The Effectiveness of the e-Student Worksheets to Improve Students' Learning Outcomes and Critical Thinking Skills on Digestive System Concepts

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Abstract

The 21st-century education focuses on emphasizing the use of technology and information. Nevertheless, only some media can support interactive learning. Therefore it causes low student learning outcomes due to a lack of interest in participating in learning. The e-student worksheets are the innovations expected to attract students to be more active during learning. This study aimed to determine the effectiveness of using the e-student worksheets to improve learning outcomes and critical thinking skills as measured by the Kolmogorov-Smirnov method using pre-test and posttest data collection techniques. The study's results stated that the experimental class's posttest average value was 77.2 while that of the control class was 64.4. So the average value of the experimental class is higher than the control class. Based on statistical analysis, proving the results of the significance of the independent sample t-test, namely 0.00 <0.05, it can be concluded that using the e-student worksheets effectively improves learning outcomes and students' critical thinking skills.

Keywords: The 21st Century Education, e-Student Worksheets, Learning Outcomes

INTRODUCTION

Education is an activity that is carried out consciously and aims to be a means of developing the potential of students not only in terms of intelligence but also religion, personality, and self-control. Education is an effort to exchange information and build skills and fulfill needs and desires to achieve a life goal (Rahman, 2022). Developing all the potential that everyone has can facilitate solving the problems faced. The development of individual potential can improve the quality of human resources. The quality of a country is determined by the quality of the individuals in it, and the quality of individuals is determined by the quality of education (Amalia, 2017). The main goal of education is to help people adapt to the times, which include changes in global currents to become more modern (Aslamiah, 2021).

According to (Sya'idah, 2020), Developments in technology, communication, and information have affected the development of the world of education. The rapid development of telecommunications causes teachers to be required to use up-to-date learning media sources, such as the Internet, which allows students to develop 21st-century skills. The form of education emphasizes on technology and information utilization that can be accessed quickly, easily, and inexpensively. Students must be more adaptive with technological development competencies to answer future challenges (Indarta, 2021). The 21st-century learning is expected to develop

students' skills in accessing information, analyzing problems, critical thinking skills, and problem-solving (Destyana, 2021).

The problem-based learning approach presents problems that stimulate students to express opinions and solve problems. According to (Astari, 2018), the problem-based learning model is student-centered. When students are given problems relevant to everyday life, these problems stimulate them to develop critical thinking skills in solving problems and building their knowledge independently. The PBL learning model can stimulate students' metacognitive abilities, increase literacy interest, and must be in line with the use of technology (Ichsan, 2022). In this case, it can stimulate students' thinking to have a more significant role than the teacher (Uliyandari, 2021).

Media is an intermediary for delivering information for teachers to students. Low interest in literacy in Indonesia makes learning using printed books less desirable; with electronic media, learning can be more fun and attract students' interest. Online learning media can make learning more effective in terms of time, energy, and cost. The use of electronic media provides many benefits, one of which is increasing students' understanding (Nuriansyah, 2020). Learning media that is packaged with an attractive appearance can attract interest and foster the enthusiasm of students in the learning process. Fauziyah et al (2023) stated that while student learning in interest and with high motivation will help students master the concepts. Interest in learning is essential in determining student learning outcomes and achieving learning objectives. Interactive media learning allows students to explore their abilities (Ridha, 2021).

The e-student worksheets are electronic sheets provided to support the learning process. The e-student worksheets result from the printed student worksheet's innovations into digital form due to technological developments. The e-student worksheets can be accessed via a cellphone or laptop, containing learning support material and questions (Mispa, 2022). According to (Suryaningsih, 2021), the need for innovative e-student worksheets follows the goals of 21st-century learning, namely to stimulate students' thinking skills. More innovative features and graphics in e-student worksheets include all indicators of critical thinking (Zahroh, 2021).

Critical thinking skills are the development of the ability to solve problems. Developing the ability to solve problems is done by evaluating, analyzing, and drawing conclusions from a problem to find a solution. Students' thinking skills are determined by the ability of students to solve problems in a structured way (Puspita, 2022). Critical thinking skills can be improved with self-confidence and an open mind in addressing problems (Barta, 2022). In addition, it is necessary to design questions that include indicators of critical thinking. Thus, this study aims

to determine the effectiveness of using e-student worksheets to improve student outcomes and critical thinking skills.

METHOD

The research method used was quasi-experimental research method. Quasi-experimental research method with a series of pretest and posttest control designs was carried out to determine the effect of using the e-student worksheets on learning outcomes and improving students' critical thinking skills. The research focus is centered on the effectiveness of using the e-student worksheets to improve learning outcomes and critical thinking skills in grade 12 science students at one of the senior high schools in Malingping, Indonesia. Figure 1 shows the stages to be carried out in this research.
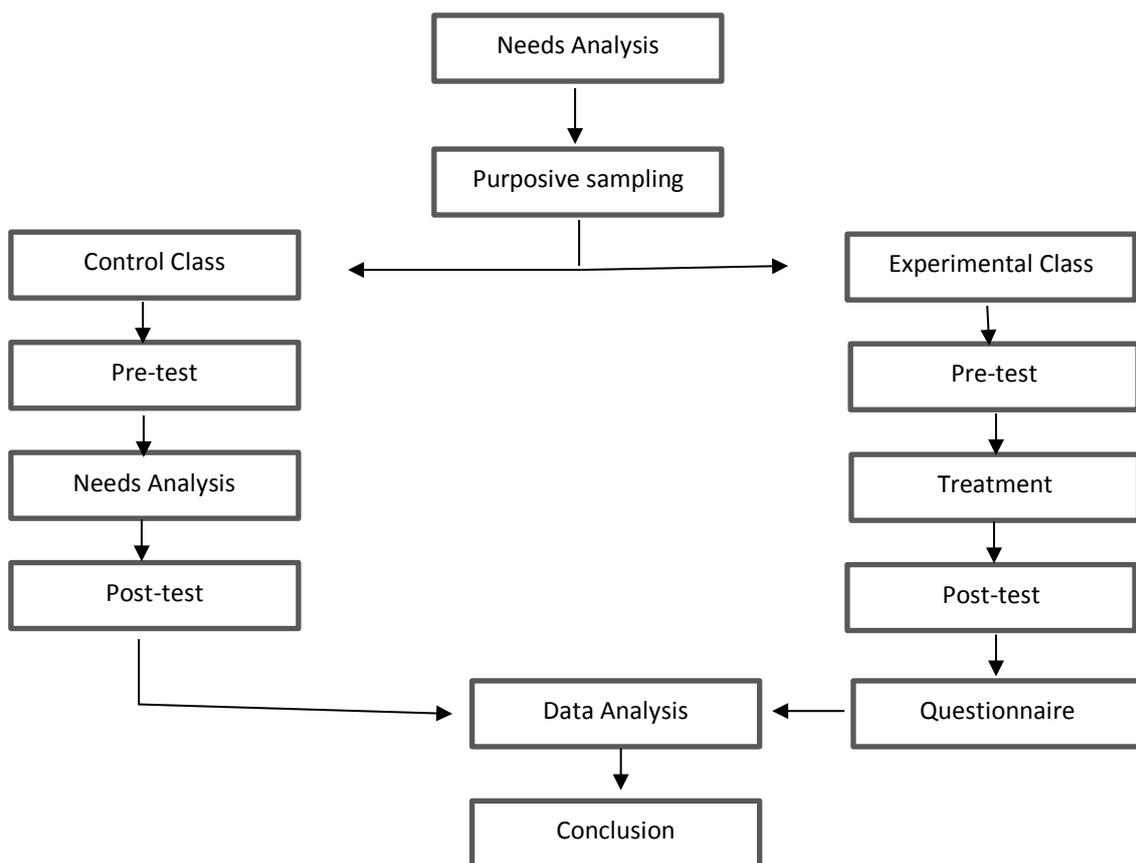

Figure 1. Research Stages

The sample population used was 30 students in class 1 as the control class and 30 students in class 2 as the experimental class, with 60 students. Based on Dywan (2020), before being given treatment, The students in both the experimental and control classes performed a pretest to measure students initial abilities. Furthermore, the experimental class will be treated using the e-student worksheets, while the control class will use conventional learning with PowerPoint media. The material taught between the two classes is the same: system digestion. After treatment, the experimental and control classes have a posttest using multiple choice

higher-order thinking skill (HOTS) questions to measure learning success and students' critical thinking skills. Comparison of the pretest and posttest results in the experimental and control classes will be used as the basis for processing data and drawing hypotheses regarding the effectiveness of using the e-student worksheets on learning outcomes.

A questionnaire on critical thinking skills in the experimental class was filled out by students after the post-test activity. The questionnaire analysis uses the Likert scale index, and the result is interpreted as a category shown in Table 1 (Ponna, 2022).

Table 1. Criteria for Likert Scale

Interpretation (%)	Category
0-19,99 %	Very low
20-39,99 %	Low
40-59,99 %	Medium
60-79,99 %	High
80-100 %	Very high

RESULTS AND DISCUSSION

The study population was students in Class 1 and Class 2, total about 60 students. After treatment, there is a significant difference in learning outcomes, as shown in Table 2. In the experimental class, About twenty one students completed and nine students did not complete. Meanwhile, in the control class, five students completed and twenty five students still need to complete it. During the learning process, the experimental class has more attractive and fun learning than the control class. In contrary in the control class, the learning proses conducted through conventional learning without engaging learning media. Therefore it can be seen that the posttest result in experiment class is 77.2, higher than in the control class with 64.4. In connection with research (Ridha, 2021), learning media significantly improves students' learning quality. The research results in Table 2 were obtained through the pretest and posttest question instruments for to the control and experimental classes.

Table 2. Learning Outcomes

No	Class	Pretest	Posttest
1	Experiment	47.2	77.2
2	Control	34.2	64.4

The research used IBM Statistics SPSS 22 software for processing the normality test, homogeneity test, and independent sample t-test. The normality test is used to determine whether or not the data distribution is normal. Based on Sintia (2022), the way to do a normality test is to use the SPSS 22 application with the Kolmogorov-Smirnov test, which is commonly used to decide on a specific distribution or decide whether or not the distribution of several data is normal at once. The normality test results can be seen in Figure 1.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Results of studying the digestive system	Contro	.128	30	.200[*]	.931	30	.054
	eksperiment	.149	30	.090	.939	30	.087

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Figure 1. Normality Test Results

Based on the normality test results with Kolmogorov Smirnov in Figure 1, it shows that the significance values are 0,200 and 0,090 so it can be concluded that the data is normally distributed because of the sig.> 0,05.

A homogeneity test is used to determine whether the data obtained is homogeneous. The way to find out the homogeneity of the data is to use the One Way Anova test. The homogeneity test is often called the two-variant similarity test, used to compare the two variances; if two groups of data have the same variance, then there is no need to do a homogeneity test because it is considered homogeneous data. Homogeneity tests may only be carried out on data tested for normality and normally distributed (Usmadi, 2020). The homogeneity test results can be seen in Figure 1.

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Results of studying the digestive system	Based on Mean	.008	1	58	.930
	Based on Median	.012	1	58	.912
	Based on Median and with adjusted df	.012	1	53,522	.912
	Based on trimmed mean	.007	1	58	.934

Figure 2. Homogenity Test Results

Based on the Figure 2, the results of the homogeneity test table with the One Way Anova test, showed the sig. values based on the median are 0.930 and 0.912, so it can be concluded that the data variance of the two classes is homogeneous.

After the data is normal and homogeneous, an independent sample t-test can be carried out. The independent sample t-test determines the difference in the mean of two unpaired samples. The t-test was carried out by comparing the significance value of t indicated by sig. of t with degrees of confidence a= 0,05 (Syahputra, 2017). This test was conducted to determine which learning was more effective between two learning comparisons: using the e-student worksheets and not using the e-student worksheets.

Based on the independent sample t-test results in Figure 3, a significance value (2-tailed) of 0,000 or < significance of α is obtained 0,05 which means H_0 is rejected. H_1 is accepted so that it can be concluded that using the e-student worksheets effectively improves learning outcomes. Mispa (2022) explains that the use of the e-student worksheets has a significant effect on improving learning outcomes. This is because the e-student worksheets includes not only material but also pictures and explanations that are detailed and related to problems in everyday life. So that students are motivated to be able to analyze problems and remember the concepts explained.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Result of Digestive Studying	Equal variances assumed	3.798	.056	-4.096	58	.000	-12.800	3.125	-19.055	-6.545
	Equal variances not assumed			-4.096	53.944	.000	-12.800	3.125	-19.065	-6.535

Figure 3. Independent Sample Test Results

Based on the results Figure 4 for the average of the student critical thinking skills questionnaire results, nine students scored 52-68, 12 in the range of 68-84, and 7 in the range of 84-100.
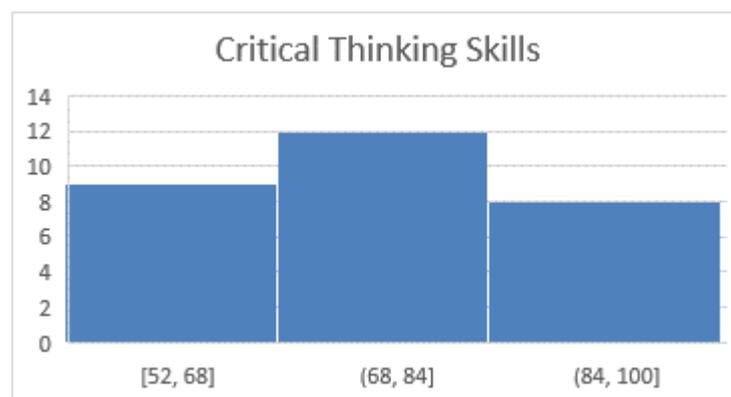

Figure 4. Value Average of the Students' Critical Thinking Skills Questionnaire Results

From the results in Figure 4, it was obtained that the average value of students' critical thinking skills was 76 or included in the excellent category on the Likert scale and in line with research conducted by Hidayah (2022) that the use of e-student worksheets is very effective in training critical thinking skills which are implemented in higher order thinking skill questions by providing problems and allowing students to build thoughts and develop reasonable views in the context of problem-solving.

The 21st-century skills develop critical thinking skills and the ability to innovate, collaborate, communicate, be responsible, have a broad global and local understanding, and be open to technological developments (Wayudi, 2020). The ability to think critically is obtained naturally by students, so habituation is needed to train and develop these abilities (Sugiarti, 2021). Critical thinking aims to eliminate students' old habits of memorizing and storing information so they can collaborate on existing information or problems (Sundari, 2021).

The importance of innovation that can play a role in individual change is related to the development of knowledge and thinking. Critical thinking is determined by actively thinking to find the essence or relevant answers to a problem (Pamungkas, 2019). The e-student worksheets are designed to be more innovative to support learning. The development of e-Student Worksheets integrates with scientific learning objectives to stimulate student involvement in learning (Amthari, 2021).

Using the student worksheets differs from the models preferred by students, can hinder the development of students' insights, and a lack of enthusiasm can unravel students' interest in participating in learning (Sari, 2022). Using e-Student Worksheets with a suitable model can improve learning outcomes because learning outcomes are directly or passively connected with learning designs. Students' competence depends on the learning design prepared by the teacher (Nurrita, 2018). So that students can control their thinking skills and manage information and are no longer passive objects in the classroom (Lestari, 2019).

CONCLUSION

Based on the results of the research, data processing, data analysis and hypothesis testing, it can be concluded that the use of the e-student worksheets has an effect on improving learning outcomes and students' critical thinking abilities. This refers to the acquisition of a t-test significance value of $0,000 < \alpha\ 0,05$ which means that H_0 is rejected and H_1 is accepted or there is an increase in learning outcomes and students' critical thinking skills. The research results prove that the e-student worksheets effectively improve learning outcomes and students' critical thinking skills.

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