# A PRELIMINARY STUDY ON TEACHING PROGRAMMING AT MALAYSIAN SCHOOL

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**ABSTRACT** This paper presents a study on teaching and learning programming in a Malaysian school. The study attempts to identify all possible relations of student's background and attitudes towards learning programming. The motivations for this study comes from the fact that introductory programming in Higher Learning Institutes face a high rate of under achievers. Since the feeder to these institutions are schools, it is felt that if the teaching and learning of programming in schools are strengthen the above mentioned problem can too be greatly reduced. This study attempts to find all possible relations that would help in proposing a more effective method of teaching and learning programming in school and at Higher Learning Institution.

## INTRODUCTION

In these last decades, computers have become prevalent tools of life. In making the computers useful as tools of its intended use, it will need to be programmed. Programming courses are usually done at tertiary education. However the teaching and learning of introductory programming in tertiary institutions face the problems of high failure rates and under achievers in producing good programmers (Susan, et. al. 2004). Failure rates are usually high and the inability of students to complete small programming tasks upon completion of introductory units is not unusual (Robins *et. al*., 2003). For that reason most schools have now embed the teaching of computers in their curriculum so students are exposed to computer and programming earlier. There are students who have learned programming prior to college but still find it hard to cope with the programming subjects in college. In developing a program, the parts that are considered as the most difficult is associated to task which requires certain skills such as problem design and strategy. Hence, a research need to be done to identify the factors of why most of the college student still fail to get good grade in programming although they've learned it before in school. This leads to the objectives of this research which are to identify the factors that might affect programming skills, the degree of subject understanding and student's interest towards the subject in school. A strategic teaching framework will be proposed based on an analysis of the finding.

Learning to program is never as easy task. According to Gomes and Mendes (2007), the problems surrounding programming can be categorized into five which are the teaching methods, the study methods, the student's abilities and attitudes, the nature of programming and also psychological effects. For teaching methods, problems arisen are teaching is not personalized, teacher's strategies do not support all student's learning style, the teaching of dynamic concepts through static materials and teachers focusing too much on programming language and syntactic. For learning problems, students sometimes don't work hard to acquire programming competencies. They think that learning programming is enough by reading a text book and attending the class. When this happened, student cannot comprehend the problem given and visualize the process of the program. There are also problems in student's abilities and attitudes towards programming for example, student don't know how to solve problems because of they don't read and interpret the problem description first. Apart from the problems on account of the teaching and learning methods, there are also problems reflected by the nature of the programming itself. First, programming language demands a high level of

abstraction whereby skills like generalization, transfer and critical thinking are needed among the programmers. Second, programming languages have a very complex syntax in where student need to focus on syntactic rules and algorithm construction so that the program works as planned. These might result in psychological effects, whereby students don't have any motivation and interest in learning programming.

Naturally, students' personal learning strategies and motivation affect their success in learning programming strategies. If the students have no interest in programming, they will be in denial state of becoming an active learner. Those traits are probably created because of the problems from teaching pedagogy which then contributes to the problems of learning. To sum up, most of the novices came from school students because ICT or programming subject already commenced at secondary school (Byrne & Lyons 2001; Wilson & Shrock 2001). There is an urge here about the effectiveness of school lesson in preparing these novices for the tertiary level of programming.

## METHODOLOGY

This research is conducted using the two major phases, which are data collection and analysis. The analysis done on the data collected will identify and answer a few research questions that would help in the recommendation of an effective method of teaching and learning programming. Data are collected in two ways which are through interviews and questionnaires. Interview covered ten open ended questions focusing on the teaching materials besides problems faced by the teacher while questionnaire used seven questions measuring the ICT activities, interest, perception, students' understanding towards the subject and also personal info. As for the reliability of the questionnaire, the author have made reviews from other research papers and case study focusing on problems and factors that affect the performance in programming such as Kristi (2003) and Bergin & Reilly (2004). Hence, most of the questions are derived from the reviews of other case study and adjusted to suit the school feel. The questionnaire forms are then analyzed using Microsoft Excel.

The survey was conducted at Sekolah Menengah Kebangsaan Bandar Baru Salak Tinggi (SMKBBST). The school was chosen not only because of its vicinity, which is half an hour away from University of Tenaga Nasional, but also because the school have been teaching ICT for Form 4 and Form 5 students for several years now. Thirty-one students took part in filling up questionnaire forms which on average takes about 10 minutes to fill-in. However, three survey forms are considered invalid since its incomplete, where only twenty-nine forms left to be evaluated. The students were enrolled in Information Technology and Communication (ICT) subject for Sijil Pelajaran Malaysia (SPM). Eighteen out of twenty nine respondents were from Form 4 while eleven respondents were form 5. Fifteen students were male and fourteen were female. The majority of the students came from Science Technology stream and only five of them were from Commerce stream. Almost all students have computer/s at home and some of them were taking the subject as a requirement of their course or out of personal interest.

## RESULT AND ANALYSIS

The background questionnaire used seven questions measuring the ICT activities, interest, perception, students' understanding towards the subject and also personal info. Five questions were close-ended and two questions used Likert scale. Question 6 consisted of nine sub-questions with three Likert scale and Question 7 consisted of twenty sub-questions with five Likert scale. A summary of the result is presented in Figure 1 and Figure 2. Figure 1 consisted of thirteen sub-questions describing the degree of understanding among school students in programming subject, a mix between question 6 and 7. While Figure 2 consisted of seven sub-questions describing student's interest and perception towards programming subject, a mix between question 6 and 7.

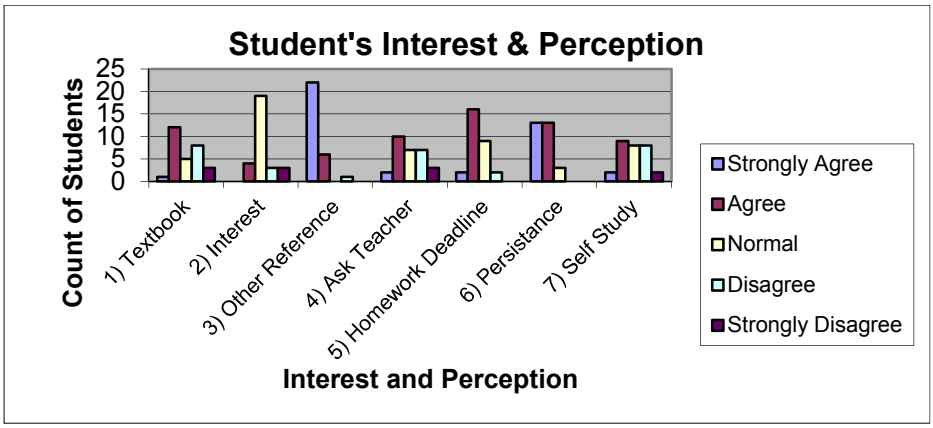


**Figure 16: Student's Interest and Perception.**

Figure 1 showed that many of the highest rate answers fall under normal category which means they neither *Agree* nor *Disagree*. There is no question that has *Disagree* as the highest rate. Question 7.3 was about student's understanding of what teacher taught in classroom or computer laboratory. Ten students *Strongly Agree* and another eighteen students *Agree*. None of the students disagreed that they understand the learning session. Question 7.4 was about the frequency of teacher helps in learning. Sixteen students *Strongly Agree* and ten students *Agree* that teacher does always help them in learning programming. Question 7.10 fourteen students *Strongly Agree* and thirteen *Agree* that learning aid such as video and audio usage is important as it helps them to learn better. Finally, question 7.20 was about the statement that *Disagree* theory is learned more compare to practical or writing program. Or simply said, there is no balancing between theory and practical learning period. Ten students *Agree* and another two students *Strongly Agree*. To sum up, majority of the students agreed that there is lack of practical session during learning.

According to Figure 2, the majority of the highest rate fall into S*trongly Agree / Agree* scale. For example question number 7.1, twelve students *Agree* and one student S*trongly Agree* that the textbook was thick and there are too many for them. While eight *Disagree* and three *Strongly Disagree* with the statement. In question 7.5, twenty-two students S*trongly Agree* and six respondents *Agree* that they used other reference such as search engine, peers help and other reference books to do homework. On another hand, there were ten students *Agree* and two S*trongly Agree* of the statement about the lack of seeking teacher helps from question number 7.6. As for question number 7.7, sixteen agreed and two S*trongly Agree* that they always met the deadline of homework. In question number 7.11, about thirteen students S*trongly Agree* and thirteen *Agree* that they will not give up in solving the questions. And lastly, about nine *Agree* and two S*trongly Agree* that they do self study outside the school. The rate for *Agree* scale almost on par with *Disagree* with eight students disagreed and another two strongly disagreed.

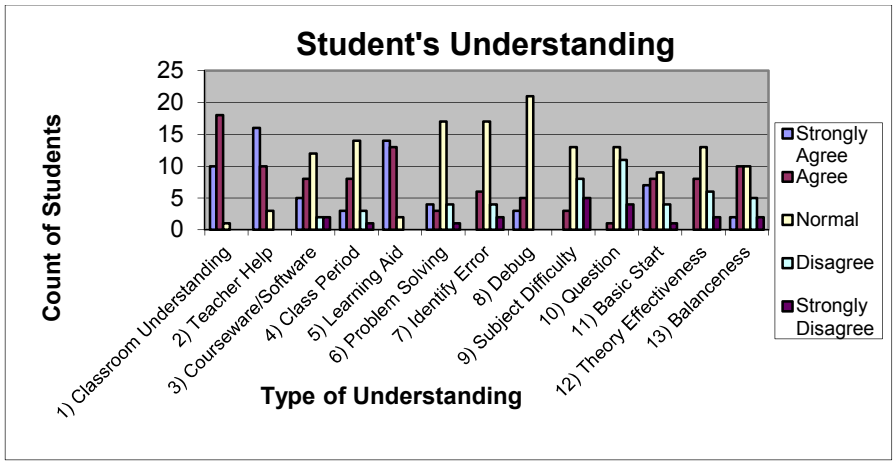


**Figure 17: Student's Understanding**

Based on an interview session done with two secondary school ICT teachers, many ideas and issues had been pointed out about the subject. Firstly, the use of Malay Language in IT term seems not effective as it should have been. The real meaning of IT term has not successfully conveyed to students when it was translated into Malay Language. Other than that, teachers need to verify their teaching style since there are three groups of learner which were excellent, average and poor. Students also do not understand even though they memorize the content (theory) so they tend to be misled when it comes to tricky questions. However, with the appropriate teaching materials such as Toolbook, Courseware and peers coaching method, there is no problem with the rate of failed students in ICT subject (100% passed).

## STATISTICAL ANALYSIS

Nine research questions are made upon the questionnaire. The gist of those research questions is to find out the relationship between two variables. Does this factor affecting the other factor or does this problem occurred because of that factor, illustrating the sketch of the research questions. Several considerations have been taken to associate between two variables according to its own category which are factors, interest and understanding.

**Table 1: Correlation of Variables (p<.05)**

| Research Questions | Independent Relation |
|---|---|
| 1) Is there any relationship between stream of studies and difficulty of the subject being perceived? | No relationship |
| 2) Is there any relationship between owning computers with ICT activities? | No relationship |
| 3) Is there any relationship between classroom understanding and learning aid such as video and audio? | There is relationship |
| 4) Is there any relationship between initiative and persistence? | No relationship |
| 5) Is there any relationship between interest and self study? | There is relationship |
| 6) Is there any relationship between theory effectiveness and basic understanding (problem solving concept)? | There is relationship |
| 7) Is there any relationship between courseware/software and difficulty of the subject being perceived? | No relationship |
| 8) Is there any relationship between interest and difficulty of the subject being perceived? | No relationship |
| 9) Is there any relationship between basic understanding (problem solving concept) and programming questions? | No relationship |

These research questions are analyzed using chi square test (x2) in order to determine the independent relation between two variables. To make sure that a variable has relationship from other variable, five percent degree of independent (as small as possible) has been put. Therefore, probability was used to represent the 'degree of independent'. If probability is lower than 0.05, there is relationship between two variables according to pivot table. The correlations of variables are shown in Table 1 where surprisingly only three research questions have correlations between two variables out of nine questions. The related question was analyzed using descriptive analysis and summarized into a table.

## DISCUSSION

Based on Table 1 above, we can see that many of the assumptions are out of track when seven of research questions shown that there were no correlation between two variables. In research question number 2 for example, it proved that having a computer at home does not guarantee someone to be skilled in using computer or heavily involved in non-programming activities such as Facebook, video game, Internet browsing or even the use of *Microsoft* software. It means that there are lots of reasons to influence them to be familiar with these ICT activities such as friends and cyber café facility. Perhaps, they don't have to be actively engaged in those activities in order to be a good programmer. For research question number 4, although the graph analysis shown a good correlation result between 7.6 and 7.11, however the chi-square test denied it. The purpose of this research question is to correlate that student's lack of initiative to ask teacher leads them to solve questions by their own (persist) until it is done. Here, it can be interpreted that sometimes the habit of do not asking help is the indicator of someone's ability to solve the problem by their own. It can be defined in various ways although shyness always popped out to be as the best factor. According to research question number 8, there was no correlation between the variables interest and difficulty of the subject being perceived based on the chi-square test. It implied that if the course is considered as difficult, that does not prove that it will be

hated by students. Sometimes, students are thrilled with the 'challenge' it offers once you manage to solve the questions. These three research questions; number 2, 4 and 8 are mainly focused on the factors, understanding and interest of school students towards programming.

For the three research questions which have relationship, the reason behind research questions number 3 is to identify the effectiveness of the learning aid such as video and audio on the understanding of the subject. It is proven that learning aid do help school children in understanding the programming when the probability shows a significant small number, 0.016 which is less than 0.05. It has been said that audio and video learning aid method was used by many researchers to tackle the novice's understanding inside the memory of program execution (Iain & Glenn, 2002; Smith & Webb, 2000). As for research question 5, the correlation between two variables which are interest and self study is positive. Interest is the essence of motivation, and motivation has something to do with willingness. The relationship indicates that student who has interest in programming are likely to study by themselves apart of what they learnt in school. This is strengthen from what Gomes et al. (2007) implied that psychological effects on programming is considered as one of the problems in learning programming. Last but not least, the research question number 6 confirmed that there is a correlation between the effectiveness of the theory module with the basic understanding of problem solving. This relationship indicates that the theory module affect the degree of understanding in problem solving concept. The relation according to the analysis goes like this, that there are more students who do not understand the theory and as a result they do not know how to apply it into problem solving during code writing stage.

Living in era of Information Technology (IT) and being an IT student had surely made these students know how to use computer and gadget for basic purpose such as emailing, computer application, playing games and surfing the Internet. According to the survey, majority of the students are able to do the ICT activities on their own except for programming software. Programming software is an advanced activity that requires special skills beyond their knowledge compared to other ICT activities mentioned just now. Based on researches done by Wilson & Shrock, 2001; Holden & Weeden, 2003; Wiedenbeck & Kain; 2004, etc. prior programming experience such as emailing, playing games and surfing the internet do affect the programming performance in class. With the experiences, student could excel the programming field. However, SMKBBST students are not familiar with programming software, but have used computers before for other basic purposes. As the result, 100% of the students are passed the ICT examination in Sijil Pelajaran Malaysia (SPM). This indicates that student may not be excellent in the subject but they still able to do programs with only single side experience which is none programming experience. It is believed that later on, they will obtain the programming experience and becoming expert as they learn further with good attitudes as a programmer.

## ACKNOWLEDGEMENT

This research project is funded by Malaysian's Ministry of Science, Technology and Innovation (MOSTI) through the E-science fund (06-02-03-SF0185). Special thanks to the students and teachers of SMKBBST for their cooperation in the survey.

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