Effects of Assistance Media on Active Learning and Creative Thinking in Online Learning

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Abstract

Online learning is the best learning strategy during the Covid-19 pandemic. However, it has obstacles for students who are still learning to adapt to internet technology. This research aims to determine the effect of using online learning strategies on students' active learning and creative thinking. The subjects of this study were 52 students of the Indonesian Language Education Study Program at the Indonesian Catholic University of Saint Paul. They are taught using the Moodle application. The experimental class was taught using media assistance in the form of WhatsApp, while the control class was not taught. Data collection uses tests and observation sheets. Data analysis used ANOVA with the help of SPSS version 27. The results showed that 1) there were significant differences in student learning activities in online learning with media assistance and students without media assistance; 2) there is no significant difference in creative thinking between students who are taught using media and students who are not given media assistance. Based on the results, findings and conclusions, suggestions will be explained for implementing future learning and further research. Especially the creation of an online learning environment for students who are still adapting to advances in internet technology.

Keywords: assistance media, active learning, creative thinking, online learning

1. Introduction

Online learning is one of the innovative learning strategies used in educational institutions, both before, during and after the Covid-19 pandemic. Through online learning, interaction between educators and students during a pandemic is maintained (Bhatt & Arshad, 2016) even without face-to-face meetings. However, virtual interactions between educators and students tend to be more effective if they have adapted or are used to using computers and the internet in their daily activities. The threat of losing learning during a pandemic (Favale et al., 2020) where the implementation of education uses online platforms, is partly because educators and students have not adapted to digital and the internet (Dhawan, 2020), including the limitations of electronic devices they have, institutional readiness and loading speed. These facts are experienced by most educators, students, and educational institutions in Indonesia at all levels of education. Previous studies have revealed that individuals who are still learning or beginners in terms of internet technology have experienced that online learning is a difficult way of learning and adds to their cognitive and emotional load (Liguori & Winkler, 2020). Similar studies suggest that the mental conditions that students need to have in online learning are adapting to digital technology and the internet, having the habit of interacting virtually, having good self-discipline and self-regulation (Khalil et al., 2022).

Implementation of online learning at the Catholic University of Indonesia Saint Paul has been running for the last three semesters since March 2020). In the first semester (March to June 2020), where the Covid-19 pandemic began to spread massively in Indonesia, the implementation of online learning was entrusted to each lecturer. But in semester II (September 2020) until 2022, online learning in all faculties uses the Modular Object-Oriented Dynamic Learning Environment (Moodle) application. However, the results obtained have not been maximized, especially related to the study habits of students. Virtual interactions that have been carried out, both synchronously (such as zoom meetings and discussions on the forum feature in Moodle) and asynchronously (such as delivering materials/files, assignments, quizzes) have not been able to increase students' motivation and independent study habits. They are often not disciplined in following learning, especially the aspect of time (interaction in Moodle) and are not optimal in completing lecture development tasks (both aspects of knowledge and skills). Online learning has not been able to

encourage them to increase learning independence, both in setting learning goals, carrying out and controlling their own learning.

This experimental study uses media assistance in online learning which is thought to increase students' active learning and creative thinking. The media assistance used in Moodle's Learning Management System (LMS) is WhatsApp. WhatsApp is a messaging application that allows individuals to send text messages, voice messages, videos, chat, and share media, both individually and in groups. The use of assistive media (in the form of WhatsApp) is assumed to guarantee personal-informal relationships between lecturers and students in carrying out educational interactions, especially outside of formal learning at the Moodle LMS. For example, for lecturers, the use of WhatApp aims to remind students to take part in online learning (LMS Moodle) regularly and on time. The use of this media assistance in online learning) is based on several considerations, such as easy access, being able to carry out private and group chats with students, being able to carry out (online) consultations before and after lectures between teachers and (groups) of students (Kim & Nor, 2019)-(Tulgar, 2019).

The use of WhatsApp is a form of pedagogy in online learning. This overcomes several learning problems during the pandemic, such as anxiety and stress problems experienced by students. The main cause of anxiety and stress experienced by most during the Covid-19   pandemic is the loss of intensive educational interaction between teachers and students, in addition to technical, access, and economic problems (Tyrer, 2019), That is, the quality of the online learning process requires the pedagogical role of educators. Research conducted by (Fauziyyah et al., 2021) revealed that the pedagogic role of educators needed by students in online learning is the role of facilitator, moderator, organizer and motivator. This role positions educators as learning partners for students. The role of this partner is in line with one of the current online learning trends, namely the very thin distance between educators and students, making it almost impossible to sharply distinguish between formal and private spaces. The effectiveness of online learning as revealed in many previous studies, eg (Satyawan et al., 2021)-(Basar et al., 2021) presupposes that the pedagogical role of educators is carried out optimally, both in the design, process, and assessment of   learning. These roles are believed to be able to facilitate learning, foster student motivation and study habits, and serve educational interactions between educators and students both individually and in groups. A meta-analysis study conducted by (Buchori et al., 2017) on 935 articles discussing mobile learning concluded that mobile learning is a strong learning preference in the digital era, especially during the COVID-19 pandemic.

It will be a strong preference if online learning can increase students' active learning and creative thinking. Active learning and creative thinking are two important indicators for the success of the learning process, learning outcomes and learning productivity (Hwang et al., 2021). Active learning and creative thinking are intertwined with one another. These two indicators can encourage students to carry out various explorations in online learning and complete academic assignments optimally.

Active learning is understood in two senses, namely physically and mentally-psychically (Moore et al., 2019). explained that learning activity was shown in various learning activities, such as interaction with learning resources, social collaboration, deeper processing, elaboration, material exploration, and metacognitive monitoring. Active learning refers to student-centered   learning methods(Markant et al., 2016). Active learning encourages students to think "creatively" (creating and realizing ideas into a construction of thoughts and actions with new nuances). Creative thinking ability is the   process of constructing ideas in seeing and doing something with an emphasis on aspects of fluency, flexibility, originality and elaboration (Mitchell et al., 2017). In short, (Bulatova et al., 2020) understand creativity as having a series of intellectual operations and allowing the recombination of knowledge and the acquisition of something new and learning activities related to the level of student   participation in the learning process, both physical and mental-psychic participation.

According to (Midun et al., 2020) physical participation is a form of interaction between students and educators in the form of listening to tutorials, reinforcement, asking and answering questions, making summaries, etc.; interaction with fellow students (such as asking and answering questions, discussing and collaborating to solve problems, carrying out presentations, simulations, projects, etc.); and interaction with learning resources (such as looking for data and facts on learning resources, asking questions and visiting resource persons, etc.). Furthermore, the mental-psychic activity can be shown by students in the form of involvement in developing ideas on problems to be solved, exploring and discussing learning points. In other words, mental-psychic activity is the conscious participation of students in every learning event. In many studies, learning activity (physical-psychic) affects learning outcomes (cognitive, affective, sensorimotor and social aspects), both quantitatively and qualitatively.

In this study, the use of WhatsApp in full online learning is a pedagogical effort by lecturers to increase students' active learning and creative thinking. The application of online learning with media assistance is an independent variable. While the dependent variables include active learning and creative thinking. The independent variable (online learning

assisted by the WhatsApp media) is thought to influence active learning and creative thinking as the dependent variables. Thus, this study aims to answer the following two questions:

1. Are there differences in learning activities between students who are taught with the assistance of the media and students who are not taught with the assistance of the media in online learning?

2. Are there differences in creative thinking between students who are taught with the assistance of the media and students who are not taught with the assistance of the media in online learning?

2. Method

This study is a quasi-experimental design with a nonequivalent control group design. By using a quasi-experimental design, this study aims to reveal a causal relationship between the experimental and control classes (Winterhalter & Jalan, 2021). Both the experimental and control classes use the Moodle application. However, the experimental class used the WhatsApp application as assistance media, while the control class did not.

The variables of this study consisted of 1) one independent variable (online learning) with two variations: by the assistance media and without the assistance media); 2) the two dependent variables (active learning and creative thinking). The active learning and creative thinking of the students are thought to be the impact of the different treatment between the experimental class and the control class. Thus, this study used a pretest-posttest experimental control group design. Both experimental class and control class students were given treatment and observation in the form of pretest and posttest. The research design is shown in Figure 1.

$$\begin{array}{cccc} C1 & O_1 & X_1 & O_2 \\ \hline C2 & O_1 & X_1 & O_2 \end{array}$$
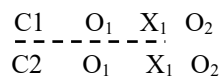
Figure 1. The research design

The subjects of this study were students of the Indonesian Language and Literature Education study program, Faculty of Teacher Training and Education, Indonesian Catholic University of Saint Paul. They numbered 52 people, consisting of 27 students in the experimental class and 25 students in the control class. They are students in the fourth semester of the 2021/2022 academic year and attend the Basic Curriculum Development course. As prospective teachers, this course supports the formation of their pedagogic competencies.

This research procedure includes pre-experimental, experimental and post-experimental. The pre-experimental stage includes the design of teaching materials, instrument development and validation, prior knowledge tests. The experimental stage is the stage of implementing the experiment. This stage was carried out after it was confirmed that the experimental and control class students had relatively the same prior knowledge through statistical tests. There are two important activities in the experimental stage. 1) carry out online learning with the Moodle application. The experimental class uses media assistance (in the form of WhatsApp); while the control class does not. The WhatsApp assistance media is used by lecturers and students to conduct learning consultations, both before and after learning. 2) observing the students' learning activities. The third stage is post-experimental activities. Activities at this stage are measuring student learning outcomes and analyzing the effect of independent variable on the dependent variables.

This study uses two types of instruments, namely instruments to measure active learning and creative thinking. Instruments to measure learning activity using observation sheets and creative thinking using tests. Based on the number of research variables, the research data analysis used Analysis of Variance (ANOVA). ANOVA analysis was carried out after fulfilling the assumptions of data normality and homogeneity of variance.

3. Results

The results of this study describe students' prior knowledge, active learning and creative thinking, testing assumptions and research hypotheses. The description of the students' prior knowledge test aims to ensure that the experimental and control classes ' prior knowledge does not have a difference. An important description of the results of this study is the results of testing the research hypothesis.

1). Prior Knowledge. Measuring the students' prior knowledge (both experimental and control classes) is one of the important activities in the pre-experimental stage. The prior knowledge in question is the knowledge possessed by students in the Basic Curriculum Development course before being given treatment. The students' prior knowledge was obtained through 25 numbered questions. The form of the test used is multiple choice. The score for each question is one or zero. The correct answer was given a score of one and the wrong answer was given a score of zero. The description of students' prior knowledge is shown in Table 1.

Table 1. Description of Students' Prior Knowledge

Groups	N	Max.score	Min.score	Mean score	SD
Experimental Class	27	64	24	37.93	11.58
Control Class	25	64	20	40.64	11.39
Total	52	64	20	39.23	11.41

Based on Table 1, mathematically the mean score of the experimental class is lower (1.701) than the control class. However, the one-way ANOVA analysis showed that the probability value (P-value) was .390. This value is greater than alpha (.05). Therefore, it can be said that there is no significant difference in the prior knowledge of experimental and control class students before conducting the experiment.

2). Student Learning Activities. Student learning activities in the online learning process (through the Moodle application on the Forum feature) are shown by several indicators, such as involvement in answering lecturer questions, asking lecturers and friends, answering friends' questions or developing their own answers after being asked for clarification by friends, and seeking answers or comments from their friends. The frequency of student activity during 10 meetings is shown in Table 2.

Table 2. Frequency of students' learning activities

Class	Frequency Level	Frequency (person)	Percentage
Experimental	10	4	14.8
	9	6	22.2
	8	8	29.6
	7	5	18.5
	6	4	14.8
	Total	27	100
Control	10	2	8
	9	4	16
	8	8	32
	7	6	24
	6	3	13
	5	2	8
	Total	25	100

Table 2 shows the activeness of the experimental class students, it can be explained that: (1) there are four students (14.8%) who always participate in discussions for ten meetings; (2) six students (22.2%) were involved nine times in the discussion; (3) eight students (29.6%) were involved eight times in the discussion, (4) five students (14.8%) were involved seven times in the discussion and (5) four students (14.8%) were involved six times in the discussion. Furthermore, in the control class it can be explained that: (1) there are two students (8%) who are always involved in discussions for ten meetings; (2) four students (16%) were involved nine times in the discussion; (3) eight students (32%) were involved eight times in the discussion, (4) six students (24%) were involved seven times in the discussion, (5) three students (12%) were involved six times in the discussion and (6) two students (8%) involved five in the discussion.

Furthermore, the description of the mean score of the students' learning activity in the experimental and control classes is shown in Table 3.

Table 3. Description of Students' Learning Activity

Group	N	Mean	SD	Minimum	Maximum
Experimental Class	27	8.78	1.18	5	10
Control Class	25	7.60	1.34	5	10
Total	52	8.21	1.26	5	10

Based on Table 3, two important points can be explained: 1) there is no difference in the highest and lowest scores

between the experimental and control classes, 2) the mean score of the experimental class is 1.18 higher than the control class. However, the significance of this difference will be analyzed through hypothesis testing.

3). Students' Thinking Creativity. The main question answered in this section is "how high is the quality of student thinking after taking lessons on the Moodle application, whether students are assisted by assistance media or not?". To answer this question, there are three levels of assessment of students' thinking skills: low, medium and high order thinking skills. Low-level thinking skills, if students' answers are replicative (repeat) the lecture materials that have been given to them. Moderate thinking ability, if students' answers do not only repeat the material that has been given to them, but also carry out certain developments, but not in depth. Furthermore, higher order thinking skills, if students' answers, in addition to mentioning lecture materials, their answers also develop ideas broadly, deeply, and substantively contain the truth.

Data on creativity were obtained through four numbers of essay tests. The thinking creativity test was carried out at the end of the experiment (after the 10th meeting), both for the experimental and control classes. The scoring technique was that low-level thinking was given a score of one, medium-level thinking was given a score of two and high-level thinking was given a score of three. Each number of questions (which are answered) gets the highest score of three and the lowest score is one. The description of the results of the students' thinking creativity test is shown in Table 4.

Table 4. Description of Students' Creative Thinking

Group	N	Mean	SD	Minimum	Maximum
Experimental Class	27	6.545	1.182	4	9
Control Class	25	6.510	1.336	4	9
Total	52	6.528	1.259	4	9

Table 4 shows that 1) there is no difference in the highest and lowest scores between the experimental and control classes; 2) the average value of the experimental class is 0.035 higher than the control class. The significance of the difference in the average value between the experimental and control classes will be analyzed through testing the research hypothesis.

4). Hypothesis Test. The minimum ANOVA analysis meets the assumptions of data normality and homogeneity of variance. The data normality test aims to ensure that the sample data is normally distributed or not and the variance homogeneity test aims to ensure that the variance prices in each category are homogeneous. Thus, before testing the research hypothesis, the assumption of data normality and homogeneity of variance was first tested.

The data tested for normality are data from dependent variables. The data is normally distributed if the significance value (*P-value*) is greater than alpha (α). The alpha level used in this study was .05. In the context of this study, the dependent variable consists of active learning and creative thinking skills. Learning activity data is data from observations for ten learning meetings. The results of the normality test of student learning activity data showed a significance value (*P = 0.086*) in the experimental class and a significance value (*P = 0.102)* in the control class. Thus, the data are normally distributed in both the experimental and control classes because the significance value (sig.) is greater than alpha (*P > 0.05*). Furthermore, the students' creativity thinking data is the measurement data at the end of the experiment. The results of the normality test of student learning activity data showed the value of sig. (*P=.085*) in the experimental class and *P=.102* in the control class. Thus, the data are normally distributed in both the experimental and control classes because the significance value (sig.) is greater than alpha (*P >0.05*).

The data tested for homogeneity of variance are data from the dependent variables. Through Levene's test, it can be seen that the prices of each variance are the same or not. If the significance value is greater than alpha (0.05), the variance values are relatively the same (Wang & Zhu, 2019). Learning activity data is data from observations during the implementation of online learning. Levene test results show the value of sig. (*P = 0.310*). This value is greater than alpha (*P > 0.310*). Then, creativity thinking data is the test result data at the end of the experiment. Levene test results show the value of sig. (*P = 0.428*). Both learning activity and creative thinking that can be said that the prices of variance in each category are homogeneous because the sig. value (*P > 0.05*).

After fulfilling the assumptions (data normality and homogeneity of variance) then hypothesis testing can be done. Hypothesis test is a test of the effect of an independent variable on the dependent variable. This study consisted of one independent variable and two dependent variables. The independent variable of this study is the online learning strategy, which consists of two variations: assisted and non-assistance media. Meanwhile, the dependent variables are active learning and creative thinking. Thus, there are two kinds of hypothesis testing in this study: (1) there is an effect of online learning on students' active learning, (2) there is an effect of online learning on students' creative thinking. The ANOVA test (in this study) was conducted to determine the effect of one independent variable (online learning) on the

two dependent variables. This study wanted to see the effect of the independent variables on each dependent variable.

5). The effect of online learning on learning activities. The results of the test of the effect of online learning on learning activities are shown in Table 5.

Table 5. Differences in learning activity between experimental and control classes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.006	1	18.006	7.852	0.007
Within Groups	114.667	50	2.293		
Total	132.673	51			

Table 5 shows that the significance value (P-value) is 0.007. If we compare with the critical value or alpha, then the value of sig. (P-value) is smaller than alpha (0.007 < 0.05). As well, if we compare between the F-count and F-table, the result is that the F-count (7.852) is greater than that of the F-table (4.034). Therefore, both the P-value and F-value have shown that there is a significant difference in learning activity between the experimental and control classes, or between students who taught by assistance media and students who taught without assistance media. Thus, it can be concluded that online learning has an effect on the learning activities of students of the Indonesian Language and Literature Education Study Program, Indonesian Catholic University of Saint Paul.

6). The effect of online learning on creative thinking. The results of the test of effect of online learning on Creative Thinking are shown in Table 6.

Table 6. Differences in creative thinking in the experimental and control classes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.019	1	0.019	0.01	0.923
Within Groups	100.981	50	2.02		
Total	101	51			

Table 6 shows that the significance value (P-value) is 0.923. If we compare with the critical value or alpha, then the value of sig. (P-value) is greater than alpha (0.923 < .05). As well, if we compare between the F-count and F-table, the result is that the F-count (0.01) is smaller than that of the F-table (4.034). Therefore, both the P-value (sig.) and F-count show that there is no significant difference in creative thinking between the experimental class (students taught by assistance media) and control class (students taught without assistance media).

4. Discussion

Active learning is an important element of the implementation of learning. Previous studies have seen active learning as an important aspect of learning success (Moranski & Henery, 2017) and one of the parameters of education productivity and has a positive effect on optimizing their learning outcomes.This study found that full online learning by assistance media (in the form of WhatsApp) was effective in assisting students to be actively involved in online discussions through the Forum feature in the Moodle application. In this study, student learning activities included the frequency and accuracy of attending virtual classes, frequently answering questions from lecturers and friends, frequently asking questions to lecturers and friends, and frequently developing ideas when responding to questions from fellow students. Student learning activity reached 80% for the experimental class and 76% for the control class. According to (Linggu & Tasir, 2022) and (Achor & Abuh, 2020), active learning encourages students to be more active in increasing physical activity, social interaction and collaboration, deeper processing, elaboration, material exploration and metacognitive monitoring. This diversity of activities reveals that online learning (by assistance media) positions students at the center of learning (Ramdhan et al., 2022).

Statistically, there was a significant difference in student learning activity between the experimental and control classes. Students in the experimental class showed higher learning activity than the control class (without being assisted by assistance media). That means, WhatsApp as a media aid in online learning (Moodle application) can encourage students to be more active in learning, including the discipline of time to take virtual classes. Through WhatsApp media, educational communication occurs between lecturers and students, both before and after class (Kumar & Sharma, 2017). Communication before and after class between teachers and students can increase student participation in learning. This was revealed in several previous studies, for example (Zakareya & Alahmad, 2019).

Thus, this study strengthens several previous similar studies, such as (Yuniarti, 2020);Indiran et al., 2022). Their study revealed that the use of WhatsApp as a mobile phone and web-based application can be used to chat (text and sound), collaboration for knowledge sharing and educational interaction between teachers and students as well as between students.

Based on the findings of this study and several previous studies, it can be emphasized that the use of media assistance can increase learning interactions in online learning. That way, the use of WhatsApp as a media assistant can increase the effectiveness of implementing online learning and reduce the threat of learning loss. Learning loss which is considered a ghost in online learning (during a pandemic) (Kristiana et al., 2022) can be overcome if educators design online learning based on student active learning. At the university level, the threat of learning loss during a pandemic can be overcome with three conditions. 1). educators have the skills to use online media in designing interactive learning. 2). the readiness of educational institutions and students to support online learning. 3). proactive educators make pedagogical efforts to increase student participation in learning, both personal-informal and collective-formal efforts.

Theoretically, active learning is related to creative thinking, namely the process of constructing ideas in seeing and doing things with an emphasis on aspects of fluency, flexibility, authenticity, and elaboration. However, in this study, the active learning shown by students during online learning was not followed by optimal thinking creativity, both experimental and control class students. Statistically there is no difference in creative thinking between the experimental and control class students. Their creative thinking tends to be at a low level. Their creative thinking only reached an average of 1.63 (scale 3) for the experimental class and 1.62 (scale 3) for the control class. Thus it can be said that online learning, whether assisted by WhatsApp or not, cannot improve students' abilities in creative thinking that include intellectual operations and combination of knowledge to recognize problems, generate ideas and associate fluency, flexibility of thinking (adaptive and spontaneous flexibility). The low creative thinking of students is closely related to their learning independence and self-efficacy.

In the context of online learning, self-efficacy is a conditional factor that allows for the effective implementation of online learning and other pedagogical efforts. The use of WhatsApp (as a medium of assistance) is one of the pedagogical efforts made by educators to increase the effectiveness of using online platforms. In this study, we found that the control class (without pre-class communication via WhatsApp between lecturers and students) tended to be late and more passive in discussions on the "forum feature".

By having high self-efficacy, students can use cognitive strategies, plan, control and manage mental processes to achieve personal goals, have self-confidence, develop positive emotions towards academic assignments and build a good learning environment. Pedagogic efforts in the form of using media assistance (such as WhatsApp) can encourage students to increase their activity in online learning. In certain contexts, efforts like this are seen as a form of scaffolding provided by lecturers to students, which aims to increase their participation and independence in learning.

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Data sharing statement

No additional data are available.

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