The Use of YouTube Social Media in the Covid19 Pandemic to Improve Understanding of Mathematical Concepts

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Abstract: The purpose of this research was to find out any improvement in mathematics learning achievements of students after using YouTube as learning media in the Covid19 Pandemic, especially improvement in mathematics learning achievements about 2-variable linear equation system of students of Class X in Semester 1 SMK Bonaventura (a vocational high School in Indonesia), 2020-2021 academic year, after using YouTube as their learning media. This research was meant to explore if there is any improvement in mathematics learning achievements of students after using YouTube as learning media, especially improvement in mathematics learning achievements about 2-variable linear equation system of students of Class X in Semester 1 SMK Bonaventura, 2020-2021 academic year after using YouTube as their learning media. The researcher utilized a quasi-experiment with a 2x2 factorial concept. A closed group of SMK Bonaventura students was used as the research sampling. The research instrument is a comprehension ability test on mathematical theories. Anakova was used to analyze collected data. The researcher found out that there are different levels of students' cognitive ability which study via YouTube created on Corel Videostudio X10 with ethnomathematical application and which studying conventionally, after controlling students' initial abilities. Conclusion of this research is that students studying using YouTube with ethnomathematical application by way of Corel Video Studio X10 has positively affected their conceptual cognitive ability and are better than performance of students who study conventionally after controlling students' initial abilities.

Keywords: youtube, mathematics, ethnomathematics

1. Introduction

There are many opinions from the community that distance learning systems make students difficult to understand the subject matter. This is proven by the students low learning achievements (Lassoued et al., 2020). This situation is of particular concern to teachers, schools, and the government. Several means have been developed to improve learning achievement during the corona-19 virus (covid-19) pandemic. Efforts made by the government to improve learning achievement at this time are provision of learning facilities and infrastructure, including internet networks for remote areas, strengthening internet signals, providing laptops, providing mobile cellular (smartphone), providing data packages, increasing family economic welfare through (government) social fund support (*Bansos*), improving the quality of teaching staff through webinars, workshops and refining the curriculum to suit the situation and conditions. With the availability of various facilities, it is expected that students will have the awareness of learning independently without being limited by space and time so that they can improve their learning achievement. Independent learning means learning by having the initiative themselves with or without the help of others in learning (Loyens et al., 2008).

During the Pandemic, the Corona 19 virus (covid-19) makes the learning process, which is usually carried out with a face-to-face system, cannot be carried out and is now replaced by an online learning system, with an intention to reduce the spread of the Corona19 virus (covid-19) (Widada et al., 2018). In the online learning system, awareness is needed to learn independently to obtain good learning achievement. In addition, the teacher's creativity in the delivery and provision of learning materials also greatly determines how much subject matter can be absorbed so that it determines the learning achievement that the student wants to achieve. In this research, the researcher defines improved learning achievement as the acquisition of the average score of the competency tests of students from first cycle which then improving in second cycle etc., then followed by an increasing number of study completion. The increase of learning achievement is one of indicators of successful learning process. To support this success indicator of learning process, the facilities and infrastructure must be adequate. The skills of teachers in the use of learning facilities and mastery of the subject matter also greatly affect the learning achievement of students (Harris, and Sass, 2011).

The current rapid technology development is very helpful in social life, for example, people today tend to use technology in their daily activities to help their work, even looking for various information in the internet. Through

internet, each person can access various information useful for their self-development. Various information available on the internet can also be useful for learning material. Many students are interested to use internet as a learning media because the information obtained is generally more up to date (Sari and Setiawan, 2018). One of learning mediums used is YouTube.

SMK Bonaventura, at the time of this current COVID-19 pandemic, has the policy to apply both online and face-to-face learning systems (when Madiun was in the orange and red zone students learned online, and when Madiun was in the green and yellow zone students learned face-to-face) because there are not many SMK Bonaventura students. In daily learning process, the school gives the teachers chance to develop their creativity in delivering learning materials. This creativity in learning process is certainly expected to improve the students' learning achievement particularly in mathematics subject ie. 2 variable linear equation system material for Class X Semester 1 SMK Bonaventura students in the 2020-2021 school year.

The YouTube media is used by the researcher to deliver key subject matter of mathematics about 2 variable linear equation system online because the researcher thought that YouTube is most fit to be used by the students to learn independently in the application of online learning system. The subject matter of 2 variable linear equation system is used in this research because many student learning achievements on this subject matters are still below Minimum Passing Grade (*Kriteria Ketuntasan Minimum/ KKM*) which defined as 68. This can be seen from average score of 58.3 with passing level of only 36.4%.

Other research results show that there are different levels of mathematic representation ability between students learned using realistic mathematic framework and the ones studied conventionaly after controlling student initial abilities; there are different levels of mathematical representation ability between students learned with ethnomathematical and without ethnomathematical approach after controlling the students' initial abilities; the study approach and the orientation of mathematics material showed interrelation impact on mathematical representation abilities after controlling students' initial abilities (Widada W. et al. 2019). However, students in reality did conceptual and principal mistakes in understanding mathematics. Conceptual and principal mistakes done by students among others are a function's limit. When the test was done by the students: $\lim_{x\to 1} \frac{\sqrt{x-1}}{x-1}$ the results were shocking ie. there are 76% students that were conceptually/ principally wrong in completing the test. If detailed, 57% of students answered 0/0, 14% of students answered 1, 5% of students answered 0, and the rest of students (24%) answered correctly with the answer of ½. As quadratic equations have a role in solving problems about these limits, students were investigated about their understanding on quadratic equations, namely solving $x^2 - 3x + 2 = 12$. There were apparently 38% of students who solved the problems with (x-2)(x-1) = 12 and were solved with x-2 or x-1. Students stated that the solutions are x = 14 or x = 13. 38% of students show conceptual and principal mistakes in solving quadratic equation.

Further, the mistakes on the limit of a function were also influenced by students' mistakes on fraction function. In relations to this, there were 23% of students did principal mistakes on kanslasi law. When students were asked to simplify $\frac{25st^3-75s}{75s}$, the students di the following mistakes: $\frac{25st^3-\cancel{75s}}{\cancel{75s}} = \frac{25st^3-1}{1} = 25st^3 - 1$.

According to Herawaty and Widada, mistake in understanding mathematics may cause student's internal cognitive conflict. Cognitive conflict is a condition of a person's consciousness who is experiencing imbalance. However, Herawaty and Widada mentioned that cognitive conflict may accelerate conceptual change process of student understanding. Contextual learning process which involves cognitive conflict may enable student to achieve ability to understand concepts and problem solving well (Widada, W. & Herawaty D., 2018). This means that learning which starts from contextual problems and involves student's cognitive internal condition which is line with learning material can increase the ability for concept understanding and problem solving. Therefore, design of learning material should fulfill these criteria. One of contextual learning material is the use of learning medium which adjusted to the information technology and communication development. Observation results show that most of Vocational Schools Bonaventura (SMK Bonaventura) students use smart phones as communication media and getting real time information during covid 19 pandemic. The use of smart phone is most reasonable condition in terms mathematics learning process. Learning using smart phone medium has become the choice in carrying out mathematics learning process. Research result (Drijvers, P., 2018) shows that mathematics teaching can be made more interesting, inventive, and explorative by using computerized algebra system. This teaching encloses small module which was developed by using Pro MuPAD. Teacher role is very important to make use of available mathematics tools effectively. According Akpan I. J., et al., (2020) the development of science has a positive impact with the emergence of cutting-edge technology which greatly helps mankind to meet their daily needs easily, quickly and cheaply. Technology advancement also touches education sector in which technology helps teaching more effective and efficient. Therefore, the term e-learning emerged, which is an electronic-based learning model that is supported by various hardware products, software and various advanced features that can be used by teachers in the learning process.

Electronic-based learning media can serve as an alternative to handle study problems and mistakes in learning mathematical theories and problem solving. Further, Lowenthal P., et al. (2017) stated that in e-learning, learning is differentiated into 2 types ie. Live (Synchronous) and On Demand (Asynchronous). This means that there is

learning which takes place live (direct) where teacher and student are face-to-face in a room or through electronic device. However, there are also "indirect" learning processes that do not take place at the same time but can still be accessed at another time.

Therefore, a learning alternative that can be done live and can be accessed any time is through YouTube. This media makes mathematics teacher easily interacting with students or other YouTube users. According to (Horstman, 2015), educator requires adequate level of technological knowledge to confidently combine various forms of technologies via YouTube into their teaching practice.

Research Results (Horstman, 2015) have gained a deeper understanding of teacher practices regarding the use of Youtube as a platform for viewing video content. Students feel comfortable using this resource. Teachers incorporate videos into lessons and how they manage students in 21st century classrooms. Students learn in an inverted classroom and how technology is used to teach knowledge to student in revolutionary means. In addition, many teachers downloaded YouTube videos at home to take to their school and show them to their students and teach using YouTube-based Learning approach (Atmojo dan Nugroho, 2020). By utilizing YouTube as learning media, students can study and repeat the learning anytime. If this becomes habit, students may play less games as games are tiring and less useful. Students turn to a more positive activity, namely learning mathematics using their smart phones.ie. learning mathematics using their smart phone. As mathematics is a human activity (Van den Heuvel-Panhuizen & Drijvers, 2018), then YouTube video as a starting point of mathematics learning must be based on realistic problems or close to students' minds. This means local culture serves as local content or which is often called as ethnomathematics (d'Ambrosio, 1985).

Mathematics learning through YouTube media oriented towards ethnomathematics leads students to study mathematics through horizontal mathematics process and do abstraction vertically. Therefore, students are capable of doing abstraction process, idealization and generalization (Widada, W. & Herawaty D., 2018) through vertical mathematics (Wasserman N. H., 2014). Students can easily reach concepts, understand concept and solve mathematics problems (Laurens, T. et al. (2018).

Therefore, we are interested to research and develop YouTube-based ethnomathematics learning tools (YBLT) using corel videostudio x10 to increase the ability of SMK Bonaventura students of understanding mathematics concept and problem solving.

2. Methodology

This research is part of developmental research. This is the final phase of research ie. implementation and summative assessment phase. It is a pseudo experiment with Factorial 2x2 concept. Reachable population of this research is chosen from SMK Bonaventura students. This research sample is chosen by intact group technic, where there are 4 classes chosen in each school. The research instrument is conceptual comprehension ability tryout. The tryout was done twice ie. pre-test and post-test. Pre-test is a measure of covariates, and post-test is a measure of dependent variables. The implementation of mathematics learning by using YouTube as a medium and ethnomathematics approach are for Group I. Group II is the one implementing YouTube as medium without ethnomathematics. Group III is the one learning mathematics without YouTube but with ethnomathematics approach. The last Group is the group which is given media without YouTube and without Ethnomathematics. This happens at two schools where research takes place.

Table 1. SMK Bonaventura 1

No	Kelas Penelitian	Subject Penelitian	Jumlah Siswa
1	X Accounting	YBLT and Etnomatematika	33
2	X Offices	YBLT and Non-Etnomatematika	32
3	X Online business	Non- YBLT and Etnomatematika	34
4	X marketing	Non- YBLT and Non-Etnomatematika	32

Table 2. SMK Bonaventura 2

No	Kelas Penelitian	Subject Penelitian	Jumlah Siswa
1	X Accounting	YBLT and Etnomatematika	35
2	X Offices	YBLT and Non-Etnomatematika	35
3	X Online business	Non- YBLT dan Etnomatematika	32
4	X marketing	Non- YBLT and Non-Etnomatematika	31

Referring to the following Table 1 and Table 2, data of tryout results of all students understanding on the concepts mentioned above was collected. It was then analyzed by means of anakova inferential statistics (Covariates analysis).

3. Analyst of the Data

Based on pre-test and post-test data of SMK Bonaventura student's conceptual comprehension abilities, the analysis was done as follows. First, prerequisite test ie. homogeneity test with the Levene test of variance similarity.

Table 2. Levene's Test of Equality of Error Variancesa

F	df1	df2	Sig.
37,925	3	261	.000

a. Design: Intercept + A * B + X + A * B * X

Based on Table 4.31, this can be analyzed and described as follows.

1. Ho: $\sigma^2 1=\sigma^2 2=\sigma^2 3$
2. Ha: apart from Ho

Table 2. shows that Levene Test of variance mistakes are F = 37,925 with db(3,253) and p-value – 0,00 < 0,010. This statistics experiment shows that Ho is accepted and therefore, we can conclude that there is similar variance/ homogenous result from average scores of the four groups of sample data.

Table 3. Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Perangkat	48.475.861	7	6.833.821	558.913	.000
Intercept	17.502	1	17.322	1.397	.193
A*B	4.902.921	3	1.603.025	131.087	.000
X	4.816.973	1	4.905.548	387.951	.000
A*B*X	3.840.981	3	1.269.033	102.934	.000
Error	3.200.772	256	12.298		
Total	1.240.146.000	264			
Corrected Total	51.721.924	263			

a. This parameter is set to zero because it is redundant.

Data analysis of Table 3 shows the four groups' regression alignment as follows.

Ho: $(AB)ij$ X=0

Ha: other Ho

The results of this research find: F = 0.013 with db(3, 192) and p-value = 0,000 < 0,05 where we can conclude that Ho is accepted. Therefore, the research shows homogenous regression coefficient of four groups, or parallel four regression equations.

Based on prerequisite tryout above, the researcher got homogenous data variance of conceptual cognitive abilities, and four groups establish parallel regression equations, so that covariance analysis of conceptual comprehension ability data can be continued.

Further, the equations of conceptual comprehension ability regression equations for the four treatment groups will be presented. Pay attention to Table 4 data analysis to determine the regression equation.

Table 4. Parameter Estimates

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	79,594	3,793	20,792	,000	72,098	86,967
[A=1.00]*[B=1.00]	-91,601	10,794	-8,396	, 000	-113,011	-70,176
[A=1.00]*[B=2.00]	-116,935	6,943	-16,792	, 000	-131,121	-103,590
[A=2.00]*[B=1.00]	-93,791	6,509	-14,601	, 000	-106,605	-82,021
[A=2.00]*[B=2.00]	0.000	-	-	-	-	-
X	-0,133	, 064	-1,794	, 062	. -.248	, 007
[A=1.00]*[B=1.00]*X	1,608	,170	9,615	, 000	1,250	1,896
[A=1.00]*[B=2.00]*X	1,902	,131	14,864	,000	1,611	2,103
[A=2.00]*[B=1.00]*X	1,401	, 124	11,820	,000	1,206	1,617
[A=2.00]*[B=2.00]*X	0,000	.	.	.	.	.

Based on Table 4, The regression equation for the four treatment groups can be presented as follows.

1. Y11 = (79,594-91,601)+(-0,133+1,608)X, Y11 = -12,007+1,475X
2. Y12 = (79,594-116,935)+(-0,133+1,902)X, Y12 = -37,341+1,769X
3. Y21 = (79,594-93,791)+(-0,133+1,401)X, Y21 = -14,197+1,268X
4. Y22 = (79,594-0,000)+(-0,133-0,000)X, Y22 = 79.594-0,133X

Table 5: Tests of Between-Subjects Effects

Source	Type III Sum of	df	Mean Square	F	Sig.

	Squares				
Corrected Perangkat	44693.330a	4	11.199,823	413,.324	,000
Intercept	1.245,051	1	1.243,951	45,973	,000
A	1.082,392	1	1.083,012	40,126	,000
B	513,063	1	512,303	18,893	,000
A*B	15.860,627	1	15.849,517	586,225	,000
X	2.836,915	1	2.836,935	104,757	,000
Error	7.007,632	259	27,126		
Total	1.236.267,120	264			
Corrected Total	51.729,912	263			

Based on Table 5, this research results show that conceptual cognitive ability of students which study using ethnomathematics learning tools through YouTube (YBLT) is higher than the students learn conventionally but are given the same material (YBLT). The conceptual comprehension ability of students which learn using YouTube-based ethnomathematics tools (YBLT) is lower than the students who are studied with conventional learning tools for students but are given YouTube-based Non-ethnomathematics learning material.
Referring to Table 4.34, this is explained below.
1) Fo (A)= 40,126, db= (1, 259) dan p-value= 0,00<0,05, Ho is rejected. Therefore, while the researcher kepts the students' early abilities under controlled, there is a difference between students learned with Ethnomathematics learning tools using YouTube (YBLT) and conventionally.
2) Fo (B)= 18,893, db= (1, 259) dan dan p-value= 0,00<0,05, Ho is rejected. Therefore, there is a conceptual comprehension difference between students taught with ethnomathematics-oriented learning and without ethnomathematics orientation after controlling students' initial abilities.
3) Fo (AB)= 586,225, db= (1, 259) dan dan p-value= 0,00<0,05, Ho is rejected. Therefore, there is an impact of the interrelations of YBLT learning tools and ethnomathematical concept on the ability to understand concepts after controlling students' initial abilities.
4) Fo (X)= 104,757, db= (1, 259) dan dan p-value= 0,00<0,05, Ho is rejected. Therefore, there is a covariates linier influence on students' initial abilities towards conceptual comprehension abilities.
5) On the device corrected line, the following are gained: Fo = 51.729,912 with db=(4, 263) and p-value = 0,00 < 0,05, Ho is rejected. Therefore, the combination of students' initial abilities, the YBLT Learning Tool and ethno-mathematical orientation impact conceptual comprehension abilities.
The results of this research strengthen previous research. Those previous research show that mathematical communication abilities of the students learned realistic mathematics learning concepts are higher than those taught by traditional concepts. Also, the average mathematics communication ability of students learning ethnomathematics-oriented material was higher than those learning non-ethnomathematics. Also, their mathematics problem solving capability were higher after being given ethnomathematics concept with external learning model than before being given the learning model (Widada et al., 2019). Widada et.al., stated that first, mathematics comprehension of student taught using realistic mathematic learning tools is higher than students taught using conventional method (both groups using non-ethnomathematics learning material). Second, mathematics comprehension of students learning ethnomathematics-oriented material are higher than non-ethnomathematics-oriented ones (both groups were introduced to realistic mathematics learning method). Third, the level of students' mathematics comprehension ability studying ethnomathematics-oriented material is lower than students learning non-ethnomathematics one (conventional learning method was applied to both groups) (W. Widada, Herawaty, & Lubis, 2018). Other research also shows that students can develop their problem-solving skills through self-reflection on planning, monitoring and evaluation of their thinking process. Students can combine puzzles of information about elements of Rejang Lebong traditional house which has properties similar to 3-dimensional math numbers such as pyramids, prisms, rectangular prisms, and cubes (W. Widada, Herawaty, & Lubis, 2018). Therefore, we are certain that learning through YouTube and ethnomathematics approach can replace conventional study mechanism.

4. Discussion, Conclusion

This research concludes that first, there is a difference of conceptual comprehension abilities between students who learn using YouTube by way of Corel Videostudio X10 versus conventional learning after the researcher contained students' initial abilities. Second, there is a difference between students who learns with ethnomathematics orientation and without ethnomathematics after controlling students' initial abilities. Finally, there is an impact of the interaction of learning model and orientation of mathematics material on conceptual comprehension ability after students' initial abilities are controlled.

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