Implementation Innovative of E-Module On Learning Non-Metallic Chemistry Based On KKNI Curriculum

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Abstract. The pandemic has become a concern in the field of education, which has made the conventional learning system switch to online; this means that educators innovate to create innovative teaching materials that access online and offline. The research objectives were to aim for (1) The improvement of student learning outcomes after being taught e-modules; (2) Student learning outcomes that met the minimum competency standards; (3) Student responses to e-modules. This study used test instruments and student response questionnaires. The research sample was 31 students of UNIMED chemistry education class 2020. The results showed an increase in student learning outcomes that achieved the high N-gain criteria of 0.74 and met the minimum competency standard, namely 80, and student responses were 89.04% in the excellent category, so the innovative KKNI-based e-module on oxygen and sulfur materials can be used as a reference for learning resources.

Keywords: *Innovative Learning, KKNI, Inorganic Oxygen, and Sulfur*.

1 Introduction

Research conducted about *Epidemiology* and *pathogenesis* explains transmission covid susceptible to health, so control moment this by reducing mobility, particularly in the education sector that requires learning online [1]. Early learning by the conventional switch is online [2]. Change system teaching at the university is also changing online. Educators must also innovate and make innovative source learning to reach destination learning [3]. one eye studying Required in structure curriculum study program education chemistry at University The State of Medan (UNIMED) is an eye looking inorganic chemical non-metal with a weight of 3 credits. Where eye studying this discusses non-metal elements like example, carbon, oxygen, silicon, hydrogen, boron, and others. Based on perceptions and interviews conducted by one of the lecturers, inorganic chemical non-metals at Medan State University obtained information that the learning process in the eyes studying inorganic chemical non-metal in 2020/2021 teaching still in the online learning process (in the network).

The need for chemistry teaching materials innovative effective for increase independence study students, understand draft chemicals with easy, knowledge, skill and help lecturer, as

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well as student learning during the Covid pandemic [4,5] The teaching materials used by students in the chemistry education of the State University of Medan, are still not all tasks integrated with the KKNI curriculum [6] The need development source study interactive innovation in chemistry education who can use online that can be accessed by large for push spirit study [7]. The need to develop integrated learning media with technology to improve students' scientific literacy skills and make learning easier [8]. Electronic modules are an efficient source of teaching materials for students in chemistry learning that can be accessed through smartphones or laptops, as well as easy application [9]. The use of innovative modules based on the KKNI oxygen and sulfur to make it more attractive needs to be combined with multimedia, an electronic module, by adding audio, video, animation, or website applications to increase student enthusiasm for learning.

The software is used to compile innovative KKNI-based electronic modules with Flip PDF Professional so that the material becomes more interesting, like a book, and can contain multimedia according to user needs [10]. Understanding draft student increase by significant moment use of the e- module in learning [11]. Based on the explanation above, this study aims to determine the implementation of innovative e-modules based on non-metallic chemistry KKNI on oxygen and sulfur materials.

2 Method

This investigation is Research and Development (R&D), which alludes to the ADDIE (Analysis-Design-Development-Implementation-Evaluation) model [12],[13]. This research is limited to the implementation and evaluation stages.

The method used in this study was Pre-Experimental Design in the form of a One-Group Pretest-Postest Design. Namely, there is a pretest before giving treatment [14]. The research design is shown in Figure 1.

Fig. 1. One group pretest-Postest design

Where :
X_1 = Pretest Score
X_2 = Posttest Value
Y = Treatment given

The sample in this study was 31 students of the Chemical Education Study Program batch 2020. Data collection began by giving a pretest to see the initial understanding. Next, distribute the e-module link to the WhatsApp group that students can click on to access it online. At the evaluation stage, posttests and response questionnaires were given to obtain data on learning outcomes, improving learning outcomes, and student responses taught through

innovative e-modules based on KKNI. The research procedure is described in Figure 2.

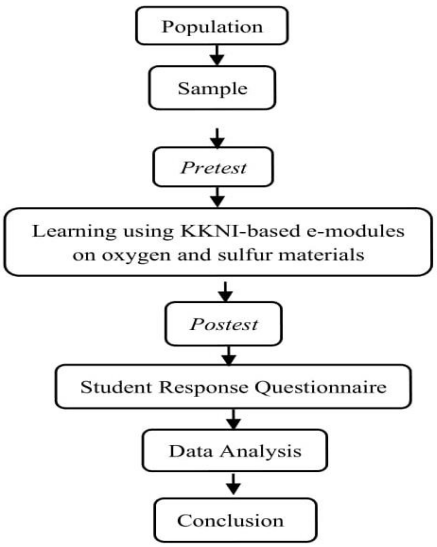

Fig. 2. E-Module Implementation Research Procedure

The data used in the analysis is the Shapiro-Wilk normality test. After testing the hypothesis, a one-sample t-test is carried out, where the trial has provisions if the result is sig> 0.05, then Ha is rejected. Conversely, if the value of sig <0.05, then Ha is accepted [15].

Ho: Student learning outcomes after using innovative e-modules based on KKNI non-metal chemistry on oxygen and sulfur materials developed cannot meet the minimum competency standards.

Ha: Student learning outcomes after using innovative e-modules based on non-metal chemistry KKNI on oxygen and sulfur materials can meet the minimum competency standards set or higher than the minimum requirements set values.

Student learning outcomes data were analyzed using N-gain to see the increase in learning outcomes with the formula:

$$\mathbf{N-gain\ Value} = \frac{Postest\ Score - Pretest\ Score}{maximum\ score - Pretest\ Score} x100\%$$

To see the normalized N-Gain classification as shown in Table 1.

Table 1. Normalized N-gain values

N-Gain Value	Catagory
N-gain < 0,3	Low
0,3 ≤ *N-gain* ≤ 0,7	Medium
N-gain > 0,7	High
<59 %	Very Bad

Student responses can be calculated using the formulas:

$$P = \frac{f}{n} \; x \; 100 \; \%$$

The criteria for the percentage of student responses are in Table 2.

Table 2. Criteria for Percentage of Student Responses

No.	Range	Category
1	80 – 100 %	Very Good
2	60 – 79 %	Good
3	40 – 59 %	Fairly Good
4	<59 %	Very Bad

Where:

P = percentage of student responses

f = the number of scores obtained by students

n = number of maximum scores

3 Result and Discussion

At this stage, the e-module that has been revised based on the validator's suggestion implemented in the chemical inorganic chemical only on material oxygen and sulfur. With the method spread, the e-module link to students through group *WhatsApp* could later access by students themselves.

Improving Student Learning Outcomes

Stage this aim for knowing results, learn, improve, and respond to students being taught by using e- module innovative based on the KKNI. Enhancement results study students obtained from result data *pretest* and *posttest* with count the value of N-gain (normalized gain) received by each student could see in Table 3.

Table 3. Enhanced N-Gain Value Data Learning Outcomes Student

Amount Student	Average Value		N-Gain	Classification
	Pretest	Posttest		

31	35	81	0.74	High

At stage this, the e - module that has been revised based on the validator's suggestion was implemented. Based on Table 3. The average N-gain of students is 0.74, categorized as high N-Gain criteria, so it can be said that there is an increase in student learning outcomes (N-Gain) when students finish applying innovative e-modules based on the KKNI that have been developed. Student learning outcomes that meet the standards can be measured through a one-sample t-test using SPSS, aiming to prove the hypothesis. The first thing to do is to test for normality. The results of the normality test are as follows in Table 4.

Table 4. Normality Test of Learning Outcome Data

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Learning Result	.158	31	.047	.936	31	.066

a. Lilliefors Significance Correction

Based on the results of the Shapiro-Wik normality test using SPSS, it was found that with the value of sig = 0.066> 0.05, it can be concluded that the student data are typically distributed. After the data is normally distributed, the hypothesis can be tested using SPSS. The results of the one-sample t-test using SPSS can be seen in Table 5.

Table 5. Test Results One - Sample t-Test

One-Sample Test						
	Test Value = 80					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Learning_Result	3.025	30	.005	3.710	1.21	6.21

Student learning outcomes after using innovative e-modules based on non-metal chemistry KKNI on oxygen and sulfur materials developed can meet the minimum competency standards set or higher than the minimum competency standard values set, which is 80. The same is done by [16]. Based on the one sample t-test, the results are sig.= 0.005 < 0.05.

Student Response

Student responses to the questionnaire consisted of 5 aspects: presentation of material, appearance, language, graphics, and interest. The average value of student responses is listed in Picture 2.

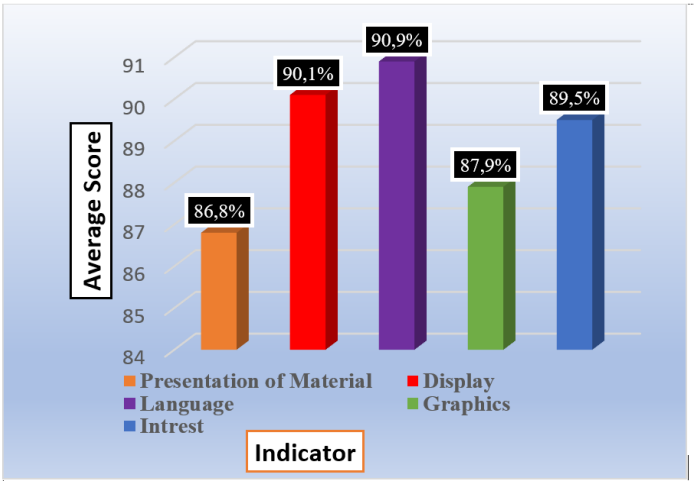

Fig. 2. Average Student Response

Based on Pic 2. it is known that the presentation of the material is 86%, display 90,1%, language 90,9, graphic 87,9%, and interest 89,5%. All the indicators measured got an average percentage result of 89.04%, which is included in the perfect aspect. The high acquisition value of student responses is because the developed e-module can make it easier for students to learn the material. After all, it has been equipped with routine assignments, evaluation questions, summaries, learning videos, and animations that make it easier for students to explore the material, and students are straightforward and independent in gaining knowledge. Similarly, what was studied by [17] showed an attractive appearance of e-modules and ease of application for students when accessing e-modules. The use of multimedia is expected to overcome student boredom in learning and re-learn the material being studied. So innovative teaching materials based on KKNI are very appropriate to be used for inorganic chemistry learning [18].

4 Conclusion

The data obtained from the results study could draw many conclusions, including whether the increment in understudy learning outcomes reaches the high N-gain criteria of 0.74 (high category) [19]. Through the one-sample t-test, the data obtained sig. = 0.005 < 0.05 so that Ha is accepted, it can be said that student learning outcomes have finished using the innovative KKNI-based e-module that was developed to meet the minimum competency standards set.and Understudy reactions to the use of innovative e-modules based on the KKNI for oxygen and sulfur are very good with an average percentage of answers of 89.04% [20]. So, could it says e- module innovative based on KKNI can be used as a source alternative in learning, and learning media facilitates the learning process that supports students' cognitive aspects in chemistry [21].

This study has weaknesses and limitations that cannot be avoided, including the absence of an instrument for student learning motivation for e-module innovative based on the KKNI for

oxygen and sulfur material, data collection is carried out using only one class, and the use of the internet is not good in the learning process.

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