

THE EFFECT OF STUDY HISTORY SHEET (TEIKEI-BUN) ON ENGINEERING SCIENCE STUDENT'S CRITICAL THINKING AND LEARNING OUTCOME.

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ABSTRACT

Education needs to prepare the students in future with knowledge and skill that are used in real world context. Skill that must owned are critical thinking, problem solving, information literacy, and global awareness. Thus, the learning process must be meaning full and significant form for daily life. This study investigated the effect of the Study History Sheet (SHS) or TEIKEI-bun for critical thinking and learning outcome into a student of Engineering Science Course. The instrument of teaching in this study was based on the One Page Portfolio Assessment (OPPA) .This study is a quantitative research with a survey design was used and the data were analysed using the descriptive statistical data. Respondents consist of 30 students Engineering Science course from 2 different classes of Civil Engineering Department. Two methods of teaching implemented with conventional method for control group and TEIKEI- bun for sampling group. Questionnaire distributed after class to all respondent to evaluate of their critical thinking and learning outcome. Comparison of result for Quiz with both groups are used to support the learning outcome finding. Research finding that worksheet score higher for critical thinking and learning outcome but no significant different on the average rate of Quiz result. Teikei-bun developing logical expression, make student abilities to clarify reasons and composing sentence differentiate fact and opinion. Beside it has provide fun and meaningful learning experience.

Keywords: Critical thinking, meaningful learning, learning outcome, conventional teaching, study history sheet

1. INTRODUCTION

This research is conducted to investigated the effect of the Study History Sheet (SHS) or TEIKEI-bun inspired for critical thinking and learning outcome towards Engineering Science Course students. The National Education Blueprint (2015-2025) highlighted the importance of critical thinking ability in the nation's education agenda for the next decade [1]. Therefore, students ought to be instructed to express their own thoughts, think innovatively and be critical in learninTHE Eg.

Critical thinking is mode of thinking about any subject, content, or problem in which the thinker improves the quality of his or her thinking by skilfully analysing, assessing, and reconstructing it. Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking [2].

While critical thinking is a systematic process, it also invites creativity and curiosity. Whether students are writing an essay, composing a piece of music, inventing a new piece of machinery, or designing a website, they need to know how to balance technical skill with imaginative thought [3].

Developing these skills will make it possible for students to make reflective judgement. Students will be able to make a reasoned judgement, based on the available information. As critical thinking skills develop, students should feel more confident about creating original work of their own.

According to lthnin et al [4] the learning approach by SHS shows that it is possible for students and teachers to identify and address problems in a joint effort by using each other's experience and knowledge. The main importance of the SHS is that it creates an opportunity for reflection. The benefits of reflective practice are to (i) encourage independent learning, (ii) develop thoughts and responses in an structured way, (iii) apply in daily life (iv) enable to identify personal strengths and areas for development and (v) improve written and communication skills [5].

Therefore, it can be concluded that SHS approach are more to student centred learning or independent learning compared to conventional approach which is more to teacher or lecture centred learning in teaching and learning process. Table 1 shows the differences between SHS and conventional approach

Table 1 : Differences between SHS and Conventional approach [6]

	Conventional Approach	SHS Approach
Content	Learners work to find correct answers.	Learners work to construct any one of a number of possible correct answers.
Instruction	Learning starts with what learners do not know.	Learning starts with learners' previous knowledge.
Classroom Environment	Learners learn passively in an often silent classroom.	Classroom environment resembles an active workplace with various activities and levels of sound depending on the kind of work being done.
Technology	Teachers use various kinds of technology to explain, demonstrate, and illustrate various topics.	Learners use various kinds of technology to conduct research, communicate, and create knowledge

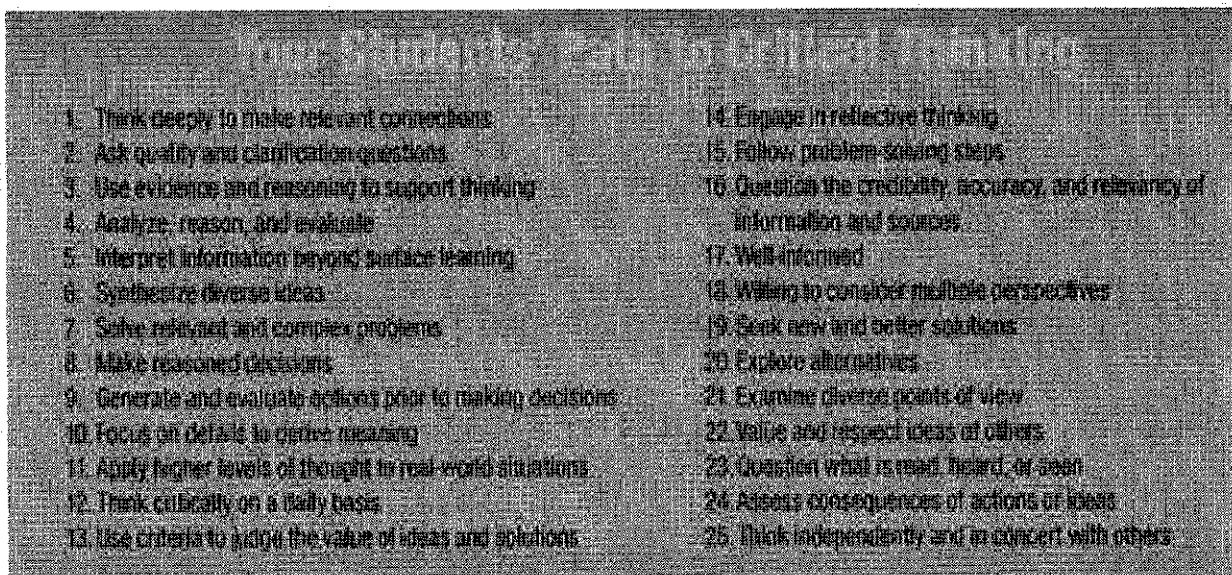
2. METHODOLOGY

This study is a descriptive research by quantitative approach. The data was conducted by survey and test. The data were analysed using the descriptive statistical data (mean score). Respondents consist of 30 Engineering Science students from two different classes of Civil Engineering Department.

The study begins with two methods of teaching implemented. Group A is the controlled group with conventional method and Group B, the sampling group with Teikeibun inspired approach. Questionnaires were distribute after class to all respondents to evaluate their critical thinking through their perception after the learning session. The comparison results of Quiz with both groups are use to support the learning outcome finding.

The questionnaire was designed after comparing with previous research findings. The survey contain 20 questions designed and adapted from 25 Critical Thinking Strategies for The Modern Learner by portal Teach Thought [7] as shown in Figure 1. While according to Ithnin [8] students response using history sheet provide a fun and meaningful learning experience. Through SHS, our engineering student also willing to express their thoughts and opinions respectfully.

Figure 1 : 25 Critical Thinking Strategies For Modern Learner [7]



The questionnaire consists of two sections. Section A are Participants demography (gender) with information measured on nominal scale. Section B are measured perception respondent in critical thinking using 5-point Likert scale. The Likert scale was designed to measure respondent opinion on agreed or disagreed with the fact expressed on the 5-point scale. Table 2 shows the scoring of items in the Likert scale developed by Mohamad Najib [9] was used 1 for strongly disagree and 5 for strongly agree

The results of the data are analysed using mean score. There are three range of mean score are represented by lower, average and high frequency. The interpretation of the mean score was adapted from Landell [10] to categorize on the frequency of critical thinking of respondent as in Table 2.

Table 2 : Interpretation of Mean score (Landell, 1977)

Range of Mean Score	Frequency
1.00 – 2.40	Lower
2.41 – 3.80	Average
3.81 – 5.00	High

3. RESULTS AND DISCUSSIONS

This section is divided into 3 parts for discussion which are the respondent demography, critical thinking, and learning outcome.

3.1 Respondent Demography

From Table 3 below shows the respondent's frequency distribution by gender. Each group consist of 15 respondents. Group A, for controlling respondent with conventional teaching involved 8 males and 7 females students. While Group B with SHS approach consists of 10 male and 5 female students. The data shows, no significant difference in the distribution of gender differences between the two groups.

Table 3 : Respondent Gender

	Group A (Control)	Group B (Sample)
Male	8	10
Female	7	5
TOTAL	15	15

3.2 Critical Thinking

The data obtained from the questionnaire for this study is show in Table 4. The score mean for each item for both group are referred to the Interpretation of Mean score (Table 2).

The overall mean score for group A (controlling group) is 3.34 in average. The data shows that the lowest mean score with 2.81 score are item number 2 and number 15, and average student can clarify reasons to make sentence and capable to seek new and better solution. Meanwhile the highest mean score of 3.86 shows that respondents are capable to question what they read, heard or seen.

For Group B respondents with SHS approach, overall the mean score are high with 3.83 score. The highest score mean 4.18 described how respondents are capable to question what they read heard or seen, followed by 4.09 mean score for item number 10 which is they can relate ton daily life. While the lowest mean score on item number 17 with 3.58, average correspondents to respondent's ability to examine various point of view.

From the data shown that there are 11 items of critical thinking mean score increased from average to high level between score of group A (conventional) and group B. The item represent by number (1) think deeply, (3) seek evidence, (4) analyse reason, (5) interpret information, (6) fun learning, (8) focus on detail opinion, (10) related daily basis, (12) existing knowledge, (14) multiple perspective, (16) explore alternatives, and (18) respect others' idea.

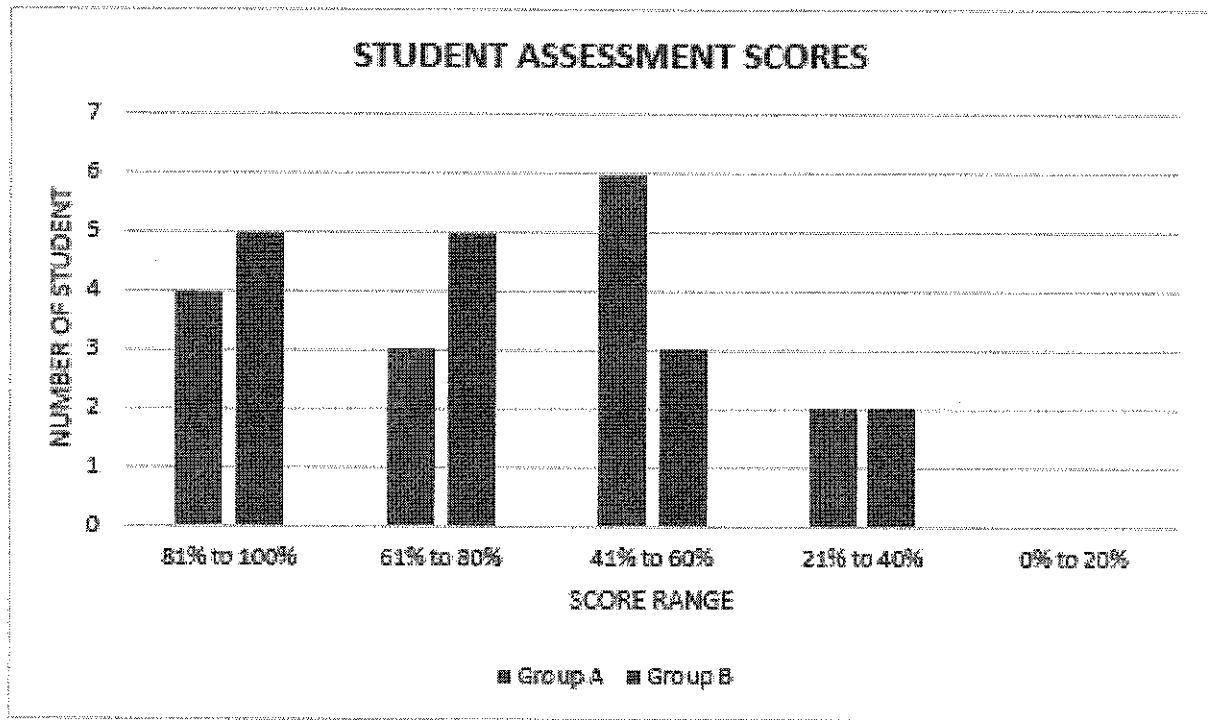
Table 4 : Critical Thinking Mean Score

Items	GROUP A		GROUP B	
	Mean Score	Level	Mean Score	Level
1. Think deeply to make relevant connections	3.56	Average	3.82	High
2. Clarify reasons to make a sentence	2.81	Average	3.68	Average
3. Seek evidence and reasoning to support my thought	3.47	Average	3.89	High
4. Analyze reason and evaluate my opinion	3.72	Average	3.86	High
5. Interpret information beyond surface learning	3.04	Average	3.84	High
6. Make learning become more fun	2.95	Average	3.88	High
7. Generate and evaluate fact to make statement or opinion	3.61	Average	3.74	Average
8. Focus on details to derive my opinion	3.51	Average	3.82	High
9. Apply to real-world situations	2.95	Average	3.74	Average
10. Relate on daily basis	3.56	Average	4.09	High
11. Use criteria to judge the value of ideas and solutions	3.82	High	3.88	High
12. Engage in reflective thinking (existing knowledge)	3.72	Average	3.82	High
13. Follow problem solving steps (Problem – thinking – solution)	2.95	Average	3.77	Average
14. Willing to consider multiple pe rspectives	3.47	Average	3.81	High
15. Seek new and better solution	2.81	Average	3.79	Average
16. Explore alternatives	2.95	Average	3.82	High
17. Examine various point of view	3.04	Average	3.58	Average
18. Value and respect ideas of others	3.51	Average	3.96	High
19. Question what i read, heard or seen	3.86	High	4.18	High
20. Asses consequences of action or ideas	3.75	Average	3.75	Average
OVERALL MEAN SCORE	3.34	Average	3.83	High

3.3 Learning Outcome

Figure 2 shows the results of student assessment score for group A and group B obtained from quiz given. From the data obtained, Group A recorded the highest score range on 41% to 60% while group B on both score range of 61% to 80% and 81% to 100%. There is no significant differences between achievement for both group A and B. It is because both group shows the same number of respondents achieve the passing mark of 40% in their quiz mark.

Figure 2 : Result of student assessment score



4. CONCLUSIONS

Overall, this study has successfully demonstrated pattern or trends in result of conventional and SHS approach for engineering science course student. Based on the analysis of the data in this study, it can be concluded that worksheet score higher for critical thinking but no significant different on the average rate of Quiz result for the learning outcome. From the finding of questionnaire for critical thinking, it can be conclude that SHS developing logical expression, make student abilities to clarify reasons and composing sentence differentiate fact and opinion. Beside it has provide fun and meaningful learning experience. It shows that SHS can improved method of learning.

In addition to the SHS approach, students are able to compare their knowledge before and after lesson, draw out the major topic for any lesson and make it more interestingly, frankly discuss their feeling and reflection about each lesson.

SHS approach is a new method of teaching and learning therefore study can be conducted and we recommend the SHS in other lessons because it make students reflect any lessons no matter how brief the lesson is. It can be used in any other topic and courses not limited to engineering science course only. Furthermore, SHS can be an important exercise for student to develop their critical thinking. Therefore, SHS should be exposed to all student in various fields.

The SHS can be one of the ways to fulfil Science, Technology, Engineering and Mathematic (STEM) approach that is a part of education policy and curriculum in Malaysia.

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