

The Effect of Electronic Chemistry Books Based on Local Balinese Culture on Learning Outcomes of High School Students

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Abstract: Student learning outcomes are still relatively low, this is due to the lack of utilization of local wisdom-based electronic textbooks in class by teachers. The application of Balinese local culture-based electronic textbooks is believed to be able to improve learning outcomes. The purpose of this study was to describe and explain whether or not there were differences in learning outcomes between students who took the pretest and students who did not take the pretest and to describe and explain whether or not there were differences in learning outcomes between students who studied using chemistry textbooks based on local Balinese culture and students who studied using conventional books. The design of this study uses the Solomon four-group design. The research location was carried out at SMAN 5 Denpasar with a research sample of class XI MIPA. The instrument in this study consisted of a learning achievement test using a dichotomous scale. The research data were analyzed using a two-way analysis of variance test. The research results obtained were that there were no differences in learning outcomes between students who were given a pretest and students who were not given a pretest and there were differences in learning outcomes between students who studied using electronic chemistry textbooks based on local Balinese culture and students who studied using conventional textbooks.

Keywords: Electronic chemistry textbooks; Balinese local culture; Learning outcomes

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Introduction

Science and technology in the 21st century have developed very rapidly, various kinds of innovations have been created in all fields as a result of ideas and real research products that have been developed by experts (Prasetyo & Sutopo, 2018). It can be said that at this time the world is entering the Industrial 4.0 era, in which almost all aspects of human life are integrated with artificial intelligence and the internet for everything. This indicates that life will be more complex and fuller of challenges, this should be followed by an increase in the quality of existing human resources. Countries that are unable to master science and technology as well as a number of skills will be losers. Therefore, preparing high-quality human resources is very important for a country (Redhana, 2014). Preparation of human resources who master 21st century skills will be effective if pursued through education (Redhana, 2019). The

required quality human resources are obtained through the educational process, so an education and training program is needed to prepare and develop the quality of human resources in accordance with social transformation.

Improving the quality of education in Indonesia is not only the responsibility of the government, but also the responsibility of all levels of society. This also applies to the development of human resources, namely educators who play a major role in organizing learning in schools and are an inseparable part of a nation, even the progress or decline of the quality of a nation can be measured by progress or not in the education sector. If you want to advance a nation, the first thing that must be done is to improve the quality of existing education (Krismiyati, 2017).

Chemistry studies composition, structure, properties, changes, and the accompanying energies. In chemistry studied about natural phenomena. Based on

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these natural phenomena, concepts, theories, and laws are developed. These concepts, theories, and laws can then be reused to explain various phenomena that occur in nature (Redhana, 2019). In teaching chemistry in the 2013 Curriculum, a teacher has a very big challenge, namely chemical material that is abstract and has to be learned a lot in a relatively short time. Doyan et al (2020 a) Teachers must have a variety of ways so that students don't get bored. From the point of view of students studying chemistry seems difficult because studying chemistry is the same as learning a new language. Changes in students' mindsets about chemistry can be a stimulus for themselves in learning and completing chemistry assignments with full responsibility. This condition can make students active learners and have the independence to find and learn new knowledge from various relevant sources, so as to achieve high learning outcomes. If learning outcomes are high, the quality of education is also high.

But in reality, student learning outcomes are still relatively low. This is evidenced by research conducted by Aisah et al (2017) that 82% of class X students of SMA N 2 Palembang did not meet the completeness score. The low learning outcomes can be seen from research conducted by Achmad et al (2017) indicating that students still do not understand chemistry concepts, especially in calculation material. In addition, students rarely repeat the material they have learned so that students only learn in class. The results of this study are supported by Widodo and Widyanti (2013) which show that student learning outcomes are still low. This is evident from the average grade VII midterm test results which do not meet the KKM standard scores. Suryawan et al (2019) also stated that student learning outcomes were still relatively low, marked by students not being able to transfer their knowledge in everyday life and often experiencing misconceptions. Santyasa et al (2020) are of the same opinion that student learning outcomes are still relatively low, as can be seen from the 2016 Human Development Report data, Indonesia's position is at position 113.

The cause of low learning outcomes is the lack of use of learning materials that are integrated with local wisdom, this is clarified by research conducted by Zinnurain and Ahmad (2018) stating that schools have not implemented innovative learning that is integrated with local wisdom. The same thing was conveyed by Saputra et al (2016) that learning is still not integrated with local wisdom. Suardana (2013) argues that in classroom learning not many teachers have developed textbooks containing local culture both in theory and practical activities. Learning still uses a lot of modules whose presentation tends to use common pictures/illustrations and has not paid attention to the importance of local wisdom in the surrounding area. Doyan et al (2020) argue that having textbooks will make

it easier for teachers in the learning process. So that in this study applying a blended learning model integrated with electronic textbooks containing local wisdom. Chemistry learning with a blended learning model integrated with electronic textbooks containing local wisdom is an effort to preserve local culture or local wisdom. Suardana et al (2013) chemical material that is understood through the local cultural context will be able to influence the increase in students' understanding of their own culture. Sasmita (2021) states that chemistry concepts based on local culture need to be integrated into textbooks so that students can better understand chemical material by relating it to everyday life and students can get to know their own culture.

Balinese local culture-based electronic chemistry textbooks are able to improve student chemistry learning outcomes, this is confirmed by research conducted by Sasmita (2021) which states that Balinese local culture-based electronic chemistry textbooks are effective in efforts to increase learning outcomes and digital literacy. The research conducted is a development of research conducted by Sasmita (2021). The research conducted by Sasmita was to develop an electronic textbook based on local Balinese culture which was tested on one group to see its effectiveness in increasing learning outcomes and digital literacy. The difference between the research conducted by Sasmita and this research lies in the method used, the number of samples tested and the research design. Karwati (2016) also holds the same opinion that the use of textbooks filled with local culture makes learning more contextual and meaningful so that the learning process will be effective and enjoyable.

This study aims to 1) describe and explain whether or not there were differences in learning outcomes between students who took the pretest and students who did not take the pretest and 2) Describe and explain whether there were or were differences in learning outcomes between students who learned to use chemistry textbooks based on local Balinese culture and students who study using conventional textbooks.

Method

This type of research used quasi-experimental research with the Solomon four-group design. The research design is shown in Table 1.

Table 1. The Solomon four-group design experiment

Group	Pretest	Independent Variable	Posttest
E	Y ₁	X	Y ₂
C ₁	Y ₁	-	Y ₂
C ₂	-	X	Y ₂
C ₃	-	-	Y ₂

Description:

- E = xperimental group
- C₁ = ontrol group 1
- C₂ = Control group 2

- C₃ = Control group 3
- Y₁ = Initial observation
- Y₂ = Final observation
- X = Balinese Local Culture Based Electronic Chemistry Textbook

Based on Table 1, the experimental group in the study was given treatment in the form of pretest and electronic textbooks based on Balinese local culture, the control group was given treatment in the form of pretest and conventional textbooks, control group 2 was given treatment in the form of electronic textbooks based on Balinese local culture and without pretest, and the control group 4 was given treatment in the form of conventional textbooks and without a pretest. The research was conducted at SMAN 5 Denpasar in class XI MIPA as many as 242 people, using the cluster random sampling technique, it was obtained that class XI MIPA 1 became the experimental group, class XI MIPA 4 became the control group 1, class XI MIPA 2 became the control group 2, and class XI MIPA 3 became the control group 3.

This study was analyzed using descriptive analysis and two-way analysis of variance. Before testing the hypothesis in the form of a two-way analysis of variance and an independent sample t test, an assumption test is carried out in the form of a normality test using the Komogorov test and a homogeneity test of variance using Levene's Test of Equality of Error Variance statistics.

Result and Discussion

Descriptive Analysis

The average value of the chemistry learning outcomes of students who received the pretest was M = 64.2 with a moderate qualification and the standard deviation was SD = 18.4 and the average value of the chemistry learning outcomes of students who did not get the pretest was M = 65.1 with moderate qualifications and the standard deviation was SD = 14.5. The average value of the two groups is shown in Figure 1.

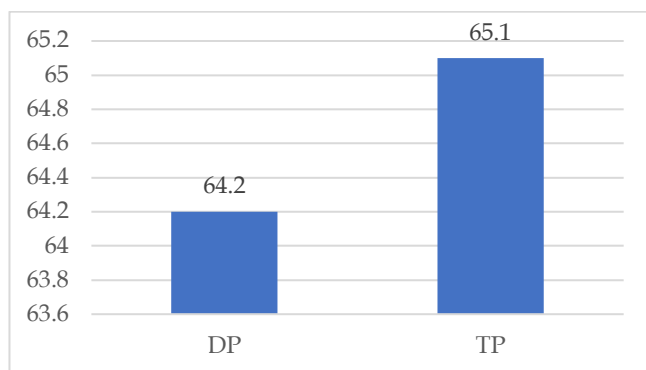


Figure 1. Histogram Comparison of the Average Scores of Student Learning Outcomes between Treatment Groups

Description:

- DP : With *Pretest*
- TP : Without *Pretest*

Based on Figure 1, in general it shows that the learning outcomes of students who get the pretest and do not get the pretest are in moderate qualifications. It can be seen from the average score in each group based on the pretest, there is no significant difference.

The average value of chemistry learning outcomes for students who study using electronic chemistry textbooks based on Balinese local culture is M = 73.8 with moderate qualifications and the standard deviation is SD = 10.5 and the average value of chemistry learning outcomes for students who learn using conventional textbooks is M = 55.3 low qualified and the standard deviation is SD = 16.4. The average value is shown in Figure 2.

Based on Figure 2, in general it shows that the learning outcomes of students who learn to use electronic chemistry textbooks based on Balinese local culture are in the moderate qualification with an average of 73.8 while students who learn to use conventional textbooks are in the low category with an average of 55.3. It can be seen from the average score in each group that the explicit learning outcomes of the group of students who studied using electronic chemistry textbooks based on local Balinese culture were higher than the group of students who studied with conventional textbooks.

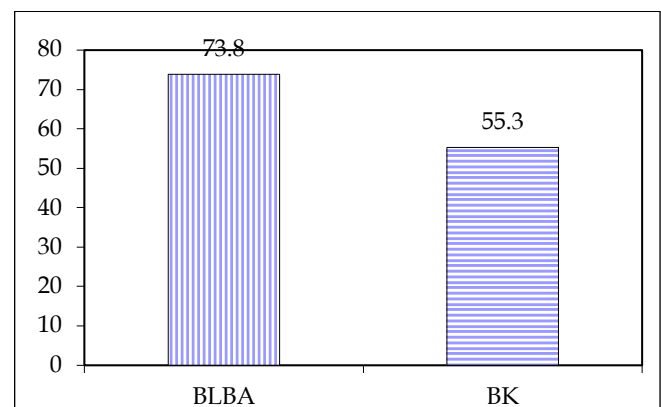


Figure 2. Histogram Comparison of the Average Scores of Student Learning Outcomes between Treatment Groups

Description:

- BLBA : Balinese local culture-based electronic chemistry textbook
- BK : Conventional textbooks

Assumption Test

The results of the normality test and homogeneity of variance are shown in Table 2 and Table 3, respectively

Table 2. Recapitulation of Normality Test Analysis Results

Units Analysis		Kolmogorov-Smirnov			Description
		Statistic	Df	P	
Pretest	Exp	0.140	36	0.820	Normal
	C1	0.148	35	0.520	Normal
	Exp	0.129	36	0.150	Normal
Posttest	C1	0.124	35	0.192	Normal
	C2	0.133	35	0.120	Normal
	C3	0.133	35	0.120	Normal

Based on the data in Table 2, the Kolmogorov-Smirnov significance value in the experimental group and the control group for the pretest and posttest of students is equally valuable above 0.05, so it can be concluded that the distribution of data on chemistry learning outcomes of student data has been normally distributed.

Table 3. Homogeneity of Variance of Chemistry Learning Outcomes Between Treatment Groups

Units Analysis		Levene Statistic	df ₁	df ₂	P
Posttest	DP and TP	3.866	1	139	0.051
	BLBA and BK	2.375	1	139	0.061

The significance value of Lavene Statistics both on the students' posttest results is greater than 0.05, namely 0.051 and 0.061 respectively. Thus, the variance of students' chemistry learning outcomes data is homogeneous.

Hypothesis Testing

Variance Analysis Test

The results of the analysis of variance test in this study will answer whether there are differences in learning outcomes between students given a pretest and without a pretest and answer whether there are differences in learning outcomes between students who study with local Balinese culture-based electronic textbooks and conventional textbooks. The results of the analysis of variance test are shown in Table 4.

Table 4. Summary of Two-Way Analysis of Variance (ANOVA) Results

Source	Mean Square	F	Sig.
Corrected Model	4,319.529	23.174	.000
Intercept	588,356.923	3.157E3	.000
TEXTBOOK	12,010.825	64.438	.000
PRETEST	41.303	.222	.639
TEXTBOOK* PRETEST	872.191		
Error		4.679	.032
Total	186.395		
Corrected Total			

Based on the summary of the results of the two-way analysis of variance, the results of the hypothesis testing can be formulated as follows.

First, based on the two-way analysis of variance (ANOVA) as presented in Table 4 it appears that the value of $F_{count} (F_{pretest}) = 0.222$ with a significance number of 0.639, because the significance number is greater than 0.05 it was decided that there was no difference in student learning outcomes between students who get the pretest with students who do not get the pretest.

Second, based on Table 4 it can be seen that the value of $F_{count} (F_{book}) = 64.438$ with a significance value of 0.0001. Because the significance number was less than 0.05, it was decided that there were differences in student learning outcomes between students who studied using electronic chemistry textbooks based on local Balinese culture and students who studied with conventional textbooks.

The Effect of Pretest on Chemistry Learning Outcomes

The results of this study indicate that the pretest has no effect on chemistry learning outcomes. The learning outcomes of the two groups that were given the pretest and those that were not given the pretest had relatively the same average score. This proves that there is no difference in learning outcomes given or not given a pretest. The research results obtained are supported by research conducted by Rivilla (2010) which states that there is no difference in learning outcomes between students who are given a pretest and students who are not given a pretest. The same results were found by Magdalena et al, (2021) who argued that not all pretest techniques were able to show success in increasing student understanding in class. It was still found that there was no increase in students' understanding after being given a pretest.

The research results obtained contradict the results of research conducted by Effendy (2016) who argues that there are differences in learning outcomes between students who learn by pretest and students who do not study by pretest. Students who study with the pretest have high learning outcomes compared to students who do not study with the pretest. Similar results were also found by Solihin et al, (2013) who argued that pretesting had an effect on learning outcomes. Students who are given a pretest have higher learning outcomes compared to students who are not given a pretest.

Pretest is defined as a measurement test to measure how far students understand or have skills regarding the material to be taught (Yusuf, 1985). The pretest is able to show the weaknesses of students so that the teacher can provide appropriate and appropriate treatment that is tailored to the skills and knowledge possessed by students (Solihin et al., 2013). Precisely in this study the pretest was not able to improve learning outcomes and was no different from students who were not given a pretest related to learning outcomes.

Students are often not serious and underestimate the pretest, students think that the pretest is not assessed by the teacher and only fills in as little as possible, this actually results in students not evaluating themselves to see the weaknesses they have through the pretest (Berry, 2008). Kelly (2019) argues that students are under a lot of pressure because of the pretest, students have to spend more time than just taking the test at the end. This actually results in fatigue and anxiety of students so that students will be difficult to be motivated. This is why there is no difference in learning outcomes between students who are given a pretest and students who are not given a pretest.

The Effect of Balinese Local Culture-Based Electronic Chemistry Textbooks on Chemistry Learning Outcomes

The results of this study have proven that there are differences in learning outcomes between students who study with Balinese local culture-based electronic chemistry textbooks and students who study with conventional textbooks. Students who study with Balinese local culture-based electronic chemistry textbooks are superior to students who study with conventional textbooks in terms of achieving student learning outcomes. This is supported by research conducted by Annur et al (2018) stating that teaching materials based on local wisdom can increase student independence which will lead to increased student learning outcomes. The same thing was conveyed by Misbah et al (2020) stating that the use of textbooks based on local wisdom can improve student learning outcomes. This is because electronic textbooks based on local wisdom present facts that are close to students' daily activities. remember and students more quickly understand the material presented. The research above is supported by research conducted by Hartini et al (2018) which states that electronic textbooks based on local wisdom are effective in efforts to improve learning outcomes.

Balinese local culture-based electronic chemistry textbooks are computer-based teaching materials that can attract students' interest in learning. In which there are many features such as animation, audio, and video which make learning more interactive and the cultural values of the local community are included in the learning implementation. Mustika, et al (2021) argues that the use of local wisdom-based electronic textbooks is still rarely applied in schools, most of them still use printed textbooks in learning.

The use of electronic chemistry textbooks based on Balinese local culture is very helpful in the learning process, especially in terms of improving learning outcomes because: (Mustika et al., 2021) 1). Contains local wisdom material that can make it easy for students to understand material related to everyday life, 2) use of visuals related to everyday life so that students are more

interested in learning the material, 3) students are able to study textbooks without time limits and place, and 4) students are able to learn independently without depending on the teacher.

Electronic chemistry textbooks based on local Balinese culture are useful for 1) making it easier for students to learn because electronic textbooks can be accessed on other computers or PCs, 2) students are more interested because electronic textbooks are facilitated by pictures and animations related to real life, and 3) electronic textbooks are more interactive because students can carry out self-evaluations of a competency while at the same time being able to follow up after knowing the results of evaluations carried out independently (Partono, 2019). Seeing some of the advantages of local Balinese culture-based electronic chemistry textbooks in learning, it is not wrong if Balinese local culture-based electronic chemistry textbooks are able to improve student learning outcomes.

Conclusion

Based on the results of the data analysis as presented, it can be concluded that 1) there is no difference in learning outcomes between students who are given a pretest and students who are not given a pretest. And 2) There are differences in learning outcomes between students who study using electronic chemistry textbooks based on Balinese local culture and students who study using conventional textbooks. The learning outcomes of students who study using electronic chemistry textbooks based on Balinese local culture are higher than students who study using conventional textbooks.

The recommendation given to future researchers is to re-examine the application of Balinese local culture-based electronic chemistry textbooks with differences in dependent variables such as cultural literacy, critical thinking skills, and others.

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