

The Analysis of the Critical Thinking Skills between Blended Learning Implementation: Google Classroom and Schoology

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Abstract One of the characters of the globalization era is the rapid changes in various aspects of life. One of them in the advancement of science and technology, especially Information and Communication Technology (ICT) has much positive influence on the progress of education. The advantage offered not only lies in the speed factor and the ease of getting information or material resources, but some multimedia facilities can make the learning process more exciting and interactive. However, the use of this technology in learning still needs to be improved and socialized among educators. Regarding the learning problem, this study aims to see the effect of blended learning assisted by Google Classroom and Schoology applications. The objective of this research is to implement more effective blended learning model using specific Learning Management System (LMS) to increase student learning achievement following the needs of the present era. The research design of this study was the posttest-only control group design. Two groups were given different learning. One group was as a class taught using Schoology. The other group was as a class taught using Google Classroom. The independent variable of this study is the learning strategy. The dependent variable is critical thinking skills. The instrument for measuring the critical thinking skills was problem-based question that validated the difficulty level and power of determination. The study population was students of a high school in Indonesia. The sampling technique used simple cluster random sampling. The sample in this study consisted of two classes. Testing the hypothesis of the effect of blended learning was on the results of critical thinking skills using ANOVA. From the results of this study, it can be concluded that in the case of blended learning, students who were taught to use Schoology as LMS obtained a score of critical thinking skills that were relatively higher compared to students who used Google Classroom.

Keywords Online Learning, Mobile Learning, Learning Management System, Critical Thinking Skills, Learning Strategy

1. Introduction

One of the characters of the globalization era is the rapid changes in various aspects of life. One of them in the advancement of science and technology, especially Information and Communication Technology (ICT) has much positive influence on the advancement of education. The advantage offered not only lies in the speed factor and the ease of getting information or material resources, but some multimedia facilities can make the learning process more exciting and interactive [1,2].

The existence of a demand for a new curriculum that integrates ICT in all subjects aims to create innovative, collaborative learning so that students can develop their capacities in the cognitive, psychomotor and maximally affective domains. Thus the development of ICT-based curriculum as a product of the development of science and technology in the national education system is inseparable, and this is in line with the curriculum innovation efforts that are consistent with the advancement of science and technology in almost all fields of life [3,4]. LMS (Learning Management System) is a software that is used to create web-based online learning materials and manage learning activities and their results [5].

LMS also provides features to store, manage, and share academic resources and knowledge [6]. There are several open source LMS technologies in the development of e-learning for schools for instance, Moodle, Google Classroom, Dokes, eFront, Ilias, Sakai, Olat, A-View, Ganesha, Docebo, OLAT, dotLRN Blackboard, Certpoint,

Canvas [7].

Also, almost all students today use an Android mobile phone, which can be used as an LMS tool. LMS that has useful features and visualizations that are easy to use is Google Classroom and Schoology. Google Classroom is a multiplatform application that is easy to use. Google Classroom provides a set of advanced features that present it as an ideal learning platform for use with students, helping teachers save time, keep classes organized, and improve communication with students [8]. While Schoology is a site that combines social networks and LMS, with social interaction, Schoology, as well as learning, can be done. Schoology can make learning classes that allow teachers and students to interact, in addition to containing learning resources that can be used by students as learning references [9]. The educator actively involves students in the process of learning to increase the blended learning effects on students' critical thinking skill as learning achievement. The effectiveness of learning can be improved by asking questions with a level of complexity that matches different target groups, combining more investigative activities to increase students' understanding of concepts and their capacity for scientific thinking, encouraging students to reflect on learning and learning difficulties [10,11]. Regarding the learning problem, this study aims to see the effect of blended learning assisted by Google Classroom Learning Management System (LMS) and Schoology applications. This research developed blended learning with specific LMS more effectively to increase student learning achievement following the needs of the current era.

2. Literature Reviews

2.1. Previous Studies

The learning interests of students who study blended learning are better than those of conventional students. Classes that are taught using blended learning are more independent than traditional classes. Blended learning classroom has a potency to improve learning outcomes better than traditional classes [12]. Google classroom has the ease and benefits of its use [13]. The use of Schoology can improve the efforts of teachers to train in applying knowledge and experience gained in subjects [14]. The use of the Schoology application receives a positive response as a learning platform because it is flexible, simple, easy to use, and its application has a variety of functions that can foster children's interest in learning [15]. From the results of these studies, we can conclude that the application of blended learning using Google Classroom-based or Schoology applications can increase interest, independence, learning outcomes. Good results in this kind of research are the basis for research using blended learning using Google Classroom and Schoology applications. There is previous

research having measured positive responses from the use of applications in learning. This study measured the achievement of learning outcomes especially in the critical thinking skills. Therefore this research was conducted, hopefully, to create the innovation in improving critical thinking skills.

2.2. Critical Thinking Skills

Critical thinking is a systematic, directed and explicit process that is used to form and build trust, take actions to argue by organization in activities, like solving problems, making decisions, analyzing assumptions, doing research [16]. There are twelve indicators of critical thinking ability summarized in five stages [17], namely:

- Necessary clarification. This stage includes three indicators: formulating questions, analyzing arguments, and asking and answering questions.
- Giving reasons for a decision. This stage contains two indicators: assessing the credibility of information sources and making observations and assessing observation reports.
- Inference. This stage consists of three indicators: making deductions, evaluating deductions, making the induction, evaluating induction, and evaluating.
- Advanced clarification. There are two indicators for this stage, i.e., defining, assessing definitions and identifying assumptions.
- Supposition and integration. Two indicators of this stage are suspecting and integrating.

Based on the previous descriptions, the critical thinking skills used in this study are as follows: The ability to formulate questions, the ability to ask and answer questions, the ability to make inductions and assess induction or draw the conclusion, Ability to define and assess definitions, and ability to integrate or decision-making abilities.

2.3. Blended Learning

Blended learning is a flexible approach to design programs that support a mixture of various times and places to learn. The blended learning model is a combination of learning excellence with face-to-face activities and virtually or e-learning ones. The effectiveness of learning can be increased by asking questions to students with a level of complexity that matches different target groups. Blended learning combines aspects of web-based/ internet learning, video streaming, audio communication synchronous, asynchronous with traditional "face to face" learning [10, 18]. Based on this explanation it can be concluded that blended learning is a learning combination of face-to-face learning in class with web-based learning (e-learning). The advantages of blended learning are that students are free to learn subject matter independently by utilizing materials available online, students can have discussions with teachers or other students outside face-to-

face hours, and learning activities conducted by students outside face-to-face hours can be managed and appropriately controlled by the teacher [19]. The disadvantages of blended learning include the variety of media needed, so that it is challenging to implement if the facilities and infrastructures do not support, the inequality of facilities owned by students, such as computers and internet access, lack of knowledge of learning resources [19].

Several factors or aspects determine the success of learning in blended learning. First, are success factors when carrying out learning in the classroom. Classroom management applied by the teacher will determine the success of students in achieving the expected competencies [20]. This classroom management includes the learning strategies that are applied, the learning media used, and learning resources that can be accessed while studying in the classroom. Second, are success factors when carrying out online learning. Although relatively similar to the factors in the classroom learning, other factors will also influence, namely the features available and used by the teacher, the technology literacy of the teacher, and the intensity of interaction or social presence when online [21]. These two factors need to be considered when implementing blended learning. Learning management system as one of the tools in blended learning needs to be explored with existing features to be used optimally in online learning. The optimum use of these features follows the characteristics of the teaching material and the characteristics of students determine the level of achievement of expected competencies.

2.4. Learning Management System

Learning Management System (LMS) is a web-based technology that provides menus or features that are useful for learning both in managing and delivering teaching material, monitoring student activity in learning, and evaluating student learning online [22]. It can be said that LMS has a broader scope compared to web-based learning mainly because the available menus can be complete and complex [23]. The features available in the LMS provide immense potential to improve the quality of learning that is in line with the curriculum objectives. The facilities available in the LMS also allow teachers to be able to communicate and store information (teaching materials, student assignments, quizzes) that can be traced back to learning needs [24]. On the other hand, students have access that they can control themselves to existing learning resources and learning activities without being limited by space and time. Students have flexibility in learning [22]. To support a right social presence in online learning, LMS also has a feature that allows teachers to provide feedback, interactive comments with students both synchronously (video, chat) and asynchronous (forum, email, message) [22, 25, 26].

Google Classroom and Schoology are learning management systems. As another learning management

system, this application has many facilities in it; such as giving announcements or assignments, collecting tasks and being able to find out who has collected tasks. Utilization of both apps can be through multiplatform namely through computers and cell phones [27, 28].

2.4.1. Schoology

Schoology is an LMS that allows for collaborative activities in learning. Same as LMS in general, this application is web-based which can be accessed at any time by teachers and students. The existence of features that enable collaborative work is an advantage of Schoology. This feature allows the teacher to facilitate students according to their needs [29]. Schoology design is relatively the same as general social media like Facebook. With this feature, the student can make conversations, send messages, update status that are shared by other students. The two main features of Schoology are interactive communication and academic information exchange. This feature is a substantial factor in building a social presence in online learning both in discussions, group work or assignments. Another useful feature for students is that students can access their grades, attendance notes, and teacher feedback [30].

2.4.2. Google Classroom

Google Classroom is integrated with various Google services simultaneously to facilitate teachers in managing online learning. Making and giving tasks can be done through Google Drive while using Gmail to make notifications on Google Classroom. Students can be included in the Google Classroom in various ways including using specific codes. The benefits of Google Classroom are straightforward to use. Google classroom design simplifies instructional, saves time [8]. Google Classroom can be integrated with other Google applications including documents, slides, and spreadsheets. The lack of Google Classroom is that there are several buttons with icons that are only familiar to Google users; the activity feed is not updated automatically [31].

3. Method

3.1. Research Design

This study was conducted with a pre-test and post-test control group design. Three groups are given different learning. One control group is taught using direct learning. The second group as a treatment group was given learning using Schoology.

The first group was taught using Google Classroom. The second group was taught using Schoology. The independent variable of this study is the learning strategy, i.e. Schoology and Google Classroom. The dependent variable is critical thinking skills. Measurement of critical thinking skills is carried out using critical thinking test questions in the form of descriptions that have previously

been validated for difficulty level and power of difference.

3.2. Sampling and Instruments

The student is a high school in Bima, Nusa Tenggara Barat, Indonesia. The technique used sampling cluster random sampling technique consists of two groups of classes. The number of students in the class who taught using Google Classroom was 30 students, and the other class who taught using Schoology was 26 students.

The problem-based test is the instrument to measure critical thinking skills in the form of essay questions. This question is developed by meeting critical thinking indicators. The questions have been tested for the right questions (validity, reliability, level of difficulty and determination).

Table 1 shows the guidelines for scoring tests of critical thinking skills. This question is then given to the two groups after students obtain blended learning with online learning activities using Google Classroom or Schoology. This result is a measure that is compared between the two groups.

Table 1. Guidelines for scoring tests of critical thinking skills

Student responses to the problem	Score
Not answering or giving wrong answers not meeting expectations	0
Only identifying problems and correcting	1
Identifying problems with right; the model is made, and the solution is wrong or giving the correct answer but is not accompanied by an explanation	2
Identifying the problem correctly, but there is an error in the model made so that the solution and the results are wrong or giving the correct answer, but the explanation is wrong.	3
Identifying the problem and making the model but there are errors in the calculation process so that the results are wrong or giving the correct answer, but the explanation has errors.	4
Identifying the problem correctly, and making a model and then solving it correctly or giving answers and explanations both of them.	5

3.3. Title Analysis Techniques

Testing the hypothesis of the effect of blended learning on the results of critical thinking skills uses ANOVA statistical analysis (analysis of variance). The value of alpha (level of error) for this analysis was 0.05. Before applying the test, the data tested the normality and the homogeneity first as the requirement. This analysis used SPSS as statistical application.

3.4. Stages of Learning

In this learning, the teacher and students do some things. The constructivist approach tends that learning will be more student-centered. The role of the teacher will shift from the source of knowledge to a facilitator student

activities in building competence. Figure 1 shows the learning phases.



Figure 1. The learning activities phases

3.4.1. Initiation Phase

At this stage, the teacher explains to students about how the learning process will be carried out both in class and online. The teacher provides training on how to interact using LMS in online learning. At this stage, the important thing is to ensure students have sufficient skills in interacting with the application.

3.4.2. Activity Phase

At this stage are the stages that determine the success of the teaching and learning process. The teacher conducts classroom management so that the material is conveyed well and students understand it. Positive ways of interacting using synchronous and asynchronous activities can be done to ensure students' success. At this stage, the teacher will use various features in the LMS to form a comfortable learning environment for students. The process of monitoring learning progress is carried out by the teacher so that no students fail to achieve competence.

3.4.3. Final or Closing Phase

In each lesson, giving feedback is very important. At this stage, the teacher evaluates learning outcomes and learning evaluations. Several tests are given to measure student achievement.

4. Results

After learning on Energy and Business materials using different LMS at the same time duration (5 meetings @ 45 minutes), students were given a test question that measured critical thinking skills. In general with this blended learning strategy, all students meet the minimum criteria (70) with frequency distribution as shown in Table 2.

Table 2. The frequency of the Critical Thinking Skills score

Learning Mgt System	Frequency				N
	<60	60-70	70-80	>80	
Google Classroom	0	0	10	20	30
Schoology	0	0	2	24	26

Achieving critical thinking skills in students who follow blended learning assisted by Schoology obtains a higher average score than students who use Google Classroom (see Figure 2).

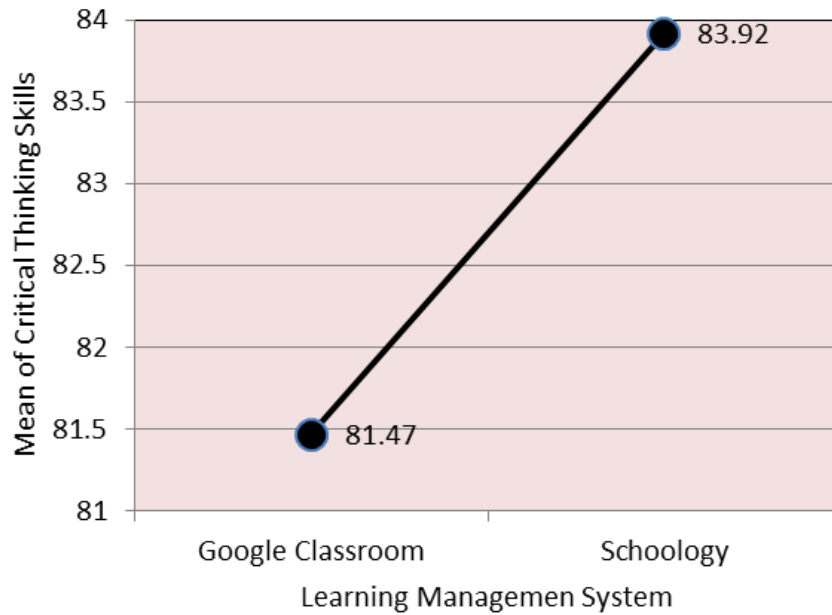


Figure 2. The means comparison between Google Classroom and Schoology

Conversely, the standard deviation score of critical thinking skills in students using Google Classroom is smaller than those who use Schoology (see Table 3).

Table 3. Descriptive of Critical Thinking Skills

	N	Mean	Std. Deviation	Std. Error	Min.	Max.
Google Classroom	30	81.47	3.89	.71	72.00	91.00
Schoology	26	83.92	4.31	.84	71.00	90.00
Total	56	82.61	4.24	.57	71.00	91.00

From Table 3, it can be seen that the two groups have relatively the same range of critical thinking skills scores; 72 to 91 for groups with Google Classroom and 71 to 90 for groups with Schoology.

The assumption in this study is that there was no influence on classroom learning between the two groups. This means that the teacher who taught Energy and Works material in the classroom was considered the same way both in the use of learning strategies and teaching media used.

Covariance analysis (ANOVA) was applied to determine the effect of online learning using two different learning management systems. The results of this analysis are shown in Table 4.

From Table 3 it can be seen that there are significant differences (at alpha 0.05) between the two groups using different LMS during online learning. These results indicate that Schoology-assisted blended learning has a higher influence on achieving students' critical thinking skills. Exploration of the factors that explain the higher results of Schoology compared to the Google Classroom in

the case of blended learning that can be the basis for improving science learning especially in utilizing existing features as advantages for each LMS.

Table 4. Analysis of Variance (ANOVA)

Critical Thinking Skills					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	84.044	1	84.044	5.024	.029
Within Groups	903.313	54	16.728		
Total	987.357	55			

5. Discussions

With relatively similar learning in the classroom in the learning and media strategies used, the difference in results in critical thinking skills between online learning that uses Schoology and Google Classroom can be traced to activities during online. This activity can be seen from the features used during learning, access to online learning resources, and teacher-student and student interactions online.

5.1. Features of LMS

The features in Google Classroom are growing continuously with increasing services but also increasingly complex. On the one hand, many features that meet the needs of learning require a variety of supporting applications, but for learning that is simpler and carried out

by students with a small level of application needs, which makes students tend to feel complicated and not easy to interact with the system. On the other hand, on Schoology, existing features that are following all-day behavior, namely the use of social media, make students feel more comfortable in interacting. A more in-depth search of learning activities that are not too rich in activity shows there is a mismatch between the available features and the features required in the Google Classroom and vice versa on Schoology.

Activities carried out in learning in this study included sharing material, giving apperception, giving assignments in the form of text, evaluating in the form of quizzes. It appears that this activity may still be enriched by using existing features. Back to note in the development of learning strategies is the selection of media under the characteristics of learning activities. This finding is the same as in other studies where simple learning activities for middle school students tend to be sufficiently facilitated with LMS which is also simple in the features they have.

5.2. Learning Resources Access

Access to online learning resources can be provided through posts, attachments, or links to other sources. In both LMS, access to learning resources can be done in these ways. Schoology with the LMS plus social media platform provides an attractive display in sharing learning resources. This feature is not in the Google Classroom. From this aspect, the two LMS applications have the same level of excellence. To be able to share learning resources, teachers in both classes can do it quickly. Students also do not have complaints on how to access these learning resources. Of course, this success is supported because the level of IT literacy is sufficient for teachers and students.

5.3. Learning Interaction

Online learning is a learning mode that develops with skill along with the development of information and communication technology. Many educators put optimism on online learning to be able to organize education that can be accessed by everyone from various regions, education that is of equal quality for everyone. Many factors influence the success of online learning, such as the level of teacher confidence, the level of student activity, and the level of interaction between teachers and students. One of the critical factors is the level of interaction between teachers and students that is influenced by social presence. Social presence is one of the most significant factors in increasing teaching effectiveness and building a sense of togetherness [32,33]. Social presence is the level at which educators and students (especially students) feel the presence of educators "real" in the mediation of learning communication [34]. This social presence will affect the level of student participation and the success of online learning. Three

dimensions of social presence namely social context, online communication, and interactivity [35]. All three can emerge as essential elements in building a sense of community among students online.

Many researchers and educators have tried to apply a variety of strategies to be able to grow and improve social security in online learning. The forum for participants can get acquainted with each other, facilitates several mutual social interactions in academic activities that are on Schoology with the format of Facebook becoming its strength in building online social interactions. This interface will ultimately have an impact on students' perceptions of interaction and social presence. Interactivity will affect the level of communication quality. The quality of this communication will foster a level of social presence.

Too many messages (both text and voice) will be considered and interpreted as not stimulating. Conversely, a message that ranks with appropriate emoticons is considered to provide stimulation. The language of online communication is different from directly spoken language. This difference needs to be fully realized by educators who will carry out online learning. Good interactivity in online learning can be done by giving a direct response, non-formal language, responding immediately, giving a touch of humor, using 'your' words correctly and 'me,' and others.

The use of synchronous and asynchronous features appropriately to apply the technique will also affect the level of interaction. Its use by looking at the psychological situation of interaction will affect the success of social presence. There are five factors that represent aspects of social presence in an online learning environment [36]: social respect (e.g., receiving timely responses), social sharing (for example, sharing information or expressing beliefs), open minds (for example, disclosing agreements) or receiving positive feedback, social identity (for example, called by name), and intimacy (eg, sharing personal experiences). This aspect is relatively lacking in Google Classroom but is fulfilled on Schoology.

6. Conclusions

From the results of this study, it can be concluded that in the case of blended learning, students who were taught to use Schoology as LMS obtained a score of critical thinking skills that were relatively higher compared to students who used Google Classroom. The main factor that causes this score difference, is the level of usefulness of the features of the LMS. In this case, a full feature (Google Classroom) is less utilized in learning that only applies a few simple activities. Determination of the complexity of this activity is determined by the characteristics of students and also the competencies to be achieved through learning certain materials. There are LMS whose features are more simple and following students' daily activities on their interface (Schoology) and tend to make students more comfortable.

The teacher is also more natural to build learning interactions with students. As a result, students can achieve better learning outcomes criteria.

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