

E-Book Based on Local Wisdom to Improve Students' Numeracy Skill: Is It Effective?

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ABSTRACT

21st-century technology in education makes it straightforward for teachers to support students for independent learning. Technology facilitates students to access information, create innovations, and increase student interest in learning. Previous studies proffered that better learning outcomes were achieved by students who used e-books than those with regular printed books. This quasi-experimental study tested the effectiveness of e-book based on local wisdom in improving students' numeracy skill. This study used a non-equivalent groups design. The sample was seventh-grade secondary school students. An experiment class comprised 30 students and a control class involved 32 students. The experimental class used the local wisdom-based e-book in learning mathematics. Meanwhile, the control class did not use the local wisdom-based e-book in learning mathematics. The two classes were taught the same lesson of social arithmetic. The sample selection used random cluster sampling. The employed instrument was a numeracy test for pretest and posttest. It was validated, tried out, and analyzed to determine the feasibility before the test. This study shows that the students' mean scores of the experimental class are greater than the control class. It was deduced that the use of e-book based on local wisdom is effective since it could improve students' numeracy skill.

Keywords: *E-book, Effective, Learning media, Numeracy skill.*

1. INTRODUCTION

The development of information technology has significant impacts on various aspects of life such as education, science, information flow, and communication [1]. The use of technology in education in the 21st century makes it straightforward for teachers to support students to learn more independently [2]. Technology plays an essential role in facilitating students to access information, create innovations, and increase student interest in students' learning. Student enthusiasm in learning is an internal factor affecting learning achievement concerning individual desires or needs [3]. Individuals with a passionate interest in learning will have strong motivation [4]. It makes students more motivated in learning [3]. An example of a means that can increase students' motivation is learning media [4]. The learning media is a means of intermediary in the learning process [5]. It helps students understand the lesson [6]. Teachers are required to maximize the use

of teaching media for developing learning concepts [7].

The use of electronic media serves as an effective teaching aid compared to non-electronic media [8]. In recent years, the development of electronic book (e-book) started a revolution in education [9]. E-books are interactive media to integrate audio, video, animation, and simulations enabling data presented to be more diverse than printed books [10]. E-books as an essential part of academic activities can be a solution in overcoming educational challenges [11]. The implementation of e-book in learning in various circumstances for their advantages and usefulness merits high-school and college students [12], including supporting learning, providing information, being a resource for students and researchers, and potentially decreasing the physical library use [13]. Previous studies stated that students who use e-books were better than those who only used PowerPoint or other aids [14].

Learning achievement affects 21st-century basic literacy skills [15]. One of the basic literacy skills is numeracy skill. Numeracy skill is a term to identify knowledge, dispositions, abilities, and practices that require mathematics and statistics to manage and solve problems in various life situations [16]. Numeracy is not only related to mathematical skills but also statistical skills [17]. Numerical skills must be equipped from an early age since the skill is required in the 21st century [18]. In this research, numeracy is defined as analyzing, applying, and interpreting quantitative data in daily life problems requiring principal mathematical skills.

Studies related to numerical literacy skills are closely related to the culture of a society which is analyzed specifically in ethnomathematics-based research [19]. The implementation of local culture in learning has a constructive influence on responsible learning behavior [20]. This study tested the effectiveness of e-book based on local wisdom in improving students' numeracy skill. The e-book develops mathematical learning media that reinforce basic literacy, numeracy skill in social arithmetic material based on local wisdom. This research focused on Cirebon local wisdom since this study was conducted in Cirebon. The e-book was designed based on Cirebon students' characteristics. It provides the feature of interactive exercises problems. The feature aims to find out the mastery of students' competency towards the material that has been studied. The exercise problems in the e-book are designed like the Minimum Competency Assessment (AKM).

2. METHOD

This research is quasi-experimental. Quasi-experiment is a study that provides natural treatment to determine the effect of treatment [21]. Previous study describes the importance of quasi-experimental research in the field of education [22]. This study used a non-equivalent groups design since this study used a pretest and posttest in the experimental and control classes. The experimental class used local wisdom-based e-book in learning mathematics. Meanwhile, the control class did not use local wisdom-based e-book in learning mathematics. The two classes were taught the same lesson of social arithmetic. The sample selection in this study used random cluster sampling since it was more practical than other sampling techniques such as random sampling and stratified sampling [23]. The sample in this study was seventh-grade secondary school students. The experiment class comprised 30 students and the control class involved 32 students. The total experiment and control class is 62 students. Table 1 summarizes the sample of demographic information in this study.

Table 1. The sample of demographic information

Group	Sample	Learning Media
Experiment	30	E-book based on local wisdom
Control	32	Non-E-book based on local wisdom

The instrument employed was a numeracy test for pretest and posttest. The numeracy skill indicators used in this study were based on the Numerical Literacy Enrichment Guidebook from the Ministry of Education and Culture [24]. There are three indicators 1) using varied numbers and symbols associated with principal mathematics to answer practical problems in several settings of everyday life, 2) investigating data presented in graphs, tables, and charts; and 3) deciphering the analysis results to augur and make conclusions. Three experts validated the test instrument as a validator. After the instrument was declared valid, the reliability test using Cronbach's Alpha was carried out since the test used was in an essay form.

Before the treatment in the experimental class using a local wisdom-based e-book, the students of the experimental and control classes were given a pretest. The pretest results were tested statistically to determine whether the experimental and control classes were equal. Duration of an intervention using the e-book in the experimental class was four weeks after the students were given the pretest. The learning treatment was carried out in four meetings in the experimental class. After it was completed, the students of those classes were given a posttest. The posttest results from both classes were tested statistically to test the effectiveness of the e-book. Statistical and reliability calculations are computed using SPSS 25.

3. RESULTS AND DISCUSSION

Table 2. Difficulty level and discriminating power index of pretest

Item Number (N)	N1	N2	N3	N4	N5
Difficulty level	0.687	0.550	0.500	0.450	0.312
Discriminating power index	0.726	0.660	0.609	0.834	0.608

The validation and trial results stated that the local wisdom-based e-book was valid and practical to be used. It had gone through validation by media experts and lesson experts to validate the validity of the e-book. It had also been tested on teachers and students to assess the practicality of the e-book.

Table 2 shows that the five pretest items of the numeracy skill test had discriminating power index and difficulty level with good categories. The reliability coefficient of the numeracy pretest was 0.718. Thus, the pretest instrument was reliable because $r_{11} \geq 0.7$.

Table 3. Difficulty level and discriminating power index of posttest

Item Number (N)	N1	N2	N3	N4	N5
Difficulty level	0.487	0.675	0.650	0.350	0.650
Discriminating power index	0.509	0.638	0.682	0.836	0.728

Table 3 shows that the five posttest items of the numeracy skill test have discriminating power index and a difficulty level with good categories. The reliability coefficient of the numeracy posttest was 0.703. Thus, the posttest instrument was reliable because $r_{11} \geq 0.7$.

Table 4. Mean score

Group	Mean Score	
	Pretest	Post-test
Experiment	52.833	69.750
Control	49.765	60.000

Table 4 shows the mean score of the experimental class is greater than the control class, ($16.917 > 10.235$). It indicates descriptively that there is a difference between the mean of the given pretest and posttest. It shows differences in numeracy skills between students who used a local wisdom-based e-book and students who did not use a local wisdom-based e-book.

Table 5. Normality test for pretest data

Group	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Exp_Pre	0.143	30	0.121
Con_Pre	0.163	32	0.030

A normality test is used to determine whether the data is normally distributed. In this study, the normality test was carried out using the Kolmogorov-Smirnov for the pretest of the experimental class and the control class. The normality test using Kolmogorov-Smirnov was used since the number of samples from this study was more than 50 [25]. A data is normally distributed if the significance value is more than $\alpha = 0.05$.

Table 5 presents the significant score of the pretest in the experimental class was greater than α of $\text{Sig} = 0.121 > \alpha = 0.05$. The data is declared to be a normal

distribution. Meanwhile, the pretest significance value of the control class is less than α of $\text{Sig} = 0.030 < \alpha = 0.05$. The data is not distributed normally. The data should be made normally distributed. The transformation of the histogram is moderate positive skewness. Thus, the form of data transformation used the square root [26]. Table 6 is a summary of the normality test that has been transformed using the square root.

Table 6. Normality test for transformed pretest data

Group	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Exp_Pre	0.150	30	0.085
Con_Pre	0.152	32	0.060

Table 6 shows the significant value of the pretest of the experimental and control classes. They are more significant than α of $\text{Sig} = 0.085 > \alpha = 0.05$ and $\text{Sig} = 0.060 > \alpha = 0.05$. Therefore, the pretest of the experimental and control classes is normally distributed. After the normality test, the data were tested for homogeneity. The homogeneity test in this study employed Levene's test. It compares the variance of the experimental and control classes that have been transformed into normally distributed data. Table 7 displays the homogeneity test results.

Table 7. Homogeneity test for pretest data

Group	Assumption	Lavene's Test	
		F	Sig.
Exp_Pre	Equal variances assumed	1.386	0.244
Con_Pre	Equal variances not assumed		

Table 7 presents that the significance value is more significant than α of $\text{Sig} = 0.244 > \alpha = 0.05$. It can be concluded that the variances of the pretest of both classes are homogeneous.

The t-test was carried out after the normality and homogeneity were fulfilled. It was to test the class balance. It was employed to test whether the experimental and control classes were in balance before receiving treatment. The data used is the mean score of the pretest of numeracy skill. Table 8 shows the t-test for pretest data.

Table 8. T-test for pretest data

Group	t-test		
	t	df	Sig. (2 tailed)
Experiment	1.384	60	0.172
Control	1.389	59.832	0.170

Table 8 shows Sig. (2 tailed) > 0.05. The conclusion is that both experimental and control classes have a balanced population. It shows that both classes have the same initial ability.

The effectivity of e-book was tested by the t-test. It was carried out after the normality and homogeneity were fulfilled. The data used is the mean score of the posttest of numeracy skill.

Table 9. Normality test for posttest data

	Group	Kolmogorov-Smirnov		
		Statistic	Df	Sig.
Score	Exp_Post	0.179	30	0.015
	Con_Post	0.102	32	0.200

Table 9 exposes the significant score of the posttest of the experimental class is less than $Sig = 0.015 < \alpha = 0.05$. The data is not normally distributed. Meanwhile, the significance value of the control class posttest is greater than α of $Sig = 0.200 > \alpha = 0.05$. Thus, the data is distributed normally. The transformation of the histogram graph is substantial positive skewness. So, the form of data transformation uses logarithms [26]. Table 10 summarizes the normality test of the data that has been transformed using the logarithms.

Table 10. Normality test for transformed posttest data

	Group	Kolmogorov-Smirnov		
		Statistic	Df	Sig.
Score	Exp_Post	0.156	30	0.059
	Con_Post	0.126	32	0.200

Table 10 shows the significant score of the posttest in the experimental and control classes which are greater than α of $Sig = 0.059 > \alpha = 0.05$ and $Sig = 0.200 > \alpha = 0.05$. The posttest data for the experimental and control classes are normally distributed.

After the normality test, the data were tested for homogeneity. Table 11 depicts the results of the homogeneity test.

Table 11. Homogeneity test for posttest data

		Lavene's Test	
		F	Sig.
Score	Equal variances assumed	1.197	0.278
	Equal variances not assumed		

Table 11 shows that the significance value is more significant than α of $Sig = 0.278 > \alpha = 0.05$. Therefore, it can be summed up that both classes' posttest data variances are homogeneous.

After the normality and homogeneity were fulfilled, the t-test was carried out. It was to test the effectivity of e-book. The data used is the mean score of the posttest of numeracy skill. Table 12 shows the t-test for posttest data.

Table 12. T-test for posttest data

Group	t-test		
	t	df	Sig. (2 tailed)
Experiment	3.499	60	0.001
Control	3.530	57.488	0.001

Table 12 exhibits that the significance value (two-tailed) in the experimental and control classes are 0.001. Then the significance value (one-tailed) is 0.0005. The significance value is less than α of Sig. (one-tailed) < 0.05. It presents that the mean score of the numeracy skill of the experimental class is greater than the mean score of the control class. It can be decided that the use of e-book based on local wisdom is effective since it could improve students' numeracy skill.

The research results are compatible with previous researches that learning using e-books is more effective than learning that does not use e-books [9], [14]. The use of learning media based on local culture also improves student achievement [27]. Learning that integrates local culture is effective and can be a learning innovation to enhance literacy skills [28]. One of the basic literacy skills that must be mastered is numeracy skill. Applying numbers, data, and mathematical symbols is related to numeracy skill [16]. The skill can be used to help solve the problems of human life [18]. Numeracy skill plays an essential role in the students' cognitive [16]. Previous study stated that there are three critical aspects of creating a supportive environment for numeracy skill. They are 1) the demands for numeracy skill, 2) opportunities to apply numeracy skill, and 3) the support and resources offered as well as solutions to the barriers that hinder numeracy skill [29].

4. CONCLUSION

This study shows a difference in numeracy skill between the experimental and control classes. It presents that the students' mean scores of the experimental class are greater than the control class. It was deduced that the use of e-book based on local wisdom is effective since it could improve students'

numeracy skill. Mathematics teachers need to apply the e-book in the classroom to enhance numeracy skill.

This study tested the effectiveness of e-book based on local wisdom in improving students' numeracy skill. The research results can be applied in mathematics learning to enhance numeracy skill. This study utilized an e-book based on Cirebon local wisdom using numeracy skill indicator. Further research is needed to develop, apply, and investigate other media by implementing numeracy skill indicators and local wisdom values in mathematics learning to all levels of education with different mathematics material to improve students' numeracy.

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