IDENTIFYING RELATIONSHIP INVOLVING LEARNING STYLES AND PROBLEM SOLVING SKILLS AMONG VOCATIONAL STUDENTS

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ABSTRACT

The purpose of this study was to determine the relationship between students' learning styles and problem solving skills among students in Building Construction Course at Vocational School. This study also investigated the differences between the students' type of learning styles and their ability to solve the problem using their creative thinking. A survey was carried out on 68 vocational students in Building Construction Course from two Vocational Schools. Felder-Soloman's Index of Learning Styles (ILS) and elements of creative thinking in problem solving for Vocational Education were the tools used in this study. Creative thinking in problem solving elements was categorized from the subject specification used in Building Construction curriculum. In brief, the ILS have five dimension; Processing, Perception, Input, Understanding and Perception. The results show that the Input style dominates the learning styles of Building Construction's students in Vocational School and manipulating idea is the dominant creative thinking elements to solve the problem which students preferred. In conclusion, type of students' learning styles will influence how they can cater their learning to improve their academic achievement and how they can use their creativity to solve the problem in actual situation in Building Construction work. However, learning styles are not main indicator to predict how students excellent are.

***Keywords**: Felder-Soloman's Index of Learning Styles, Vocational Education and Creative thinking*

1.0 Introduction

Learning styles are more and more incorporated to enhance learning and lot of research work is done in this area. Many researchers agree that learning styles play an important role in education. Felder points out that learners with strong preference for a specific learning style may have difficulties in learning if the teaching style does not match with their learning style (Sabine, Silvia, Kinshuk and Tommaso; 2002) confirmed this by a study showing that students attending an online course that matches with their preferred learning style achieved significantly better results than those who got delivered course that did not match their learning style. Malaysia's education is an "exam-oriented" concept. Students are exposed to a variation of assessment and evaluation such as quiz, test, project work and final exam before attainting their own academic achievement. Academic achievement has become the benchmarking line in determining what students have gathered and learned throughout a certain period of their learning process (Masita, Maizam and Maizan; 2009). The Vocational Education also constructs the concept of "exam-oriented" system. There are few parts in vocational subject thought in schools will assess the problem solving skills using students' creative thinking. The concept of teaching vocational subject to cater the students' cognitive level and creative thinking should follow the criteria; used slightly more class time for activities, spent less time lecturing and explanation or presenting material and engaged students more in task or activities in which students exercise a degree of control such as physical demonstration, practice and performance (Weber and Puelo; 1988). By identifying how students' used their creative thinking in problem solving which the high level of taxonomy and match with their learning styles, it is hoped that the strategy and teaching approach can be improved. Consequently, teachers will be able to use their creativity to improve their teaching according to students' learning and their ability to achieve the learning goals for better academic achievement.

2.0 Felder Learning Style Model (FSLSM)

The Felder model of learning styles (Felder and Silverman; 2005) focuses on aspects of learning styles significant in engineering education and is very popular among engineering educators even though the psychometric instrument associated with the model, the Index of Learning Styles (ILS) (Felder and Silverman; 2006), have four dimensions: Processing (Active/Reflective), Perception (Sensing/Intuitive), Input (Visual/Verbal), and Understanding (Sequential/Global). Since, there is no model specifically to measure learning style of vocational students ILS was used in this research to identify what type of learning style for vocational students. The characteristic of engineering students are similar with vocational students in even though the vocational needs are more hands on and engineering needs are more the intellectual ability. There are several different learning style models in literature such as by Kolb (1984), Honey and Mumford (1982) as well as Felder and Spurlin (2005), each proposing different description and classification of learning types. FSLSM described the four dimension of learning styles (Felder and Spurlin; 2005), the first dimension distinguish between active and reflective learners way of processing information. Active learners learn best by working actively with learning material by applying the material and trying things out. In contrast, reflective learners prefer to think about reflect on the material. The second dimension covers sensing versus intuitive learning. Learners prefer a sensing learning style like to learn facts and concrete learning material. They like to solve problem with standard approaches and also tend to be more patient with details. Furthermore, sensing learners are considered as more realistic and sensible, they tend to be more practical than intuitive learners and like to relate the learned material to the real world. In contrast, intuitive learners prefer to learn abstract learning material, such as theory and underlying meanings. The third, visual-verbal dimension differentiates learners who remember best what they have seen e.g picture, diagrams and flow charts and learners who get out textual representations, regardless of the fact whatever they are written or spoken. In the forth dimension, the learners characterized according to their understanding. Sequential learners learn in small incremental steps and therefore have linear learning progress. They tend to follow logical stepwise paths in finding solutions. In contrast global learners use a holistic thinking process and

learn in large leaps. They tend absorb learning material almost randomly without seeing connections but after they learned enough material they suddenly get the whole picture.

2.1 Index Of Learning Style (ILS)

ILS developed by Felder and Soloman (2006) is a 44-item questionnaire for identifying the learning style according to FSLSM.. These preferences are expressed with values between +11 to -11 per dimension. This range comes from the 11 questions that are posed for each dimension. When answering a question, for instance, with an active preference, +1 is added to the value of the active/reflective dimension whereas answers for reflective preference decrease the value by 1. Therefore, each question is answered either with value of +1 (answer a) or -1(answer b) (Sabine, Silvia, Kinshuk and Tommaso; 2002).

Grouping of questions were manually according the similarity of semantics. The following table provides semantic group of learning styles as well as the questions belonging to these groups.

Table 1: Semantic Groups Associated With ILS Questions

Style	Semantic Group	ILS Questions
Active (answer a)	trying something out	1,17,25,29
	social oriented	5,9,13,21,33,37,41
Reflective (answer b)	think about material	1,5,17,25,29
	impersonal oriented	9,13,21,33,41,37
Sensing (answer a)	existing ways	2.30,34
	concrete material	6,10,14,18,26,38
	careful with details	22,42
Intuitive (answer b)	new ways	2,4,22,26,30,34
	abstract material	6,10,18,38
	not careful with details	42
Visual (answer a)	Pictures	3,7,11,15,19,23,27,31,35,39,43
Verbal (answer b)	spoken words	3,7,15,19,27,35
	written words	3,7,11,23,31,39
	difficulty with visual style	43
Sequential (answer a)	detail oriented	4,28,40
	sequential progress	20,24,32,36,44
	from parts to the whole	8,12,16
Global (answer b)	overall picture	4,8,12,16,28,40
	non-sequential progress	24,32
	relations/connections	20,36,44

2.2. Problem Solving In Building Construction For Vocational Students

The problem solving approach to teaching and learning has evolved from the theories of John Dewey. It has been used in one of the field in vocational education as a way to relate classroom learning to real-life situations or problems. Reluctance to deviate from traditional teaching methods and to learn and incorporate a new teaching philosophy and practices is a major obstacle to adoption of the problem solving approach to teaching. Garton, Cano and Raven (1992) found that cooperating student agriculture teachers devoted less than 20% of instructional time to a problem solving approach to teaching. Classroom teachers cooperating with the study spend most of their time on maintaining subject-matter interest; student teachers focused primarily on seeking information to resolve the problem. Learning style is another factor thought to influence teacher use of problem-based instruction and students outcomes (Bettina, 1988). Various research studies have found that teachers of vocational field organized their lessons on a problem solving basis but did not follow with active problem solving teaching. Research

in agriculture education has emphasized problem solving as means of helping student to develop decision making skills and teachers to alter their teaching methodology. The problem solving method of teaching incorporates problem solving activities but places the responsibility for learning on the student. It requires teachers to move from the traditional instructional model to one that engages teachers and students as partners in learning with the teacher functioning in the role of facilitator or coach rather than leader or all-knowing authority (Bettina, 1988). Problem solving in Building Construction (BC) in this research context derived from what is students' ability to overcome the problem given then produce new ideas. The actual situation related to building construction such as landslide, building failure will be given to the students and they need to think how to solve the problem. This is high level of cognitive require in BC curriculum. Analysis of this element was done before shows that small number of students had an ability to overcome this situation.

2.3 Creative Thinking

Creative thinking involves creating something new or original. It involves the skills of flexibility, originality, fluency, elaboration, brainstorming, modification, imagery, associative thinking, attribute listing, metaphorical thinking, and forced relationships. The aim of creative thinking is to stimulate curiosity and promote divergence. At the simplest level "creative" means bringing into being something that was not there before and has been brought into being. The word "creativity" covers a wide range of different skills. Creative skills needed to change concepts and perceptions (Halizah Awang and Ishak Ramly, 2008).

In most descriptions of problem solving, there is usually a step called "search for alternatives". This implies that creativity is needed in this step. Creativity is poorly understood and difficult to teach but there are positive techniques that everyone can learn. Edward de Bono notes creative techniques such as focus, challenge, alternatives, concepts etc (De Bono, 1993). The revised taxonomy by Anderson and Krathwohl (2002) stated in cognitive dimension, the level of creative thing focus on apply, analyze, evaluate and create. There are more description in these focus area. Creative thinking will make students move "sideways" to try different perceptions, different concepts, and different points of entry. Students can use various methods including provocations to solve the problems. Creative thinking has very much to do with perception to put forward different views. The different views are not derived each from the other but are independently produced. In this sense, creative thinking has to do with exploration just as perception has to do with exploration.

3.0 Purpose Of The Study

The purpose of this study is to identify the relationship between learning styles and creative thinking in problem solving among Building Construction Students in Vocational School. The guide of this study, the following objectives are going to be investigated:

1. To identify the type of students' learning styles in Building Construction Course
2. To identify the differences between students' learning styles and creative thinking in problem solving among Building Construction students.
3. To determine the relationship between students' learning styles and creative thinking in problem solving among Building Construction students.

There are prepared for the study in order to achieve the objective of the study. These are hypotheses are stated as below:

Hypothesis 1:

Ho1 : There is no significant difference between students' learning styles and creative thinking in problem solving among Building Construction students.

Ha1 : There is a significant difference between students' learning styles and creative thinking in problem solving among Building Construction students.

Hypothesis 2:

Ho2 : There is no relationship between students' learning styles and creative thinking in problem solving among Building Construction students.

Ha2 : There is a relationship between students' learning styles and creative thinking in problem solving among Building Construction students

4.0 Methodology

In order to investigate the learning style and creative thinking in problem solving case study was performed where 68 students participated from two Vocational Schools.

4.1 Research Samples

This study involved 68 Building Construction students in two Vocational Schools. School A involved 35 students and School B 33 students.

4.2 Research Instrument

Two data gathering tools have been administered to identify learning styles and creative thinking in problem solving. Both instruments are combined to come out with a set of questionnaires for the study. The instrument is divided into three sections.

Section A
This section is students' demography including the family background and mid year examination result.

Section B
This section includes 44 items of ILS to assess the type of students' learning styles.

Section C
This section consist the questions relate to creativity in problem solving using the achievement test. The questions developed based on the needs of assessment in Building Construction combine with Cognitive Dimension suggested by Anderson and Krathwohl [13].There 12 questions in this section.

4.3 Data Analysis

Research used quantitative approach and the gathered data were analyzed using Statistical Package for Social Science (SPSS) Version 16.0. The analysis used inferential and descriptive statistics.

5.0 Result And Discussion

5.1 Type of students' learning styles of Building Construction students in Vocational Schools.

In identifying types of learning styles for students in Building Construction Course, percentage was used to analyze the data. Table 2, summarizes the findings of four types of learning styles being studied. The highlighted figure (visual) is the dominant learning style for Building Construction Students.

Table 2: Dimension of FSLSM- ILS

Styles	N	Min	Max	Mean	SD
Active	68	.27	1.00	.76	.21
Sensing	68	.27	1.00	.66	.21
Visual	68	.36	1.00	.84	.16
Sequent	68	.27	1.00	.55	.19
Valid N (listwise)	68				

5.2 The differences between students' learning styles and creative thinking in problem solving among Building Construction students.

The creative thinking in problem solving questions based on the requirement of assessment in Building Construction subject. There are two situations given and four type of creative thinking stated to identify how students solve the problem. Figure 1 and 2 are the picture of situation given.

Figure 1: Situation 1- Landslide problem

Figure 2: Situation 2- Failure of floor surface

Using four type of creative thinking to solve the problem given which are; **manipulating idea (i), exploring procedure (ii), identify the factor (iii) and using logic (iv)** the result illustrated in Table 3: Differences between learning styles and creative thinking. Using ANOVA as the test, the result show there was no significant differences in problem solving creative thinking on learning styles except *visual* students are better in creative thinking with highest mean shown in manipulating ideas.

Table 3: Differences Between Learning Styles And Creative Thinking

Styles	Creative thinking in problem solving								P
	i		ii		iii		iv		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Active	1.75	.35	1.89	.54	0.68	.58	0.68	.65	.577
Sensing	1.34	.39	0.98	.25	2.01	.68	0.67	.34	.609
Visual	**2.39**	**.28**	**1.22**	**.45**	**1.01**	**.33**	**0.16**	**.65**	**.038**
Sequent	0.95	.54	1.53	.33	0.56	0.55	1.97	.47	.549

**Difference significant level at.05*

The visual students choose to manipulate idea how to solve the problem. From the questions, details described students will use their previous knowledge, they also can apply actual situation when find out the solution based on picture given. They will relate the facts to topic that teachers teach in class.

5.3 The relationship between students' learning styles and creative thinking in problem solving among Building Construction students.

In determining the relationship between learning styles and creative thinking the Chi Square Test is used. Table 4 presents the relationship between learning styles and creative thinking in problem solving.
Hypothesis was predetermined significant level .05. The result indicates there is no significant relationship between learning styles and creative thinking in problem solving (exploring procedure, identify factor and using logic) but there is significant relationship in manipulating idea.

Table 4: Relationship between Learning Styles and Creative Thinking

Creative thinking in problem solving	Learning styles		
	x^2	df	P
Manipulating idea	1.567	1	0.036
Exploring procedure	1.064	1	0.632
Identify factor	0.743	1	0.648
Using logic	0.654	1	0.712

6.0 Conclusion

This paper contributes the ongoing work on knowing students' learning styles match with their ability to choose how to learn. By knowing the students' learning styles teachers are able to develop their ability to suit learning environment in vocational education setting. From the findings we can know the vocational students tend to learn in visual type by using picture, diagram, charts n etc. On the other hand, teachers will focus to teach them match with their learning styles. Problem solving is the highest level of taxonomy which is the best way to examine students' ability how they cater their learning. In Building Construction subject, when students asked about the problem solving situation they are free to give any answer as long it make sense and relate to the topic. These will show the difference in each student how the produce the solution. Furthermore, the research will continue with another way of problem solving approach and how students adopt the effective method and strategy in their learning.

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