

# **INTERACTION EFFECTS OF TEACHER-PRESENCE AND STUDENTS' ACHIEVEMENT LEVEL OF SCIENCE PHYSICS WITH COMPUTER-AIDED LEARNING**

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## **Abstract**

This research aims to identify the impact of computer-aided learning (CAL) on the level of achievement in the subject of science-physics among high school students. The findings of the research showed the main effect of the CAL teacher-presence (no teacher and with teacher) and performance level (low and high) is significant. CAL teacher-presence (no teacher and with teacher) give different effects on performance in science-physics. The mean post-test for students with teacher group (74.79) was significantly higher than the mean for student with no teacher group (71.25). Similarly, the mean for the upper level students (75.35) is higher than the mean for the lower level students (71.67). Two-way ANOVA test showed the presence of CAL teacher-interaction (no teacher and with teacher) and the level of achievement (low and high) are not significant. Simple correlation test is carried out to find out the relationship between learning skills and attitudes towards learning in science-physics performance. The correlation analysis achievement and learning skills were shown positive and significant at the 0.05 level. Similarly, the relationship between students' attitudes and their performance shows a positive and significant at the 0.05 level. The findings of this research also showed that students perceived CAL as positive. Students also felt convenient and fun due to the effectiveness of science-physics learning using CAL. Based on these research findings, CAL should be promoted in science education, particularly for students with low achievement. CAL can be done in the classroom with the teacher as facilitators alone, or even at the high school open-learning organized by the students themselves. CAL is claimed as effective towards learning among students either with no teacher or with teacher.

**Keywords:** Computer-Aided Learning, science-physics, students' attitudes, achievement performance.

## **1.0 Introduction**

Science-physics is a study about the phenomena of the world which existed through deep meaningful thinking and scientific research. According to Trowbridge dan Bybee (1990) science was known as a part of three basic facts namely the extent body of scientific knowledge, the value of science and; the methods and processes of science. Based on this science concept, it is claimed that science-physics is one discipline which contains dynamic relationship, experimental planning, observation, hypotheses, classification, measurement, data interpretation, summarization, making predictions and communicating learning output.

The performance achievement of science-physics in the Republic of Indonesia is at number 36 out of 45 countries in the world (Republika online, Koran Pendidikan, Jumaat 24 Disember 2004). This low achievement is claimed to be due to either the students' academic ability or the teachers' teaching ability. According to Zamroni (2001) the low achievement in science-physics is due to teachers' method of teaching. Teachers' lack in teaching methods can influence students' achievement because according to Sharma dan Mc Dermott (1990) the quality of science-physics depends greatly on the teaching quality and teachers' professionalism.

This research is done to identify the effectiveness of using computers in science-physics teaching and learning which in this study is known as CAL. CAL can make the students more active, build interaction among students, and learn to criticize or being analytical. CAL is used in the teaching and learning process and between students and teachers. The teachers, however, are expected to act as the facilitators and are able to become source of knowledge and as a consultant (Tabrani, 1994:181).

Teaching and learning using CAL also can increase students' motivation to learn the subject science-physics. The increase in learning motivation is able to encourage students to become more active and effectiveness in the teaching and learning will enable the students to achieve a higher performance in achievement (Dimiyati, 1994:78-79).

Science-physics lesson using CAL can provide students with the important concepts and the natural happenings of the world can become more interesting and meaningful for the students.

This is due to the fact that through students' activities using CAL, students are able to see in concrete the abstract concepts. This will help students grasp the concepts easily (Clard dan Mayer 2003). Making the abstract concepts concrete can be done through the preparation of updated and suitable audio visual aids for each lesson. Audio and graphics like pictures and video clips which have been programmed in the computer make teaching and learning easy. These teaching aids are constructed to make lesson more meaningful and can help increase students' understanding towards the science-physics materials. Teaching and learning that is more effective can increase students' understanding of concepts with reflection and the learning process all programmed in the computer (Dubinsky and Tall, 1991: 235).

## **2.0 Problem Statement**

The education vision in Aceh is that all education is IT-based. In Aceh, at present, 20% of the schools are equipped with ICT facilities (Anas, 2007). Teaching and learning using computers or CAL is aimed to help students to make learning more effective. The problem is that although after seven years of implementing teaching and learning using IT, the students' performance and achievements in science-physics at the Sekolah Menengah Pertama in Aceh is still below the expected national level which is 70 to 100 percent.

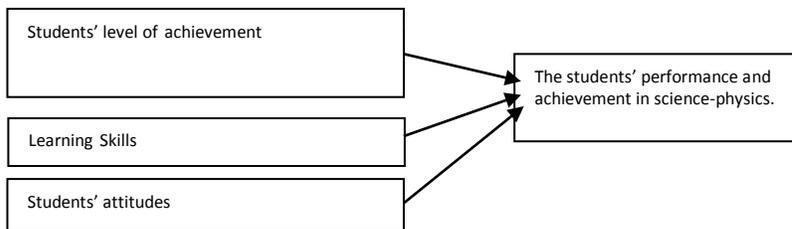
## **3.0 Research Objectives**

1. To identify the effect of teacher-presence towards the performance and achievement of students in science-physics lesson using computers.
2. To identify the effect of no teacher-presence towards the performance and achievement of students in science-physics lesson using computers.

3. To identify the relationship between science-physics learning skills and the performance and achievement of students with teacher-presence.
4. To identify the relationship between students' attitudes and the performance and achievement of students with teacher-presence.

#### 4.0 Research Methodology

This research design is using the Control Group Posttest Only (Ary, 2007). It involves two independent variables and one dependent variable. The first independent variable is teacher-presence that is in two categories namely with teacher and with no teacher. The second independent variable is the level of academic achievements of the students in two categories namely the upper and lower levels. Meanwhile, the dependent variable in this research is the students' achievement and performance in science-physics



**Figure 4.1: Research Framework**

The factorial design 2 x 2 has produced four groups of students who are treated similarly that is learning with the aid of computers (CAL) to identify the effects of both independent variables. The categorisation of the groups is based on lower and upper levels of achievements which are sort from upper to lower levels for each selected class sample. The lower level group is identified through the value with is lower than the average value, whereas, the upper level group is identified by the value that is larger than the average value (Suharsimi, 2000). The four experimental groups are shown in Table 3.1.

**Table 4.1: Factorial Design 2 x 2**

Level of achievement	Teacher-presence	
	(No teacher)	(With teacher)
Lower	1	3
Upper	2	4

Description 1 = Low level with no teacher.      2 = upper level with no teacher.

3 = low level with teacher.      4 = upper level with teacher.

## 5.0 Research Sample and Population

The research sample consists of 68 Form 3 students who study science-physics from two schools in Kabupaten Pidie Jaya Propinsi Aceh Indonesia. The purposive sampling is to differentiate between rural and urban schools. The selection of which school became the control group or the experimental group was done at random. But, the selection of group that represents the lower and upper levels was based on the science-physics results of the students' achievement before CAL. The group that represents the upper level was indicated by collecting the score which was equivalent to the average score students got before CAL. The lower level group was determined based the score that is much lower than the average performance score before CAL.

The setting for which school represents group with teacher, or, CAL with no teacher and groups with teachers, it was done randomly. The distribution of groups for research sampling is as the table below.

**Table 5.1: Factorial Research Sample Group**

No	Teacher Presence (With/Without)	Level of Performance (Lower / Upper)	Students ( N )
1	Without	Lower	21
2	Without	Upper	13
3	With	Lower	22
4	With	Upper	12
Total			68

## 6.0 Research Findings

ANOVA 2 x 2 factorial analyses were used to analyse the data. The summarization of the ANOVA analysis output with regards to the interaction effects between the variables of the level of students' achievement and teacher-presence is shown below.

**Table 6.1 ANOVA analysis output – Teacher presence and Level of Students**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Teacher presence (A)	251.257	1	251.257	18.039	.000
Level of Students (B)	230.062	1	230.062	16.517	.000
Teacher presence x Level of Students (A*B)	25.607	1	25.607	1.838	.180
Error	891.418	64	13.928		

Total	363923.793	68
Corrected Total	1357.587	67
a. R Squared = .343 (Adjusted R Squared = .313)		

With reference to table 6.1, ANOVA test showed that the main effect of teacher presence is significant at  $F(1, 64) = 18.039$ , Sig, 0.000 atau  $p < 0.05$ . The effect of with teacher presence towards the students' achievement is higher significantly than without teacher presence. **The mean achievement of the group with teacher presence is higher significantly than the mean achievement of the group without teacher presence.**

The students' mean achievement based on teacher presence is shown in the table 6.2 below. Based on the table, the mean achievement of students without teacher presence is 71.25 while the mean achievement of students with teacher presence is 74.79.

**Table 6.2: Mean Achievement of Students according to Teacher presence**

CAL	Mean	N
Without teacher	71.2497	34
With teacher	74.7894	34

The main effect towards students' achievement is also significant,  $F(1, 64) = 16.571$ , Sig 0.000 atau  $P < 0.05$ . The main effect towards students' achievement in the upper level group is higher significantly than students' in the lower level group. The mean achievement of students in the upper level group is higher significantly than the mean achievement of students in the lower level group as shown in Table 6.3. The table shows that the mean achievement of students in the lower level group is 71.67 while the mean achievement of students in the upper level group is 75.35.

**Table 6.3.: Mean Achievement of Students according to Students' Level**

Level of Achievement	Mean	N
Lower	71.6665	43
Upper	75.3468	25

The interaction result between the variables in teacher presence with the students' level of achievement is insignificant,  $F(1, 64) = 1.838$ , Sig. 0.180,  $p < 0.05$ . Table 4.5 shows the mean and SD of teacher presence and the students' level of achievement.

**Table 6.4: Mean dan SD of Students' Level of Achievement (upper and lower)and teacher presence(without and without teacher)**

<b>Students' Level of Achievement</b>	<b>Teacher presence</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>
Lower Level Group	Without teacher	70.2771	2.59934	21
	With teacher	72.9927	4.69714	22
	Total	71.6665	4.01690	43
Upper Level Group	Without teacher	72.8208	1.94153	13
	With teacher	78.0833	4.74558	12
	Total	75.3468	4.40537	25
Total	Without teacher	71.2497	2.65328	34
	With teacher	74.7894	5.25780	34
	Total	73.0196	4.50139	68

**Table 6.5 Mean of Students' Level of Achievement and Teacher presence**

<b>Students' Level</b>	<b>Mean Teacher presence</b>		<b>N</b>
	<b>Without teacher</b>	<b>With teacher</b>	
Lower	70.2771		21
		72.9927	22
Upper	72.8208		13
		78.0833	12

With reference to Table 6.4, the mean achievement of students in the lower level group without teacher is 70.28 whereas the mean achievement of students in the lower level group with teacher is 72.99. Therefore, the performance of students in the lower level group with teacher is higher than the performance of the students in the lower level group without teacher.

The mean achievement of students in the upper level group without teacher is 72.82 while the mean achievement for students in the upper level group with teacher is 78.08. Therefore, it is shown that the mean achievement of students with teacher is higher than the mean achievement of students without teacher.

**6.1 The Relationship between Learning Skills and the performance achievement in Science-physics for students without teacher group.**

**Table 6.1.1 : Correlation between Learning Skills and the performance achievement in Science-physics for students without teacher group.**

	Variables relationship	r	p	
Table 6.1.1	Learning Skills and the performance achievement in Science-physics for students without teacher group.	0.573	0.000	showed that correlation learning achievement
the	Significant at the level $p \leq 0.05$			
between				achievement
skills and the				
performance for students without teacher group.				
	The result showed that there is a weak relationship and significance ( $r=.573$ , $p=0.0000$ ) between learning skills and the performance achievement in science-physics for students without teacher group. This means that the learning skill is also a factor that influences the performance achievement in science-physics.			

Relationship between Students' Attitudes and Learning Skills and the performance achievement in Science-physics for students without teacher group.

**Table 6.1.2: Correlation between Students' Attitudes and the performance achievement in Science-physics for students without teacher group.**

	Variables relationship	r	p
	Students' attitudes and the performance achievement in Science-physics for students without teacher group.	0.299	0.086
	Significant at the level $p \leq 0.05$		

Table 6.1.2 shows the correlation between students' attitudes and performance achievement of students without teacher group. The correlation analysis showed that there is a weak relationship and no significance between students' attitudes and performance achievement of students without teacher group.

**Table 6.1.3 : Correlation between Learning Skills and the performance achievement in Science-physics for students with teacher group**

	r	p
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Variables relationship		
Learning Skills and the performance achievement in Science-physics for students with teacher group.	0.753	0.000
Significant at the level $p \leq 0.05$		

Table 6.1.3 shows the correlation between learning skills and performance achievement for students with teacher group. The correlation analysis showed that there is a strong relationship and significance between learning skills and performance achievement for students with teacher group.

**Table 6.1.4 : Correlation between Students' Attitudes and the performance achievement in Science-physics for students with teacher group**

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Variables relationship		
	r	p
Students' attitudes and the performance achievement in Science-physics for students with teacher group.	0.653	0.000
Significant at the level $p \leq 0.05$		

Table 6.1.4 shows the result from the correlation between students' attitude and the performance achievement for students with teacher group. The correlation analysis showed that there is weak relationship and significance between students' attitude and the performance achievement for students with teacher group in science-physics.

## 7.0 Discussion

The research findings in this study found that performance achievement after CAL is better than the performance achievement before CAL. This finding is also proved by (Qi Chen, 1995) that is, learning using computers can increase teaching and learning quality which at the same time can increase students' performance achievement. This also was claimed by Rusdina (1993) who said that with the existence of certain characteristics which are prepared in teaching with the aid of computers can solve or remedy learning problems that are faced by students.

The findings of this study is also strengthen by a research done by Zamri & Nur Aisyah (2011) which found that teaching and learning using computers increase the cognitive ability and social skills and made learning more conducive and effective for students.

The findings from this study also found that the score performance after CAL is better than the score performance before CAL. This finding is similar to the finding in the research by Irene Cheng (2008), Yahya and Dayang (2011) Chenu, Gayraud, Martinie and Tong (2007) Naba'h, Hussain, Al-Omari, and Shdeifat (2009) that teaching and learning that comes with multimedia can increase students' understanding, can increase score performance and make learning environment more effective from learning through the conventional method.

## 8.0 Conclusion

This study has managed to answer all the research questions through the findings. The research findings and discussion found that performance achievement of students with and without teacher groups after CAL is better and CAL has helped in increasing their understanding in science-physics.

## REFERENCES

- Annas. (2006). Tekkomdik Nanggro Aceh Darussalam Banda Aceh. *Jurnal Kiprah Pendidikan*, 36(4), 110-128. Dipetik pada 27/2/2007. Dipetik dari <http://www.kiprah.tekkomdiknad.net>.
- Chenu, F., Gayraud, F., Martinie, B., & Wu, T. (2007). Is Computer Assisted Language Learning (CALL) efficient for grammar learning? An experimental study in French as a second language. *The JALT CALL Journal*, 3(3), 85 -93.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Rev Educ Res*, 53(4): 445-459.
- Dubinsky, E., & Tall, D. (1991). *Advanced Mathematical Thinking and Computer*. Dalam D. Tall (ed.). *Advanced Mathematics Thinking*. Dordrecht: Kluwer Academic Publishers.
- Irene, C. (2008). Assessing rhythm recognition skills in a multimedia environment. *Educational Technology Journal*, 45 (3), 73-89.
- Naba'h, A. A., Hussain, J., Al-Omari, A., & Shdeifat, S. (2009). The effect of computer assisted language learning in teaching English grammar on the achievement of secondary students in Jordan. *The International Arab Journal of Information Technology*, 6 (4), 431-439.
- Qi, C. (1995). "Effects of learners" character and instructional guidance on computer assisted learning Intergrating Information Technology into Education. *Chapman&Hall*, 193-201.
- Rusdina, A, R. (1993). Kearah pengkomputeran pengajaran bahasa: cereka atau fakta. *Dewan Bahasa*, 37(6): 16-30.
- Sharma, R. C. (1983). *Modern Schience Teaching*. New Delhi: Dhanpat Rai & Sons.
- Tabrani. (1994). *Pendekatan dalam Proses Belajar Mengajar*. Jakarta: Remaja Rosdakarya.
- Trowbridges, L. W., & Rodgen, W. B. (1990). *Becoming a Secondary Achool Science Teacher*. Columbus Meril Publisyng Company.

Zamri, M., & Nur, A, M, N. (2011). Persepsi guru tentang penggunaan aplikasi multimedia dalam pengajaran komponen sastra Bahasa Melayu. *GEMA Online Journal of Language Studies*, 11(3), 163-177.

Zamroni. (2001). *Peran Kolaborasi Sekolah-Universitas dalam meningkatkan Mutu Pendidikan Matematika dan Ilmu Pengetahuan Alam di Indonesia*. Makalah. Disampaikan pada National Seminar on Science and Education. Faculty of Science and Mathematic Education on Colaboration with Japan International Cooperation Agency and Directorate General of Higher Education. Bandung, August 21, 2001.