

The Effect of mCSCL to Improve Student Learning Outcomes

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Abstract

Mobile Computer-Supported Collaborative Learning (mCSCL) is an alternative that can be used in mobile learning. In this study, mCSCL consists of three steps. First, create groups of three to five students. Second, make learning activities starting from understanding the problem to discussion. Third, facilitating group discussions starting from one-to-one discussions to dissemination. The goal of this study was to see how mCSCL affected student learning results. The participants in this study were students from Duta Bangsa University's Informatics Engineering Study Program, which comprised of three classes totaling 90 individuals. This research is a quasi-experimental study with a one-way analysis of variance. The independent variables in this study were mCSCL, mobile learning, and e-learning based on Moodle. The results show that there are differences in learning outcomes in the number of material from the three learning models carried out. The mCSCL model is more effective than using the Mobile Learning model. Furthermore, the mobile learning model is more effective than e-learning Moodle

Keywords: *mCSCL, Mobile Learning, Student Learning Outcome*

Introduction

Science management is one of the subjects taught in the 7th semester of the Informatics Engineering study program at Duta Bangsa University. This course is often also known as linear programming. The current state of the COVID-19 pandemic does not allow face-to-face learning. Online learning innovations began to emerge, starting from the use of the Zoom, WhatsApps, and Google Classroom applications. Online learning also maximizes the function of Smartphones, which were originally only used for communicating and playing, now they are used for learning. Advances in Information and Communication Technology in the field of education on the use of learning media are marked by the emergence of the concept of Electronic Learning (e-learning) (Hidayat & Sudibyo, 2018). Smartphones with the Android operating system (OS) are now owned by many students. On the Android OS, it is mostly used for games, Facebook, Twitter, WhatsApp, BBM, but with the pandemic conditions that do not allow face-to-face learning in class, it provides opportunities for lecturers to implement mobile-based learning or mobile learning (Siti Suprihatiningsih et al., 2020).

The development of technology makes the need for IT-based learning unavoidable. This kind of development is known as e-learning. One type of e-learning is mobile-based learning or commonly called mobile learning. Mobile learning is one of the uses of information and communication technology for interactive learning media in the learning process so that the student learning process can be interesting and not limited by space and time (Nurcahyo et al., 2020). In addition, most of the existing content is still entertainment and has not been widely used for learning. Mobile learning in mathematics provides various advantages,

including the ability to operate anywhere and at any time, increased student motivation, and improved learning based on student needs (Rusdi, 2021).

The process of learning mathematics has been using conventional learning models that require face-to-face in class. Lecturers teach using the teacher-centered learning method where the role of the lecturer is very dominant during learning. This causes students to only absorb information, memorize, and take notes from the explanation of the material given by the lecturer. Students are not required to understand the material, express ideas, and solve mathematical problems. The very dominant role of lecturers causes students to be less independent (Adi Nurcahyo & Sudibyo, 2020).

The development of mobile learning media carried out by previous developers was online and offline. The development of online mobile learning requires an internet network connection (data package) in its use, while offline mobile learning is an application that is installed on a mobile which can then be used as a learning resource without requiring an internet network connection (data package). Online and offline mobile learning media have their respective advantages and disadvantages. By using online mobile learning, students can access learning anytime and anywhere and can communicate with instructors or educators, but the drawback is that it requires an internet network connection (data packets) which can increase the cost of learning (Zaitun et al., 2021).

Mobile Computer-Supported Collaborative Learning (mCSCL) is an alternative that can be used in mobile learning (Zhan et al., 2015). The mCSCL requires supporting software to build a dynamic collaborative learning environment. Much network-based learning software can be used to assist the collaborative learning process, although teachers still have to develop and design relevant pedagogical aspects (Pratama et al., 2012).

In this study, mCSCL consists of three steps. First, create groups of three to five students. Second, make learning activities starting from understanding the problem to discussion. Third, facilitating group discussions starting from one-to-one discussions to dissemination. Some related studies are as follows. Research explains that mobile learning can improve learning outcomes in terms of the ability to work together (Etcuban & Pantinople, 2018). Furthermore, research conducted by Eka Budhi explains that mCSCL can improve problem-solving abilities and improve learning outcomes (Santosa et al., 2020). So the purpose of this study is whether there is an effect of using mCSCL to increase the effectiveness of learning.

Method

This study is a quasi-experimental design with a one-way analysis of variance. The independent variables in this study were mCSCL, mobile learning, and e-learning based on Moodle. The dependent variable in this study is student achievement on the simplex method material. This study involved three groups, namely the first group was taught using mCSCL, the second group was taught using mobile learning and the third group was taught using Moodle-based e-learning. The participants in this study were students from Duta Bangsa University's Informatics Engineering Study Program, which comprised of three classes totaling 90 individuals. On the Simplex Method material, this study was conducted in the odd semester of the 2020/2021 school year. The research was place over the course of five meetings. The identical subject is taught to each group.

The instrument in this research is a test instrument. The test instrument is used to measure student learning achievement. The test instrument used was an essay test consisting of 5 questions given to students. The data collection of student achievement data is carried out using the test instrument given at the end of the simplex learning material. The data obtained in the form of student test scores will then be analyzed.

In this study, the one-way ANOVA test was utilized to analyze the data. The normality and homogeneity tests were utilized as part of the preliminary investigation. The Kolmogorov Smirnov test and the Levene test were employed to determine normality and homogeneity, respectively. IBM SPSS Statistic was used to analyze all of the data.

Results and Discussion

Quasi-experiments were carried out by giving different learning models to three classes. After being given treatment, each class was given a learning outcome test which was used to obtain test data on learning outcomes. Table 1 shows the findings of the descriptive analysis based on the learning outcomes exam administered.

Table 1. Statistical Descriptive Analysis

Model	Mean	Std. Deviation	N
Elearning Moodle	49,5	8,411	30
Mobile Learning	58,63	7,122	30
mCSCL	74,57	8,402	30

After knowing the results of the descriptive analysis in the form of the average value and standard deviation of each class, normality and homogeneity will be sought as prerequisites for the analysis before the analysis of variance is carried out. The results of the normality and homogeneity tests are shown in Table 2 and Table 3.

Table 2. Normality test

Shapiro-Wilk			
Model	Statistics	df	Sig.
Elearning Moodle	0,959	30	0,300
Mobile Learning	0,941	30	0,100
mCSCL	0,971	30	0,565

From Table 2 it can be concluded that the three models are normally distributed. This indicates that each learning model has a significance value of more than 5%, so H_0 is accepted, which means that the sample obtained comes from a population with a normal distribution.

Table 3. Test of Homogeneity of Variances

Levene Statistics	df1	df2	Sig.
0,386	2	87	0,681

In table 3, the significance value is $0,681 > 0,05$, which means the variance is homogeneous. So it can be concluded that the sample data obtained has a homogeneous variance. Therefore, a one-way analysis of variance analysis can be carried out carefully using a significance level with an alpha of 5% which is listed in table 4.

Table 4. One Way ANOVA Test

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	9656,267	2	4828,133	75,415	0,000
Within Groups	5569,833	87	64,021		
Total	15226,1	89			

Based on the output in table 4, the value of Sig = 0.000 < 0.05 can be concluded so that it can be concluded that H_0 is rejected. Apart from the Sig value, it can also be seen from the F value in the column F table. From the table it is obtained that $F_{\text{count}} = 43.797 > F_{\text{table}} = 3.101$ so that H_0 is rejected. So there are differences in learning outcomes in the number of material from the three learning models carried out.

Furthermore, to see the difference in learning outcomes between learning models, it can be known by doing the Scheffe test as a test after analyzing variance. Scheffe test data are presented in Table 5.

Table 5. Scheffe Test

		Mean Difference	Sig.
Elearning Moodle	Mobile Learning	-9,133	0,000
	mCSCL	-25,067	0,000
Mobile Learning	Elearning Moodle	9,133	0,000
	mCSCL	-15,933	0,000
mCSCL	Elearning Moodle	25,067	0,000
	Mobile Learning	15,933	0,000

From the Scheffe Advanced Test, it can be concluded that the Elearning Moodle, Mobile Learning and mCSCL models have a probability value of Sig. $0.00 < 0.05$ which means there is a difference between Elearning Moodle, Mobile Learning and mCSCL. By looking at the mean difference between Elearning Moodle, Mobile Learning and mCSCL, it can be observed that using the mCSCL model is more effective than using the Mobile Learning model. Furthermore, the mobile learning model is more effective than e-learning Moodle. This is in line with research conducted by (Santosa et al., 2020), who explained that mCSCL is the most effective model. In addition, according to study, mobile learning is more effective than e-learning. E-learning for learning is currently quite boring because it has been more than a year that online learning has been carried out.

During the pandemic, modern interactive media is likely to improve student motivation to learn. Mobile learning is one of the options available today, and it has proven to be successful (Siti Suprihatiningsih et al., 2020). It is expected that teachers/lecturers will use alternative learning media in this study, mCSCL or mobile learning. Because the research's subject (University Duta Bangsa students) has been shown to increase student learning results.

Conclusion

The results show that there are differences in learning outcomes in the number of material from the three learning models carried out. The mCSCL model is more effective than using the Mobile Learning model. Furthermore, the mobile learning model is more effective than e-learning Moodle. During the pandemic, modern interactive media is likely to improve student motivation to learn. Mobile learning is one of the options available today, and it has proven to be successful. It is expected that teachers/lecturers will use alternative learning media in this study, mCSCL or mobile learning. Because the research's subject (University Duta Bangsa students) has been shown to increase student learning results

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