The relationship between using ICT and mathematics achievement A Comparison of ASEAN students in TIMSS 2011

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THE RELATIONSHIP BETWEEN USING ICT AND MATHEMATICS ACHIEVEMENT : A COMPARISON OF ASEAN STUDENTS IN TIMSS 2011

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Abstract

This paper explores relationship using ICT and activities for teaching mathematics of ASEAN Eighth Grade students. The TIMSS 2011 data was used to compare ASEAN countries participants (Indonesia,Malaysia,Thailandand Singapore).Successful of the curriculum is determined by availability of ICT in the mathematics classroom. Using ICT in this study contains two components, the first aboutSchools with Computers Available for Instruction consisted of the four items, there are computers for mathematics instruction, computer software for mathematics instruction, audio visual resources for mathematics instruction and calculators for mathematics instruction, and second about computer activities during mathematics lessons. The Indonesia sample consisted of 5795 students, Malaysia sample consisted of 5733 students, Singapore sample were of 5927 students while the Thailand sample consisted of 6124 students. Analyses were undertaken using the Lisrel software to examine the relationship between using ICT and mathematics achievement. The result of the study shows that using ICT was positively related to their mathematics achievement in the ASEAN expert of the Singapore students, these results supported the t value were used Structural Equation Modelling undertaken using the Lisrel software.

Keywords: *ICT, Mathematics Achievement*

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1. Introduction

Today, use Information and Communication Technology (ICT) has been one component to improve the quality in mathematics education. According to WillemJ and Joke V(2009) the school organization needs to be structured in such a way that teachers are supported in the pedagogical use of technology in their teaching practice.Now, how to give teachers skills to use Information and Communication Technology effectively in teaching and integrate their in the curriculum.Thus, the six aspects of a teacher's work : 1)Understanding ICT in education, 2)Curriculum and assessment,3)Pedagogy,4)ICT,5)Organisation and Administration and 6) Teacher professional learning.(UNESCO,2008).Teacher's Information and Communication Techonoly competences are the key element to introduce and integrate into educational such resources into the teaching learning process and the teacher plays several important roles in a technology, making decide when and how ICT will be used so can help students to use ideas from mathematics to better understands one area of mathematics to another area of mathematics.

There are considered to be six major opportunities for learner to benefit from the use of ICT in mathematics: 1) learning from feedback,2)observing patterns, 3) seeing connections, 4) developing visual imagery, 5) exploring data and 6) teaching the computer (Adrian Oldknow, et al, 2010). For example, students trying to use software to look the shape of the geometry, use graph plotting software to draw the parabola and could be learning from feedback and developing visual imagery. Software developers in the world have attempted to introduce and develop ICT into classrooms to improving mathematics education.In TIMSS 2011, students was asked about the home possess computer and internet connections and asked about frequency use computer in home, schoo and other. During the decade of the 2000s, there was a big interest use computer and internet as a support for learning mathematics. Researche in France (Jean-Baptiste L and Chronis K, 2013) carried out about digital technologies to teach and learn mathematics, they are found consistent relationships between contextual characteristics and the Dynamic Digital Artefact(DDA) design.But team do not found at which differ and relationship between ICT components with mathematics achievement.

ICT also can support investigation by students in mathematics, including geometry,statistics, measurement,algebra and number. And the TIMSS achievement scale summarized students to measure breadth of content in number,algebra,geometry and data as well as a range of cognitive domain within knowing,applying and reasoning . Students can learn more mathematics more deeply with the approprite use technology, technology should not be used as a replacement for basic understanding and intuitions, it can and should be used to foster those understandings and intuitions (NCTM,2011). Home Posess computer can help students more learn mathematics, for example, with computer students can examine graphic power of technological affords access to visual models, as well as home possess internet, students can resources from the World Wide Web to design students task. We had investigation by students to use ICT (home possess computer and internet, use computer/ how often use computer) and related mathematics achievement.

To investigate affecting the use of ICT, we were developed for the using ICT and relationship on mathematics achievement, as well as characteristics the itself: The focus of this paper is mathematics student's and using ICT of the ASEAN student's.

Home possess : Availability computer and internet connection at home.Use Computer : Home, school and other

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Mathematics Achievement:1st Plausible Value mathematics through 5th Plausible Value mathematics test.

2. Method

This study of secondary data analysis., Trends in International Mathematics and Science Study (TIMSS) 2011 data for eight grade students was used as the data source for this study. TIMSS 2011was the fifth international mathematics and science education research organised by the IEA (International Association for the Evaluation of Educational Achievement). Four ASEAN countries participated in this study, there were 23579 students was presented in Table 1. The items were collected from the TIMSS questionnaire about ICTconsisted of the two latent variables : 1) Home possess score consisted of the two items observed variables : computer and internet connections, 2) Use Computer/ how often student's to use computer score consisted of three items observed variables : how often use computer in home, school and other. To assess mathematics achievemnt, the latent variable labelled as the Achievement with taken instead of student's score of the five plausible variables as the observed variables, those instruments for the study presented in Table 2. The relationship between use ICT consisted (Home Possess and use computer of the students) and mathematics achievements were analyzed with Structural Equation Modelling (SEM) used Lisrel software to conducted relationship between observed variables and laten variables and then between latent variables. Statistical descriptive were also used to presented average precentage items or poin scale of the latent variables and related with average mathematics achievemnt which is average from five plausible value.Researchers used data from the TIMSS to examine using the ICT to teach and learn mathematics and also investigate the mathematics achievement (Jean B L and Chronis K, 2014; Asako Yoshino, 2012; Willem J. Pelgrum and Tjeerd Plomp, 2002)

Tabel 1.Respondent of the study

No	Country	Code count	Number of			Number of
			Tot	Gir	Bo	
1	Indon	360	579	29	28	153
2	Malay	458	573	29	28	180
3	Singa	702	592	29	29	165
4	Thaila	764	612	34	27	172

Table 2. Instruments of the study

Latent variable	Observed Variable	Code	Point Scale
POSSESS	Home Possess\ Computer	BSBG05A	1= YES 2= NO
	Home Possess\ Internet Connection	BSBG05E	
COMPUTER	Use Computer/ Home	BSBGH0A	1= Every Day or Almost Every Day 2= Once or

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	Use Computer/ School	BSBG10B	Twice A Week 3= Once
	Computer\ Other	BSBG10C	Twice A Month 4 = Never or Almost Never
ACHIEVEMENT	1st Plausible Value Mathematics	BSMMAT01	-
	2nd Plausible Value Mathematics	BSMMAT02	-
	3rd Plausible Value Mathematics	BSMMAT03	-
	4th Plausible Value Mathematics	BSMMAT04	-
	5th Plausible Value Mathematics	BSMMAT05	-

3. Results and Discussion

Figure 1 provides of the percentage how often student's to use computer. There was considerable variation from ASEAN countries, with the highest use computer in home every day or almost every day in Singapore (73 % of students) and the lowest in Indonesia(16,4% of students), the used computer in home with once or twice a week with highest frequently in Malaysia (26,1 % of students) and the lowest in Indonesia (15,5% of students), the used computer in home with once or twice a month with highest frequently in Malaysia (8,9 % of students) and the lowest in Singapore (3,2 % of students), the used computer in home with never or almost never with highest frequently in Indonesia (63,4 % of students) and the lowest in Singapore (3 % of students). The percentages of students use computer in schools every day or almost every day (highest in Thailand, 4,4% of the students and lowest in Malaysia, 1,8 % of the students), the used computer in schoos with once or twice a week (highest frequently in Thailand, 74,7% of students and the lowest in Singapore 33,9 % of students), the percentages of students use computer in school with once or twice a month with highest in Singapore, 39,4% of the students and lowest in Thailand, 12,6% of the students and last the percentages of students use computer in school with never or almost never with highest in Malaysia, 34,8% of the students and lowest in Thailand, 8,3 % of the students.

The percentages of students how often use computer in others every day or almost every day (highest in Indonesia, 9,3% of the students and lowest in Singapore, 3,1 % of the students), the used computer in others with once or twice a week (highest frequently in Indonesia,33,7% of students and the lowest in Singapore 15,1% of students), the percentages of students use computer in others with once or twice a month with highest in Malaysia, 32,9% of the students and lowest in Indonesia, 26,2% of the students and last the percentages of students use

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computer in others with never or almost never with highest in Singapore52,5 % of the students and lowest in Indonesia30,8 % of the students.

Figure 2 provides of the percentage of home possesshave done two item such as computer and internet connection. The 97,3% of student's home possess computer and 95,9% of student's home possess internet connection in Singapore country had higher home possess than the students other countries and Indonesia student's had the lowest percentage home possess computer (27% of the student's) and home possess internet connection (19,3% of the student's).

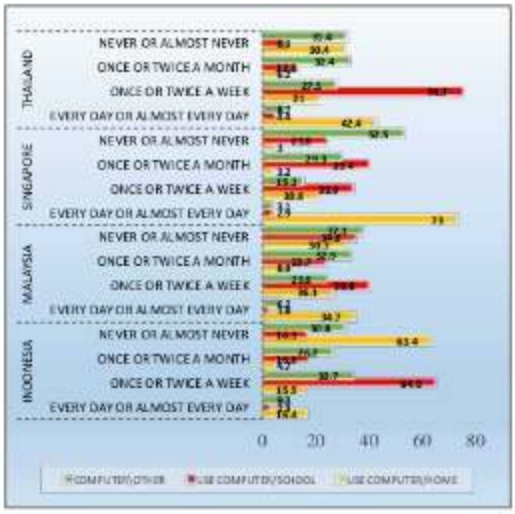

Fig. 1.Percentage of using computer of the ASEAN student's.

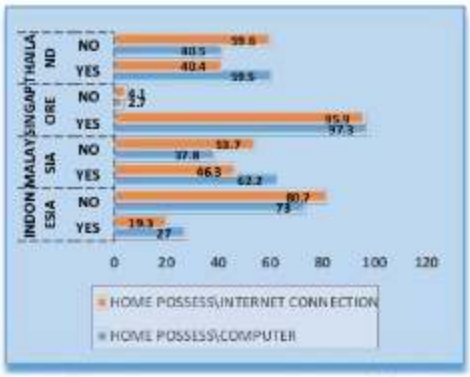

Fig. 2.Percentage of home possess computer of the ASEAN student's.

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Fig. 3.Trend in mathematics achievement

In figure 3 shows that Singapore had highest students average mathematics achievement from 1995, 1999, 2003, 2007 and 2011(with average 609, 604, 605, 593 and 611) than the students whose the ASEAN countries and then the following in the Malaysia country with average mathematics achievement start from 1999 through 2011(with average 519,508,474 and 440), and then Thailand country start from 2007 with average mathematics achievement in 2007 and 2011 (441 and 427) and last the lowest average mathematics achievement in Indonesia country start from 2007 and 2011 with average mathematics achievement 397 and 386.However, in some research show that there are significantly different mathematics achievement between ASEAN student's (Desi R, 2014)

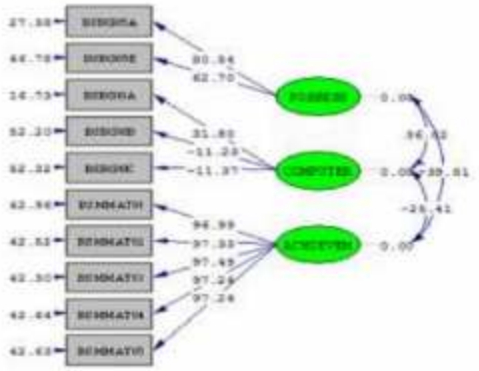

Figure 4. t value of the variables of the Indonesia student's

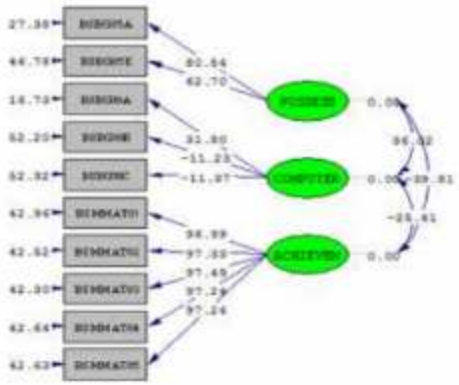

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Figure 5. t value of the variables of the Malaysia student's

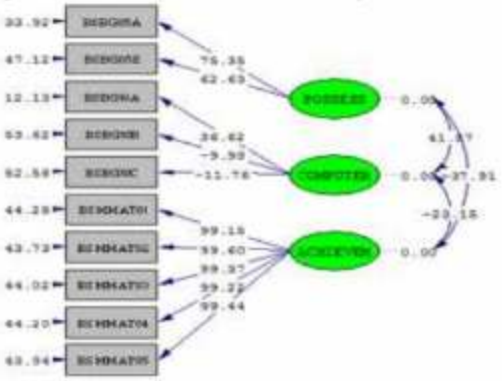

Figure 6. t value of the variables of the Thailand student's

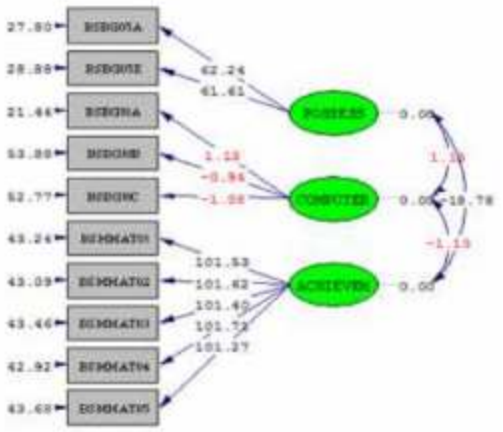

Figure 7. t value of the variables of the Singapore student's

In figure 4, figure 5 and figure 6 shows those observed variable significant toward latent variables with t value greather than 1,96 and also between latent variables show there are significantly correlation between latent variables of the Indonesia, Malaysia and Thailand student's.Futher in figure 7, shows that there are observed variables not significant with laten variables such as used computer in home, school and other not have significant correlation with latent variable use computer with t value 1,13, -0,94 and -1,08 respectively. Between latent variable also not significantly such as home possess with use computer with t value = 1,18 and between use computer with mathematics achievement with t value = -1,13, so can conclussion that home possess of the Singapore student's contains the items such as possess computer and internet connection not have significant correlation with use computer contains several items there are use computer at home, school and other, and so like use computer (at home, school and other) and mathematics achievement (1st Plausible Value Mathematics through 5th Plausible Value Mathematics). Otherwise, home possess have significant correlation with mathematics achievement with t value = -18,78< -1,96.

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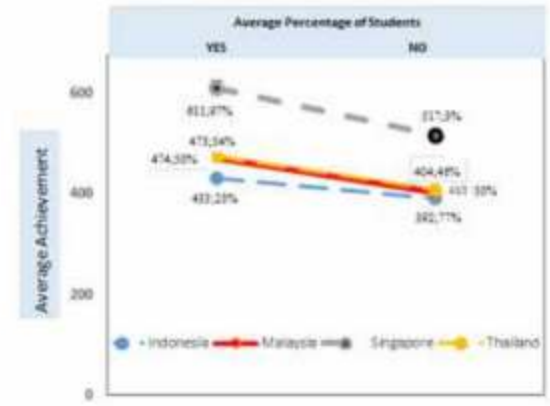

Figure 8. Relationship home possess withmathematics achievement

Figure 8 show that relationship home possess computer

have done two item such as computer and internet connection with mathematics achievement. The are positive relationship between home possess and mathematics achievement, it's mean that students's had home possess computer and internet connection show that mathematics achievement also increase. As well as the relationship between use computer with mathematics achievement, those students in ASEAN countries which were used computer in home, school or other had mathematics achievement increase. Such as relationship between use computer/how often use computer,presented in Figure 9, the increase percentage of students use computer average every day or almost every day them had higher everage mathematicsachievement than the students average once or twice a week, once or twice a month and small percentage of student's use computer avergae never or almost never.

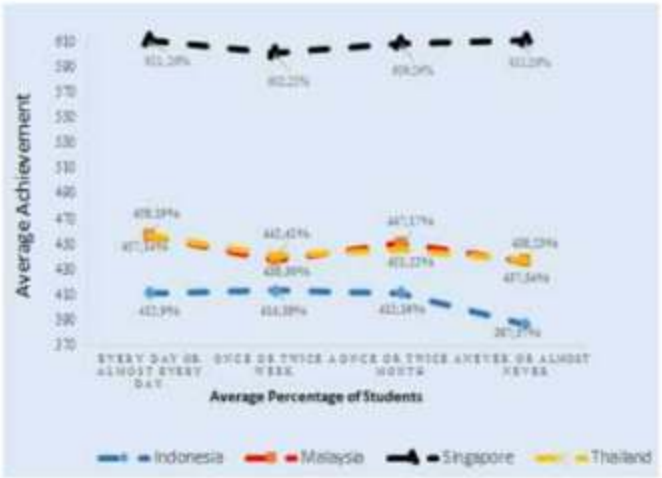

Figure 9. Relationship how eften/use computer with mathematics achievement

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