

PAPER • OPEN ACCESS

Improve Outcomes Study subjects Chemistry Teaching and Learning Strategies through independent study with the help of computer-based media

To cite this article: Gulmah Sugiharti 2018 *J. Phys.: Conf. Ser.* **970** 012018

View the [article online](#) for updates and enhancements.

Related content

- [Effect of Chemistry Triangle Oriented Learning Media on Cooperative, Individual and Conventional Method on Chemistry Learning Result](#)
L Latisma D, W Kurniawan, S Seprima et al.
- [The impact of problem solving strategy with online feedback on students' conceptual understanding](#)
H Y Pratiwi, W Winarko and H D Ayu
- [Edutourism Taka Bonerate National Park through Scientific Approach to Improve Student Learning Outcomes](#)
R S Hayati

Improve Outcomes Study subjects Chemistry Teaching and Learning Strategies through independent study with the help of computer-based media

Gulmah Sugiharti^{1,2*}

¹Education Technology Doctoral Program, Postgraduate , Universitas Negeri Medan, Medan, Indonesia

² Department of Chemistry Education Faculty of Math and Natural Science Universitas Negeri Medan, Medan, Indonesia

*Corresponding author: gulmahsugiharti@yahoo.com

Abstract. This study aims to see the improvement of student learning outcomes by independent learning using computer-based learning media in the course of STBM (Teaching and Learning Strategy) Chemistry. Population in this research all student of class of 2014 which take subject STBM Chemistry as many as 4 class. While the sample is taken by purposive as many as 2 classes, each 32 students, as control class and experiment class. The instrument used is the test of learning outcomes in the form of multiple choice with the number of questions as many as 20 questions that have been declared valid, and reliable. Data analysis techniques used one-sided t test and improved learning outcomes using a normalized gain test. Based on the learning result data, the average of normalized gain values for the experimental class is 0,530 and for the control class is 0,224. The result of the experimental student learning result is 53% and the control class is 22,4%. Hypothesis testing results obtained $t_{count} > t_{table}$ is $9.02 > 1.6723$ at the level of significance $\alpha = 0.05$ and $df = 58$. This means that the acceptance of H_a is the use of computer-based learning media (CAI Computer) can improve student learning outcomes in the course Learning Teaching Strategy (STBM) Chemistry academic year 2017/2018.

Keywords: Self-study, Computer-based Media. Improve learning out

1. Introduction

Teaching and Learning Strategy (STBM) Chemistry is one of the compulsory courses with the weight of 3 credits to be studied by the students of Chemistry FMIPA UNIMED. This course is a prerequisite for students to be able to follow Mikroteaching course (Micro-Teaching) and PPL. A few years experience in STBM Kimia subjects still there are students who failed or did not pass. The number of students who still have not successfully passed, sometimes opened a special class outside the semester.

Students often learn self-taught, the ways they can do since in primary and secondary education, so it becomes a tendency to learn only from lecture notes and diktat when going to take the exam. As a result of such events, it is feared that students can not afford to fulfill the burden of tasks assigned to him after he becomes a lecturer in secondary school later. For that self-learning students need to be improved. Self-learning problems can be overcome in many ways, including with computer-based learning media. Computer-based learning media is called "computer assisted instruction" or CAI. According to Dhani Harda (2016) CAI media is an interactive media that can improve student interaction, can stimulate students' thoughts, feelings, interests, and attention in such a way. In order for the computer can be made interactive learning media and can be used independently need to be designed and developed based on instructional principles. Computer-based



learning media or CAI used to improve student learning outcomes in this study is CAI tutorial. The results of the research (Tambunan, Gulmah, 2010) found that 87.83% of students enjoy computer-based independent learning in General Chemistry II courses.

2. Computer Based Media and Independent Learning

The demands of today's educational world have led to enjoyable learning and make it easier for learners to learn. With plan and design that meet the rules and instructional components, the computer can be used as one of the media that can learn individually. Computers will greatly help educators to convey knowledge to learners and conversely with computer learners will be able to learn easily and surprisingly.

According to Shute and Psotka (in Jonassen 1996) computer-based learning makes it easy to describe the contents of the curriculum for someone to learn. The purpose and content of the curriculum can be programmed in such a way by utilizing intelligence machines. In learning computer-aided teaching process is increasingly interactive and helps self-learning.

The forms of presentation of information on the CAI model include: tutorial, drill and practice, simulation and games and others (Arsyad, 2011). Tutorial is a computer-aided teaching program that mimics a tutor's work system. Information of a concept presented on the screen in the form of: text, image or graph. After students have read and considered the information well, a question is asked. If the student's correct answer the computer will present the next concept, if the wrong answer the computer will return to the previous concept or provide remedial. The move to one of the remedial concepts is determined by the mistakes made by the students. The CAI model is good for self-learning because computers can accommodate students who slowly receive lessons, the computer will work according to the desired instruction, the computer can stimulate students to do the exercises because of the availability of graphical visualization, images, colors and music, immediate feedback, can be used without the help of guide teachers, students can learn individually, the control is in the hands of students so that the level of student learning speed adjusted to the level of mastery. the ability to record student activities during program use, so that student development. The CAI tutorial model as proposed by Shute and Psotka in Jonassen (1996) is illustrated as shown below.

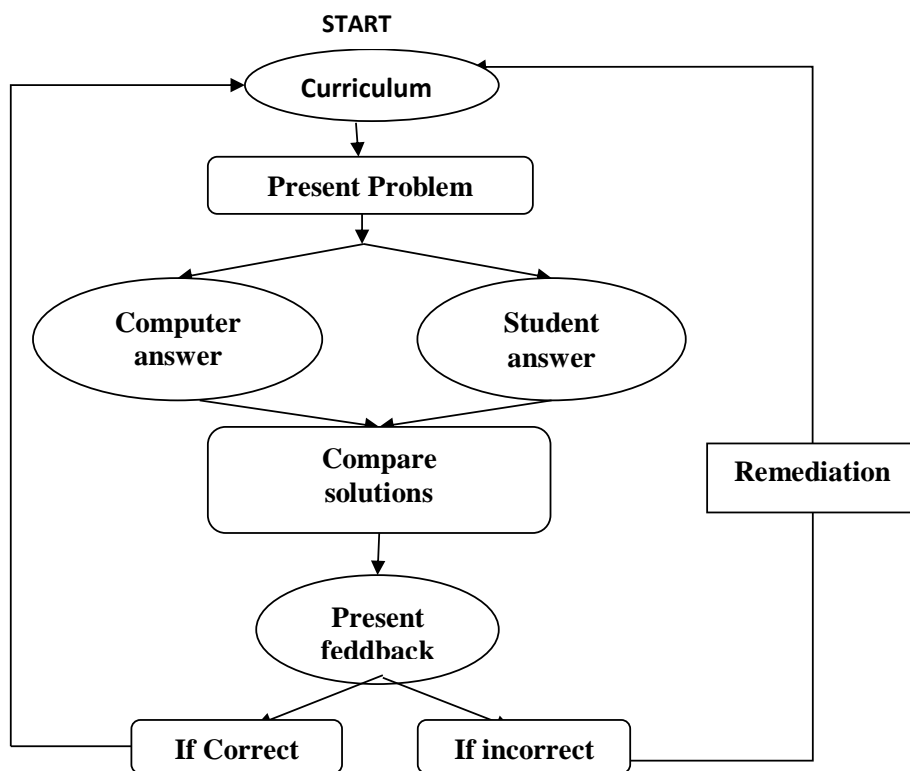


Figure. 1. CAI Tutorial

The procedure includes the material being studied, followed by a problem to be solved as a sub-section of the curriculum. Problem solving was tested by a learner's skill test (in this case a student) displayed through the knowledge and skills instructed at that time. The answer given is compared with the correct answer, then the computer will give feedback. If the answer is correct, a new problem is selected and presented. If the answer is wrong, remediation is given to repeat the learning materials, which are given more simply.

3. Research Methodology

Population in this research is all student of class of 2014 which take subject STBM Chemistry as many as 4 class, and by purposive taken 2 class as sample which each class 32 student. The research design is as follows:

Table 1. Research Plan

Group	Pre test	Treatment	Post Test
Experiments	T ₁	X ₁	T ₂
Control	T ₁	X ₂	T ₂

To see the application of computer-based learning media in improving student learning outcomes in the course Learning Strategy of teaching chemistry, used t test one party is the right side test while

To see the improvement of student learning outcomes taught by using computer-based media can be seen by using gain (gain) with the formula $g = \frac{\text{post test score} - \text{pretest score}}{\text{Maximum score} - \text{pretest score}}$

By criterion g (normalized gain):

$$g < 0.3 = \text{low}, 0.3 \leq g \leq 0.7 = \text{medium}, g > 0.7 = \text{high}$$

% Improved learning outcomes were calculated through the average gain of the experimental class x 100%.

While the magnitude of the influence of computer-based media can be calculated by the formula;

$$= \frac{\text{gain eksperimen} - \text{gain kontrol}}{\text{gain eksperimen}} \times 100\%$$

$$= \frac{\text{experiment gain} - \text{control gain}}{\text{experiment gain}} \times 100\%$$

To see Percent (%) increase in learning outcomes used g factor formula (normalized gain gains). The formula used is:

$$g = \frac{\text{Sum of total gain}}{\text{Sum of total student}} \times 100\%$$

If value g:

<50%: Ineffective media to improve student learning outcomes.

50% - 70: Effective media to improve student learning outcomes.

> 70%: Media is very effective to improve student learning outcomes

4. Research Result and Discussion

4.1 Data of Result Study

Table 2. Table of Average Result Study of Student

Experiment Class						Control Experiment					
PRETES		POSTES		GAIN		PRETES		POSTES		GAIN	
\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S
44,00	9,595	75,83	7,08	0,560	0,139	44,00	7,812	57,83	6,524	0,241	0,117

To test the hypothesis, firstly tested the requirement analysis that is the normality and homogeneity test at the significant level ($\alpha = 0,05$) and $n = 30$. While the homogeneity test of variance between group of the comparison sample can be done by equality test of two variance with significant

level 0,05. Normality test results and homogeneity of variance obtained normal distribution data and come from homogenous population.

4.2 Hypothesis Testing Results Student Learning

Hypothesis testing is done by using one party test, that is right side test with $\alpha = 0,05$. The calculation results obtained t arithmetic = 9.62 is greater than t table = 1.6723, which means H_0 is rejected, meaning the application of computer-based learning media (CAI) can improve student learning outcomes in the course of STBM Chemistry

4.3 Improvement of Student Learning Outcomes

To see the improvement of chemistry learning result of experiment class student and control class seen from mean of normalized gain of experiment class and control class multiplied by 100%. Data on the improvement of students' learning outcomes of experimental class and control class in table 4.

Table 3. Improvement of Student Learning Outcomes Between Experiment Class and Control Class

Sample	Average Gain	% Improvement of Learning Outcomes
Experiment class	0,530	53,0%
Control Class	0,224	22,4%

Based on the above table it can be seen that the Improved Learning Outcomes of Experiment class students is higher than Control class, can be described in the following graph:

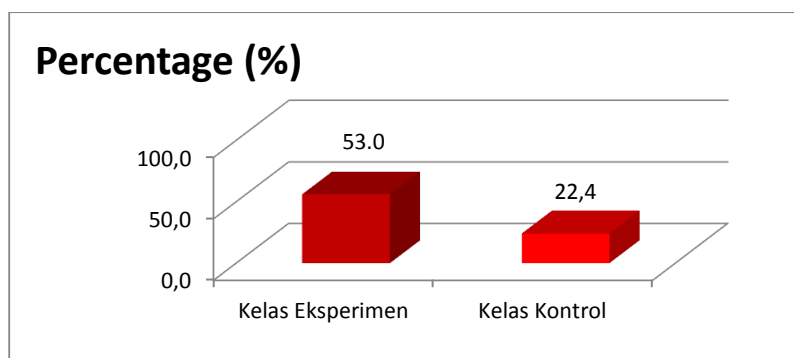


Figure 2. Improvement of Learning Outcome

The results showed that student learning outcomes were taught by using CAI Computer media higher than the student learning outcomes taught without using media. This is because with the application of CAI Computer media, students can more deeply understand the lecture material by using the time available for self study. Things that have been seemingly abstract and difficult to convey through computer-based media (CAI Tutorial) to be interesting and clear.

According to Rusman (2012), with continuous practice, it will be embedded and then will become a habit. Computer-based learning system CAI in the tutorial program is basically the same as the guidance program that aims to provide assistance to students in order to achieve optimal learning outcomes. Thus the learning outcomes can be improved.

From the results of the above data analysis can puladilihat that by using computer-based mediaCAI tutorial provides a new atmosphere to students because of the integration of each sub subject that is taught into the media that makes students easier in understanding the subject matter. Students are actively studying independently using media that gives the learning outcomes of STBM Chemistry course for the better.

Immediate feedback, CAI media developers can design a learning situation that requires students to do something and get positive feedback immediately after students do something (Dhani, 2016). Computers are able to provide information to students about errors and amount of time learning and time to work on problems, computer-assisted learning can also be designed to overcome

problems and weaknesses in large group learning. In addition, computer-assisted learning trains students to skillfully select the parts of the desired content of learning. The development of carefully designed learning and psychological attention of students will be useful for students who have difficulty following the traditional method of learning. With Computer Based Learning can provide strengthening to students who are weak in learning because the material or questions can be repeated. Another benefit is computer-assisted learning that allows students to become familiar with and become familiar with computers that are becoming increasingly important in today's modern society.

Based on research that has been done in the study of chemistry education obtained data - data showing that improving learning STBM course through independent learning with the help of computer-based media has been able to improve student learning outcomes.

References

- [1] Dhani, H.,. 2016. Pengembangan Media Computer Assisted Instruction (CAI) Untuk Perhitungan Volume Pekerjaan dan Analisis Biaya Bahan Pada Kompetensi Keahlian Teknik Konstruksi Batu Beton. *Jurnal Teknologi Pendidikan*. 18 (2)
- [2] Tambunan, M, Gulmah Sugiharti(2010). *Perbaikan pembelajaran MK Kimia Umum II melalui belajar mandiri dengan bantuan media berbasis komputer pada matakuliah Kimia Umum 2*. Laporan Penelitian PHKI 2010
- [3] Jonassen DH (1996). *Handbook of Research for Educational Communications and Tecnology. A project of the association for educational communications and Technology*. New York: Prentice Hall International
- [4] Arsyad, A. 2002. *Media Pengajaran*. Jakarta : PT Raja Grafindo Parsada.
- [5] Rusman. K, Deni. R, Cepi. 2012. *Pembelajaran Berbasis Teknologi Informasi Dan Komunikasi: Mengembangkan Profesionalitas Guru*. Jakarta: Raja Grafindo Persada.
- [6] Surjono, H. (1995). Pengembangan Computer-Assisted Instruction (CAI) Untuk Pelajaran Elektronika. *Jurnal Kependidikan*. No. 2 (XXV): 95-106