International Journal of Evaluation and Research in Education (IJERE)
Vol. 13, No. 1, February 2024, pp. 547~558
ISSN: 2252-8822, DOI: 10.11591/ijere.v13i1.25486

The evaluation of problem-solving oriented e-module in learning computer-based subject

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Article Info

Article history:

Received Jan 29, 2023
Revised Nov 30, 2023
Accepted Dec 9, 2023

Keywords:

Facebook
Module
Online learning
Problem-solving
Social presence
Students' performance

ABSTRACT

It is tough and challenging to learn several computer-based subjects via an online learning setting during COVID-19 for students from the education field. It required a lot of skills, techniques, understanding among students, and the ability to think critically to solve problems. To date, a lack of studies provides digital content as learning approaches to computer-based subject students for their learning via online learning. Thus, the problem-solving oriented e-module in learning computer-based subject via Facebook for Higher Education was proposed. An exploratory sequential research design (qualitative and then quantitative approach) has been used in this study. Research samples were selected based on purposive sampling (10 students) to find out what they needed from the e-module. Then, the module was developed based on ADDIE Model and problem-solving learning strategy. There were nine experts validated the e-module in terms of the ADDIE model approach, problem-solving approach, and content. This module was tested on 34 undergraduate students towards students' performance and social presence for quantitative part. The t-test showed that the e-module significantly improved student performance (p 0.00; t=5.52) with Cohen's d=0.944. Interestingly, the results from the content analysis show that this module fosters social presence via Facebook learning groups such as interactive, affective, and cohesive.

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1. INTRODUCTION

Computer-based subjects such as audio-video techniques, programming, database, system design, and others are challenging subjects in the educational field, especially when fully conducted via online during COVID-19. Learning computer-based subjects is challenging as they require many skills, techniques, and understanding among students. It required students to be critical in solving the problem. Students had problems learning computer science subjects due to teaching approaches and the course content [1]. A study conducted by Tan *et al.* [2] found several factors that lead to undergraduate' learning difficulty in a computer-based subject, such as lacking understanding of the concept, tough subjects and challenges.

It is difficult to teach several computer-based subjects via online due to their challenging nature. Besides, asking students to discuss computer-based subjects via an online learning platform is difficult. Thus, it is necessary to provide alternative digital content for helping computer-based subjects that could foster students' discussion and solve problems via online learning. In online learning, social presence is one of the important elements of students' discussion [3]. Online Social presence refers to feeling connected among

participants in online learning. They feel like everyone is in the same physical room even though they are in an online platform in different places. The participants in online learning can engage in intellectual and social interactions with others for knowledge construction and meaning-making through social presence [4]. The roles of instructors are crucial for students' social presence in online learning.

Instructors must be creative to make online learning interesting and attract students' attention. One of the ways is to produce a learning module using an interactive learning environment such as Facebook that can trigger students' performance and online social presence. In Malaysia, using Facebook in online teaching and learning during COVID-19 has attracted the attention of many educators and students in higher institutions [5]–[7]. In addition, Malaysian Facebook users are Generation Z, who spend most of their time on gadgets. In 2022, Malaysian Facebook users will be 23,300,000 [8]. Thus, this research will propose a module via Facebook to cater to students' performance and social presence in higher education.

Students' social presence via an online learning setting differs from face-to-face learning. Several studies have found that social presence is important in online learning discussions [9]–[11]. Nowadays, the new generation uses Facebook in their life. Through the Facebook platform, it could foster students' social presence and as well as increased discussion engagement. Thus, Facebook can be used as one of the alternative platforms for online learning. Several studies found that Facebook can be used to conduct online teaching and learning [12]–[15]. Interestingly, several studies found that Facebook is the most suitable platform to support online learning and encourage students' engagement in discussion [14]–[16]. Besides that, Facebook also can support social presence in online learning [17]–[19].

Facebook can be used as a platform for employing digital content as learning approaches for computer-based subject students, known as computer-based subject problem-solving oriented e-module via Facebook for higher education. In order to encourage students' engagement in online collaboration via the Facebook group, an appropriate problem-solving strategy must be embedded in the e-module. Besides that, proper guidance is needed to develop the e-module using the ADDIE model. Thus, the new contribution made by this study is to provide a new e-module known as a computer-based subject problem-solving oriented e-module via Facebook for higher education students. It will help foster students' performance and social presence in online learning. Additionally, this e-module could promote engaged learning in computer-based subjects through social presence. Therefore, there is a high potential to design and develop computer-based subject e-modules via the Facebook group. In addition, an e-module is one digital content that can be implemented in technology tools such as Facebook.

2. LITERATURE REVIEW

2.1. Problem solving learning strategy

Computer-based subjects require technical skills and students to solve problems to help them be critical and able to solve the problems and apply problem-solving learning strategies in their learning. In online learning, several studies embedded problem-solving as their learning strategies [20]–[24]. Their studies found that problem-solving learning strategies could help students in their learning. Furthermore, problem-solving is an important element that needs to be explored [25]. However, few studies employed problem-solving learning strategies for computer-based subjects via online learning.

There are many strategies of problem-solving that can be used in online learning. One approach is the problem-solving strategy by Jonassen [26]. There are seven learning criteria in online problem-solving, which are: i) Present all elements of the problem; ii) Define the problem with a probable solution; iii) Engage the application of a limited number of rules and principles; iv) Involve concepts and rules; v) That seems organized and consistent in domain knowledge; vi) Possess correct and convergent answers; and vii) Have a preferred and prescribed solution process. This strategy was embedded in the e-module for this study.

2.2. Online learning module

Online learning modules are one of the alternatives for implementing online learning. In Malaysia, several studies have designed and developed modules, such as multimedia-mediated learning modules [27], mobile-based online learning courses [28], and ICT literacy modules [29]. There is a positive impact on students using the online learning module, such as increased student performance [30], [31]. Learning through an online learning module could help students understand better and maintain students' motivation. These prove that online learning modules are one way to make online learning interesting. However, there is a lack of modules of computer-based subjects that focus on students' performance and social presence in higher education for online learning.

Thus, it proved that online learning modules could help students, particularly learning through online learning. To date, lack of studies on computer-based subject problem-solving e-module via Facebook. Moreover, there is a lack of modules regarding computer-based subjects that focus on students' performance

and social presence behavior in higher education for online learning. In online learning, students face problems such as loss in their learning and a lack of interaction between peers and instructors. In order to have good interaction and discussion on online learning platforms, the element of online social presence has to be triggered. Thus, there is a need for this research to provide an e-module that triggers students' performance and students' social presence.

2.3. Online social presence

Social presence via online learning settings is different from face-to-face learning. Online social presence can be defined as the psychological phenomenon in which, to a certain extent, the others are perceived as physical "real" persons in technology-mediated communication enabled by computer-mediated communication (CMC) tools and electronic platforms [32]. In online learning, social presence is defined as being present, there, or to a degree in which a learner feels personally connected with the other students and instructors in an online learning community [33]. Strategies to promote social presence in online courses such as providing good learning materials and giving more opportunities. Several studies on online social presence have revealed that it could improve students' performance in learning [34], [35], increase students' motivation in learning [36], and encourage interaction, and increase students' performance [37]. One of the ways to foster social presence is by using an appropriate platform such as Facebook group. However, a lack of studies developed an e-module for the computer-based subject. It tested students' performance via a Facebook group. Thus, this study was created e-module and implemented in a Facebook group.

2.4. Facebook group

Facebook can be used as a platform that facilitates the interaction between students and their instructor as it offers a new, broad and exciting learning platform between students and instructor as well as alternative platforms for students to collaborate on the subject matter [38]–[40]. In addition, this platform fosters students' participation [41] and peer-to-peer learning [42]. In addition, Facebook has been used as a learning platform for online teaching and learning and as a sharing platform [43], [44].

One of the ways to utilize Facebook for online learning is via an implemented online module in a Facebook group. Additionally, several advantages of using the technology of the Facebook platform, such as a platform for social interaction for meaningful learning [45], Facebook as a supplementary learning resource [46], and Facebook discussion groups, could enhance students' critical thinking [47].

This study chose Facebook as the learning platform because of its flexibility and potential. It provides a learning environment that allows collaboration in online learning. Besides that, Facebook has a learning environment where students can control their learning, such as posting information and pictures, sharing links or videos, providing a social learning environment [48], and fostering students' engagement to solve the problems. In addition, Facebook is a powerful social networking site for online collaboration [49]. Thus, this study proposed an e-module that can be implemented via a Facebook group called the computer-based subject problem-solving oriented e-module via Facebook for higher education. Therefore, this study aims to answer research questions as: i) What are the students' needs in learning computer-based subjects via online learning for higher education?; ii) What will the problem-solving oriented e-module in learning computer-based subject via Facebook for higher education look like?; iii) What is the effect of the problem-solving oriented e-module in learning computer-based subject on students' performance?; iv)What are the dominant behaviors of students' online social presence when using the problem- solving oriented e-module in learning computer-based subject via Facebook? Further, the hypotheses in the study are: (H0) There is no significant difference in students' performance before and after using a problem-solving oriented e-module via a Facebook group and (H1) There is a significant difference in students' performance before and after using a problem-solving oriented e-module via a Facebook group.

3. RESEARCH METHOD

3.1. Research design

This research employed the mixed method approach. The exploratory design aims to gather qualitative data regarding the phenomenon before collecting quantitative data. Therefore, the exploratory sequential design is chosen for this research for the qualitative approach. Meanwhile, the quantitative approach used the one-group pretest and post-test design. This research used qualitative data to support the design and development of the problem-solving oriented e-module. Then, the problem-solving oriented e-module was evaluated through the quantitative approach.

3.2. Research procedure

Firstly, interviews were conducted among ten respondents to investigate the needs of the computer-based subject e-module. After that, the problem-solving oriented e-module was developed based on students'

needs using the ADDIE model and problem-solving approach. Then, the problem-solving oriented e-module was evaluated based on students' performance and the online social presence based on 34 respondents. All the respondents were given a consent form and agreed to participate in this study. They were also informed that their data and information remain private and confidential. It only can be used for this study purposes.

3.3 Respondents

3.3.1. Set I: sample for qualitative approach

A total of 10 undergraduate students were involved in this set. These samples were used to answer research questions for this research. These samples were selected based on purposive sampling as: i) students had been enrolled in the computer-based subject; and ii) students had been involved in online learning. These samples were used in the interview process. The data from the interview was used to create the problem-solving oriented e-module in learning computer-based subject via Facebook for higher education.

3.3.2. Set II: sample for quantitative approach

A total of 34 undergraduate students were involved in Set II. These samples were used to answer research questions for this research. These samples were selected based on purposive sampling as: i) students have enrolled in the computer-based subject; ii) students have enrolled in an education course; iii) students are involved in online learning; and iv) students have the experience of using Facebook. These samples evaluated the students' performance and online social presence when using a problem-solving oriented e-module in learning computer-based subject in a Facebook group.

3.4. ADDIE model

In this study, the ADDIE model was employed to design and develop the problem-solving oriented e-module in learning computer-based subject as shown in Figure 1. There are five phases, which are: i) Phase 1: Analysis of the subtopics in the problem-solving oriented e-module in learning computer-based subject; ii) Phase 2: Design of the problem-solving oriented e-module in learning computer-based subject; iii) Phase 3: Development of the problem-solving oriented e-module in learning computer-based subject; iv) Phase 4: Implementation of the problem-solving oriented e-module in learning computer-based subject; and v) Phase 5: Evaluations of problem-solving oriented e-module in learning computer-based subject.

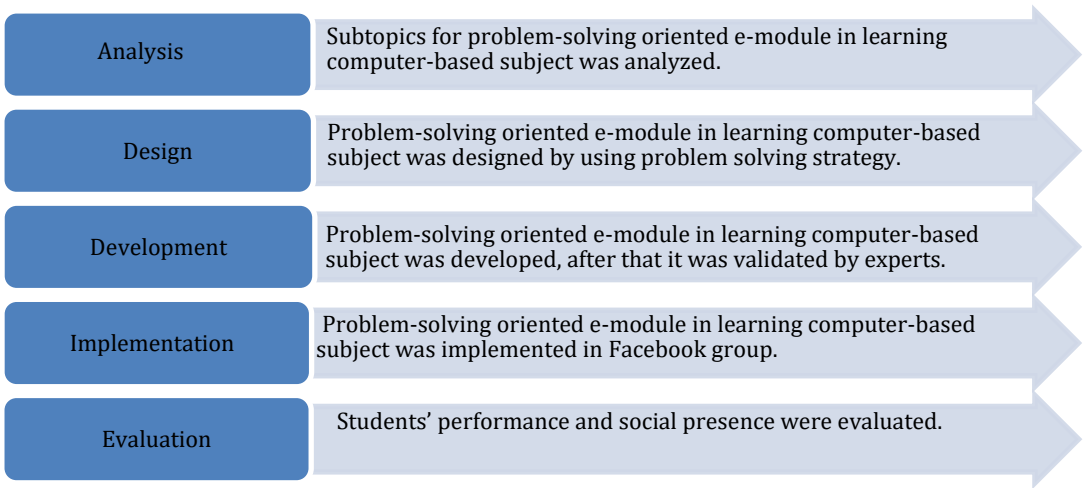

Figure 1. ADDIE model for designing and developing e-module

3.4.1. Analysis of the problem-solving oriented e-module in learning computer-based subject

In this phase, an analysis of computer-based subjects was conducted. The Audio-Video Techniques subject has been chosen for the computer-based subject in this research. The specific topics for computer-based subjects were also analyzed for the e-module. Then, several students were interviewed to gain insight into real problems in learning computer-based subjects. An interview was conducted among ten students to identify the difficult topics in the Audio-Video Techniques subject and the needs of the problem-solving oriented e-module in learning computer-based subject among them.

3.4.2. Design of the problem-solving oriented e-module in learning computer-based subject

After conducting a thematic analysis, the results were used to design and develop the problem-solving oriented e-module in learning computer-based subject. The e-module was designed based on the ADDIE model and problem-solving strategy [26]. According to the research [26], there are seven learning criteria in online problem-solving. Table 1 shows one example of the embedded online problem-solving learning strategy in one of the learning activities in the e-module.

Table 1. Example of the embedded online problem-solving strategy in the learning activities in e-module

Content in Learning Activity 2	Online problem-solving criteria	Example/Explanation
Marlisa was infected by COVID-19, quarantined, and treated at the hospital for two months. She had missed most of the classes at the university. She missed most of the lessons when she started taking online classes. She had problems completing her project alone due to her absence. Her lecturer had assigned a project that needed to be submitted soon. Then, Marlisa asked for your guidance to complete her assignment regarding the storyboard and video for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic.	i) Present all elements of the problem	"Marlisa was infected by COVID-19 and was quarantined and treated at the hospital for two months. She had missed most of the classes at the university. She missed most of the lessons when she started taking online classes. She had problems completing her project alone due to her absence."
	ii) Define the problem with a probable solution.	"Then, Marlisa asked for your guidance to complete her assignment regarding the storyboard and video for the standard of procedure in buying some essential products in Watsons during the COVID-19."
1. Share three types of software that Marlisa can use to create the storyboard.	iii) Engage the application of a limited number of rules and principles	"Share three types of software that Marlisa can use to create the storyboard."
2. Discuss the advantages of using the storyboard with Marlisa.	iv) Involve concepts and rules that seems organized and consistent in domain knowledge.	"Sketch six scenes for the standard procedure in buying some essential products in Watsons during the COVID-19…."
3. Sketch six scenes for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic and explain the storyboard to guide Marlisa.	v) Possess correct and convergent answers	"Choose and discuss three types of software that can be used to edit and develop the video for the standard of procedure …."
4. Choose and discuss three types of software that can be used to edit and develop the video for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic.	vi) Possess knowable and comprehensive solution	"Discuss the advantages of using the storyboard to Marlisa." "Choose and discuss three types of software that can be used to edit and develop the video for…."
5. Discuss types of video editing that can show the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic to help Marlisa complete the project.	vii) Have a preferred and prescribed solution process	"Discuss six types of video editing that can be applied to the video……."

3.4.3. Development of the problem-solving oriented e-module in learning computer-based subject

Several software and tools such as Adobe Photoshop, Canva, and www.pixtoon.com have been used to develop the computer-based subject e-module. After developing the computer-based subject module, several experts validated it. Three experts validated that the e-module was developed based on the ADDIE Model, which consists of analysis, design, development, implementation, and evaluation. Three experts validated that the e-module embedded online problem-solving strategy [26], and three experts validated that the content of the e-module is appropriate for the Audio Video Techniques subject. Figure 2 shows one of the examples of the learning activities in an e-module.

3.4.4. Implementation of the problem-solving oriented e-module in learning computer-based subject

Then, the Facebook group was created to employ the e-module. The e-module was developed as a treatment for an experimental condition in this research. Each activity was posted in the Facebook group for 2-3 weeks after the lecture session. Three learning activities in the computer-based subject e-module were implemented within five months.

3.4.5. Evaluations of problem-solving oriented e-module in learning computer-based subject

Before implementing the e-module in the Facebook group, a pre-test was conducted. The 34 students enrolled in the Audio Video Techniques subject received the pre-test. After eight weeks, the post-test was conducted among 34 students in the Audio Video Techniques subject. In this phase, students' performance was evaluated. In order to evaluate students' performance, a t-test was conducted in this study. After that, to support the t-test, an effect size analysis was conducted to prove how strong the treatment had been given to the 34 samples by interpreting Cohen's *d* value.

Meanwhile, a coding scheme from Rourke *et al.* [50] was adapted to examine online social presence behaviors in this study. Social presence is affective, interactive and cohesive [50]. This coding scheme was used to evaluate social presence for content analysis from e-module discussions in a Facebook group. Previous researchers had used this coding scheme to evaluate online social presence in the content analysis [51]–[53]. This is the strength of choosing an established coding scheme for this study.

Marlisa was infected by COVID-19 and was quarantined and treated at the hospital for two months. She had missed most classes at the university. When she started joining the online classes, she missed most of the lessons. She had problems completing her project alone due to her absence. Her lecturer had assigned a project that need to be submitted soon. Then, Marlisa asked for your guidance to complete her assignment regarding the storyboard and video for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic.

1. Share three types of software that Marlisa can use to create the storyboard.
2. Discuss the advantages of using the storyboard to Marlisa.
3. Sketch six scenes for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic and explain the storyboard to guide Marlisa.
4. Choose and discuss three types of software that can be used to edit and develop the video for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic.
5. Discuss six types of video editing that can be applied to the video for the standard of procedure in buying some essential products in Watsons during the COVID-19 pandemic to help Marlisa complete the project.

Figure 2. Example of one of the learning activities in the e-module

4. RESULTS AND DISCUSSION

4.1. Students' need to learn computer-based subjects via online learning for higher education

Figure 3 shows the word cloud regarding students' needs in learning computer-based subjects via online learning for higher education. After the interview, the student's answers ran with the word cloud generator, which is https://wordart.com/create. The world cloud revealed that computer-based subjects are difficult to learn, and students need guidance. Then, the word cloud also revealed that students need an e-module, an interactive e-module and a flexible e-module for learning computer-based subjects.

The interview results revealed that students had problems learning computer-based subjects via online learning. This is because of the nature of this subject. This subject requires students to utilize their problem-solving skills. Several studies also found that problem-solving skills were utilized in computer-based subjects [54], [55]. Besides that, students also mentioned that they needed guidance in learning this subject. Making an e-module is one alternative to aiding students in their learning. These are following several types of research that using e-module could help students in their learning [56], e-module as an

emergency-innovative learning source during the COVID-19. Previous study [57] revealed the effective is learning style material with e-module during the COVID-19, and the effect of using the e-module assisted by the Kvisoft flipbook maker in improving students' critical thinking skills during the COVID-19 [58].

The interview results also showed that students require an interactive and adaptable e-module to learn. This is an important element that must be considered when developing the e-module. This follows previous researchers who developed interactive modules to help their students learn [59]–[61]. This is necessary to provide students with interactive and flexible e-module to make them focus and attract interest in their learning. As we know, COVID-19 changed our education system to be conducted fully via online learning. Thus, an interactive and flexible e-module needs to be developed to attract interest among students.

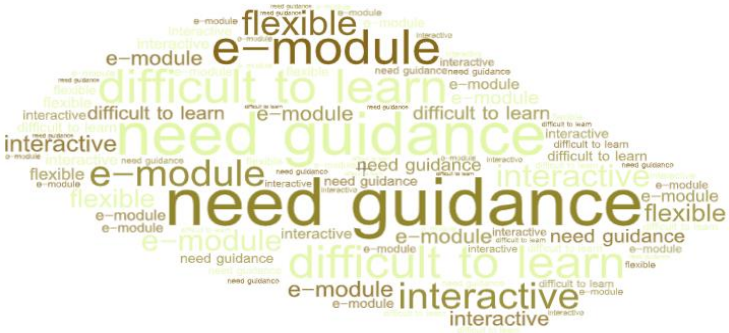

Figure 3. Word cloud for thematic analysis

4.2. The evaluation of student's performance

After the problem-solving oriented e-module in learning computer-based subject had been developed and validated, it was tested and evaluated in terms of students' performance. A pre-test and post-test were given to the students before and after using the e-module. Figure 4 shows the results of the pre-test and post-test in this study. The outcome demonstrates rising marks for all the 34 students who participated in the pre-test and post-test. Then, a normality test was conducted. All the data was normally distributed. After that, a paired sample t-test was conducted. The result revealed that t=5.505, df=33, p=.000, and correlation=.079 as presented in Table 2. Consequently, the null hypothesis was rejected. Thus, it was proven that problem-solving oriented e-module in learning computer-based subject affect students' performance.

This study explored further the strength of problem-solving oriented e-module in learning computer-based subject towards students' performance by employing effect sizes. The result of Cohen's d is 0.944, according to (1). Cohen's d ≥0.8 is a large effect. This shows that the e-module had a large effect on students' performance [62].

$$\text{Cohen's d} = \frac{Mean\ differences\ post-test-pretest}{standard\ deviation\ \ differences\ post-test-pretest} \quad (1)$$

$$= \frac{18.176}{19.252}$$

$$= 0.944$$

This study proved that problem-solving oriented e-module in learning computer-based subject could increase students' performance in their learning. This finding is supported by previous researchers [30], [31], who also found that using the online learning module could positively impact students' performance. E-module in distance learning during COVID-19 enhanced students' achievement in their learning [63]. In addition, another study [64] proved that e-module fosters students' learning via online learning. Besides that, Zoom cloud meeting platform found that it increased students' performance [65]. Meanwhile, e-module is an innovation for online learning solutions which enhance students' performance [66].

Moreover, this e-module is problem-solving oriented, which helps students in their learning. Other studies strongly support this finding and found that problem-based learning could raise students' interest [67], improve students' achievement in their learning [68] and give an impact as a good problem-solver in learning STEM projects [69] and mastery in their learning [70].

Thus, it was proved with strong support from previous research that e-module could contribute to students' performance. E-module is one of the learning approaches that help students learn with problem-solving based on online learning. Through this module, students can discuss with their peers to solve the problems in the e-module. This module required students to utilize their problem-solving skills. Therefore, it will affect the student's ability to solve problems and improve their thinking styles, contributing to their performance.

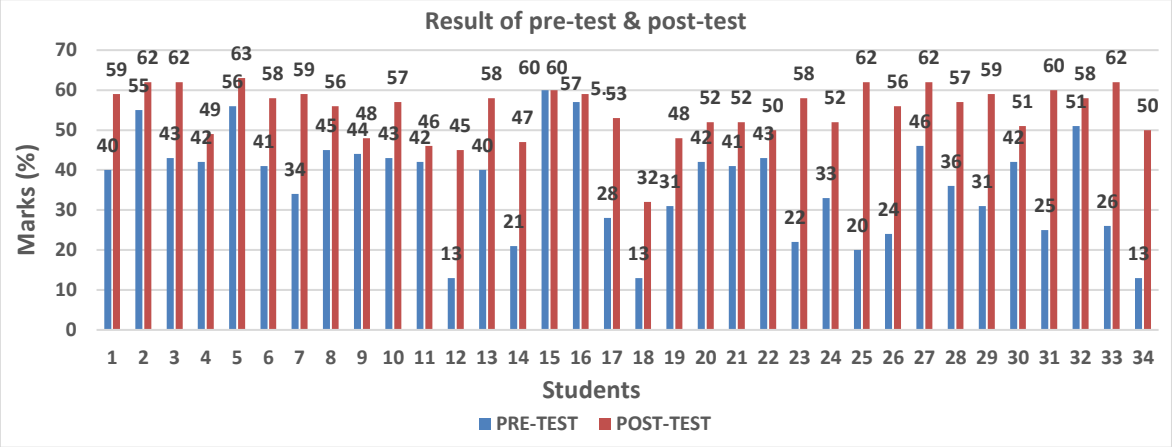

Figure 4. Pre-test and post-test

Table 2. Paired samples t-test

	Mean	Standard deviation	Paired differences: Mean differences	Standard deviation differences	95% Confidence interval of the difference: Lower	Upper	t	df	Sig. (2-tailed)	Correlation
Pre-test	35.26	16.41	18.18	19.252	24.89	11.45	5.50	33	00*	079
Post-test	53.44	11.43								

*Significant at p <0.05

4.3. Result of the evaluation of the dominants for students' online social presence

The summary for the content analysis of students' social presence is presented in Table 3. The results show the frequencies (f) of each social presence involved in this study. The problem-solving oriented e-module in learning computer-based subject fosters students' social presence in affective, interactive, and cohesive ways. Several dominant social presences have been identified in this content analysis.

In the affective category, the expression of emotion is the dominant mode of social presence (f=700). Meanwhile, the dominant social presence for interactive categories is continuing a thread (f=1175). Next, for cohesiveness, the dominant social presence is addresses or refers to other group members (f=1473). Furthermore, the value of inter-rater reliability for the content analysis between two raters ranges from 0.91 to 0.95 (very reliable). Thus, it proved that Facebook is the appropriate platform to implement the e-module. Facebook could foster students' social presence, and they can actively discuss their learning [71], [72]. This is due to the environment on Facebook. Facebook provides an informal learning environment. Previous studies [73], [74] strongly supported that Facebook could be one of the platforms for online learning.

Besides that, the problem-solving strategy that embeds in the e-module encourages students to discuss comprehensively to solve the problem. Several studies strongly supported that problem-based learning could foster students' discussion via online learning, such as developing students' communication and collaboration skills [75] and encouraging online collaboration [76]. Hence, online collaboration could foster students' social presence in online learning.

This e-module also had been injected with problem-solving criteria, which encourage students to discuss and collaborate on their learning in the Facebook group, then foster students' social presence. In addition, the e-module is one of the interactive learning modules since it was employed with a cartoon comic to attract students' interest to discuss comprehensively in a Facebook group.

Table 3. Summary of content analyses of social presence

Social presence	Definition	Example of content analysis	Learning activities (LA) LA 1 (f)	LA 2 (f)	LA 3 (f)	Subtotal
Affective						
Expression of emotion	Conventional expression of emotion, or unconventional expression of emotion, includes repetitious punctuation, conspicuous capitalization, emoticons	Let's discuss learning activity 2	246	219	235	700
Use of humor	Teasing, cajoling, irony, understatements, sarcasm	VN the best!	171	154	119	444
Self-disclosure	Presents details of life outside of class or expresses vulnerability.	Oh, I'm hungry. Guys, have you eat?	3	0	0	3
Interactive						
Continuing a thread	Using the reply feature of the software rather than starting a new thread.	Using the reply button in a Facebook group	406	409	360	1175
Asking questions	Students ask questions of other students or the moderator.	Anyone care to answer this question?	141	143	104	388
Expressing agreement	expresses agreement with others or others' messages.	True, exactly! since I always use Canva.	78	89	94	261
Referring explicitly to others' messages	Direct references to content or others' posts	But, I choose VN to edit via phone, while for iMovie via my Windows, like that!	221	157	211	589
Complementing, expressing appreciation	Complimenting others or the content of other messages.	Farahiyah Hasya Wow, I see. So, this inquiry concerns the techniques that can be used in the SOP video.	177	163	230	570
Cohesive						
Vocatives	Addressing participants by name.	Nur Fatanah Alright!	197	252	227	676
Phatic, solutions	Communication that serves purely social functions, greetings, closures.	Hi guys!	140	133	164	437
Addresses to other group members.	Address the group as 'we', 'us', 'our', 'group'	Yes, we are able to exchange our opinions.	484	473	516	**1473**

5. CONCLUSION

This study developed problem-solving oriented e-module in learning computer-based subject via Facebook for higher education based on ADDIE Model and online problem-solving approach. Several experts validated the e-module in terms of content, ADDIE Model, and problem-solving criteria. Hence, this e-module was appropriate and valid for the computer-based subject with oriented problem-solving. This e-module greatly impacts students' performance in online learning via the Facebook group. Interestingly, e-module also fosters students' online social presence via Facebook groups. This e-module could be one of the interactive e-module for online learning to attract students' interest.

However, some limitations have been acknowledged in this study. First, the sample for this study only focused on one university from the education field. In the future, it could be interesting to see findings from several samples across different disciplines in the same university. Second, this e-module only focused on several topics from the audio video techniques subject. In future research, other topics from the audio video techniques subject will be added to the module. As a result, after the e-module is implemented in a Facebook group, the researchers will receive more information and feedback.

ACKNOWLEDGEMENTS

This paper is based on the research project entitled "Development of the computer-based subject module for student's performance and social presence in higher education during COVID-19 Pandemic via Facebook". The authors would like to extend their gratitude to Universiti Pendidikan Sultan Idris for the University Research Grants (GGPU 2021, Code: 2021-0073-107-01) that helped fund this research.

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