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Effectiveness of Learning Activities Using Interactive Modules Successful Intelligence

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ABSTRACT

Background: This study was conducted to investigate the effects of learning activities using interactive modules successful intelligence. **Objective:** The main purpose of this module is to help the students who are the future teachers to improve intelligence scores analytical, practical and creative thinking. Three types of rubrics developed by three types of thinking intelligence. Three thinking intelligence (analytical, creative and practical) discussed through successful intelligence theory. True experimental design was applied. Combined approach between quantitative and qualitative data used to make triangulation. A total of 70 students in UUM education program randomly selected as respondents. Students then split randomly into control group (n=30) and treatment (n=30). SPANOVA used for analysis quantitative data and content analysis was used to analyze student interview data. The findings show that there is a significant difference. Three types of rubrics have been successfully developed as guidelines related to three types of thought processes. **Results:** SPANOVA analysis shows that there are major effects of independent variables Semester [F (1.00, 68.00) = 560.00, p <.05] and Semester * Group interaction effect [F (1.00,68.00) = 321.02, p <.05], which is significant for analytical intelligence. There are major effects of the independent variables Semester [f (1.00, 68.00) = 358.40, p <.05] and Semester * Group interaction effect [F (1.00,68.00) = 418.31, p <.05], which is significant for practical intelligence. Even some of the main effects of the independent variables Semester [F (1.00, 68.00) = 421.78, p <.05] and Semester * Group interaction effect [F (1.00,68.00) = 306.06, p <.05], which is significant for creative intelligence. Qualitative findings also received a positive response from students. Three matters dealt with by the students on successful intelligence module is (i) provided thought-provoking activities using higher-order thinking, (ii) rubrics help students understand the three types of thinking intelligence, (iii) the activities of successful intelligence modules helpful and positive impact on students. **Conclusion:** In conclusion successful intelligence modules have a significant impact on increasing scores of analytical, creative and practical thinking.

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INTRODUCTION

Malaysia is a country that is concerned with the education sector as the basis for generating quality human capital. In mid-January 2006 the Ministry of Education has launched the Educational Development Master Plan (DMP). This plan is a framework policy direction of education in Malaysia between 2006 and 2010. The Ministry of Education Malaysia (2006) has outlined six strategic plan to ensure the quality of education in Malaysia, namely: (i) nation building, (ii) developing human capital, (iii) strengthening national schools, (iv) bridging educational gaps, (v) enhancing teaching profession and (vi) accelerating excellent of educational institutions. This study focuses on the ability of learning activities to enhance the teaching profession in Institutions of Higher Learning (IPTA) and ensure development of human capital is expected. Therefore, teachers and prospective teachers (currently enrolled in education programme) is a major driving force in creating human capital. The important role of the educator is to foster a culture of learning and thinking among students (Beerens, 2000). According Rinkevich (2011), creative thinking culture among teachers should be fostered in order to promote student learning. Starting last decade of the 20th century until now, there is an increase in the policy of the state in developing and fostering a culture of creativity as was the case in Europe, USA, Japan and China (Craft, 1997). Generating thinking intelligence must begin at the university level. Even students who majored in education should be provided with the mindset of

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analytical, creative and practical thinking through successful intelligence theory (Sternberg, 2005) because they are the driving force in the development of human capital. Successful intelligence theory introduced by Sternberg (1985) see the human capacity of the four corners of the following: (i) the ability to achieve one's goals in life, socio-cultural context; (ii) by utilizing the strengths and compensate for weaknesses; (iii) to adapt, shape, and select environments; (iv) through a combination of analytical, creative and practical.

Related Literature:

The Nature of Successful Intelligence:

Successful Intelligence Theory introduced by Sternberg (1985) is a theory which introduces different views regarding level of thinking than traditional intelligence theory. The difference is in terms of the emphasis on the level of thinking that can be applied in everyday life. According Nevid (2003) and Sternberg, Kaufman and Grigorenko (2008), the reality of success in life is supported by three thinking intelligence that the analytical (intellectual skills in solving problems in traditional, creative (intellectual skills in problem solving outstanding), and practical (adaptive skills in everyday life by using the skills and knowledge available). Thinking Intelligence is important to equip students for a better life in an environment of constant change (Tang, 2004). According to Sternberg (1985), a program that applies the thinking intelligence must have some important features. These characteristics are responsive to students' motivation and intellectual needs, sensitive to individual differences of students, and to provide an explicit relationship between the training given by the function it plays in the real world. Through the successful intelligence theory, the individual has three types of thinking namely analytical, creative, and practical (Nevid, 2003; Sternberg, 1985; 1996). The three thinking intelligence is owned by individuals in different levels, most individuals who excel in one or excel in all three aspects. Students' ability to apply their knowledge in real life associated with thinking intelligence (Sternberg, et.al, 2008).

According to Sternberg, et.al, (2008), the activity of problem solving, analytical thinking intelligence involved when students analyze, assess, decide, compare and differentiate, explains the causes and consequences, examines the relationship a small part of the whole, making assumptions, predictions, make inferences and peeling a problem. In problem solving learning activity, creative thinking intelligence needed to determine options to problem solving, (Sternberg, Lautrey & Lubart, 2003). According to Sternberg (2005), practical thinking associate with the actual environment that are relevant to the life of an individual. Practical thinking intelligence, demonstrating how individuals adapt to the environment, shaping the environment, and select environments. This is one of the aspects contained in practical thinking intelligence or also called street smart.

Problem Solving:

According Meegan and Berg (2002) problem solving in world real life is defined as insight into the challenges, obstacles, and demand in the daily context, goals, activities, and individual relationships. According to Mohammed Omar (2006) concept of problem solving in real life, focusing on how people solve problems in natural context. While Sternberg et. al, (2000), stated as a problem-solving abilities focused and involves three types of treatment, namely adaptation to the environment, shaping the environment, or choose environment.

Interactive Modules of Successful Intelligence:

Computer based learning (CBL) is a term that can be used to describe almost all forms of learning to use a computer program as the main center. CBL approach offers the use of interactive computer software elements, together with the ability of computers to present various types of media. Media refers to a tool or a means for presenting or submitting any information such as text, graphics, audio, video and animation. Interactive modules of successful intelligence have been successfully developed based on three types of thinking intelligence. This module is a technique used in this study to integrate various media such as text, graphics, audio, video and animation in a digital environment that is characterized by interactivity.

Research Questions:

1. What is the appropriate rubric to assess students' analytical thinking, creative and practical when problem-solving activities carried?
2. Does interactive modules of successful intelligences have a significant impact in term of intelligence scores on analytical thinking, creative and practical?
3. What are the perception of students education programs about interactive modules of successful intelligence theory?

Methodology:

True experimental research design was applied. This study employs a combination of quantitative and qualitative. Rational blend of the two approaches is because according to Neuman (2000) and Creswell (2012), the best studies are studies that often combines features found in the form of quantitative and qualitative research. Even triangulation of data can be done. Total students selected from the bachelor education program is about 70 people. Students Universiti Utara Malaysia is randomly assign into control and treatment groups. The

instrument used to obtain quantitative data and qualitative research. The instrument of this research includes pre-test and post-test consisted of Sternberg Triarchic Abilities Test (STAT) and interview questions. STAT test scoring procedure is in accordance with the scoring procedure prescribed by Sternberg (1993) through the STAT test level H. It is divided into two parts, the scoring part of multiple-choice questions and essay questions. Distributions of marks are shown in Table 1. Overall mark is incorporating aspects of analytical, creative, and practical is 90 marks. Further assessment of the essay question is in accordance with the minimum scale of 1 to 9, which is the maximum.

Table 1: Distribution Scoring Test (STAT)

Aspect	Distribution of Questions		Score
	Multiple Choice Questions	Essay	
Analytical	Question 1 to 12	Question 10	12 + 18 = 30
Practical	Question 13 to 24	Question 12	12 + 18 = 30
Creative	Question 25 to 36	Question 11	12 + 18 = 30
Total = Analytical score + Practical score + Creative score =			90

For essay questions there are two categories namely first category focuses on thinking intelligence. Every thinking intelligence assessed by different questions such as section 10 (analytical essay question), section 11 (practical essay question) and section 12

(creative essay question). Evaluation of the answer essay questions are reviewed by an expert in the field of language that has been trained in respect of each type of thinking involved. While the evaluation in the second category is based on an assessment of the content of the essay whether it meets criteria such as (i) meets the requirements of answers to questions, (ii) complete, (iii) grammar and spelling (iv) it is easy to understand**.**

STAT coefficient test (multiple choice) obtained from the study Sternberg (1996) is an analytical thinking skills = .63; creative thinking skills = .62 and practical thinking skills = .48). While for essay questions Sternberg (1996) reported as follows: Analytical = .69, = .58 creative and practical = .68. The reliability of the study Syarifah Amnah (2009) was .74 for the subscales analytical, creative .83 for the subscales and .79 for the sub-scale practical. For this study, researchers have conducted a pilot study on 63 students and the overall coefficient of STAT exam (essay) is .67. While reliability objectives (STAT) using the method of reliability Kuder Richarson (Kr-20) is .67. Five students were randomly selected to be interviewed for achieving the 3rd research question. Construction rubric adapted from (Brookhart, 2013; Stevens & Levi, 2013). Rubric is an effective way to evaluate a learning process. Part-scale rubric that shows the thought process required. The term used to scale should be tactful but clear. Scale placed in the top row of column. The scale used in this study were excellent (3), satisfying (2) and unsatisfactory (1). The purpose rubric as a guide to the thought process is required for each level of thinking.

Findings:

Rubric Assessment of Three Types of Thinking Intelligence:

Table 2 shows the three types of thinking intelligence assessment rubric. Production of this rubric is the first study objective. The purpose of this rubric is to support students' thinking process when problem solving activities undertaken. Each group of students use this rubric as a guide to the requirements that must be met when solving problems in learning activities that are carried out. There are several categories for each type of thinking intelligence that should be given attention by the students. The rubric also assist lecturers in the process of encouraging students to think and relevant scoring ability shown by the student.

Screening Data:

Before testing the hypotheses made all data must qualify SPANOVA analysis. Box test values (Refer Table 3) were not significantly showed that the covariance across groups of independent variables are the same. Equality of the covariance test conditions SPANOVA observed. Levene test results (Refer Table 4) were not significant indicating that the variance of the dependent variable in the study population were similar across the two groups of respondents. Terms of equality of variance tests SPANOVA met.

Table 2: Rubric Assessment of Three Types of Thinking Intelligence

Analytical Thinking Rubric				
Categories	Excellent (3)	Satisfactory (2)	Unsatisfactory (1)	Score
Analyze information: (Messages, ideas or opinions).	Students interpret information accurately and appropriately in the context of the foregoing.	Students present the information accurately and in accordance with the little information that is not consistent and relevant.	Student information is often inaccurate, incomplete or omission of information.	

Apply the principles, procedures or theme.	Students use the procedures, principles or appropriate in the context of the theme presented.	Students use appropriate procedures, principles or themes inaccurate.	Students failing to use the procedure, principles or themes.	
Presents various solutions or perspective.	Students accurately presents and explains the overall progress of various angles or perspectives.	Students accurately presenting two or more solutions from different angles or perspectives.	Students present a solution from different angles or perspectives inaccurate.	
Drawing a conclusion supported with relevant arguments.	Students create complex detailed conclusions are supported by logical, consistent and comprehensive.	Students organized a logical conclusion and consistent with the evidence or explaination.	Students who do not present a logical conclusion or inconsistent with the issues raised.	
Synthesize ideas in a clearer form.	Students integrate ideas or develop a solution that is very clear, cohesive and coherent.	Students connect ideas or develop solutions in a clear and coherent structure.	Students present their ideas and solutions in a way that is incomplete, unclear and incoherent.	
Practical Thinking Rubric				
Identify and summarize the problem or issue which is an issue of discussion.	Accurately identify the problem or issue and develop a comprehensive summary.	Accurately identify the problem or issue and develop a less comprehensive summary.	Identify problems or issues inaccurate and weak in developing the summary.	
Identify and assess the quality of data support or evidence.	Identify and assess the quality of data or data support through aspects accuracy, adequacy and completeness. Can clearly distinguish between fact and opinion writers.	Examine the evidence and quality issues highlighted. Distinguish between fact and opinion writers.	Merely repeating the information provided. Not justify the difference between fact and opinion writers.	
Identifying and considering contextual issues.	Accurately identifying and providing relevant explanations advanced contextual issues highlighted.	Accurately identify and provide an explanation of the contextual issues highlighted.	Not explain the contextual issues, providing inaccurate information or just provide a list without a detailed explanation.	
Creative Thinking Rubric				
Categories	Excellent (3)	Satisfactory (2)	Unsatisfactory (1)	Score
Fluency: The number of ideas generated.	Generate a lot of ideas.	Generate some ideas.	Not a lot of ideas generated.	
Flexibility: The diversity of ideas generated.	Providing diversity of ideas that vary based on the objective.	Identified several channels idea.	Generate ideas matching function based on the same principle.	
Originality: Reform ideas.	Entirely new ideas or unique.	Idea is the renovation or improvement of existing concepts.	The idea is to copy ideas available.	
Effectiveness: The generation of ideas that have the potential and coincides with the theme.	Ideas meet all themes.	The idea is to meet the theme.	The idea is to show the potential of small to meet the theme.	

Table 3: Box's test of equality of covariance matrices

	Box's M	F	df1	df2	Sig.
Analytical thinking	4.272	1.378	3	832320.000	.247
Practical thinking	6.381	2.059	3	832320.000	.103
Creative thinking	12.529	4.043	3	832320.000	.007

Table 4: Levene's test

Group	F	df1	df2	Sig.
Analytical score semester 1	.185	1	68	.668
Analytical score semester 2	1.811	1	68	.183
Practical score semester 1	.292	1	68	.591
Practical score semester 2	1.470	1	68	.229
Creative score semester 1	.316	1	68	.576
Creative score semester 2	4.666	1	68	.034

Descriptive Analysis:

Table 5 shows descriptive information. Found that the mean level of analytical thinking, practical and creative in the 1st semester was not much difference between control and treatment groups. In contrast to the 2nd semester (after treatment is given), analytical thinking intelligence scores for the treatment group (mean = 22.2000), practical (mean = 21.5429), creative (mean = 19.2000). The mean treatment groups for the 2nd semester overcome the mean control group in the 2nd semester.

Table 5: Descriptive statistics

	Group	Mean	Std. Deviation	N
Analytical thinking score semester 1	Control	13.8571	4.05218	35
	Treatment	15.1714	3.45973	35
Analytical thinking score semester 2	Control	14.8286	3.48514	35
	Treatment	22.2000	2.56446	35
Practical thinking score semester 1	Control	14.4286	3.78298	35
	Treatment	14.8857	3.73199	35
Practical thinking score semester 2	Control	14.1714	3.62577	35
	Treatment	21.5429	3.13747	35
Creative thinking score semester 1	Control	12.0571	2.83821	35
	Treatment	12.7714	3.34388	35
Creative thinking score semester 2	Control	12.5714	2.78954	35
	Treatment	19.2000	3.97640	35

Spanova Result:

To test the hypothesis, SPANOVA tests applied. Based on Table 6 Huynh-Feldt value indicates that there are major effects of the independent variables Semester [f (1.00, 68.00) = 560.00, p <.05] and Semester * Group interaction effect [F (1.00,68.00) = 321.02, p <. 05] significant for the analytical thinking intelligence. There are major effects of the independent variables Semester [F (1.00, 68.00) = 358.40, p <.05] and Semester * Group interaction effect [F (1.00,68.00) =418.31, p <.05], which is significant for practical thinking intelligence. In fact there is also the main effect of the independent variables Semester [F (1.00, 68.00) = 421.78, p <.05] and Semester * Group interaction effect [F (1.00,68.00) = 306.06, p <.05], which is significant for creative thinking intelligence. Researchers reject the null hypothesis and interactive modules of successful intelligence significantly give the main effect and interaction effects on intelligence scores analytical thinking, creative and practical student education program at Universiti Utara Malaysia (UUM).

Table 6: Test of within –subject effects (Huynh-Feldt value)

	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Analytical thinking	semester	560.000	1.000	560.000	129.536	.000
	Semester*Group	321.029	1.000	321.029	74.259	.000
	Error (Semester)	293.971	68.000	4.323		
Practical thinking	semester	358.400	1.000	358.400	50.849	.000
	Semester*Group	418.314	1.000	418.314	59.350	.000
	Error (Semester)	479.286	68.000	7.048		
Creative thinking	semester	421.779	1.000	421.779	69.168	.000
	Semester*Group	306.064	1.000	306.064	50.192	.000
	Error (Semester)	414.657	68.000	6.098		

Profile Plots:

Referring to Figure 1, 2 and 3 clearly shows that the mean scores of thinking intelligence analytical, practical and creative for treatment group (treatment with interactive modules of successful intelligence) increases linearly from semester 1 to semester 2. While the mean score of thinking intelligence analytical, practical and creative for the control group (without interactive module of successful intelligence) almost unchanged in both semesters. This shows learning through interactive modules of successful intelligence is effective for increasing scores three types of thinking intelligence student education program in UUM.

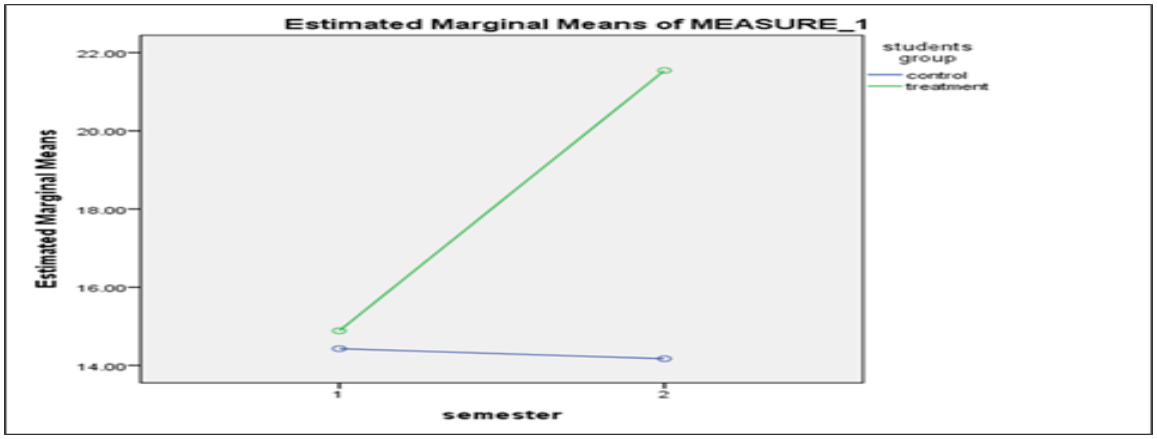

Fig. 1: Analytical thinking score semester 1 and 2between control and treatment group

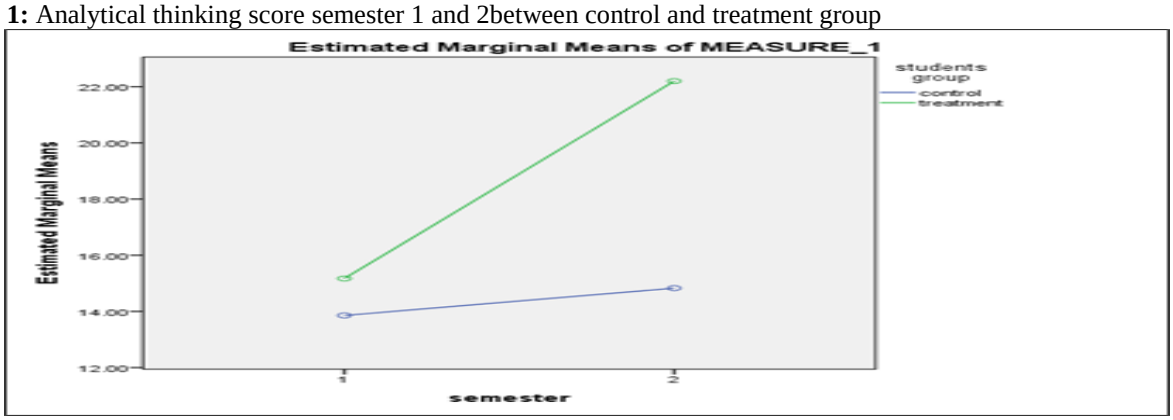

Fig. 2: Practical thinking score semester 1 and 2 between control and treatment group.

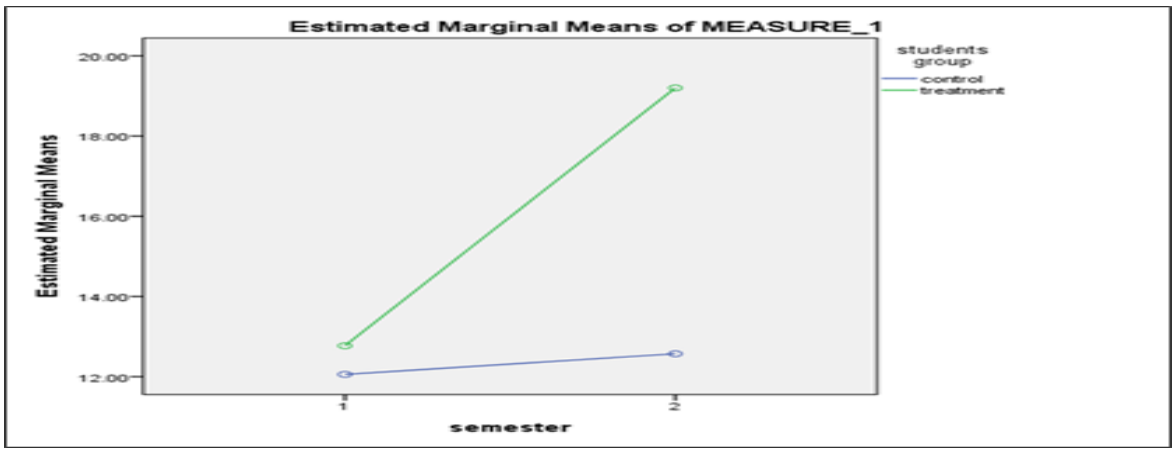

Fig. 3: Creative thinking score semester 1 and 2 between control and treatment group.

Interview Finding:

Findings from interviews with a qualitative approach was to determine students' perceptions after undergoing learning activities through interactive modules of successful intelligence. The findings are as follows:

a)The module provide challenging activities using higher-order thinking:

All five students interviewed stated that the activities undertaken to promote the use of higher-order thinking skills. Activities provided challenging and hone their thinking. Examples of such activities are analytical and practical activities. Here are some examples of the results of interviews from some participants:

"Yes, because all the activities available requires me to think using higher-order thinking to identify the root cause of a problem and how to solve it. For example, in a practical and analytical activities"(P2).

"Yes, because all activities encouraged me to use higher-order thinking skills, within the given time I had to think to solve a given problem"(P3).

"Yes, all activities challenge my thoughts. Activities realized that a major challenge when we apply higher-order thinking skills"(5).

b)Rubrics help students to understand the three types of thinking intelligence:

All five students interviewed could describe accurately the definition of thinking intelligence analytical, practical and creative, with examples of activities that they undertake. Even they agree that the rubric to guide them think through the thinking intelligence analytical, practical and creative. Here are some examples of the results of interviews from some participants:

"What I understand, analytical thinking is a way of thinking to make a decision or to solve a problem and it should be viewed from various aspects. For example, in recent activities is analyze the senario from video"(P1).

"Rubric provided really helped us to think in an analytical, practical and creative" (P3).

"Problem-solving process become easier because each type of thinking intelligence rubric can be used as a guide "(P4).

c) Activities based on thinking intelligence modules give positive and significant impact on students:

All five students interviewed agreed that the activities of thinking intelligence modules give positive and significant impact on students. Here are some examples of the results of interviews from some participants:

"Through these activities, the benefits and positive impact on myself is that I can improve my thinking and can find ways to solve a problem"(P2).

"My feeling very happy and excited. For example in creative activities because I had the opportunity to produce new products with friends "(P3).

"Yes, because this program can help students to improve their thinking and thus can help improve academic achievement and relationships with group members" (P4).

Discussion:

The positive perception from students about thinking intelligence in learning activities:

Positive perspective of the students after undergoing treatment in the 2nd semester. Most of them agree that learning activities through successful intelligence module is fun. Even through the application of flash program allows various media such as text, graphics, animation, video and audio through a single module loaded. In addition, the collaboration between a group of friends can be nurtured because each group is given a rubric for measuring any type of thinking intelligence. This allows them to work together to think in order to achieve the best score rubric.

The findings of this study are consistent with the fact Sternberg, et.al, (2008), teachers can create problem-solving activities by level of difficulty. This is because through problem solving students began using three types of thinking intelligence. Conclusions can be made about these findings is that the application of thinking intelligence aspects based on problem solving activities help generate thinking intelligence students in higher education institutions. These findings demonstrate that the thinking intelligence has close ties with the problem solving process. This finding is expected to inspire lecturers to develop learning activities in the classroom-based problem solving as indirectly these conditions can increase the thinking intelligence among students as well as students' confidence to speak up. Creative teaching practices that apply theories and cognitive learning should be promoted by the lecturer in Institutions of Higher Education. Creativity in teaching practice is gaining attention worldwide. The implementation of these practices were capable of forming a conducive learning environment, fostering cognitive development of students, the predictors of achievement and academic success as well as make learning more meaningful (Freund & Holling, 2008). According to a source of education development 2001-2010, one of the causes of low achievement is because the majority of teachers still use traditional teaching methods and less use of Information and Communication Technology to attract and unable to stimulate the learning process of students in these subjects (Ministry of Education, 2001). Even this teaching strategy also identified as the cause of student academic ground or at risk of becoming less motivated (Tang, 2004).

The Effectiveness of Interactive Modules Successful Intelligence:

The results of the descriptive analysis of the data showed a mean score of thinking intelligence analytical, practical and creative in the 2nd semester better than the score of the first half. This situation shows that there is a significant impact on learning using interactive modules of successful intelligence. Even with these findings, we conclude that the thinking intelligence can be enhanced through problem-solving activities based on the three thinking intelligence. The findings of this study are consistent with the findings of the study (Sternberg, 2004; Nurulwahida & Ahmad Azman (2014), which found that students have the thinking intelligence at different levels. Line with the findings Syarifah Amnah (2009), that when combination of practical and creative intelligence enables students to generate ideas and to determine the appropriate selection to problem solving. He also noted that practical intelligence involves the application of problem solving in real world contexts. This relates to the surrounding environment of the individual, in which knowledge is not taught or given directly opposite

result from his own experience and observations. This coincided with the learning activities provided through the assessment of scenarios and situations of each student trying to solve a problem that required by rubric provided. The findings of this study are consistent with the opinion Wagmeister and Shifrin (2000) that the application of intelligence to think in learning activities can attract students to explore the content and interact with others. According to Johnson (2007), through analytical thinking, practical and creative can help teachers plan learning activities that can challenge the level of thought and the ability of students to solve problems encountered in certain situations.

Conclusion:

Interactive modules of successful intelligence that emphasize student-centered approach has attracted active participation and involvement of university students as a whole in the process of thinking. Analytical thinking skills, practical and creative emphasis should be placed not only in the enrichment program at the university. Even in the process of teaching and learning in schools. This is because the exposure level of thinking is to prepare the students to face the problem more complex with technological changes occur suddenly. Thus, students have the skills to respond effectively to solve problems and adapt to its environment. This is because intelligence showed the efficiency of the students think logically carry out the process of thinking. Someone with thinking intelligence shows efficiency in compiling the information, concepts and ideas on a regular basis and draw conclusions or decisions for appropriate and concerted action.

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