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The Effect of Media of Chemondro and Hybrid of Video Conference on Teaching-Learning towards Students' Self-Efficacy and Students' Achievement on the Subject of Solubility and Solubility Product

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Abstract

This research analyzes the effect of using media of Chemondro and hybrid video conference in the teaching-learning toward students' self-efficacy and students' achievement on the subject of solubility and solubility product. The instruments of this research were questionnaire, solubility, and solubility product test. Thus, the research was set as quasi-experiment research using posttest only and non-equivalent control group design. The samples from 6 classes composed of 2 public senior high schools were selected by purposive sampling technique. The classes were divided into two-hybrid learning with video conference and Chemondro game (A), two classes of hybrid learning with video conference (B), and two classes of Chemondro game (C). The corresponding data were collected based on a self-efficacy learning questionnaire and a multiple-choice posttest of students' achievement in the subject of solubility and solubility product. MANOVA then tested the data. The results show a significant difference in students' self-efficacy and students' chemistry cognitive achievement amongst the three classes, A, B, and C.

Keywords: self-efficacy learning, achievement, video conference, Chemondro, solubility

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INTRODUCTION

Today, information technology is essential. Science and information are two inseparable things. The development of information technology can be used in learning Chemistry. Learning media makes learning more enjoyable, effective, efficient, and flexible using time (Sumintono, et. al., 2012). Through hybrid learning, it allows students to learn more flexible because students can learn whenever and wherever. Information technology has not been used optimally in the learning science process, so it is thought to impact the quality of learning Chemistry (Susilana and Riyana, 2008).

Chemistry is one of the essential lessons in high school; therefore, every student must understand Chemistry. Many students consider Chemistry as a complex subject. For example, in the solubility and solubility product material, students need counting skills. If students do not have good calculation skills, students will get a problem. There is much content that must be taught in Chemistry. The teacher needs much time to teach, but allocation time is too short. Curriculum content (sub-microscopic, macroscopic, and symbolic), presentation of the learning process, and low motivation (Sirhan, 2007), as

well as the chemical, is abstract concepts and lack of teacher support are the causes of students in learning Chemistry (Yusrizal, 2016).

There are many problems in Chemistry students for solubility and solubility products. Hybrid learning is the solution to this problem. Hybrid learning is learning that combines face-to-face and online phases (Jabbour, 2014). Students can learn anywhere and anytime, making hybrid learning more effective and efficient (Zhao and Breslow, 2013). In hybrid learning, students and teachers use information technology for learning (Pandey and Pande, 2014). Video conference is very similar to face-to-face learning in class. Video conferences in the learning process make students can talk to the teacher in a different place. Video conference is not maximum implemented (Candarli and Yuksel, 2012).

Learning based on information technology can affect students' motivation. Many cognitive and affective aspects of motivation, such as self-efficacy, attraction, and confidence to succeed, have long been studied. Students' self-efficacy is often considered critically, especially for complex material. Self-efficacy is one of the motivational beliefs based on expectancy-value (Woldeamanuek, Atagana, & Engida, 2014). Learning games can increase motivation by adding game rules and or competition to learning activities. Games can provide many opportunities for students to learn (Roblyer, 2006). Learning games can influence students to provide a sense of fun in learning, a positive learning experience, and a positive learning outcome (Jabbour, 2014). Cognitive learning achievement is student's abilities possessed learning that can be observed by students' performances (Suprihatiningrum, 2013). Android learning game media are advantages that can be used as innovative learning strategies (Jeng, et. al., 2010). Students who are familiar with the game as a learning media get an impact on cognitive learning achievement. Chemondro (Chemistry on android) is an Android-based game that can be used as innovative Chemistry learning (Jabbour, 2014).

METHODS

This research used a quasi-experiment with a posttest-only design. The population of this research was students in eleventh grade in Sleman regency. The sample of 143 students enrolled in the eleventh grade (with an average age of 16) in two public senior high schools in Sleman regency, Special Region of Yogyakarta, Indonesia, were selected. The sampling technique was random cluster sampling with two steps. The first step chose the school, and the second established the sample. First step we got SMA N 1 Depok and MAN 3 Yogyakarta as sample. In the second step, we chose the classes as the sample. The sample was classified into three classes depending upon the media used in the teaching-learning process. From SMA N 1 Depok we got XI MIA 1, XI MIA 2, and XI MIA 3. From MAN 3 Yogyakarta we got XI MIA 1, XI MIA 2, XI MIA 3. XI MIA 1 SMAN 1 Depok and XI MIA 1 MAN 3 Yogyakarta were group A classes that used hybrid learning with video conference and Chemondro game. XI MIA 2 SMAN 1 Depok and XI MIA 2 MAN 3 Yogyakarta were group B classes that used hybrid learning with video conferences. XI MIA 3 SMAN 1 Depok and XI MIA 3 MAN 3 Yogyakarta was group C as classes that used Chemondro game.

The students' self-efficacy was collected through a questionnaire, and solubility and solubility product tests were self-developed. The self-efficacy questionnaire consisted of 23 statements with four answer choices. The choices were never, sometimes, often, and always. The student's cognitive achievement test consisted of 20 questions. The results of the instrument analysis showed that the self-efficacy questionnaire was in the excellent category, while the solubility and solubility product test was in the excellent category.

MANOVA technique was used to analyze the differences in self-efficacy and cognitive achievement in these instructional models. Moreover, the descriptive quantitative method was used to analyze the profile of students' self-efficacy.

RESULTS & DISCUSSION

Results

Learning based on information technology has a positive impact on the self-efficacy and cognitive learning achievement of students. In this study, the impact of information technology on students' self-efficacy and learning achievement on hybrid learning mediated by video conferencing and Chemondro games on solubility and solubility product material. The results of this research shown in table 1.

Table 1. Rate value of student's self-efficacy and student's achievement

No	Class	Self-efficacy	Student's Achievement
1	A	67,94	70,85
2	B	64,47	74,80
3	C	60,84	72,40

From Table 1. We can make a diagram. The rate of self-efficacy of students' score is shown in figure 1.

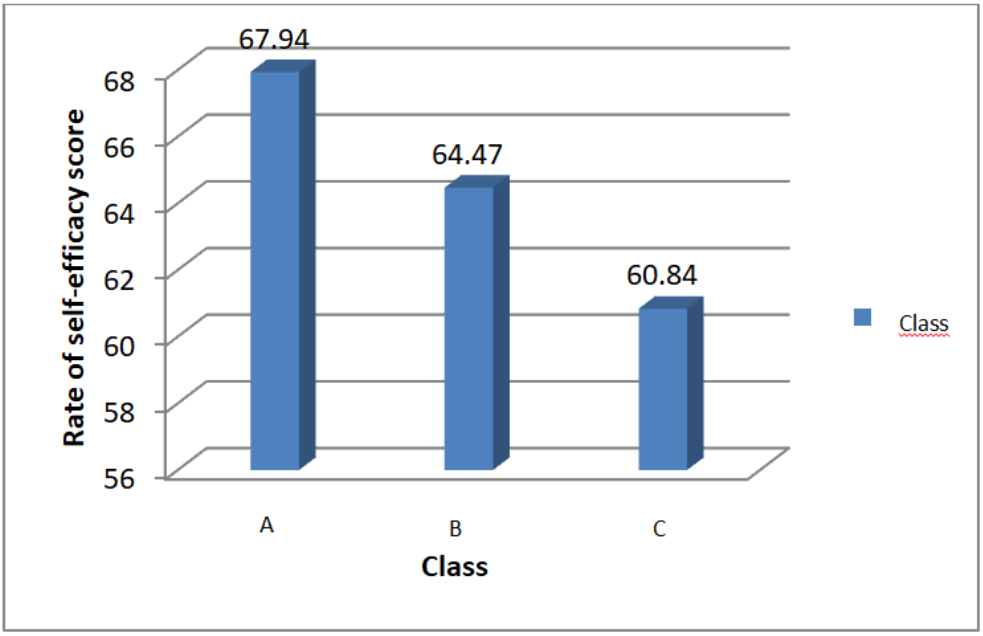

Figure 1. Diagram Rate of Self-Efficacy Score

The distribution of self-efficacy in this study is reviewed and analyzed based on the average score of self-efficacy of students in each class is used as a sample and categorized based on an assessment ideal. The distribution of students' self-efficacy achievement is based on the mean obtained in each class used in the study sample (shown

in figure 1). Based on this figure 1, the highest student self-efficacy is in the experimental class A. The score is 67.94.

Meanwhile, class C is the lowest rate self-efficacy score. The score is 60.84. After that, the distribution of student's self-efficacy achievement based on the percentage of students' self-efficacy category is shown below. The distribution of self-efficacy score is a review based on the percentage of students' self-efficacy ideal categories in each class used in this research. The distribution of this self-efficacy score is based on the percentage of idealized categories, which is carried out by counting the number of students who have "very good" to "very poor" self-efficacy criteria in each class. After that, the ideal percentage is made and compared between the three classes used as the sample in this study. The distribution of self-efficacy scores based on the percentage of ideal self-efficacy categories can be seen in Figure 2.

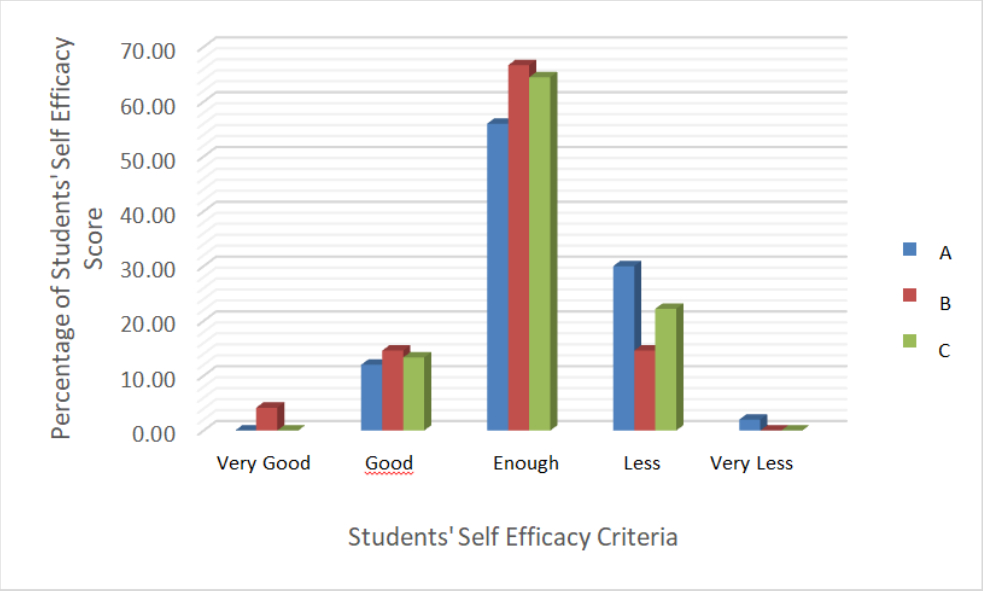

Figure 2. Distribution of Student's Self-Efficacy Achievement Based on the Percentage of Students' Self-Efficacy Category

Figure 2. shows that class A students at most have enough self-efficacy, namely as much as 56.00%, and 2.00% of students have very poor self-efficacy. Class B students have the most enough self-efficacy, with a percentage of 67.00%, while in class C, it has a percentage of 64.00%. So we can conclude that the self-efficacy in experimental class A is better than the other two classes.

Discussion

Based on table 2, SMA N 1 Depok class has differences, and it is an experimental class with a comparison class 1 (hybrid) and a comparison class 1 (hybrid) with a comparison class 2 (game) and for learning achievement based on the class that has differences is an experimental class with a comparison class 1 (hybrid). Students' achievement classes in MAN Yogyakarta 3 have differences. They are experimental class with comparison class 1 (hybrid) and experimental class with comparison class 2 (game).

Chemondro is a supplement for solubility and solubility products. Chemondro can be used as an evaluation for solubility and solubility product material. In Chemondro,

some parts make the students understand the material deeply. They can learn happily. They study but not felt, because they enjoy it.

Video conference is one of the media that makes online learning very similar to face-to-face learning in class (Pandey and Pande, 2014). The use of asynchronous online learning media with mobile learning involves two types of technology, namely mobile technology and social networking technology, in the learning process (Kaypak, et. al., 2017). There are many advantages of using phone cellular for learning for students are very familiar with phone cellular. Chemondro games can provide many opportunities to learn Chemistry quickly. Self-efficacy and self-regulation can affect students' learning achievement (Hodges and Kim, 2010). From the result, we get that self-efficacy results from effective learning related to improving the content of learning in the form of academic performance (Villafañe, Raker and Xu, 2016). Furthermore, students who have higher self-efficacy will have more influence on their education because they have high motivation (Mataka and Kowlaske, 2015).

From the research, we can show the best video conference and Chemondro game. There are many dynamics in this research. Sometimes need much signal. So the student must find the signal in the best place. Video conferences make students talk with the teacher not only in the class but also at home. It makes the study easier. Talk with the teacher to make students can solve the problem in study solubility and solubility product.

Based on the test of between-subject effects, we can conclude something different in students' self-efficacy in three classes. Hybrid learning can show that it can increase self-efficacy (Chyung, Moll and Berg, 2010). Through hybrid learning, we can use technology, especially in Chemistry learning. Students' confidence in their abilities makes their self-efficacy suitable. Students who use hybrid learning have additional time in learning, increase interactive learning resources, and increase interaction between students and other students and teachers in the teaching and learning process (Means, et. al., 2013). From the Post Hoc test, we can conclude a difference in self-efficacy between class A and class B and class A and class C. There is a significant difference from using hybrid learning mediated by video conferencing and Chemondro games. Students of class A have a higher self-efficacy score category than the other two classes. It causes students to be happy and excited for doing hybrid learning and Chemondro games. The new activities are applied in the teaching and learning process, making students confident in completing the given task. Learning games positively impact the students' self-efficacy (Hung, Huang and Hwang, 2014). Most students feel that mobile applications are helpful to hold discussions in an educational context (Ojino and Mich, 2018).

The distribution of self-efficacy is analyzed based on the average self-efficacy score of students in each research class. The students are classified by the ideal category of students' self-efficacy. Based on figure 3, the comparison of students' self-efficacy scores in each research class shows that students' self-efficacy in class A is the highest score than others. The high self-efficacy of students in class A because they use hybrid learning mediated by video conferencing and Chemondro games. It has a positive effect on students' self-efficacy. Hybrid learning with video conferences depends on students' self-motivation and self-efficacy (Pandey and Pande, 2014). Mobile learning can be used in collaboration, distance learning, communication, and interaction between students in the learning process (Kaypak, et. al., 2017). Students who have a problem in learning material can immediately solve the problems.

Using this technology in distance learning is that students can get accustomed to using technology in everyday life more accessible than dealing with the structure that learning media used. Students can easily access Chemistry learning materials anywhere and anytime. Students can understand the material so much because it can be repeated anytime.

Based on this description, the reason for the self-efficacy of class A to increase is due to the application of hybrid learning mediated by video conferencing and Chemondro games on solubility material and solubility products. However, the self-efficacy results of class C had lower scores than other classes. Class C students are not sure and feel worried about their abilities if they only use face-to-face learning with Chemondro games, so the time for question and answer is still lack. According to social cognitive theory, if students do not feel confident that they can complete an independent task or set of tasks, they will avoid the task (Britner and Pajares, 2001). Task avoidance is a way used to delay what students have to do to learn the topic. Avoidance behavior is a form of low student's efficacy. Students who have low self-efficacy delay their efforts to complete a task and give up after an experiment fails.

Chemondro game is an Android-based learning game that can be used as a Chemistry learning innovation that can affect student's learning achievement. The Chemondro game contains the core competencies and essential competencies of solubility and the product of solubility that must be studied. That is a summary of the solubility material and solubility and exercises on solubility questions and solubility products, which are packaged in an exciting game. Chemondro games provide space for students to learn independently anywhere and anytime. Hence, students will understand more about the material being taught. Based on this reason, the students' self-efficacy in class A and class B increased. Game-based learning positively affects students' self-efficacy (Hung, Huang and Hwang, 2014).

CONCLUSION

Based on the results and discussion, there is a significant difference from students' self-efficacy hybrid learning mediated by video conference and Chemondro games compared with using Chemondro games on solubility and solubility product and material.

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