Effects of Using Media of Chemondro and Video Conference on Teaching Learning towards Students' Self-Efficacy and Students' Self-Regulated Learning on the Subject of Hydrocarbon

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Abstract

This research aimed to analyze the effect of using media in the teaching learning toward the aspects of students' self-efficacy and students' self-regulated learning. The media used were chemondro and video conference on the subject of hydrocarbon. This research was set as a quasi-experimental post-test only design. The population was the students of 11 public senior high school in Purworejo regency, Central Java, Indonesia. The sampling technique was two steps of cluster random sampling. The samples of this study were the six eleventh grade students (the mean age was 16) in two public senior high school in those regency. The samples were classified into three classes depending the media used in the teaching learning, they are Class CG-2 using chemondro only, Class CG-1 using hybrid of video conference only, and Class E using both chemondro and video conference. The data of students' self-efficacy and students' self-regulated learning were collected through questionnaire for each class. The data are analyzed according to MANOVA method, and it was found that there are significantly differences among the three classes for both aspects.

Keywords*: hybrid learning, video conference, chemondro, students' self-efficacy, students' self-regulated learning, hydrocarbon.

INTRODUCTION

Chemistry teaching and learning can be designed in such a way as to provide a learning experience to students through a variety of learning resources in order to achieve the basic competencies. The learning experience can be realized through the use of ICT-based media (Information and Communication Technology). The development of ICT nowadays is quite rapid and give the great advantage in human life especially in the education field. The ICT-based media made the teaching learning process more interesting, interactive, effective, time efficient, and its implementation is flexible, one of them is by using hybrid learning.

Hybrid learning is a learning that combines face-to-face and online, so that teaching learning occurs in a flexible way. Hybrid learning is found to be more effective and efficient [1] compared to the conventional teaching learning only or e-learning only. The media based on learning management system become one of the

solution that can be used in the online phase of hybrid learning. The use of learning management system supports the students' learning tools [2]. In addition of the learning management system, one of the media used in the online phase of hybrid learning is video conference. Among the available distance teaching technologies, video conference is very similar to formal classroom teaching learning and therefore includes a very important process teaching element [3]. But in fact, ICT-based media has not been implemented properly by the teachers.

On the other hand, the optimization of ICT can be done by integrating the digital media in the teaching and learning activities. One of the digital media that can be developed according to the digital era is the android-based media. Chemondro is one of the android-based-game which can be used as independent learning sources. Educational game can increase motivation by adding game rules or competition into the teaching learning activities [4]. The game media could facilitate student's self-regulated learning. But in reality, most students use the game just for fun only, they have not used the game as a media in the learning process.

This article discusses the effect of using media of chemondro and video conference in the teaching learning toward the aspects of students' self-efficacy and students' self-regulated learning on the subject of hydrocarbon.

METHODS

Research Design

This study was set as a quasi-experimental post-test only design. The samples were classified into three classes depending the media used in the teaching learning, they are Class CG-2 using chemondro only, Class CG-1 using hybrid of video conference only, and Class E using both chemondro and video conference. The research design can be seen in the Table 1.

Table 1 Research Design

Class	Treatment	Questionnaire
Experimental (E)	X_1	Q_1, Q_2
Compared-group 1 (CG-1)	X_2	Q_1, Q_2
Compared-group 2 (CG-2)	X_3	Q_1, Q_2

Notes:
Q_1: Self-regulated learning questionnaire
Q_2: Self-efficacy questionnaire
X_1: Hybrid learning mediated by video conference and chemondro on the subject of hydrocarbon
X_2: Hybrid learning mediated by video conference on the subject of hydrocarbon
X_3: Learning mediated by chemondro on the subject of hydrocarbon

Participants

The study was conducted on six eleventh grade students (the mean age was 16) in two public senior high school in Purworejo regency, Central Java, Indonesia. The sampling technique was two steps of cluster random sampling. The first step was to choose the school; two public senior high schools were cluster randomly selected from as many as 11 public senior high schools in those regency. While the second step was to establish the research sample. The six classes were assigned cluster randomly into a compared-group 1 of 48 students,

compared-group 2 of 45 students and an experimental group of 50 students. The total number of participants was 143.

Research Setting

The comparison of the use ICT-based media in the hydrocarbon lesson has been done. They are three classes were used in this study, class CG-1 used hybrid learning mediated by video conference only, class CG-2 used conventional teaching-learning mediated by chemondro only, while class E used both hybrid learning mediated by video conference and chemondro. In the class E and CG-1 was used hybrid learning consisting of face-to-face and online phase teaching-learning. In the online phase of teaching learning was mediated by video conference. Webex was used as a media of video conference in this study. In addition, a learning management system was used to support those online phase of hybrid learning. Edmodo was used as a learning management system in this study. While in the class CG-2 was used conventional teaching-learning so that there was face-to-face teaching-learning only. The face-to-face teaching-learning in this study was mediated by chemondro game. Chemondro is one of android-based-game consisting of the summary of teaching-learning material and an exercise which packaged in the game form. The difference of the treatment in each class can be seen in the Table 2.

Table 2 Research Setting

Hybrid learning phase	Class		
	E	**CG-1**	**CG-2**
1st, 2nd, and 3rd meeting			
Face to face	Experiment, discussion, presentation, question and answer, exercise.	Experiment, discussion, presentation, question and answer, exercise.	Experiment, discussion, presentation, question and answer, exercise, individual task with the feedback.
Online	Individual task, and feedback using edmodo.	Individual task, and feedback using edmodo.	-
4th meeting			
Face to face	Discussion, presentation, question and answer, exercise.	Discussion, presentation, question and answer, exercise.	Discussion, presentation, question and answer, exercise, task about model of hydrocarbon isomerism, feedback on the next meeting.
Online	Presentation about model hydrocarbon isomerism via webex, gives direct feedback.	Presentation about model hydrocarbon isomerism via webex, gives direct feedback.	-
5th meeting			
Face to face	Discussion, presentation, question and answer, exercise, chemondro game.	Discussion, presentation, question and answer, exercise, quiz.	Discussion, presentation, question and answer, exercise, chemondro game.
Online	Continue presentation about model hydrocarbon isomerism via webex.	Continue presentation about model hydrocarbon isomerism via webex.	-

Data Collection

The data collected in this study were students' self-efficacy and self-regulated learning which collected through a single measurement that is after the treatment. The data of students' self-efficacy and students' self-regulated learning were collected through questionnaire for each class. Both questionnaires were self-developed and were validated in two steps, content and empirical validation.

The self-efficacy questionnaire

The various aspects and the characteristics of students who have high and low self-efficacy from [5, 6, 7, 8, 9] were synthesized to develop the questionnaire. The aspects of self-efficacy questionnaire which being synthesized were task orientation, effort and persistence, beliefs, and performance. The questionnaire consists of 23 points statement using 4 scales (from 1=never to 4=always) which are modification of the Likert scale. The content validation of self-efficacy questionnaire conducted by asking the judgments from the expert of Psychology department cover the aspect of substance, construct, and language. While the empirical validation was tested against 342 students. The data of empirical validation was analyzed and the Cronbach's Alpha value found to be 0.72.

The self-regulated learning questionnaire

The various aspects of self-regulated learning from [10, 11, 12, 13, 14] were synthesized to develop the questionnaire. The aspects being synthesized were three phases of self-regulated learning, namely planning, implementation, and reflection phase. The planning phase consist of self-motivation and task analysis aspects. The implementation phase consist of self-observation and self-control aspects. While the reflection phase consist of self-evaluation and self-judgments aspects. The questionnaire consists of 15 points statement using 4 scales (1=strongly disagree to 4=strongly agree) which are modification of the Likert scale. The content validation of self-regulated learning questionnaire was conducted by asking the judgments from the expert of Psychology department. The aspects of being considered in the content validation were substance, construct, and language. While the empirical validation was tested against 243 students. Based on the analysis of the empirical validation it found the Cronbach's Alpha value of 0.72. In addition, an observation sheet was used to determine the activities of students' self-regulated learning during the teaching-learning process. The data from the observation sheet was used to support the data which obtained from the questionnaire but the analysis was done separately.

Data Analysis

Multivariate Analysis of Variance (MANOVA) technique with the prerequisite test (multivariate normality and covariance matrix homogeneity), and qualitative descriptive to analyze the results of the checklist of utilization of chemondro game were employed in the data analysis.

RESULTS AND DISCUSSION

MANOVA has been used to determine the effect of the treatment on students' self-efficacy and self-regulated learning. The results of the MANOVA analysis which is based on the Roy's Largest Root test (p value of 0.000 < 0.05) can be concluded that at the 95% confident level there is a significant influence of the treatment on students' self-efficacy and self-regulated learning. The presence of significant influence caused by different

treatment in each class. Video conference is very similar to face-to-face learning activities in the classroom because between teachers and students can interact directly. In addition, in the online phase of hybrid learning also used a Learning Management System so that students can access teaching-learning materials in a flexible way. This study confirm the previous study conducted by [15] that self-efficacy of user learning management system has a positive effect on students' performance in hybrid learning. On the other hand, educational games can increase motivation by adding game rules or competition into teaching learning activities [16]. Chemondro game that used in this research is found in mobile android whose presence is very close to the students so that the students can utilize chemondro game as effective and efficient media. Therefore, students' self-regulated learning become good. Moreover, the effects of the treatment toward each students' self-efficacy and students' self-regulated learning can be seen in Table 3.

Table 3 Test of Between Subject Effects

Aspect	P value	Conclusion*
Self-efficacy	0.001	Significantly difference
Self-regulated learning	0,009	Significantly difference

*computed using alpha of 0.05

Based on Table 3 it can be concluded that there was a significant difference on each students' self-efficacy and students' self-regulated learning among the three classes. However, different results were obtained based on the Post Hoc test. The difference of students' self-efficacy occurred between class E and CG-2 while for students' self-regulated learning was occurred between class CG-1 and CG-2.

One of the motivational beliefs that develop and maintain students' self-regulated learning is self-efficacy. Self-efficacy defined as a person's beliefs about his/her ability to organize and execute an action to achieve desired goals [17]. Self-efficacy plays a very important role in the students' self-regulated learning because self-efficacy affects the extent to which students engage and survive in challenging tasks. Students with higher self-efficacy tend to choose a challenging task and spend a lot of effort in the face of challenging tasks that can even survive and control anxiety when facing failure than students who have low self-efficacy [6]. Self-efficacy has proven to be responsive to improvements in students' methods of learning (especially those involving greater self-regulation) [14]. Self-regulated learners report higher self-efficacy beliefs, outcome expectations, and task interest for assignments than more naive self-regulated learners [3]. Based on the results of [18] shows that there is a very positive relationship between students' self-efficacy and students' self-regulated learning. This is not in line with the results of this study. Based on the results of this study self-efficacy is not always in line with the students' self-regulated learning. Many factors are responsible for this. One of them is due to the characteristics of students in each class. The good results of self-efficacy indicated by achieving predetermined indicators. Nevertheless, there is an element of self-regulated learning from students was unfulfilled, one of them is in the phase of implementation. Most students can not control themselves when the online phase of hybrid learning was occured.

In this sample, students' self-efficacy scores were already relatively high and hence the variance in students' self-efficacy levels might have not been very sensitive for predicting self-regulated learning scores. The comparison of students' self-efficacy and self-regulated learning in each class can be seen in Figure 1.
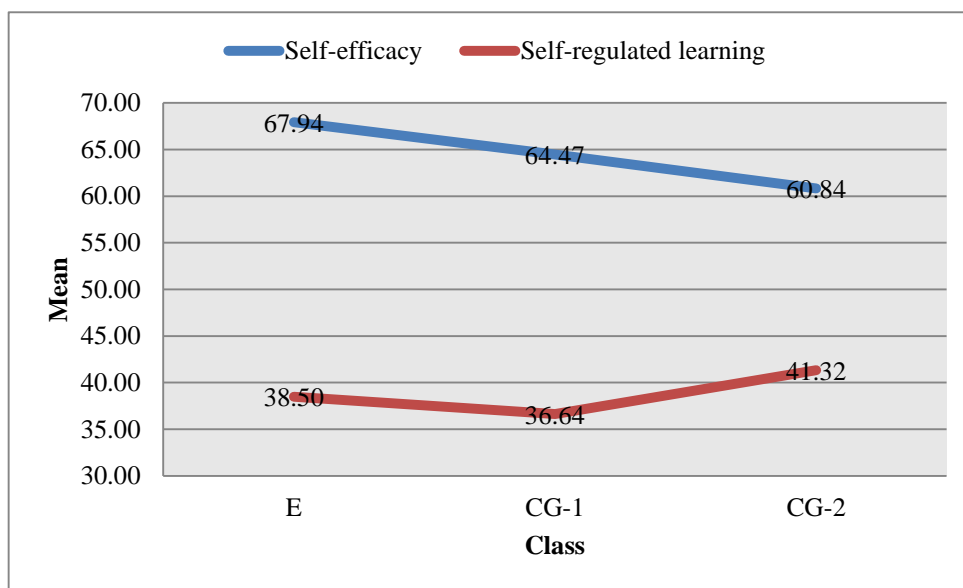
Figure 1 The Comparison of Students' Self-efficacy and Students' Self-Regulated Learning

Based on Figure 1, every class used in this study shows the results that self-efficacy determines students' self-regulated learning, except for CG-2 class. In the CG-2 class, although the self-efficacy of students was low, but the self-regulated learning was high compared to the other two classes. This is because in the CG-2 class used chemondro game that can facilitate students to learn independently. The chemondro game can be used as an independent learning sources and very flexible compared to the other props in the hydrocarbon teaching-learning, so it can be used anywhere and anytime. Based on the checklist of the utilization of chemondro game, obtained the result that 78% students using chemondo game as an independent learning sources. In this study, students' self-regulated learning data was supported by an observation sheet. The observations activities in each class were done three times. The results of the observations show the same result as in the questionnaire result as shown in Figure 2.
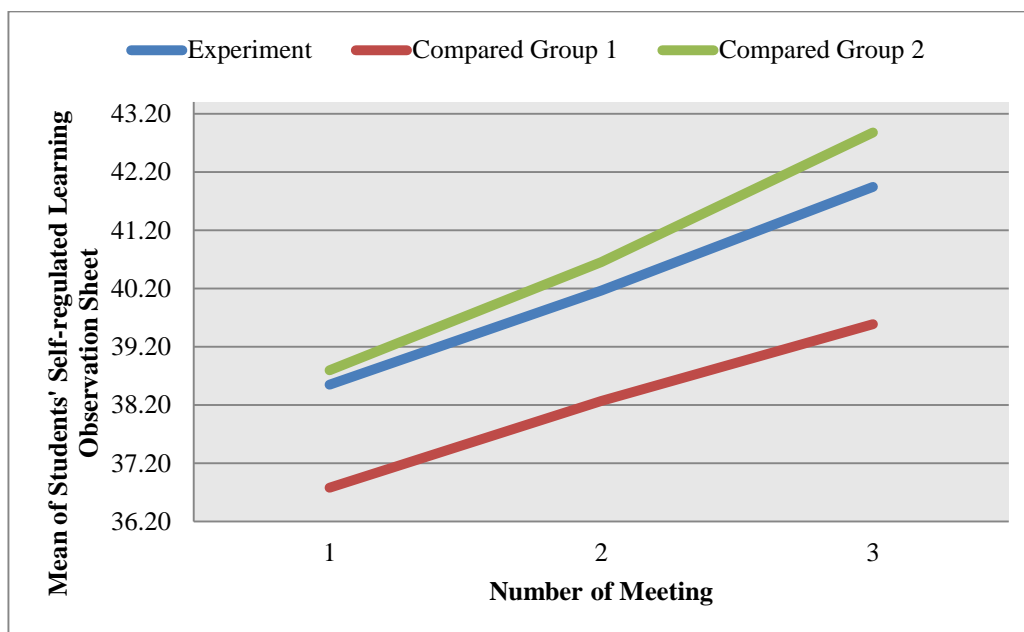
Figure 2 The Result of Students' Self-Regulated Learning Observation

At each meeting, the students in each class showed increased self-regulated learning. The better results of students' self-regulated learning are passed through a process. At each meeting, students are assigned the tasks with different form. Therefore, students become accustomed to the tasks assigned by the teachers and make the regulation better.

CONCLUSION

There is a significant differences of students' self-efficacy and students' self-regulated learning among the hydrocarbon teaching learning mediated by chemondro only, hydrocarbon hybrid learning mediated by video conference only, and hydrocarbon hybrid learning mediated by chemondro and video conference. The use of hydrocarbon hybrid learning mediated by video conference has a significant effect toward students' self-efficacy while the use of chemondro game has a significant effect toward students' self-regulated learning. The students' self-efficacy scores were already relatively high and hence the variance in students' self-efficacy levels might have not been very sensitive for predicting self-regulated learning scores.

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