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Effect of integrating student-developed videos into a virtual environment

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ABSTRACT

Many users experience loneliness' and feel disconnected from teachers and friends during online learning. Lack of engagement between teacher and students can hinder learning and lead to unpleasant feelings such as anxiety and a lack of motivation. Hence, some lecturers require students to develop videos in pairs and share them with peers. The purpose of this study was to measure the effect of integrating of student-developed videos into a virtual environment. The quasi-experimental method with was conducted to investigate students' perceptions of interest, motivation, engagement and performance. A total of 333 students was divided into experimental and control group. Results showed a positive impact of this approach, which can draw out students' creativity and their understanding of the content knowledge to integrate these with information and communication technology skills. Examination of the qualitative results suggest that the students need to be closely monitored while making the video to prevent free-riders. This study also recommends that the design of the video must be integrated into the course in order to achieve the learning outcome. This study contributed to literature on the effect of student-developed videos.

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1. INTRODUCTION

Online learning is a current learning trend; it became highly popular after the outbreak of COVID-19 because students can attend class without any of the restrictions of a physical classroom. Even this online learning can help students practice social distancing effectively, many users experience loneliness' and feel disconnected from teachers and friends. Lack of engagement between teacher and students can hinder learning and lead to unpleasant feelings such as anxiety and a lack of motivation [1]. In addition, these problems may cause a loss of learning interest. Educators have realized the importance of student engagement, and digital tools has been widely used in online learning contexts to make lessons more meaningful.

The constructivist scholar Vygotsky [2] believed that knowledge is built up through learning activities or materials. Modern scholars have also supported this statement and believe that learning cannot solely entail passive reception [3]. As a result, student learning occurs when students develop their own meanings based on prior experience and current instructional material in either a traditional or online. Video is the most fruitful digital tool in this regard [4]. Video clips have an unquestionable impact on our daily lives. Millions of people visit online video sharing platforms like YouTube each month. The popularity of

these video sharing sites owes to their ease of use and how quickly videos can become widely disseminated, and so, they can have a major impact on the education system if utilized in that context. Even though educators have developed videos for use in lessons, active learning requires that learners be engaged with learning materials. Students are expected to actively participate and be involved in the learning [5]. While engaged, students can absorb and retain knowledge and skills more efficiently [6]. Hence, student-developed videos can foster student engagement in learning activities. Despite the advantages of student-developed videos, the overall acceptance rate is low [7]. Likewise, research on such videos is limited, a gap in the literature that this study aims to fill. Student-developed videos are an innovative and supportive learning method. [8] believed that student-developed videos enhance students' learning.

Recent studies highlight the potential of student-developed videos as an effective tool in online learning. Stanley and Zhang [9] emphasized that student-developed videos foster a more engaging virtual learning environment by enabling students to participate a more active role in their learning, thus enhancing their learning. This approach aligns with findings from study [10] that suggest active learning through student produced video can lead to improve motivation in online learning and students feel more connected to the content they produce and interact with peers by sharing the videos. Further supports this statement that self-developed videos promote self-efficacy and a sense of ownership, encouraging students to invest time and effort into learning activities, which assist to higher motivation and performance [11]. Additionally, active video creation helps reduce feelings of isolation often associated with online learning [12], as students perceive a greater sense of social presence through their shared project and lead to higher engagement with course content.

Moreover, Wakefield *et al.* [13] found that the use of student-generated media in coursework enhances understanding and allows students to engage in reflective practices, which are essential for deeper learning. Studies revealed that integrating student-developed videos into online learning can have a significant positive impact on engagement, motivation [14], and performance [15], thereby filling a crucial gap in digital education strategies. Regardless of the advantage of student-developed videos, any use of digital tools must align with proper teaching methodology. As one of the available teaching methods, active learning in online classrooms is especially suited to pair student-developed videos in terms of capacity to measure learning outcomes. In addition, online learning makes learning possible anywhere when the internet is available. Most students are raised with digital technology and access to the internet. It is interesting to measure the effect on interest, motivation, engagement and academic performance of using active learning in online classrooms. This study will answer the following research questions:

- What is the effect of integrating of student-developed videos towards interest, motivation, engagement and performance?
- Is there any difference for the results of pre-post-test?

Additionally, this study has several contributions to the literature reviews. In other words, the novelty of this paper is its focus on student-developed videos as a learning tool and methodology. Extensive research on the effect of student-developed videos will be carried on. Previous research only explored on students' hands-on experiences. The second contribution is related to the research design. Studies using quasi-experimental research designs to measure the effect of this method are limited. Third contribution is related to the development of the videos. The videos were developed based on Malaysia cultural and daily activities. This unique element hardly gets in literature review.

2. STUDENT-DEVELOPED VIDEOS

Technological changes impact human being activities in various ways. Students created videos after class as an active learning activity. This activity allowed students to master the content by making videos. Incorporating videos into class enhanced students' understanding. People learn more readily from pictures than words. Graul *et al.* [16] shared the view about the significance of making videos. Students making videos is the most innovative form of assessment in higher education [17]. Good assessment supports students' learning. Contemporary students are familiar with making videos using their phones; however, they have no experience of making videos that integrate course content. This study promotes students using their skills at making videos to learn.

2.1. Active learning and student interest

Active learning engages the students in the learning process in the classroom and through online activities [18], [19]. Educators can add opportunities for reflection and application [20]. Learning becomes more meaningful when students are involved in hand-on activities rather than just listening to teachers [21]. When students are engaged in learning activities, they will be more interested in learning and can master content knowledge more easily. Active learning online classrooms can utilize meaningful learning activities

that allow for reflection on the task in hand [22], [23]. Previous studies have shown the potential of active learning for enhancing students' learning interest with activities like problem-based learning or social media [24]. Jürima *et al.* [25] also discuss how active learning elicits active thinking from students, develops collaboration and social skills, and develops self-management skills and critical thinking. It also promotes students' learning interest in a subject because students actively think about subject. Students report that active learning makes lesson more interesting [26].

In addition, insufficient pre-class preparation on the part of teachers, limited participation, and inadequate depth of class discussions are major concerns. Studies have also reported that students enjoy multitasking and distract themselves during online learning, both of which lead to lower performance and decreased levels of attention in class [27]. Therefore, a proper pre-class preparation is important in active learning.

2.2. Active learning and students' motivation

Motivation is a key element in academic success and can be affected by learning activities. Students' ability to create goals for academic tasks, as well as their ability to complete the task even if it does not interest them, is referred to as motivation [28], [29]. Motivation leads to increased effort, and motivated students are able to complete difficult school tasks [30]. Though many studies have reported on the significant effects active learning has on motivation, Elshareif and Mohamed [30] reported that students are motivated to use information and communication technology for non-academic purposes in order to relieve the boredom of lectures. Pawlak *et al.* [31] found that 59% of students reported that their class lectures are boring. Therefore, integrating active online learning into the classroom to engage students may prevent boredom. In contrast, other studies have claimed that online active learning is unsuccessful primarily because of the lack of social interaction, which leads to lower levels of motivation and academic achievement [32].

2.3. Active learning and student engagement

Student engagement is related to motivation. The literature describes student engagement as being influenced by educators and peer support [33]. The crucial point of student engagement is teacher support. Teacher support is a psychological need of students [34]. Chiu [34] discussed student engagement's effect on motivation, indicating that greater engagement was possible in more supportive learning environments such as collaborative learning. Martin and Bolliger [35] identified three types of engagement: learner to learner, learner to instructor, and learner to content. Learner-to-learner engagement is the most important element in online learning. For example, making videos in groups and other group discussions prevent feelings of boredom. On the other hand, activities like peer assessment, conversation, and quizzes promote student engagement in online classroom activities and content. The study also indicates that essential elements of learning success in online classrooms are collaboration between students and instructors during group discussions and assignment feedback.

2.4. Active learning and academic performance

One study has demonstrated that significant relationship between active online learning and academic performance [36]. This study also showed that active online learning, such as flipped classrooms, provide students with opportunities to engage in group discussions, emphasizing higher order thinking and allowing students to think deeply. Flipped classrooms provide meaningful academic activities that have a positive impact on student performance [37]. These findings are consistent with other studies [27], [38]. Other studies found that active learning that uses technology promotes critical thinking and an attitude and improves academic performance [39]. Research has shown that compared to traditional classrooms, active learning environments using high technology (such as the creation of social networks among students both in and out of the classroom) lead to students expressing a more positive view of learning [40]. Colleges and universities are designing and building classrooms that facilitate small work groups and integrate computers at work stations. On the other hand, low-tech active learning classrooms in conventional teaching environments typically used projectors and Power Point during class. Video clips were sometimes used to reinforce the content of a lesson. Student-developed videos are an innovative way to measure student performance and students' grasp of a subject. Noetel *et al.* [38] stated that there is no different between a high-tech and a low-tech classroom in terms of students' grades.

The literature has addressed the effect of active learning in various respects. However, studies of that investigate the integration of student-developed videos into online courses are limited. Videos may entail hands-on experiences; the literature also does not address this. During the pandemic teachers had to teach online, but this arrangement will continue after the pandemic. The purpose of this study was to investigate the effect of active online learning who were required to produce videos. Student interest, motivation, engagement, and academic performance were measured in the study.

3. METHOD

A quasi-experimental quantitative-qualitative (quan-qual) approach was chosen to answer the research questions. A quantitative survey was used to determine the effect of active learning on motivation, interest, and academic performance. An open-ended question in the survey was measure qualitatively about students' feedback. A summary of quasi experimental pre-post research design illustration is shown in Table 1.

Table 1. Summary of quasi-experimental pre-post research design

Group	Pre-test	Intervention	Posttest
Experiment group	Y_1	X_1	Y_2
Control group	Y_1	-	Y_2

The experiment involved experimental and control groups that were exposed to economics topics in economics such supply and demand, necessity and requirement, monetary responsibility, and banking and investment. The economics course is a weekly two-hour lecture with a one-hour tutorial section. After receiving consent, we requested that participants complete a survey and take a pretest before conducting the experiment. The experiment took six weeks to complete. Two instructors were trained before the lesson; students trained in basic skills for video preparation. For the experimental group, the discussion questions appeared after each video. The participants had to watch online videos and participate in group discussions during the tutorial lesson. The students were arranged in groups of two, and the discussions occurred in "breakout rooms" on Zoom. The survey took approximately 30 minutes to complete. Students completed the questionnaire and pretest in week 1. In week 5, each group had to produce a short video clip, as shown in Figure 1, and share this with their peers online. They could produce a short video clip based on the lesson they had studied. The production of the video clip was intended to reinforce the economics concepts they had studied. The students completed a questionnaire and the posttest in week 6. The control group had online lessons as usual but shared their material via Power Point.

Figure 1. Example of video

3.1. Samples

This study was conducted at a public university in central Malaysia. A total of 333 business, management, and economics students voluntary participated in the study. Participants' consent to participate in the study was acquired via email after receiving approval from the research ethics committee. Researchers used the (1) to calculate the sample size of experimental and control group [41].

$$Sample\ size\ (n) = \frac{P1(1-P1)+P2(1-P2)}{(P1-P2)\times C} \quad (1)$$

Where, n is sample size for one group that we need to find out; P1 and P2 are proportion of two groups; and C is standard value for the corresponding level of α and β.

From the pilot study, proportion of the two group was taken as 40% and 20%. The confident interval of 95% and 80% power for the study was selected. A minimum requirement of each group is 86. The experimental group had 165 students, and the control group 168 students. It means that the selection of the sample size exceeds the minimum requirement for statistical analysis to ensure the reliability of the results. All participants were first-year university students, 203 of whom were female and 130 males. The participants ages ranged from 20 to 21 years. All of the students were selected randomly to divide into experimental and control group. The random sampling was employed to minimizing biases and ensuring the experimental group is comparable to the control group.

3.2. Instruments

The primary researcher developed a performance test and survey instrument in order to investigate the effect of the videos. The questionnaire consisted of 19 closed-ended questions, one open-ended question, and a set of performance tests. The questionnaire assessed student interest and motivation. Questions were developed based on previous studies [23], [27]. Demographic questions referred to students age, gender, and experience with active learning online (online course, type of active learning). The questionnaire was reviewed by three panels in a related field. The researchers also first conducted a pilot test. The questionnaire was revised somewhat and had an internal reliability coefficient of 0.905 (Cronbach's alpha). An internal reliability coefficient of 0.905 indicated a high level of consistency among the items in the instrument. The instrument was verified by a group of experts in a related field. The evaluation process by the experts helped to ensure that all the items are relevant and appropriate. The questionnaire employed a five-point Likert scale ranging from strongly agree to strongly disagree. A total of 10 closed-ended questions asked participants to indicate whether making videos enhanced students' learning interest, student interest in participating for videos developing, how do students enjoy the lesson. In addition, nine questions ask the students about their level of motivation for or engagement in in making videos. After the experiment had concluded, participants were also asked to answer an open-ended question about the benefits of and/or drawbacks associated with making the videos in the context of the active learning online classroom.

3.3. Data collection and data analysis

Participants were invited via email to complete an online survey before and after intervention. Reminders were sent after one week and after two weeks. All the responses were anonymous and code number system was used while employing the survey. The response rate was 68.6% (N=333). Two missing data were deleted because the respondents did not answer part of the survey. The descriptive statistics was generated with SPSS. Open ended question was analyses using open coding to find the theme and categorize the data [41].

4. RESULTS

The findings were presented from pre-experimental data checking and followed by answering two research questions for comparing the pre-posttest in order to examine the effect of student-developed videos towards interest, motivation, engagement and performance.

4.1. Data checking pre-experimental

Researcher has run the statistic for checking the normality prior experimental. Firstly, Levene test showed the result of performance $F_{(1,\ 332)}$=0.687, p=0.444, p>0.05. This result was not significant and it indicated the variance was homogeneous. Secondly, Skewness and Kurtosis was conducted to check the normality of the data. Table 2 shows the z-score Skewness for dependent variable students' performance with the score Z=0.192 for the experimental group and Z=0.321 for control group. Right Skewness or positive distribution showed that the tail is more pronounced in the right than left side. In contrast, negative or left-Skewness indicated the tail is more pronounced in the left. A z-score for Kurtosis for performance is 0.768 for experimental group and -.448 for control group. Positive Kurtosis indicated a more peak distribution and heavier tail; whereas negative Kurtosis showed flatter distribution a delighter tail. The assumption of normality accepted Z value ±1.96 [42]. In other words, all the data are normally distributed.

Table 2. Skewness and Kurtosis analysis

Group	Z score (Skewness)		Z score (Kurtosis)	
	Exp.	Control	Exp.	Control
Performance (DV)	0.192	0.321	0.768	-0.448

4.2. Demographics

All the students who participated in this research were enrolled in online classes. However, only 96% had been admitted in active online classroom. About 80% had been involved in an online discussion before, 93% had taken an online quiz, and 96% given a Power Point presentation online. About 74% of students had made videos for fun using their cell phones, but none had created an educational video. Fourteen students stated that they were new to the active learning online classroom.

4.3. Descriptive statistics for scale items

Tables 3 and 4 provide the mean score and standard deviations for all items. All items had a mean score between 2.7083 and 3.9515. It indicated an average to high mean for this survey.

Table 3. Mean and standard deviation for scale items

No	Constraints and items	Pretest experimental group		Posttest experimental group		Pretest control group		Posttest control group	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Interest									
1	I enjoy making videos.	3.4909	0.9081	3.9679	0.7360	2.8869	1.0577	2.7083	0.8431
2	I am able to spend time making videos	3.3758	0.8859	3.7394	0.8475	3.4821	0.7736	3.4071	0.8757
3	I feel that making videos is a meaningful learning activity.	3.3636	0.8772	3.5818	0.7968	3.4702	0.8256	3.5595	0.8665
4	I ask many questions while making videos.	3.6545	0.9216	3.9455	0.7671	3.6310	0.9385	3.6488	0.8626
5	Making videos increases my learning time.	3.4121	1.0181	3.7879	0.9195	3.6429	0.9174	3.5179	1.0437
6	My interest in this course increased after making videos.	3.2727	0.8790	3.6182	0.9071	3.4464	1.0015	3.4532	0.8669
7	Making videos improved my understanding of basic concepts.	3.2364	0.9620	3.6303	0.9254	3.2679	0.9186	3.5536	0.8738
Motivation									
8	Making videos motivates me to learn.	3.3939	0.9671	3.7212	0.9212	3.2857	0.9099	3.6905	0.8543
9	I will try to make videos using the new technique.	3.3758	1.0142	3.7333	0.9508	3.4940	0.9221	3.5239	0.8885
10	I pay attention to all the online activities.	3.4061	1.1147	3.6726	0.9571	3.4821	1.0380	3.8545	0.9516
11	I choose to attend this class because it excites my personal interest.	2.7273	0.8291	3.4405	0.9952	3.4226	0.9939	3.0788	0.9814
12	I feel that making videos is challenging.	2.7515	0.9461	3.4107	0.9685	3.0714	0.8084	3.2061	0.9402
13	I believe that I will receive good grades in this course.	3.0364	0.8688	3.5595	0.9201	3.1667	0.8868	3.4364	0.9582
14	I am confident that I understand the basic concepts better after making a video.	3.0242	0.8968	3.4524	0.8463	3.2917	0.8846	3.4121	0.8694
Engagement									
15	I feel engaged making videos.	2.9455	0.8356	3.4048	0.9492	3.2857	0.9099	3.1697	0.8161
16	I feel eager to make videos.	3.4000	0.9226	3.6310	0.8655	3.3036	0.8388	3.3242	0.9522
17	I can study on a regular basis.	3.6970	0.9068	3.8274	0.8041	3.6488	0.8626	3.9515	0.6967
18	I participate regularly in discussions and making videos.	3.0364	0.9428	3.6369	0.8506	3.5714	0.8446	3.5242	0.8858
19	I get to know the other students in the group.	2.8727	0.9638	3.2976	1.0003	3.1845	0.9391	3.2424	0.9509

Table 4. Mean and standard deviation for performance

Variable	Mean and standard deviation	Pretest		Posttest	
		Experimental group N=165	Control group N=168	Experimental group N=165	Control group N=168
Performance	Mean	55.649	57.467	74.467	62.313
	SD	12.537	15.319	12.491	13.211

4.4. Interest

There were seven items measured interest as indicated in Table 3. The students in the experimental group outperformed the students in the control group according to mean score. Item 1 “I enjoy making videos” showed the highest mean score (3.9697) in the posttest experimental group. The mean score of the posttest experimental group was also higher than that of the pretest experimental group. However, in the control group, students did not make the videos themselves, and so, the mean score dropped in items 1 and 2.

Comments made in the open-ended question were coded as, for example, "I found making videos with my peers fun" or "making video is really interesting." Other students stated that they though had used their phones to make videos for fun before, they had never tried try to make videos that were educational. Feedback indicated that the majority of students enjoyed the making videos for the lessons.

However, a few comments indicated dissatisfaction regarding how time consuming making videos was: "compared to written assignments, making videos took a lot of time." Another student commented "I got hardly any help from my group members; I had to do it myself." Five students also experienced technical difficulties in making the videos.

4.5. Motivation

Motivation had seven items. Overall, the posttest experimental group had a higher mean score than that of the control group, except for item 10, "I pay attention in all the online activities." In addition, "I will try to make a video using the new technique" scored the highest in the posttest experimental group. Meanwhile, items 8 and 11 of the posttest control group had lower mean scores than in the pretest.

Some positive feedback was provided in the open-ended question: "I would like to try this again in other courses." Another student responded, "I am sure I will do it better […] I have learned a technique for creating good videos." In contrast, some comments expressed dissatisfaction: "I do not want to create videos again" and "I had to do every task; I don't want to create videos in a group."

4.6. Engagement

Of the five items pertaining to student engagement, three had a mean score above 3.50. The majority agreed with the three engagement items that pertained to their involvement in making videos. The experimental group were outperformed than control group in most post-experimental items except item 17, "I can study on a regular basis." However, for this item, students in the control group scored higher (M=3.9515).

About 90% of participants found that online learning involving making videos promoted engagement with the content and their peers. Some preferred discussions with their peers to making videos. Many felt engaged with the lesson. Others valued the instructor's feedback and responses. One student wrote critically, "it was a bad experience because I failed to get feedback from (my group) members." The comparison among three variables, interest, motivation and engagement have summarize in Figure 2.

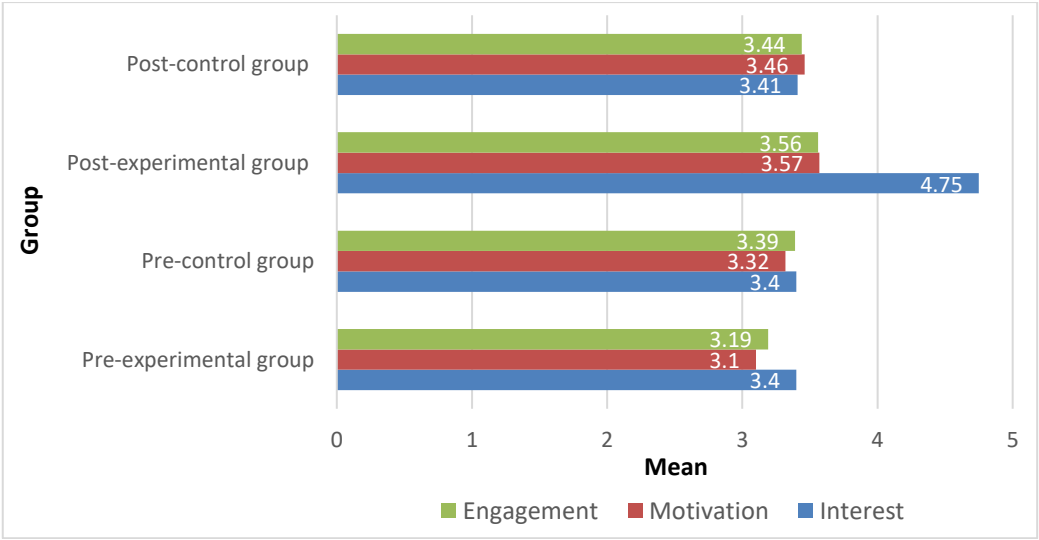

Figure 2. Comparing between experimental and control group for average mean of variable engagement, motivation, and interest

4.7. Performance

Students performance was measured before and after the experimental. Both groups have similar mean score in pre-test (M experimental group=55.649, M control group=57.467). The result in Table 4 showed that students in experimental group (M=74.467) was outperformance than control group in posttest (M=62.313).

More than two third of the students left the positive comments included "I can understand the content better during developing the video", "I feel that I can understand better the concept after developing video. I am sure I will get a better grade…" Two students were not sure whether they can get better performance. In order to present a clearer result, a bar graph is illustrated in Figure 3.

A further investigation was conducted to check the effectiveness of making videos and student performance. The ANOVA findings in Table 5 show that F=284.137 was significant ($p<0.05$). This finding indicates that making videos predicts their performance. The value of R is 0.765, and the adjusted R^2 is 0.465, meaning that 46.5% of the variance in performance can be predicted by student development.

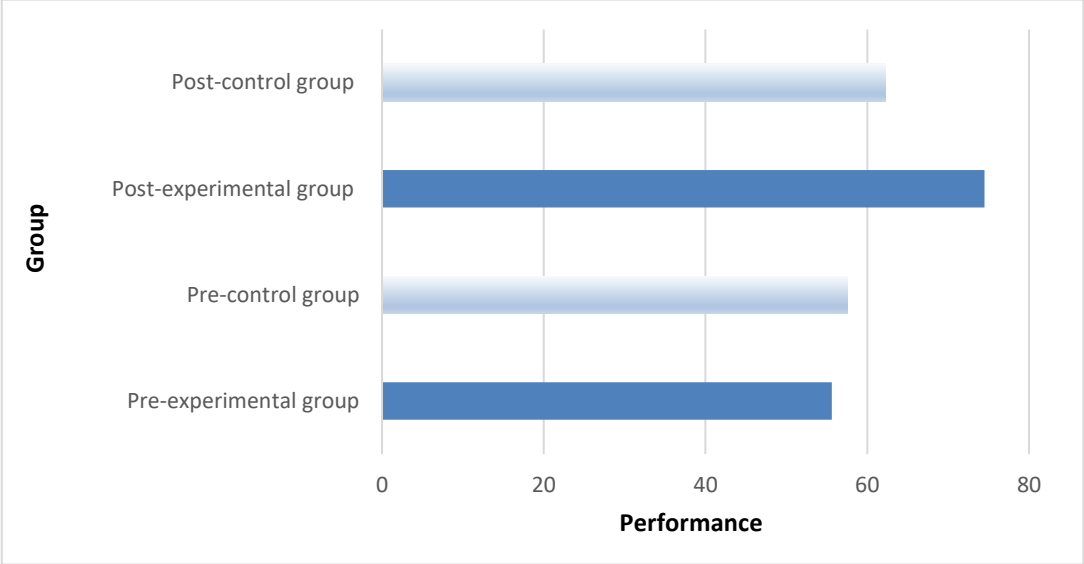

Figure 3. Comparing between experimental and control group for performance

Table 5. Descriptive statistics (ANOVA) and interaction

DV (performance)	SS	df	MS	F	Significance
Between groups	27342.219	1	23742.291	284.137	0.000
Within groups	29384.569	332	87.337		
Total	52126.850	333			

*Significance at $p<0.05$; R=0.765; R square=0.465

5. DISCUSSION

The main purpose of the study was to investigate the effect of student-developed videos on student interest, motivation, engagement, and performance. The findings of posttest indicate that the majority of students were satisfied with the approach. Most students found that making videos fostered their interest and engagement with the course [17], [43], [44]. Furthermore, this approach also heightened their motivation [45], [46] and improved their performance [27]. Students who made videos in groups and shared them online expected to express themselves in a creative way. Videos also can assist students in learning and enhance their understanding of concepts. These findings are consistent with previous studies of the advantages of video creation [38], [47]. However, some students criticized the method because it was time consuming compared to written assignments. Students working in uncollaborative groups might be one reason for this negative assessment. These findings are not surprising as other studies had similar results [48]. Research by Erlangga [48] emphasizes the important of making videos and shared a positive view of the method with that many students. On the other hand, Erlangga [48] also stated that some instruction in how to make videos was needed before giving such an assignment because some students were frustrated that they could not master the skill.

Students in posttest experimental group showed the most improvement in mean scores of interest compared to the control group in two items: "I enjoy making videos" and "I ask more questions while making videos." Even though the majority of students had experienced online learning before, none had made an educational video before. Research also indicated that student interest was enhanced when they were

involved in hands-on activities because they content was easily understood [23]. Motivation and engagement are the variables that are always connected. The experimental group outperformed the control group except for items 10 and 17: "I pay attention in all the online activities" and "I can study on a regular basis." The experimental group had a lower mean score in both items possibly because the students were excited to make videos, and so, they selected the activities that would appropriately draw their attention. For item 17, students in the experimental group preferred online learning to face-to-face class settings.

The findings indicated that the students in the experimental group outperformed the students in the control group. This result aligns with the results of previous studies [35]. Students in the experimental group had held discussions in pairs and created videos. In other words, they developed skills in discussion and collaboration. Even though the quantitative results show a positive impact of making videos, the qualitative results indicate that a few students had difficulties in collaborating with their peers, especially if these inactive and uncollaborative peers were their friends. Instructors can address this lack of collaboration if informed about it early on. For instance, instructors should monitor progress every two weeks to prevent "free riders." An important point of interest emerges from the results. Student interest, motivation, engagement, and performance can be enhanced by properly using the making of videos in online classes.

Nevertheless, this study has some limitations. First, all the data were collected at a university. Second, only economics students participated in the study, and so, the results cannot be generalized to a larger group setting in other institutions or courses. Third, the qualitative results are based on an open-ended question posed in the survey; no follow-up interview was conducted. Future research needs to conduct follow-up interviews and recruit students from different courses and universities. The biggest challenge of this study is to monitor students to creating videos in pairs.

This study developed based on Vygotsky social interaction theory. Vygotsky posited that learning is inherently social. The learning process that integrated student-developed video promote collaboration among students, encourage communication and develop higher-order thinking. The concept of zone of proximal development (ZPD) is central to Vygotsky highlighted the difference between a learner can achieve independently and what they can achieve with the assistance of tools or peers. Additionally, this method not only aligns with Vygotsky's theory but also implications in educational practices such as enhance engagement during collaborative learning. Educators can provide scaffolding strategies by offering guidance during video production. All the support that offered by educators encouraging students to explore their ZPD. Educators can encourage students to reflect on their learning through reflection sessions after developing the videos. This activity may help students to understand and recognize their weakness and continue to improve.

On the other hand, participants reported a positive impact of making videos. Such a method can draw out students' creativity and understanding of class content and integrate with information and communication technology skills. It is important to note that the creation of videos is a current educational trend that suits many students. Student-developed videos have been reported to be an effective digital tool for enhancing student learning. Two recommendations have been made based on the findings: the making of the videos must be integrated into the course in order to achieve the learning outcome, and so, the instructor must be trained in video creation. Student engagement in the course is another crucial point. Clear instructions and guidelines must be given prior to a lesson. Instructors must monitor the process of video creation from time to time. The format, technological support needed, and content of student-developed videos must be carefully considered before they are selected as an assessment method.

6. CONCLUSION

From the findings, several important ramifications found for the future online education. The effect of student-developed videos suggests that educators should incorporated project-based learning into curricula and lead to the development of new innovative teaching method. This method can create a platform to improve engagement of students during the learning process. The importance of close monitoring group work such as structured peer evaluation or checkpoint to ensure all students participate actively. Additionally, university students can gain some experience of video making that integrated with content. They will have the opportunity to express their ideas in more creative ways. Students from different backgrounds and different places can share their cultures in videos. Creating videos has provided many learning possibilities in university as assessment or learning materials. Comparative research with mixed method approaches and employed students from neighbor country such as Indonesia can be done as future research. In summary, the ramifications of these findings suggest a shift towards more innovative, collaborative, creative and hands-on learning approaches in online education, with the potential to enhance student engagement and learning outcomes.

FUNDING INFORMATION

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the authors' institutional ethical board.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author [KYY], upon reasonable request.

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