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The Use of E-Module Based on Higher Orther Thinking Skill (HOTS) Question to Improve Cognitive Learning Results College Students of Primary School Teachers

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Abstract

This research is motivated by the thinking ability of PGSD students at one university is still relatively low. This study aims to determine the use of Higher Order Thinking Skill (HOTS) -based e-module to improve cognitive learning outcomes of prospective elementary school teacher students. This research is a quantitative study with a quasi-experimental method and a nonequivalent control group design. The instrument used in this study was the validated e-module based on HOTS questions and test questions to measure the cognitive learning outcomes of prospective elementary school teacher students. The population in this study were students of 2018 prospective elementary school teachers for the Elementary School Teacher Education Study Program at a University in Bandung. The sampling technique is saturated samples. The data obtained were analyzed using descriptive analysis and inferential analysis of the one-sample t test and independent sample t test assisted by SPSS version 25. The results showed that the use of HOTS question-based e-module can improve the cognitive learning outcomes of prospective elementary school teacher students.
Keywords: cognitive learning outcomes, higher order thinking skill, e-module

INTRODUCTION

Learning in the 4.0 era is learning oriented towards Higher Order Thinking Skills (HOTS). Higher Order Thinking Skills (HOTS) are thinking skills that require critical, creative, and analytical thinking on information and data in solving problems (Barrat, 2014). HOTS-oriented learning is used to underline higher-order thinking processes according to Bloom's taxonomy which is classified into two skills, namely: low-level skills consisting of remembering, understanding, and applying, and higher-order thinking skills, which consists of skills in analyzing, evaluating, and creating. HOTS-based learning is learning that familiarizes students to analyze, evaluate, and create based on educational needs by always based on the content standards and competency standards of existing graduates (Wiyoko & Aprizan, 2020), In every lesson, the final goal is to obtain learning outcomes. Students are said to be successful in learning, if they can develop knowledge skills and attitude development (Hamalik Oemar, 1990), while learning outcomes are changes in skills and abilities, attitudes, understanding, knowledge, and appreciation, known as cognitive (conceptual understanding), affective, and psychomotor (process understanding) through learning actions (Abror, 1993).

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Cognitive learning outcomes are learning outcomes that refer to learning outcomes. Bloom, in (Sudjana, 2011) divides the "learning domain" as a goal formulated into three classifications or aspects, namely: (1) cognitive aspects; (2) affective aspect; and (3) psychomotor aspects. Bloom's cognitive domain is divided into 6 levels, namely knowledge, comprehension, application, analysis, synthesis, and evaluation. Cognitive learning outcomes have improved by Anderson & Krothwahl (2011), namely: remembering, understanding, applying, analyzing, evaluating, and creating). Based on the level of cognitive abilities described above, the indicators of cognitive learning outcomes used in this study include remembering, understanding, applying, analyzing, evaluating, and creating(Faizah et al., 2019).

Based on the results of observations in one of the tertiary institutions, students' cognitive learning outcomes are less than expectation. This can be seen in the midterm test scores (UTS) or the final semester test scores (UAS) which are still low. The exercises used by educators, in this case the lecturer, are still in the form of Lower Orther Thingking Skill (LOTS) oriented questions and are not yet based on Higher Orther Thinking Skills (HOTS), so students still have not completed problems at the higher order thinking skill stage. This is in line with the results of research which states that the thinking ability of students in the Primary School Teacher Education Study Program (PGSD) is still low (Lukmannudin et al., 2018); (Ariyana et al., 2018)This fact is in line with the results of other studies which prove that the ability of PGSD students in one highet edication institution in the LOTS cognitive process is higher than HOTS cognitive ability (Wiyoko & Aprizan, 2020) .

In general, students' cognitive abilities are not as expected, one of which is because they have not had HOTS experience in their learning. The HOTS experience of students can be obtained through solving problems or questions from existing teaching materials or modules. Along with the development of information technology, the transformation of electronic teaching materials has become an urgent need so that their accessibility is getting higher with the presence of increasingly sophisticated technological devices. Students as generation Z need interesting teaching materials in order to improve their learning outcomes, so that they can carry out the learning process openly according to the merdeka belajar and kampus merdeka program. The e-module used by lecturers aims to transfer learning from lecturers to students so as to stimulate thoughts, feelings, interests and students' willingness to learn (Asmi et al., 2018), (Sriyanti et al., 2021). The use of e-modules is practically carried anywhere and is made with an attractive appearance to make it easier for students to study independently and attract attention to reading. Previous research also stated that learning using e-modules also facilitates the implementation of learning, because it can be used not only when the learning process in the classroom is face-to-face (face-to-face learning) but can also be used anywhere and anytime (Fisnani et al., 2020).

Many researches related to e-modules have been carried out, including problem-solving-based e-module research that can be used to develop critical thinking skills for class X high school students in straight motion and parabolic motion (Wahyuni et al., 2020), the effectiveness of the STEM-integrated Project Based Learning e-module in the moderate category (Cahyani et al., 2020), the use of problem solving-based E-modules on the digestive system material is effective for improving students' problem solving abilities (Puspitasari et al., 2020). Based on this research, research related to HOTS-based e-modules is still little done, therefore research on e-module teaching materials equipped with HOTS questions is a novelty in this study, HOTS-based e-modules are e-modules that are expected to improve HOTS students through the practice of students' thinking skills in order to achieve the objectives of learning outcomes. This research is a study of the use of e-modules based on Higher Order Thinking Skill (HOTS) questions to improve cognitive learning outcomes for prospective elementary school teacher students.

METHOD

The method in this research is quasi-experimental research with the design called Nonequivalent Control Group Design. The experimental group and the control group were not randomly selected. The Nonequivalent Control Group Design design can be seen in the Chart below.

O_1	**X**	**O_2**
....		
O_1		**O_2**

Figure 1. Research design (Sugiyono, 2008),

Note:

X : Treatment of HOTS-based modeule

O_1 : *Pretest* of experiment class and control class

O_2 : *Posttest* of experiment class and control class

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The research begins with giving a pretest to the experimental class and the control class to determine the cognitive learning outcomes before learning. The pretest results of the two classes were processed to obtain the average value achieved by students in each class. The next stage, researchers used e-modules in learning in the experimental class, while in the control class researchers did not use e-module.

After learning in the experimental class is complete, students in the experimental class and control class are given a final evaluation (posttest), which is then the results of the final evaluation of each class are compared to see the differences in cognitive learning outcomes between the control class and the experimental class that have received different treatment.

The population in this study were all 2018 semester 5 regular students in one of the Elementary School Teacher Education Study Programs at a University in Bandung, which consisted of classes AO1, AO2. The sampling technique is saturated sample, so that the population is equal to the number of samples.

The instrument used as data disclosure in this study is a test item to measure student cognitive learning outcomes. The validity and reliability of the test questions were first tested. The data collection technique in this study was a test in the form of description questions to measure student cognitive learning outcomes.

Data analysis was carried out on test results (pretest and posttest) which were conducted individually on student cognitive learning outcomes. Furthermore, statistical analysis processing was carried out using SPPS version 25.0 for Windows software in several stages of testing, namely the prerequisite test (normality test and homogeneity test), T-test and gain test.

RESULTS AND DISCUSSION

Results

The e-module used in this study is an electronic module that is not printed, but can be accessed or opened using a Smartphone, Tablet, PC computer and all operating system-based media, especially Android So that students can open and use this e-module not only limited to classrooms and meetings, but students can study anywhere, anytime and with anyone. This electronic module is an individual learning package that functions as a learning supplement. HOTS-based e-modules are e-modules that are equipped with questions that can improve students' HOTS, so that HOTS-based teaching materials can train students' thinking skills in order to achieve student cognitive learning outcomes.

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To determine the use of e-modules based on HOTS questions to improve student cognitive learning outcomes, a quasi-experimental study (quasi-experimental) was carried out with the Nonequivalent Control Group Design design with the experimental group and control group not being chosen randomly. The research begins by giving a pre-test to the experimental class and control class to determine cognitive learning outcomes. The results of the pre-test from the two classes were processed to get the average score achieved by students in each class. The next stage in the control class the researchers did not use e-modules in their learning, while in the experimental class the researchers used e-modules. After the learning was carried out in the experimental and control classes completed, students of both classes were given a final evaluation (posttest). The pretest and posttest results of the control class and experimental class are shown in table 1 below:

Table. 1 Pretest and Posttest Scores in Experiment Class

Pretest and Posttest Score of Control Class			Pretest and Posttest Score of Experiment Class		
No Sample	**Pretest**	**Postest**	**No Sample**	**Pretest**	**Postest**
1	77	90	1	77.5	90
2	77	90	2	77	96
3	75	82	3	77.5	97
4	77.5	90	4	77.5	90
5	77.5	92	5	77.5	97
6	77.5	88	6	77.5	93
7	75	84	7	80	95
8	75	88	8	77	95
9	77	88	9	75	95
10	77.5	90	10	77.5	90
11	77.5	90	11	75	98
12	77.5	90	12	77.5	90
13	75	88	13	77	90
14	77.5	92	14	75	95
15	75	92	15	77.5	95
16	75	80	16	80	95
17	75	88	17	75	90
18	75	80	18	77	90
19	80	90	19	75	92
20	77	88	20	75	90
21	80	90	21	77	88
22	77.5	90	22	77	90
23	77.5	90	23	75	90
24	77.5	88	24	80	90
25	75	88	25	77	90
26	77	92	26	75	92
27	77.5	90	27	77.5	88
28	75	90	28	75	90
29	77.5	90	29	77	88
30	75	92			

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Hypothesis of the data above is tested by first analyzing the data on the test results (pretest and posttest) which are carried out individually on student cognitive learning outcomes. Hypothesis testing consists of several stages of testing, namely the prerequisite test (normality test and homogeneity test), T-test, and gain test. Statistical analysis processing was carried out using SPPS version 25.0 for Windows software with the following results:

Results of pretest and posttest of Control Class

The data in table 1 was tested using a paired sample t-test with the SPPS version 25.0 for Windows software application to see if there was a significant difference between cognitive learning outcomes in the pretest and posttest data for the control class or for the class that did not use the e-module. The processing results are shown in Table 2 and Table 3 below.

Table 2. Output Paired sample statistic

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	76.667	30	1.4582	.2662
	Post-test	88.667	30	3.2092	.5859

Based on table 2 above, it is obtained that the pretest average for the control class is 76.67 and the posttest average for the control class is 86.67. Judging from the average, there was an increase of 12 points.

Table 3. Output Paired sample test

		Paired Differences					t	df29	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-test - Post-test	-12.0000	2.8467	.5197	-13.0630	-10.9370	-23.089		.000

Based on table 3 above, the sig value (2-tailed) = 0.000 is smaller than (α 0.05), so Ho is rejected and Ha is accepted, which means that there is a significant difference between cognitive learning outcomes in the pretest and posttest data for control class

The results of the pretest and posttest of experimental class

Like the pretest and posttest value data for the control class, data from the experimental class was also processed and tested to see whether there was a significant difference between cognitive learning outcomes in the pretest and posttest data for the experimental class or for class using e-module. The processing results are shown in table 4 below

Table 4. Output Paired sample statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	76.845	29	1.5184	.2820
	post-test	92.034	29	3.0294	.5625

Based on table 4 above, it is obtained that the pretest average for the experimental class is 76.85 and the posttest average for the experimental class is 92.03. Judging from the average, there was an increase of 15.18 points.

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Table 5. Output Paired sample test

Paired Samples Test									
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pre-test - post-test	-15.1897	3.3338	.6191	-16.4578	-13.9215	-24.536	28	.000

Based on table 5 above, the sig value (2-tailed) = 0.000 is lower than (α 0.05), so Ho is rejected and Ha is accepted, which means that there is a significant difference between cognitive learning outcomes in the pre-test and post-test data for experimental class. To see the effectiveness of using e-module based on HOTS questions, an N-Gain Score test was carried out, with the results shown in Table 6 below.

Table 6 Results of N-Gain Score Test

Experiment Class			Control Class	
No	**N-Gain Percent**		**No**	**N-Gain Percent**
1	55.56		1	56.52
2	82.61		2	56.52
3	86.67		3	28.00
4	55.56		4	55.56
5	86.67		5	64.44
6	68.89		6	46.67
7	75.00		7	36.00
8	78.26		8	52.00
9	80.00		9	47.83
10	55.56		10	55.56
11	92.00		11	55.56
12	25.56		12	55.56
13	56.52		13	52.00
14	80.00		14	64.44
15	77.78		15	68.00
16	75.00		16	20.00
17	60.00		17	52.00
18	56.52		18	20.00
19	68.00		19	50.00
20	60.00		20	47.83
21	47.83		21	50.00
22	56.52		22	55.56
23	60.00		23	55.56
24	50.00		24	46.67
25	56.52		25	52.00
26	68.00		26	65.22
27	46.67		27	55.56
28	60.00		28	60.00
29	47.83		29	55.56
			30	68.00
Average	65.4999			51.6193
Min	46.67			20.00
Max	92.00			68.00

Table 7 Category of N-Gain Effectiveness interpretation

Percentage	Meaning
<40	Not effective
40 -55	Less effective
56 – 75	Quite effective
>76	Effective

Based on the results of the calculation of the N-Gain score test above, which is then interpreted in table 7 of the N-Gain effectiveness interpretation category table, it shows that the average N-Gain score for the experimental class (using e-module based on HOTS questions) is 65.49% and included in the quite effective category with a minimum N-Gain score of 46.67 and a maximum score of 92.00. Meanwhile, the average N-Gain score for the control class (not using the HOTS question-based e-module) is 51.6%, including in the less effective category with a minimum N-Gain score of 20.00 and a maximum score of 68.00. So it can be concluded that the use of HOTS question-based e-module is quite effective to improve the cognitive learning outcomes of prospective elementary school teacher students.

The effectiveness of using HOTS question-based E-Module to improve student cognitive learning outcomes is tested in classroom learning. Cognitive learning outcomes can be trained and guided by several features found in HOTS-based e-module. The characteristics of the HOTS question-based E-Module can guide students in improving cognitive learning outcomes because the HOTS-based E-module trains students to remember, understand, apply, analyze, evaluate, and create.

In the HOTS question-based e-module in this study, there are practice questions that refer to the indicators of cognitive learning outcomes being trained, namely the ability to remember, understand, apply, analyze, evaluate, and create. This shows that the use of HOTS- based e-module is quite effective in improving the cognitive learning outcomes of prospective elementary school teacher students. This fact is in line with research which states that the use of learning modules causes an increase in HOTS skills and student learning outcomes (Sabar & Maureen, 2013). The HOTS question-based e-module has advantages because each module indicator sub-material, namely material descriptions, student activities and evaluation questions has been integrated with aspects of higher-order thinking skills (HOTS). Electronic teaching material or e-module has advantages, one of which is that they contain electronic teaching materials which include material and practice questions presented varying not only text but also images (Puspitasari et al., 2020).

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CONCLUSION

Based on the findings and discussion of this study, it is concluded that :

1. The use of Higher Order Thinking Skill (HOTS) question-based e-module is quite effective in improving cognitive learning outcomes for prospective elementary school teacher students with an N-Gain score of 65.49%.
2. This effectiveness is tested in classroom learning by looking at the increase in cognitive learning outcomes. These cognitive learning outcomes can be trained and guided by several features contained in HOT-based e-modules, HOTS-based e-modules train students to remembering, understanding, applying, analyzing, assessing, and creating.

For further research related to the HOTS-based e-module, it is recommended that it be applied to all circles of students so that students can think at a high level and be useful for their lives in society.

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