development life cycle.

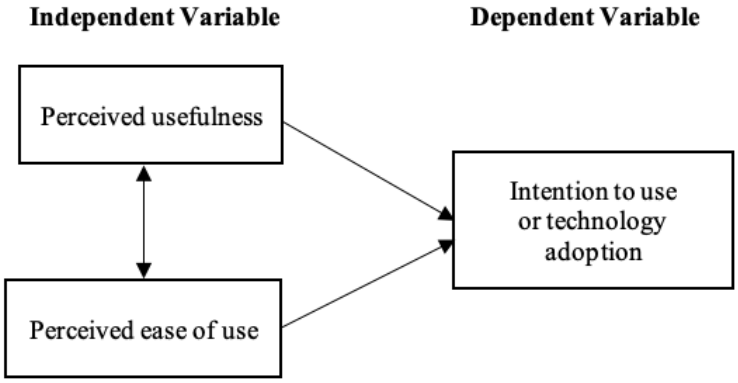

Figure 2. Factors affecting Intention to use or technology adoption.

Participants

116 fourth-year nursing students at Boromrajonani College of Nursing, including 4 males and 112 females, participated as volunteers to use the developed multimedia technology to learn materials in the basic medical care courses and answer the questionnaire.

Contents used to develop online lessons

This research has contents related to primary medical care, divided into ten topics as follows:

Topic 1: Preparing to clean the wound (scrub wound)
Topic 2: Selection of materials and equipment for stitches
Topic 3: Incision and drainage
Topic 4: Single interrupted suture
Topic 5: Vertical mattress suture
Topic 6: Half-buried horizontal mattress suture
Topic 7: Nail avulsion
Topic 8: Emergency intravenous fluid administration
Topic 9: Preparing equipment for doctors for emergency intubation
Topic 10: Basic cardiopulmonary resuscitation according to AHA 2020 guidelines.

Research Statistics

We evaluated the system after its use over a one-semester period with 116 nursing students. The degree of agreement or acceptance was used on a 5-point scale according to Likert's scale related to Jebb et al. (2021) as follows:

A score of 4.51 – 5.00 means the highest level of agreement or acceptance
3.51 – 4.50 means a high level of agreement or acceptance
2.51 – 3.50 means a moderate level of agreement or acceptance
1.51 – 2.50 means disagreement or unacceptance
1.01 – 1.50 means very disagreement or poor unacceptance

Data were analyzed using descriptive statistics, including mean and standard deviation for satisfaction with using the system, while technology acceptance was analyzed using multiple regression using SPSS statistical software version 26 (IBM Corp., New York, USA) with a significance level of $P<0.05$.

RESULTS AND DISCUSSION

The multimedia online lessons in medical care courses

This research develops the online lesson system following the Software Development Life Cycle (SDLC) and finally finishes the development of the system with the following figures:

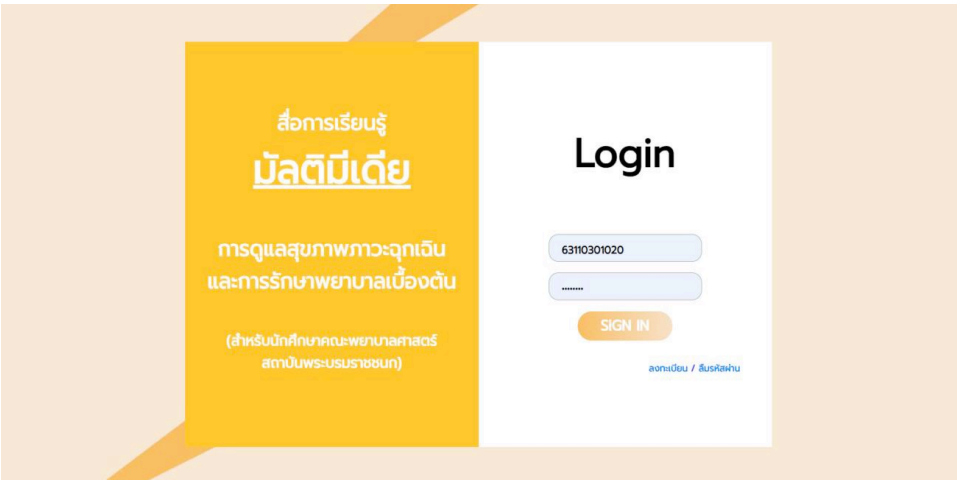

Figure 3. Login page.

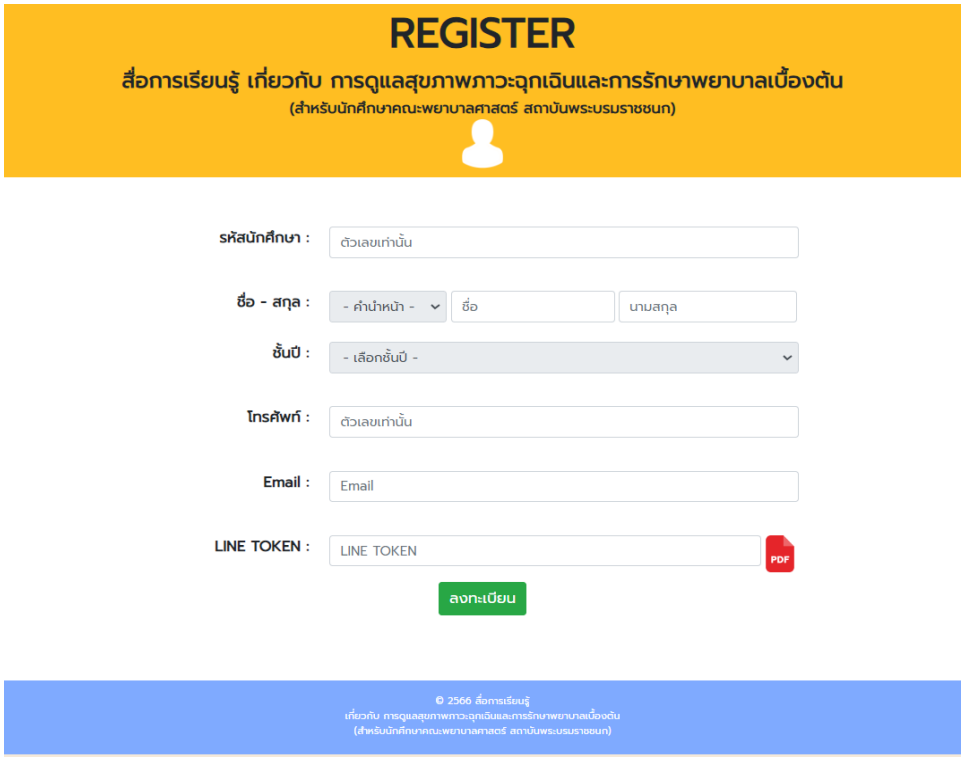

Figure 4. Register page.

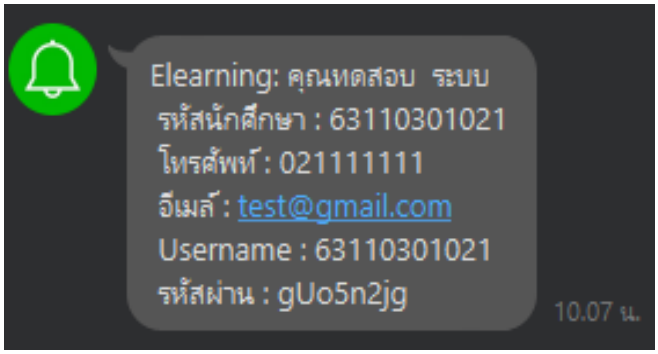

Figure 5. LINE notification.

Figure 6. Course page.

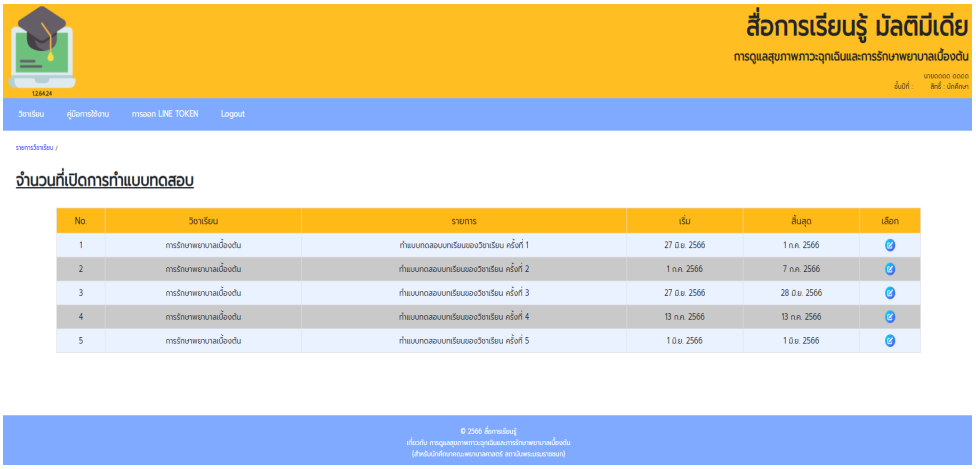

Figure 7. Examination page.

Figure 8. Course summary page.

Figure 9. Forgot password page.

The analysis of factors affecting the adoption of technology in the use of online lessons in medical care courses was divided into two topics. First, the analysis of satisfaction with using the system was designed to examine the assessment of the system after use. Second, the analysis of technology acceptance towards the use of online lessons in medical care courses based on the technology acceptance model (TAM) was designed to predict the user's need to use the system again.

Satisfactions of using the system

After the development of the online lesson system, the medical course was completed. The system has been deployed for nursing students. The assessment of the system is divided into two parts: the appropriateness of the online lesson system and the efficiency of the online lesson system. According to the method, the results of the appropriateness of the online lesson system are shown in Table 1, and the efficiency of the online lesson system is shown in Table 2.

Table 1. Factor: perceived usefulness factor of the online lesson system

Items	Mean	SD	Outcome
1. The content in multimedia about the nature of the subject is easy to read and clear	4.50	0.61	Highest
2. The content sequencing is easy to understand	4.50	0.56	High
3. The content in multimedia media is substantive, accurate, and meets the learning objectives that are very suitable for students	4.56	0.60	Highest
4. The amount of content in each topic is short, concise, and clear	4.47	0.58	High
5. Students understand the material easily and can learn better	4.64	0.55	Highest
6. Content in multimedia knowledge is transferred by explaining examples clearly and easily	4.52	0.58	Highest
7. Encourage students to think critically, make decisions, solve problems, and develop more skills	4.60	0.56	Highest
8. Learners can access self-paced learning through multimedia anytime, anywhere	4.62	0.50	Highest
9. Learning multimedia can be used for teaching, learning, and practical application in daily life.	4.63	0.55	Highest
10. Before and after learning quizzes are consistent with the content	4.61	0.54	Highest
11. Test processing is quick and convenient, making students aware of their abilities and what they need to develop	4.56	0.56	Highest
Overall mean	**4.56**	**0.56**	Highest

Highest = highest level of agreement or acceptance. High = high level of agreement or acceptance.

According to Table 1, we found that online lessons in medical treatment courses were overwhelming. In terms of the suitability of the lesson system, the overall average score level was 4.56, and the average standard deviation was 0.56 (Mean = 4.56, SD = 0.56), which was at the highest agreement or acceptance level. When considering all topics individually, 11 topics were found appropriate. The assessment results are in the highest agreement. The most-rated scale topic was that students understood the material easily and could learn better (Mean = 4.64, SD = 0.55). The minimal rated topic was the amount of content in each topic that is short, concise, and clear (Mean = 4.47, SD = 0.58). Perceived usefulness refers to a person's level of belief that the introduced technology can help increase work efficiency (Sabbunyat, 2019)

Table 2 shows that online lessons on medical treatment courses are overwhelming. In terms of the effectiveness of the lesson system, the overall average score level is 4.50, and the average standard deviation is 0.61 (Mean = 4.50, SD = 0.61), which is at the level of very agreeable. When considering all topics individually, 11 topics were found appropriate. The assessment results are between very and maximum. The most-rated scale topic is multimedia media, which has a connection with content, essence, and a step-by-step summary (Mean = 4.62, SD = 0.52). The design, layout, use of multimedia media, and screen are proportional and beautiful (Mean = 4.40, SD = 0.64). Perceived ease of use refers to a person's level of belief that using technology will not require much effort. If the technology is simple, there will be no obstacles. If the system is complex, it can create a positive attitude towards service users (Himarat, 2016).

Table 2. Factor: perceived ease of use of the efficiency of the online lesson system

Items	Mean	SD	Outcome
1. The design, layout, use of multimedia media, and screen are proportional and beautiful	4.40	0.64	High
2. The establishment of various menus of multimedia media is clear and interesting	4.42	0.62	High
3. The colors of multimedia are appropriate	4.44	0.66	High
4. The font size in multimedia media is easy to read and clear	4.43	0.63	High
5. Multimedia media is beautiful	4.48	0.64	High
6. Multimedia media uses creative thinking	4.53	0.61	Highest
7. The presentation style is beautiful and interesting	4.42	0.66	High
8. The amount of material in each subject matter is accurate, clear, and up-to-date	4.55	0.61	Highest
9. The arrangement of each topic is easy to read and clear	4.60	0.59	Highest
10. Multimedia media has a connection with content, essence, and a step-by-step summary	4.62	0.52	Highest
11. Multimedia media showing images, videos, and audio commentary are clear	4.59	0.56	Highest
Overall mean	**4.50**	**0.61**	High

Acceptance towards the use of online lessons in medical care courses based on TAM

In the process of analyzing the adoption of technology towards online lessons on medical care courses according to the technology acceptance model (TAM), the research uses a multiple regressive analysis of technology adoption to intent to use online lessons, defining the following points:

Perceived usefulness

1. In the process The content in multimedia media is substantive, accurate, and meets the learning objectives that are very suitable for students.
2. Content in multimedia Knowledge is transferred by explaining examples clearly and easily.
3. Encourage students to think critically. They can learn more skills.
4. Learning multimedia can be used for teaching, learning, and practical application in daily life.
5. Before and after quizzes from multimedia are consistent with the content.

Perceive ease of use

1. The content in multimedia about the nature of the subject is easy to read and clear.
2. Content sequencing is easy to understand.
3. The amount of content in each topic is short, concise, and clear.
4. Students understand the material easily and can learn better.

For technology adoption, it could be statistical inference using the multiple regression equation to predict the value of the change in the intention to use the online lesson system, which is equal to a percentage of 56.70. This analysis found the elements of technology adoption (Y_t) responded to perceived usefulness. (X_1) and perceived ease of use. (X_2), which were statistically significant with detail in Table 3 and could be illustrated in a multiple linear regression equation as follows:

$$Y_t = 0.697 + 0.573X_1 + 0.277X_2 \quad \text{with } R^2 = 0.567$$

Table 3. Multiple regression equation of technology adoption vs. perceived usefulness and perceived ease of use for online lesson systems

Items	B	SE	Beta	t	P-value
Constant	0.697	0.319		2.183	0.031
Perceived usefulness (X_1)	0.573	0.102	0.530	5.642	0.000
Perceived ease of use (X_2)	0.277	0.097	0.269	2.867	0.005
$R^2 = 0.567$, SEE = 0.320, F = 74.003, P-value = 0.000					

The equation suggests that the adoption of technology is relatively related to perceived usefulness and perceived ease of use ($P < 0.05$). However, the relationship is quite weak due to a moderate low in R^2. In terms of technology adoption, the results were in agreement with Yeemali (2017), who reported a relationship between perceived usefulness and perceived ease of use in terms of adoption or intention to use a technology (movie application and series) in Bangkok.

CONCLUSIONS

An online learning media system based on the principles of the software development life cycle was developed for introductory medical care courses and benefits students at Lampang Boromrajonani College of Nursing, Lampang, Thailand. Factors that affect the adoption of technology are perceived usefulness and perceived ease of use, which have shown a linear relationship. Related multimedia technology may require further development to enhance learning styles and promote digital literacy that is appropriate for 21st-century skills.

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