ONLINE LEARNING: THE EFFECTS OF USING E-MODULES ON SELF-EFFICACY, MOTIVATION AND LEARNING OUTCOMES

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ABSTRACT

Teachers' mastery of learning technologies is highly necessary for the digital era. Among such skills is the ability of teachers to package learning materials using various software. One form of presenting learning materials with technology is an e-module. E-modules serve as the main teaching material in online learning and can also be used in face-to-face learning. The purpose of this study was to analyze the effects of using e-modules on self-efficacy, motivation, and learning outcomes in an online learning environment. This research used a quasi-experimental research design with three pretest-posttest groups. The students involved in this study consisted of the control group without e-modules (Group A), the experimental group using emodules independently (Group B), and the experimental group using e-modules collaboratively (Group C). 30 students per group participated in the Geography Learning Planning course. Data was collected through questionnaires and a 10-item essay test and were exposed to descriptive and inferential statistical analyses. The findings showed that the application of e-module in online learning resulted in significant increases in self-efficacy, motivation, and learning outcomes. The e-modules with the collaborative learning option was the most effective.

Teachers' mastery of learning technologies is highly necessary for the digital era. Among such skills is the ability of teachers to package learning materials using various software. One form of presenting learning materials with technology is an e-module. E-modules serve as the main teaching material in online learning and can also be used in face-to-face learning. The purpose of this study was to analyze the effects of using e-modules on self-efficacy, motivation, and learning outcomes in an online learning environment. This research used a quasi-experimental research design with three pretest-posttest groups. The students involved in this study consisted of the control group without e-modules (Group A), the experimental group using emodules independently (Group B), and the experimental group using e-modules collaboratively (Group C). 30 students per group participated in the Geography Learning Planning course. Data was collected through questionnaires and a 10-item essay test and were exposed to descriptive and inferential statistical analyses. The findings showed that the application of e-module in online learning resulted in significant increases in self-efficacy, motivation, and learning outcomes. The e-modules with the collaborative learning option was the most effective.

INTRODUCTION

21st century learning demands the mastery of technology among educators and students alike. The use of media and technology-based learning resources affects the quality of the process and learning outcomes. This is especially true in the Covid-19 pandemic situation which promotes the shift from face-to-face learning in class to virtual class with an e-learning system. E-learning is an electronic learning method supported by the internet, the use of digital platforms and devices such as computers, laptops, tablets or smartphones (Muller & Faltin, 2011; Nussbaumer, Dahn, Kroop, Mikroyannidis & Albert, 2015). Electronic learning is thus also supported by electronic learning resources (Berutu, Delita, Astuti, Novira, & Wirda, 2019)-one such resource being e-module.

E-modules are teaching materials or learning media that are presented electronically to support active learning. E-modules would make it easier for teachers to convey material to their students as well as make learning more interesting for being in accordance with present-day technological developments. Presentation of material in e-modules is not only done textually, but can also vary through multimedia in the form of video, audio, short films and others (Herawati, 2017; Kismiati, 2018). The development of electronic-based teaching materials is similar to that of e-books. E-modules are often required to be self-instructional, self-contained, stand-alone, adaptive, and user friendly (Ministry of Education and Culture of the Republic of Indonesia, 2017). Thus, e-modules can serve as the main learning resource for students, if developed according to student profile and designed in an interesting way to avoid boredom while studying (Asrial, Syahrial, Maison, Kurniawan & Piyana, 2020).

E-modules are part of learning tools that contain learning outcomes or competencies in each learning activity, material, summary, and systematic evaluation. The current e-module developed for purposes of this study facilitates student learning, independently, in groups or conventionally. E-modules are presented with self-study instructions so that students can learn at their own pace. E-modules promote learning effectiveness, learning independence (Syahroni, Dewi & Kasmui, 2016), (Aprilia & Suryadarma, 2020), self-efficacy, motivation, learning performance and learning outcomes (Jeske, Backhaus & Roßnagel, 2014; Herawati, 2017; Kismiati, 2018; Hapsari 2016). When learning or studying content independently, students self-efficacy and motivation can increase, and learning outcomes may improve. The ability of teachers to develop technology-based teaching materials must be a concern, since learning resources in the form of e-modules are required in education today, especially in the face of the current situation as online learning policies are adopted worldwide. With online learning, teachers' and students' physical interactions are limited, and e-modules can help students learn more independently, thereby minimizing teacher guidance and allowing learners' independent tracking and evaluations of their own learning (Syahroni, Dewi & Kasmui, 2016; Ministry of Education and Culture of the Republic of Indonesia, 2017). This certainly affects the extent of learning that takes place and the subsequent learning outcomes.

However, there are still few teachers who developed learning resources independently and are more likely to use teaching materials that have been developed by others. This includes materials that are downloaded from internet or attained from other teachers who experiment with similar subject. Teaching materials need to be prepared with a consideration of the needs and characteristics of the diverse learners they address (Delita, Arif, Rosni, Sitompul & Rohani, 2019). The current Geography Learning Planning course is set out to build on one specific topic: the development of learning tools oriented toward higher order thinking skills. One of the outputs of this course is the learning implementation plan. The initial survey using google forms distributed to 95 students showed that as many as 91.6% stated that it was difficult for them to design lesson plans independently, and they mostly preferred the lesson plans that are already available on the internet. This seemed to result in feelings of lower perceived competence in learning design in students' as prospective teachers. In addition, 96.8% of the students stated that they needed a series of e-learning modules to study and practice the Geography Learning Planning as part of the course. Based on these problems reported in survey, e-modules were developed as the main teaching materials in online classes.

Several studies on e-modules have been carried out by other researchers including: Tamrongkunanan, & Tanitteerapan (2020) who developed e-modules that can improve students' knowledge and skills; Sofyan, Anggereini & Saadiah (2019) who designed e-modules based on local wisdom; Aprilia & Suryadarma (2020) who used e-modules to enhance self regulated learning; Hill, Sharma, & Johnston (2015) who

conducted research to study the impact of online learning modules on conceptual understanding; Asrial, Syahrial, Maison, Kurniawan & Piyana (2020) developed ethnoconstructivism e-module to increase students motivation, interest and perception. The current research differs in the variables it investigates including self-efficacy, motivation and learning outcomes. Self-efficacy can influence motivation. Overall, self-efficacy and motivation can affect learning outcomes (Mukti & Tentama, 2020; Slameto, 2010). Another difference lies in the grouping procedure employed as there are three groups in this study one without e-modules, one using e-modules independently and a final group studying e-modules collaboratively.

PURPOSE OF THE STUDY

The study aims to analyze the effects of e-modules on students':

1. self-efficacy
2. motivation, and learning outcomes

in an online learning environment.

METHOD

This research used quasi-experimental method with three groups of pretest-posttest research design. The research was conducted through 6 meetings (2 x 50 minutes each) conducted online using Zoom Cloud Meeting, LMS SIPDA and WhatsApp. Learning in the control class was not carried out with e-modules, whereas the experimental classes used e-modules independently or in collaboration.

Participants

A total 90 students, 56 girls and 34 boys, in Geography Education Department, Social Sciences Faculty, Universitas Negeri Medan, participated in this study. There were 30 students in each class. They were selected based on the purposes of the research and registered in the same course namely Geography Learning Planning. The students involved in this research consisted of control class without e-modules (Group A), experimental class using e-modules independently (Group B) and experimental class using e-modules collaboratively (Group C).

Data Collection and Analysis

The researcher conducted this study in February 2021. The learning topic was the Development of HOTS-Based Learning Tools. Overall, the study consisting of 6 online meetings using Zoom, LMS and WhatsApp. The students participated in the pretest at the first Zoom Cloud Meeting with all groups. It lasted 50 minutes and measured their prior knowledge. They also took the self-efficacy and motivation surveys. During the treatment period from the second to the fifth meetings, Group A was taught the material without e-modules, and Group B used e-modules independently. Meanwhile, Group C used e-modules collaboratively in learning groups consisting of five students each. After the treatment, the students participated in a posttest that measured their learning outcomes and they also took self-efficacy and motivation surveys again. Self-efficacy contains three indicators: magnitude, strength and generality (adopted from Bandura, 1997). The data was obtained from a questionnaire consisting of 20 items. Data on student motivation was collected using a questionnaire in the ARCS format (attention, relevance, confidence, and satisfaction) developed by Keller (2006). This questionnaire consists of 20 items which contain all indicators. Learning outcomes data were collected through a pretest and a posttest. Questions were given in the form of an essay test consisting of 10 items. Subsequently, self-efficacy, motivation, and learning outcomes data were analyzed using SPSS version 24 software. Tests on normality and homogeneity of data were carried out using the Shapiro-Wilk and Levene tests. The statistical analysis was computed using the ANCOVA test at 5% significance level.

The Scales

In the self-efficacy and motivation surveys, a Likert scale was used with the response options of 1) strongly disagree; 2) disagree; 3) neutral agree; and 4) agree and 5) strongly agree. The qualitatively construct validation of the instruments was carried out by three field experts in team. Empiric validation per item was performed using Pearson product moment and the result showed that all the items in the three instruments were valid. The reliability of the self-efficacy, motivation and learning outcomes instrument was measured using Cronbach's alpha. The Cronbach's alpha value was .89 for self-efficacy; .89 for motivation) and .70 for learning outcomes, respectively. The results of the analysis indicate the instruments are declared valid and reliable.

FINDINGS

The Effect of Using E-Modules on Self-Efficacy

The data of self-efficacy were homogeneous in variances, and the result of the Levene's test was 0. 219. A one-way ANCOVA was conducted to test whether statistically significant differences existed among the three groups from the perspective of the students' self-efficacy. As shown in Table 1, statistically significant differences existed among the three groups on self-efficacy, specifically $F_{(2.86)} = 15.068$, $p < .001$. The means were respectively 70.03 for Group A, 72.23 for Group B and 75.23 for Group C. The results of the pairwise comparisons also indicated that Group B (learning with e-modules independently) significantly outperformed Group A (learning without e-modules), while these interventions were both significantly less effective than the interventions implemented in Group C (learning with e-modules collaboratively) in terms of enhanching students' self-efficacy (see Table 2).

Table 1. Summary of ANCOVA on Self-Efficacy

Learning Method	N	M	SD	F
Learning without E-Modules	30	70.03	5.17	
Learning with E-Modules Independently	30	72.23	4.49	15.068
Learning with E-Modules Collaboratively	30	75.23	4.08	

Note: *** *p < .001*

Table 2. Results of the Pairwise Comparisons of the Groups for Self-Efficacy

(I) Learning Method	(J) Group	MD (I-J)	SE	Sig.
Learn without E-Modules	Group A	-4.214*	0.765	0.002
	Group B	-1.855*	0.765	0.000
Learning with E-Modules	Group C	2.359*	0.765	0.008

Note: *Adjustment for multiple comparisons: Bonferroni.*

p < .05.

The Effect of Using E-Modules on the Motivation

On the questionnaire data about the student motivation, a one way ANCOVA was conducted. Similarly, the data met all basic data assumptions. The results of the Levene's test of equality showed that the data were homogeneous in variances with a significance value 0.950.

As shown in Table 3, statistically significant differences existed among the three groups from the perspective of student motivation, specifically $F_{(2.86)} = 5.051$, $p < .001$. The means were respectively 71.30 for Group A, 72.40 for Group B, and 74.00 for Group C. The results of the pairwise comparisons as shown in Table 4 indicated that the intervention implemented in Group C (learning with e-modules collaboratively) and Group B (learning with e-modules independently) were significantly more effective than that ini Group A (learning without e-modules).

Table 3. Summary of ANCOVA on Motivation

Learning Method	N	M	SD	F
Learning without E-Modules	30	71.30	4.647	
Learning with E-Modules Independently	30	72.40	4.598	5.051
Learning with E-Modules Collaboratively	30	74.00	4.934	

Note: ***$p < .001$

Table 4. Results of the Pairwise Comparisons of the Groups for Motivation

(I) Learning Method	(J) Group	MD (I-J)	SE	Sig.
Learning without E-Modules	Group A	-3.076*	0.970	0.001
Learning with E-Modules	Group B	-1.741*	0.970	0.006
	Group C	-1.335*	0.970	0.027

Note: *Adjustment for multiple comparisons: Bonferroni.*

*$p < .05$.

The Effect of Using E-Modules on Learning Outcomes

Another one-way ANCOVA was conducted to test whether statistically significant differences existed among the three groups in terms of enhancing students' learning outcomes, after controlling for their pre-test scores. The data were analysed using one way ANCOVA meeting the basic data assumptions, including normal distribution, homogeneity of regression slopes and homogeneity of variance. Specifically, the results of the Levene's test of equality showed that the data were homogeneous in variances with a significance value of 0.227.

As shown in Table 5, statistically significant differences existed among the three groups in the terms of improving the students' learning outcomes ($F(2.86) = 9.668$, $p < .001$). The means were respectively 73.30 for Group A, 77.17 for Group B and 79.80 for Group C. The results of the pairwise comparisons as shown in Table 6 indicated that Group C (learning with e-modules collaboratively) and Group B (learning with e-modules independently) performed significantly better than Group A (learning without e-modules).

Table 5. Summary of ANCOVA on Learning Outcomes

Learning Method	N	M	SD	F
Learning without E-Modules	30	73.30	4.154	
Learning with E-Modules Independently	30	77.17	3.931	9.668
Learning with E-Modules Collaboratively	30	79.80	5.671	

Note: ***$p < .001$

Table 6. Results of the Pairwise Comparisons of the Groups for Learning Outcomes

(I) Learning Method	(J) Group	MD (I-J)	SE	Sig.
Learning without E-Modules	Group A	-3.394*	1.113	0.007
Learning with E-Modules	Group B	-4.845*	1.113	0.000
	Group C	-1,451*	1.113	0.006

Note: *Note Adjustment for multiple comparisons: Bonferroni.*

*$p < .05$.

DISCUSSION AND CONCLUSION

The Effects of E-Module Use on Self-Efficacy, Motivation and Learning Outcomes

In the digital era, learning resources that can also be accessed in electronic or digital form are required in any learning situation. These electronic teaching materials can support online and offline learning processes and face-to-face learning in the classroom. One such electronic learning resource is the e-module. Electronic modules (e-modules) are similar to electronic books in that they are arranged such that students can study them independently, either with or without teacher guidance. E-modules as learning programs can be studied by students only with minimal supervision from the teacher because they are designed as complete packages (Hill, Sharma & Johnston, 2015; Nisa, Ismet & Andriani, 2020). This component includes competencies and learning outcomes, instructions for use, tools and materials needed, material descriptions, material summaries, exercises and assignments, discussion forums, and disclosed answers that allow for independent assessment.

Learning resources in the form of e-modules can be developed using software and presented in various formats. Software that can be used in the development of e-modules includes Sigil, Canva, Book Creator, Flip Book Maker, and various other software that can be used for free either by download/installation or online (Ministry of Education and Culture of the Republic of Indonesia, 2017). The e-module in this study was developed using Sigil software in epub (electronic publication) format. The advantages of this epub, among others, are: it can be used in various software and accessed on various devices; it is easy to transform to other formats and allows video-embedding (Boyd, 2019; Ministry of Education and Culture, 2017). Thus the use of e-modules becomes more practical, effective and efficient. The development of e-modules can be aimed at facilitating learning independently and strengthening the mastery of a competency. E-modules can also be aimed at increasing learning independence and improving learning outcomes (Syahroni, Dewi & Kasmui, 2016), knowledge and skills (Tamrongkunanan & Tanitteerapan, 2020), self regulation (Aprilia & Suryadarma, 2020), perception, interest and motivation (Asrial, Syahrial, Maison, Kurniawan & Piyana, 2020). In this study, e-modules were developed and implemented to investigate their impact on students' self-efficacy, motivation and learning outcomes in the Geography Learning Planning course, especially with respect of the topic of HOTS Oriented Learning Device Development. A detailed discussion on each variable is presented in the following.

The Effects of the Use of E-Module on Self-Efficacy

Self efficacy is the ability of students to independently and actively motivate themselves in order to achieve a specific goal (Zimmerman, 2000), and an active and constructive process in students to guide and control their cognition, motivation and behavior (Senemoglu, 2005; Pintrich, 2005; 1990; Saks & Leijen, 2014). Self-efficacy can be improved through technology-based learning. This can be in the form of learning activities using ICT, digital media, managing learning with e-learning platforms such as LMS and presenting materials electronically. More learning materials that can be accessed with various hardware such as computers, laptops and smartphonescan be developed (Muller & Faltin, 2011; Nussbaumer, Dahn, Kroop, Mikroyannidis & Albert, 2015). One group of materials with such characteristics is e-modules.

The findings of this research revealed a statistically significant effect of using e-modules on student selfefficacy. With respect to this variable, the treatment of learning with e-modules collaboratively was the most effective, followed by the intervention of learning with e-modules independently; with the option of learning without e-modules returning the lowest effective. Regarding the students in collaborative method with emodules, they collaborated for task completion and mastery the material learning by discussion, and they reported to have felt confident while completing the whole learning package. Therefore, their selfefficacy had increased greatly as well. The students in the learning using e-modules independently also were confident that they had mastered the materials. On the other hand, the students in the learning without emodules appeared less certain about their full mastery of the courses materials and completion of the tasksrequired. With the currect study, it was confirmed that when provided with the ability to plan, control and reflect on their learning activities confidently, students can show higher mastery of learning content and perform better overall (Pintrich, 2005). Similar studies on e-module use also report an increase in students' self efficacy, self-regulation, and self-directed learning activities (Jeske, Backhaus & Roßnagel, 2014; Herawati, 2017; Kismiati, 2018; Hapsari 2016).

The Effect of E-Module Use on Motivation

The use of technology in learning will make the learning process more interesting and motivate students (Jeske, et al., 2014). The integration of technology in lectures, for example, is carried out in the presentation of course material. Materials presented electronically in the form of e-books, e-modules, videos, animations, graphics and images help clarify concepts, increase motivation and create a pleasant learning atmosphere (Herawati, 2017; Kismiati, 2018). In this study, the use of e-modules was proven to increase student motivation and promote student interest in the material studied in lectures. Based on the observations, it can be claimed that, in the experimental class, students were more motivated than those in the control class. The students were more enthusiastic and the learning activities were more appealing and varied. This could be seen in the frequency of student-initiated questions, arguments, concerns and expressed confidence in learning, as well as in the ability to complete assignments correctly and in a timely manner.

The results indicated a statistically significant effect of using e-modules on learning motivation. The collaborative method were significantly better than the independent study method and the option of learning without e-modules, in this respect. This seemed to be due to the fact that learning with e-modules collaboratively involved discussions, and enabled students to support each other. Similarly, the students in the independent study with e-modules group showed higher motivation as they also had the opportunity to discuss the learning material although they mostly relied on themselves while analyzing the content. However, the group without e-modules felt confused due to limited interaction during the learning process and being deprived of the enriched electronic content. Hence, it can be stated that there is a significant effect of using e-modules in increasing student learning motivation in Geography Learning Planning lectures. Similar findings were also found by Asrial, et al., (2020) where e-modules were able to increase students' perceptions, interests and motivations to take part in the learning process.

The Effects of E-Module Use on Learning Outcomes

Learning outcomes are the indicators of student achievement or performance as a result of their participation in any learning process. They include cognitive, affective and psychomotor aspects. Students' attainment of cognitive outcomes can be observed in their mastery of the material they have learned. Since cognitive outcomes are primarily delivered through the content of the teaching material, their attainment can be improved by the teacher preparing and packaging the material content. Developing it in a format that is more accessible, easy to understand and can be used flexibly by students certainly improves the mastery of the material. Presentation of material in electronic form with a consideration of student needs and conditions facilitates the learning process so that they can directly build their skills and knowledge (Sanghi, 2007).

In this study, the material was packaged in the form of an e-module. E-modules are developed following appropriate criteria such as self-containment and self-instruction, and students can improve their mastery of the material both independently and through collaboration. Students' mastery of the materials was tested using multiple choice questions as well as practical application tests that involved designing learning tools. The experimental class performed better on both these knowledge and skills tests because the learning activities in the module provided students with specific guidance, enriched their knowledge about learning tools and helped strengthen their skills. In the multiple choice test, students mostly had errors in questions related to learning models and higher order thinking skills, while in the practice test of designing lesson plans, their biggest challenge was planning core activities oriented to a scientific approach and planning authentic assessments that included attitudes, knowledge and skills. The results of this study are in line with research conducted by Tamrongkunanan & Tanitteerapan (2020), where the use of e-modules were shown to improve students' knowledge and skills significantly. Syahroni, Dewi & Kasmui (2016) also found that emodules increase learning independence and learning outcomes.

The use of e-modules in learning in this study was proven to increase students' self-efficacy, motivation and learning outcomes. Thus, teachers must improve their ability to master learning technology to produce teaching materials that are relevant and designed in accordance with the demands of 21 st century learning. The integration of e-modules in learning can improve the learning process and outcomes. E-modules are very useful as the main learning resource because they are designed based on the contextual characteristics of

students, the uniqueness of the material and the principles of active and interactive learning and technology integration. E-modules can help to clarify the concepts much more effectively because they are presented in various forms, with the inclusion of textual, and visual, audio or audiovisual content. The use of e-modules in learning in this study was proven to increase students' self-efficacy, motivation and learning outcomes.

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APENDIX 1.

Display and Content of E-Modules
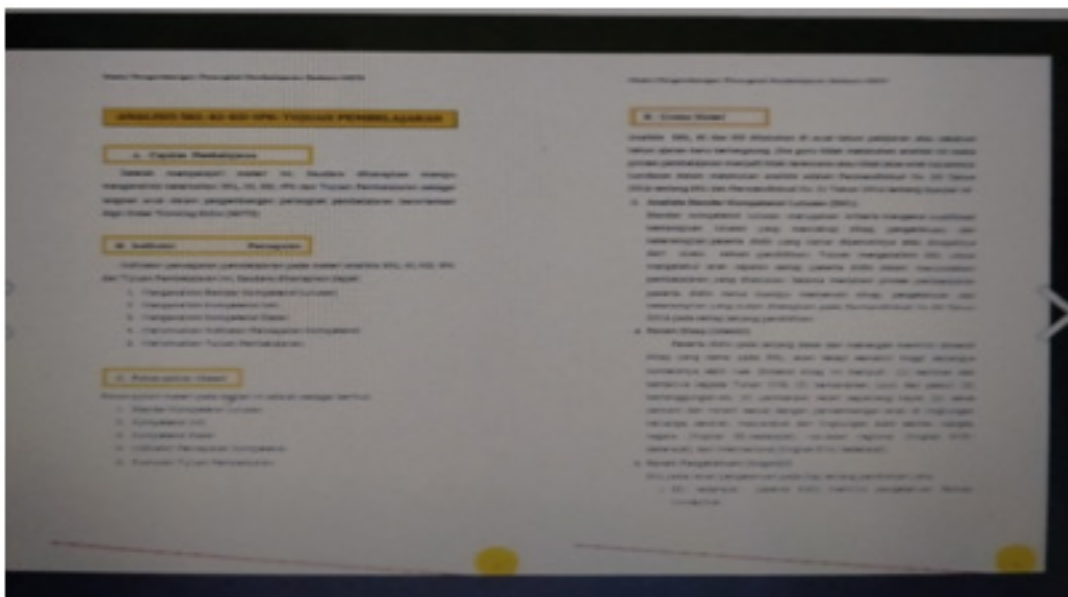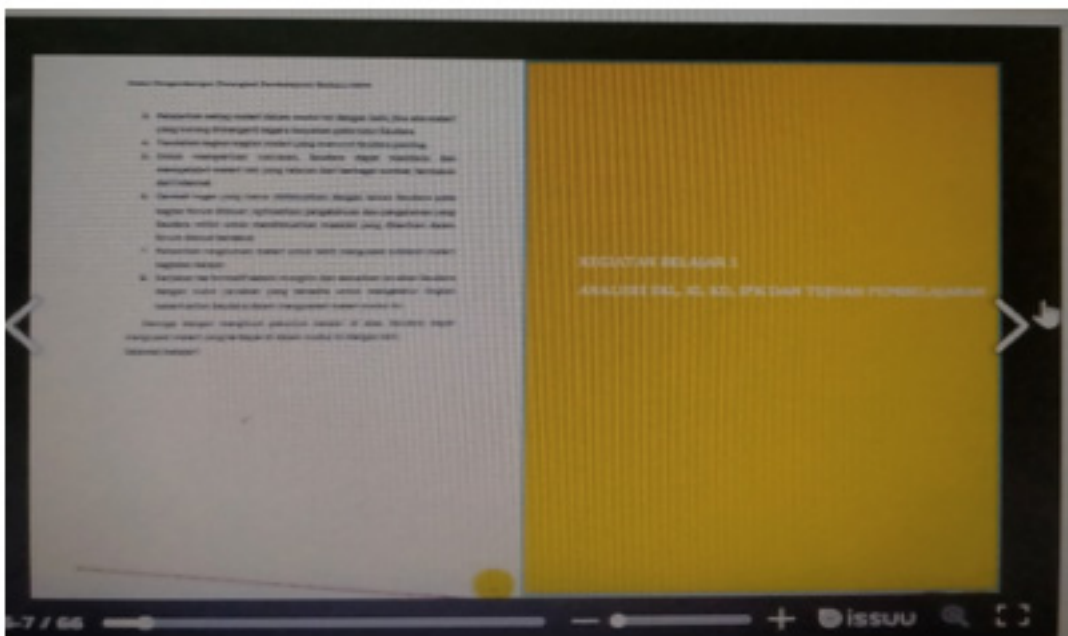
Self-Efficacy Instrument

A Likert scale was used with the response options of 1) strongly disagree; 2) disagree; 3) neutral agree; and 4) agree and 5) strongly agree.

No	Statements	SD	D	N	A	SA
	Magnitude (the level of difficulty in learning the material, questions, assignments and practice)					
1	I try to understand the lecture material even though the material is difficult.					
2	I try to work on difficult questions in class.					
3	I try to complete assignments with high difficulty in lectures.					
4	I will not be able to master the lecture material that has high difficulty.					
5	I easy to do tasks and questions.					
6	I will fail if I encounter high difficulties in my studies.					
	Strength (strong or weak students' belief in their abilities)					
7	I have a strong belief that I can manage myself to understand every lecture material.					
8	I have a strong belief that I can manage myself to solve problems correctly.					
9	I have a strong belief that I am able to complete tasks on time and correctly.					
10	I really believe that if I study diligently, I will get good results.					
11	I am only able to do lectures if the amount is small.					
12	I was not able to answer the exam questions correctly.					
	Generality (student belief in ability in various situations and conditions)					
13	I can master any material if I try hard.					
14	If I practice every day then I can master all the subject matter.					
15	If I've decided on something that's important to me, then I'll keep trying to achieve it even if it's harder than I thought.					
16	I believe that the amount of effort I put in can achieve better results.					
17	I can overcome any obstacles I encounter in this course.					
18	I can solve the questions given even though I have never studied it.					
19	I am able to do assignments even though I have to look for references from various sources.					
20	I will not succeed if I encounter material and questions that have not been discussed in lectures.					

Motivation Instrument

A Likert scale was used with the response options of 1) strongly disagree; 2) disagree; 3) neutral agree; and 4) agree and 5) strongly agree.

No	Statements	Response				
		SD	D	N	A	SA
	Attention					
1	I am interested and read the material before it is discussed in the lecture.					
2	I pay attention to the lecturer's explanation when presenting the material.					
3	I took notes on the explanation of the material.					
4	I ask if there is any material that is not understood.					
5	I do other activities when the lecturer explains the material.					
	Relevance					
6	I do not know the purpose of learning the lecture material.					
7	I discussed with friends and I realized the importance of this course material more and more.					
8	I can relate lesson planning materials to current learning needs in the school.					
9	I can use the previous material to study advanced material.					
10	I do not know the benefits of the material studied.					
	Confidence					
11	I am sure that I will succeed in mastering this course material.					
12	I can solve exam questions independently.					
13	I can do all coursework well.					
14	I can always find a solution to the problems I encounter.					
15	I feel like I can't do this coursework.					
16	I have doubts about being able to do the exam questions.					
	Satisfaction					
17	I feel satisfied because I can understand every lecture material.					
18	The method used by the lecturer can help me understand the material.					
19	I gained useful new knowledge in this course.					
20	This course material is not important to study.					

Learning Outcomes Instrument (Pretest and Posstest)

Answer the following questions:
1) What are the components in the Learning Implementation Plan?
2) What are the steps in preparing the Learning Implementation Plan?
3) How to formulate learning objectives in the Learning Implementation Plan?
4) What are the characteristics of higher order thinking-oriented learning?
5) Describe an innovative learning model that is appropriate for this century's learning?
6) Should teachers design lesson plans? Explain the reason
7) Should every teacher's lesson plan be the same? Explain the reason
8) Describe the assessment components in the Learning Implementation Plan
9) What media is most suitable for online learning? Explain the reason
10) Learning activities in the Learning Implementation Plan consist of initial activities, core activities and closing activities, explain