



The Effect of CLWD-Flipped Classroom on Student Learning Outcomes: A Quasi-Experimental Study

Aminuddin Prahatama Putra¹, Nurul Hidayati Utami¹, Kaspul¹

¹ Department of Biology Education, Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

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Corresponding Author:

Aminuddin Prahatama Putra

aminuddinpatra@ulm.ac.id

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Abstract: Most teachers agree to implement LMS for learning Biology, but some of them still have difficulties. Most of them thought that LMS helped reduce learning loss after pandemic covid-19. One of them is using a Learning Management system (LMS). CLDW (Culture Literacy Digital Wetland) is one of the innovations as a learning for students. CLDW helps students and teachers improve their activities during online learning, such as discussions. A flipped classroom with a learning management system Systems-based flipped classrooms produce positive learning. CLDW-Flipped Classroom was designed in two phases, namely: first phase; out-of-class was marked by students using CLDW as teaching materials, and second phase; in-class was marked by conducting face-to-face learning in class. The research used quasi-experimental research with a non-equivalent control group pretest-posttest design. The population of all students in 3 schools then consists of students in SMAN 4, SMAN 7, and MAN 2. The students are class X high school. Sampling was done by selecting two classes that were used as the control class and the experimental class. It is concluded that there is a significant effect on learning outcomes from integrating CLDW in the flipped classroom for learning biology. Overall, using CLDW-flipped classrooms has an effect on improving learning outcome. Flipped classrooms create effective classrooms through interaction with learners. Moving some aspects of the learning process to create extra time for active learning activities through teacher-led class discussions.

Keywords: CLDW- flipped Classroom; Environment Topic; Learning Outcomes

Introduction

One of the post-covid learning recovery steps is through the use of technology. One of them is using a Learning Management System (LMS) such as Google Classroom, Schoology, or Edmodo. If teacher and students are supporting an online classroom to collaborate in learning management system, then it would help to organize and provide for a wide range of activities (Aldiab et al., 2019; Bradley, 2020). An LMS be able to drawback discussion through online learning, but it will be a course center rather than a student center (Tseng, 2020).

Based on the Focus Group Discussion, most teachers agree to implement LMS for learning Biology,

but some of them still have difficulties. Most of them thought that LMS helped reduce learning loss during the COVID-19 outbreak, but there are several concerns with LMS, such as (1) teachers must use online teaching materials rather than books, so students can learn anytime. (2) The teacher must design any activities like quizzes, chats, and forums for controlling the situation. (3) The teacher must prepare many specific topics. (4) Teachers must increase technological literacy by using a variety of ICT. Some research found that LMS with the SNS improved pedagogical, social, and cognitive skills (Hidalgo et al., 2019), and then LMS integrated flipped classrooms, improving students' metacognitive skills (Nurdiyanti & Wajdi, 2023). And there was a positive

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influence on the use of blended learning like Edmodo (Budyaningsih & Fikroh, 2023).

During the pandemic, less than 60% of students came from less-educated homes, confirming worries about the uneven toll on children and families (Engzell et al., 2021), and after the recovery era, learning loss was a concern for teachers. Learning loss is the decline of both knowledge and skills academically as a result of learning at home that takes place within a certain time frame. This is largely due to the disruption of the formal education process (Farrini et al., 2022). One of the innovations in LMS was implementing CLDW.

CLDW (Culture Literacy Digital Wetland) is one of the innovations as a learning tool during the pandemic. CLDW is a learning management system equipped with various biology content related to wetlands phenomena. Then CLDW will include modules, quizzes, and videos to improve learning in senior high school. Some research found that digital books integrated by CLDW improve student generic skills and have positive responses for students and teachers (Ayuningtyas et al., 2022), CLDW helps students and teachers improve their activities during online learning, such as discussions (Safitri et al., 2022). Also, there is a significant difference in learning outcomes between the experimental class using CLDW and the control class (Putra et al., 2021).

CLDW is a learning management system that allows students to open documents from various devices without location or time limitations. CLDW development is based on accessible, easy-to-use, collaborative educational content and training tools (Putra et al., 2021, 2022). LMS also assists the Zoom meeting application as a video recording tool and a virtual face-to-face communication tool (Syafei & Mawardi, 2022). Then LMS must facilitate all aspects of learning, such as knowledge, attitudes, skills, and habits (Hikmawati et al., 2022). The LMS is part of e-learning. E-learning is learning that uses the services of electronic devices, especially computer networks, and then uses hardware such as mobile devices and computers, as well as different software, such as the LMS Moodle (Daru, 2013; Ørngreen et al., 2021). E-learning makes it easy to collect assignments according to each student's ability (Fadhilah, 2021). CLDW is integrated into the flipped classroom to carry out online learning at home and face-to-face learning.

A flipped classroom is an approach to minimizing the amount of direct instruction by utilizing technology to support learning materials for students that can be accessed online or offline. This instructional has different ways. For the flipped classroom approach, students study the instructional videos outside of the classroom and do assignments (Suanse & Yuenyong, 2021). Students get cognitive learning outcomes, especially for high school students during a pandemic

(Putra & Utami, 2022; Putri et al., 2022) by it reflected to do exercises and discussions. Meanwhile flipped classroom helps improving student motivation (Ndoa & Jumadi, 2022). Homework activities in the form of practice questions, which are usually done outside the classroom (at home), are replaced by watching videos to understand the material for the upcoming meeting (Hasanah et al., 2021).

Flipped Classroom combines offline learning with online learning and has a significant effect on improving critical thinking (Fadli et al., 2022). The effectiveness of online learning can be increased by using it together with face-to-face learning (Engzell et al., 2021; Suryawan et al., 2021; Zagouras et al., 2022) In addition, flipped classrooms promote student-centered learning so that students are responsible for their learning. A flipped classroom with a learning management system Systems-based flipped classrooms produce positive learning behavior (Aidoo et al., 2022). Other facts show that the combined flipped classroom with the Google Classroom is effective in increasing students' learning motivation and learning outcomes (Huda et al., 2023; Putra & Utami, 2022; Putri et al., 2022; Suryawan et al., 2021).

The hypothesis in this study is that there are differences in the cognitive learning outcomes of students in environmental material using CLDW-flipped classrooms on the concept of environment. Based on the background, this study aims to examine the effect of CLDW integrated into the flipped classroom on increasing cognitive learning outcomes during the post-pandemic era.

Method

This research used quasi-experimental research with a non-equivalent control group pretest-posttest design. It means that a treatment group that is given a pretest receives a treatment and then is given a posttest, but at the same time there is a non-equivalent control group that is given a pretest, does not receive the treatment, and then is given a posttest. The design used in this study is the pretest-posttest control group design, namely in Table 1.

Table 1. Non-equivalent Control Group Pretest-Posttest Design

Treatment	Pretest	X	Posttest
Experiment	O ₁	X ₁	O ₂
Control	O ₃	X ₂	O ₄

Description:

- O₁ = pretest results in the experimental class
- O₂ = posttest results in the experimental class
- X₁ = Treatment using CLDW-Flipped Classroom
- X₂ = using flipped classroom
- O₃ = pretest results in the control class
- O₄ = posttest results in the control class

The population of all students in 3 schools then consists of students in SMAN 4, SMAN 7, and MAN 2 Banjarmasin. Those 3 schools got an A for accreditation, which means they have met a predetermined quality standard. For sampling, this study used the purposive sampling technique. This sampling in the study was of 198 students in three schools. The students are class X high school students in the 2022–2023 academic year. Every school selects two classes as the control class and the experimental class.

Learning outcome instruments were based on cognitive tests to assess students' abilities after participating in a learning activity, so this instrument is valid for measuring student achievement. This implementation of the flipped classroom was supported by worksheets, modules, and a short video developed by the teachers.

The implementation of the CLDW-Flipped Classroom was designed in two phases, namely: (1) the out-of-class phase was marked by students using CLDW as teaching materials, and (2) the in-class phase was marked by conducting face-to-face learning in class (Putra & Utami, 2022). The experimental class using a flipped classroom by utilizing CLDW as a learning

management system for uploading content. The activities are listed in Table 2.

Table 2. Teacher Activities in two different classes

Phase	Control class	Experimental class
Out class	Carry out a pretest for students Share video tutorials, worksheet and modul supported by WhatsApp group.	Carry out a pretest for students Share video worksheet, modul learning supported such as modules uploaded to CLDW
In class	Carry out face-to-face activities like like discussions and group work.	Carry out face-to-face activities like discussions and group work.

Adapted from Putra & Utami (2022)

The view of the teacher account on CLDW is shown in Figure 1.

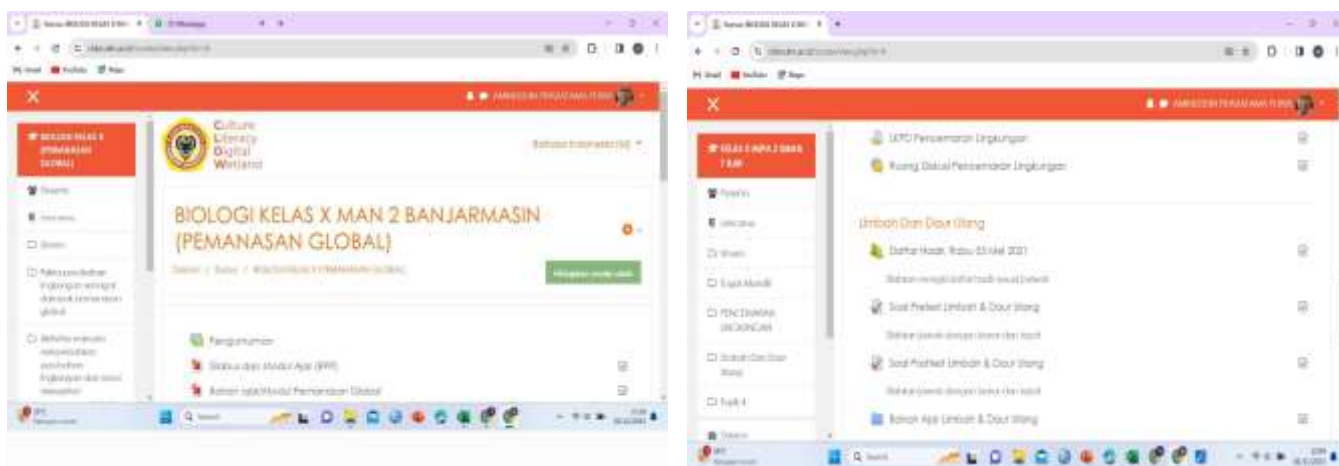


Figure 1. View of CLDW

Student learning outcomes is using descriptive statistics and inferential statistics. The descriptive statistics describe the results of cognitive test in Environment material. To take hypothesis, this data set tested by Wilcoxon signed rank test. It was non parametric statistic used to compare population based on two matched samples. This test using the Statistical Package for Social Sciences (SPSS 24.0 Program). Meanwhile, testing the hypothesis in this study was used to explain differences in learning outcomes between the experimental class and the control class.

Result and Discussion

Before examining the effect of CLDW integrated to flipped classroom on increasing cognitive learning outcomes, a prerequisite test was carried out as depicted in Table 3 and Table 4.

Table 3. Normality Test

Data	Statistics	N	Sig	Conclusion
Pretest	0.107	198	0.00	Unusual
Posttest	0.115	198	0.00	Unusual

Based on the prerequisite test using Kolmogorov Smirnov, it is known that sig value is 0.000, so the data presented is unusual.

Table 4. Homogeneity test

Class	N	Levene statistics	Sig	Conclusion
Control	100	28.880	0.000	Not normal
Experiment	98			

Based on homogeneity test using the Levene statistic shown in Table 4, the data is not homogeneous. Those data shown that hypothesis testing used a non-parametric test that is Wilcoxon test. The results can be seen in Table 5.

Table 5. Wilcoxon Test

Z	Asymp. Sig. (2-tailed)	Conclusion
-9.906 ^b	0.000	Significant difference in learning outcomes.

Based on Table 5, it is known that the hypothesis is accepted. It means that there is a significant difference in learning outcomes for those who implement CLDW-Flipped Classroom. Learning outcomes are the results achieved by someone after experiencing the learning process and evaluating it (Syamsinar et al., 2023). In addition to describing the difference between pretest and posttest, both classes can be seen in Table 6.

Table 6. Mean Ranks

		N	Mean Rank
Post - pre	Negative ranks	15 ^a	67.40
	Positive Rank	153 ^b	86.18
	Ties	30 ^c	
	Total	198	

Description (a) post < pre, (b) post > pre, (c) post = pre

Table 6 shows that the negative ranks indicate that 15 students experienced a decrease in posttest scores. In the positive rank section, 153 students experienced an increase in score after implementing flipped classrooms.

Then, ties in rank were conducted with 30 students without increasing their scores. Furthermore, to see the amount of influence on the dependent variable, it is done by calculating the R-square, which can be seen in Table 7.

Table 7. Mean Ranks

Model	R	R-Squared	Adjusted R Square
1	0.330 ^a	0.109	0.100

Overall, using CLDW-flipped classrooms has an effect on improving learning outcomes; this is confirmed by the results of the R-squared value, which contributes

10.9% more to improving student learning outcomes than classes that only use flipped classrooms. Based on previous research, implementing CLDW in biology learning during virtual class showed differences in the results of generic science skills for students (Ayuningtyas et al., 2022; Putra et al., 2022). A flipped classroom is a strategy that focuses on learners in class" and "out class". Flipped classrooms create effective classrooms through interaction with learners. Moving some aspects of the learning process out of class" creates extra time for active learning activities through teacher-led class discussions. In addition, flipped classrooms promote learner-centered learning, active learning, and collaborative learning (Akçayır & Akçayır, 2018).

In planning and implementation, there are several things that can improve learning outcomes and learning independence, among others. The outclass phase, which is before the class, is held first by uploading material in the form of a CLDW digital module. This aims to provide opportunities for students to understand learning before class. Using e-learning provides freedom in the classroom without having to meet face-to-face (Sati et al., 2021) and can be done anywhere for efficiency in learning.

In implementation, videos were 2-5 minutes long to guide students and provide an initial experience, and there was a digital module as material prepared by the teacher. Video helps students directly see, listen to, and understand something that happens, think critically, and be able to draw conclusions (Suryawan et al., 2021). In learning biology, it shows that visual representations can be presented in visual form, for example, photos, images, and videos (Utami et al., 2021).

The in-class phase is carried out by providing a virtual face-to-face learning space. The teacher is a facilitator, namely guiding and fostering discussions and providing positive reinforcement to students. In the in-class phase, students discuss in large groups and small groups. In addition, the implementation of learning through the stages of discussion, presentation, question and answer, and writing the final results of the discussion has a positive impact on learning (Utami, 2019).

The components that are prepared include digital modules. The availability of digital modules helps students obtain information about subject matter. Digital modules are a set of media that are systematically arranged for self-study purposes, as well as learning aids. It has an impact on mastery. Digital modules have advantages such as a more interactive and dynamic presentation and the presentation of visual elements such as images and videos. The digital module used has been categorized as practical (Utami et al., 2021). This implies that the modules prepared are interesting, easy

to understand by students, and can be used anywhere and anytime easily and without difficulty.

The implementation of flipped classrooms helps internalize learning outcomes, resulting in behavioral changes. This is shown in the R-square value of 10.9%, which means 10.9% of learning outcomes are influenced by the implementation of CLDW-flipped classrooms, while 89.1% of other factors must be explored to maximize learning outcomes. Some research found that a positive relationship between the achievement of cognitive ability, independence of learning and self-management (Mukhlisa et al., 2021; Novitri et al., 2022)

Improving learning outcomes, especially in learning, is a complex matter, so there are other influential factors such as (1) internal factors, including psychological aspects, interests, talents, and motivation. and (2) external factors such as home atmosphere, discipline, and the activities of the learners themselves. Changes in the learning process are expected to be able to change learners who have low cognitive abilities to be in the same condition (Martiningsih et al., 2018).

Conclusion

Based on the research and discussion, it is concluded that there is a significant effect on learning outcomes from integrating CLDW in the flipped classroom for learning biology. Overall, using CLDW-flipped classrooms has an effect on improving learning outcomes; this is confirmed by the results of the R-squared value, which contributes 10.9% to improving student learning outcomes compared to classes that merely use flipped classrooms.

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Author Contribution

APP and NHU conceived of the presented idea. APP and KK developed the theory and instruments. Then, NHU tested for all data set and APP verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

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Conflicts of interest

No conflict of interest

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