INTEGRATING STUDENT’S COGNITIVE LEARNING WITH LEARNING STYLES IN VOCATIONAL EDUCATION

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Abstract

Cognitive process in student’s learning need the student has ability to manipulate information and idea to solve the problem which can produce new knowledge. In Vocational Education (VE), the importance of cognitive process based on a few factors; world of work currently need the cognitive ability, the changing of work need adaption and flexibility and VE in global context supply the demand of cognitive development. VE students have their own learning preferences, they less use their cognitive but more to psychomotor include physical movement, coordination and use of the motor skill areas (Bloom,1956). Student’s learning usually influenced with a few factors, one of the factors is learning styles. This paper is to discuss about the research will be conducted how to integrate the student’s cognitive and student’s learning styles in VE. Research conceptual framework will be explained in this paper and the focus group in VE is Building Construction Course which offered in Vocational Schools. Discussion of Bloom Taxonomy (1956) and revision taxonomy by Anderson & Kartwohl (2001) also the theory of learning styles will be described in this paper. VE is a wide range courses or skills that help students to prepare for entering employment or workplace; occupational based (ILO,2000), while the concept of VE is bridging theory and practical components such as lab and workshop oriented to workplace knowledge and specific skills. In summary vocational students have their own learning styles and their cognitive capability to fulfill the needs of their learning.
1.0 Introduction

As Wenden (1985) reminds us, there is an old proverb which states: “Give a man a fish and he eats for a day. Teach him how to fish and he eats for a lifetime”. Applied this to the vocational education field, this proverb might be interpreted to mean that if students are provided with answers, the immediate problem is solved. Every year the Malaysian Government spends a high figure to improve the quality of education. Education is an expensive investment for the future of students; much emphasis is on the curriculum and values of education to meet the needs of the industry.

Discussion about teaching and learning based on Taxonomy of Educational Objectives by Bloom (1956) classified three major domain; cognitive, affective and psychomotor. Each domain contains low order and high order of level to achieve education goals. The cognitive domain is commonly occurring in educational settings to help teachers understand and implement standard-based curriculum. The structure of Bloom’s Taxonomy contains knowledge, comprehension, application, analysis, synthesis and evaluation. Anderson and Karthwolh (2002) revised Bloom’s Taxonomy and concluded from the original number of categories to four numbers knowledge dimension of Taxonomy; factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge.

Initially, schools, institutions, colleges and universities should adopt a theory of learning upon which it is based on the classroom approach. Various learning theories exist and caution should be exercised during the selection. The quality of teaching are measured by how effectively and extensively the teaching approach of teachers selected the learning theory. However, since teachers usually do not know which approach is the most effective, the measurement of teaching is left to the students (Benke and Hermanson, 1988). The relationship between teacher’s teaching approach and students’ learning can be seen as one mediated through the process whereby teacher’s beliefs influence their teaching strategies which will in turn influence student’s learning style.

Learning in Vocational Education (VE) is similar definition with another field of education. The difference in VE is students are more expose to the working education oriented. It is possible to say that VE is an educational activity oriented to provide the necessary knowledge and skills to perform either a particular job post, an occupation or a professional activity in the labour market (ILO, 1975). It also connected the process of technology transfer, innovation and development. In VE training is the most important element which applied in the curriculum. Vocational training has pedagogic component as well as other type of education. The pedagogical approach is focused in teaching and learning.
1.1 Fundamental Issues of Learning Styles and Cognitive

Cognitive process in student’s learning need the student has ability to manipulate information and idea to solve the problem which can produce new knowledge. Many features of current cognitive theory-based on teaching and learning are reflected in earlier model of teaching such as Bruner’s, Taba’s and various group-based and student centered teaching models (Ruth.1992). In VE, the importance of cognitive process based on a few factors; world of work currently need the cognitive ability, the changing of work need adaption and flexibility and VE in global context supply the demand of cognitive development (Tee et.al,2009). Johnson and Thomas (1992) in their cognitive research summarized that; learning did not automatic changing, it is hard to understanding learning content, cognitive process does not encouraged by passive learning and higher order of learning did not the changing of behavior but the form of knowledge.

VE students have their own learning preferences, they less use their cognitive but more to psychomotor include physical movement, coordination and use of the motor skill areas (Bloom,1956). In order to face the work situation they need more ability of cognitive factors so that they can be creative and innovative workers. Student’s learning usually influenced with a few factors. The basic issues of student’s learning as reported by Muhammed et.al. (2008) including home background, learning environment and government policies. Martins et.al. (2007) stated that class factors was determined of student’s academic performance while Azizi et,al (1998) the learning styles influenced student’s academic performance. Francis et,al (2008) in his research conclude the school environment and teacher-related factors are the dominant to the student’s achievement support with high self motivation. Learning in VE is defined as movement from novice-like toward expert-like problem solving strategies (Ruth,1992). Learners in VE must observe and experience the cognitive process of interest in order to learn them and know how, where and when to use them. One of the factors that was debated a few decade related to student’s achievement was the student’s learning styles. The learning style (LS) involves the strategies that student tends to apply frequently to a given teaching situation. Each individual can fit into different styles that cause students to adopt attitudes and behavior that are repeated in different moments and situations. There are many categories of students’ characteristics. The focus group of students in this research is VE students in Vocational Institutions (VI). VE students have their own characteristics, according to Brennan (2003); they are verbal learner; watch and see rather than read and listen, hands-on; learn by doing and practicing, learn in groups and dependent learners need instructor guidance for clear understanding.
To deliver an effective teaching in class, teachers should know what the students’ preferences are. Since the characteristics of students are more on hands-on and learn by doing, therefore understanding students’ LS among VE teachers are necessary to help teachers in providing their teaching delivery method which could match their student’s needs. Student’s needs according to Posner (1992), students deal with curricular task by employing relevant learning structure. Hence the goal in teaching for students in VE is to gain experience in utilizing second order procedures to apply existing knowledge to new situations. The role of the teacher is to create learning environment for students handling the presented tasks. Figure 1.1 shows a considerable VE students learning the technique based on the teachers behaviour, classroom environment and students ability.

![Figure 1.1: The role of teaching to adapt students learning](Source: John C Stevenson, 1995)

Vocational education (VE) is a wide range of courses or skills that help students to prepare for entering employment or workplace; occupational based (ILO, 2000), while the concept of VE is bridging theory and practical components such as lab and workshop oriented to workplace knowledge and specific skills. As a result vocational students have their own LS to fulfill the needs of their learning.
Building Construction Course (BCC) is one of the vocational courses offered in certain Vocational Institutions (VI) in Malaysia. It contains many fields in Building Construction Industries (BCI) such as brick work, carpentry, plumbing, painting and all related works to construct building. Students will learn theory and practical in Building Construction (BC). But how could they learn to be more effective in theory if the characteristic of vocational students are that they prefer to learn more by doing and practicing? They need to adapt the skills and knowledge to their learning as preparation for occupational needs they also should have the ability to solve the problem in their learning and produce new ideas. Each student may have their style to adapt the elements of vocational subject based on curriculum in BC which contained skills, knowledge and problem solving. In order to identify how students in BCC using their LS with cognitive level and elements in BC, a few factors will be investigated in this research.

1.2 Research Objectives

i. To identify students’ LS in BC using Felder and Silverman Learning Style Model (FSLSM)?

ii. To identify students’ cognitive level of learning needs in BC especially to adapt skills, knowledge and problem solving.

iii. To analyze the differences between types of students’ LS with the learning needs in BC contain skills, knowledge and problem solving.

iv. To identify BC’s students cognitive learning based on their LS

2.0 Research Conceptual Framework

Research will use Taxonomy Bloom (1956) combined with revised taxonomy proposed by Anderson and Krathwohl (2001). The cognitive process is very clear using this taxonomy. The original taxonomy provided carefully developed definitions for each major in the cognitive domain. The categories were ordered from simple to complex and from concrete to abstract (David, 2002). Like the original, the knowledge categories of the revised taxonomy cut across subject matter lines. The new knowledge dimension was introduced in contained four instead of three main categories. A new category is metacognitive knowledge provides a distinction that was not widely recognized at the time the original scheme was developed. The cognitive level how students have their ability in BC elements contained
skills, knowledge and problem solving can be analyzed using the subject specification. Students will be identified their LS using Felder-Silverman Learning Style Model (FSLSM) by Felder and Silverman (1988). Learning Styles Index (LSI) of FSLSM will analyze students’ LS in active/reflective, sensing/intuitive, visual/verbal and sequential/global. Connection between student’s cognitive level and LS will produce the model of student learning in BC as shown in Figure 1.2.

**Figure 1.2 : Conceptual Framework**
2.1 Overview of Bloom’s Model Structure

Bloom (1956) proposed the Taxonomy of Cognitive Domain, which has six levels from the least to the most complex. These levels are knowledge, comprehension, application, analysis, synthesis and evaluation. This complexity is not rigid, the individual may move among levels during extended process. This classification system was developed to help teachers think about their objectives they write, the learning activities they design and the assessment they prepare. One paramount value of the taxonomy is to remind us what we want our students to learn more than knowledge of the topics we teach. The goal is more important to increased on student thinking, decision making and problem solving (Eggen and Kauchak, 1999). The literature research of Sharda et al. has found that all three learning domains; cognitive, affective, and psychomotor are interrelated. Hauenstein (as cited in Sharda et al., 2004) has illustrated the relatedness of the learning domains as applied to other levels of learning as shown in Figure 2.1. In this depiction, the relationships shown between affective and cognitive learning development vectors have been reflected in the psychomotor development vector.

![Figure 2.1: Relationship of Cognitive, Affective, and Psychomotor Domains](image-url)
2.2 Revision of Bloom’s Taxonomy - Anderson & Krathwohl’ Taxonomy (2001)

The original Taxonomy provided carefully developed definitions for each of the six major categories in cognitive domain. The categories description as stated before was ordered from simple to complex and from concrete to abstract. The revision of Bloom’s Taxonomy made by Anderson and Krathwohl (2001) produce two dimension of taxonomy which are knowledge dimension and cognitive dimension.

Table 2.1: Structure of The Knowledge Dimension of Revised Taxonomy

<table>
<thead>
<tr>
<th>A. Factual Knowledge</th>
<th>The basic elements that students must know to be acquainted with a discipline or solve problems in it.</th>
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<tbody>
<tr>
<td>Aa. Knowledge of terminology</td>
<td></td>
</tr>
<tr>
<td>Ab. Knowledge of specific details and elements</td>
<td></td>
</tr>
<tr>
<td>B. Conceptual Knowledge</td>
<td>The interrelationships among the basic elements within a larger structure that enable them to function together.</td>
</tr>
<tr>
<td>Ba. Knowledge of classifications and categories</td>
<td></td>
</tr>
<tr>
<td>Bb. Knowledge of principles and generalizations</td>
<td></td>
</tr>
<tr>
<td>Bc. Knowledge of theories, models, and structures</td>
<td></td>
</tr>
<tr>
<td>C. Procedural Knowledge</td>
<td>How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.</td>
</tr>
<tr>
<td>Ca. Knowledge of subject-specific skills and algorithms</td>
<td></td>
</tr>
<tr>
<td>Cb. Knowledge of subject-specific techniques and methods</td>
<td></td>
</tr>
<tr>
<td>Cc. Knowledge of criteria for determining when to use appropriate procedures</td>
<td></td>
</tr>
<tr>
<td>D. Metacognitive Knowledge</td>
<td>Knowledge of cognition in general as well as awareness and knowledge of one’s own cognition.</td>
</tr>
<tr>
<td>Da. Strategic knowledge</td>
<td></td>
</tr>
<tr>
<td>Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge</td>
<td></td>
</tr>
<tr>
<td>Dc. Self-knowledge</td>
<td></td>
</tr>
</tbody>
</table>

(Source: David R. Krathwohl, 2002)
Table 2.2: Structure of Cognitive Dimension of The Revised Taxonomy

<p>| | |</p>
<table>
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</tr>
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</table>
| **A** | **Remember** – Retrieving relevant knowledge from long-term memory.  
  - **Recognizing**  
  - **Recalling** |
| **B** | **Understand** – Determining the meaning of instructional messages, including oral, written, and graphic communication.  
  - **Interpreting**  
  - **Exemplifying**  
  - **Classifying**  
  - **Summarizing**  
  - **Inferring**  
  - **Comparing**  
  - **Explaining** |
| **C** | **Apply** – Carrying out or using a procedure in a given situation.  
  - **Executing**  
  - **Implementing** |
| **D** | **Analyze** – Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.  
  - **Differentiating**  
  - **Organizing**  
  - **Attributing** |
| **E** | **Evaluate** – Making judgments based on criteria and standards.  
  - **Checking**  
  - **Critiquing** |
| **F** | **Create** – Putting elements together to form a novel, coherent whole or make an original product.  
  - **Generating**  
  - **Planning**  
  - **Producing** |

(Source: David R. Krathwohl, 2002)

2.3 Felder-Silverman Learning Style Model (FSLSM)

This model originating in the engineering sciences, defines learning style as the characteristic strengths and preferences in the ways individual take in process information (Felder-Silverman, 1988). Most of other learning style models classify learners in few groups, whereas Felder and Silverman describe the learning style of a learner in more detail, distinguishing between preferences on four dimensions. Another main issue FSLSM is based on tendencies, saying that learners with high preference for certain behaviour can also act sometimes differently. According to Felder and Silverman and others
(McKeachie 1980, Lawrence 1990, Lyons 1999) optimum learning occurs when the reception of information is congruent with how it will be processed. And not surprisingly each person will have a favoured and unique routine. Table 2.3 presents the dimension of FSLSM learning styles index.

Table 2.3: Dimension of FSLSM

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>CHARACTERISTIC</th>
</tr>
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<tbody>
<tr>
<td>ACTIVE</td>
<td>Learn with material by applying material and try things out</td>
</tr>
<tr>
<td>REFLECTIVE</td>
<td>Learners prefer to think about and reflect on material</td>
</tr>
<tr>
<td>SENSING</td>
<td>Learn facts and concrete material</td>
</tr>
<tr>
<td>INTUITIVE</td>
<td>Learn abstract material</td>
</tr>
<tr>
<td>VISUAL</td>
<td>Learn use picture, diagram, charts</td>
</tr>
<tr>
<td>VERBAL</td>
<td>Learn written or spoken</td>
</tr>
<tr>
<td>SEQUENTIAL</td>
<td>Tend to follow logical stepwise in finding solutions</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>Holistic thinking process and learn in large leaps</td>
</tr>
</tbody>
</table>

(Source: Sabine et al. 2002)

3.0 Cognitive Learning in Vocational Education

Many of features of current cognitive theory-based perspectives on teaching and learning are reflected in earlier models of teaching such as Bruner’s concept attainment model, Taba’s inductive model, Suchman’s Inquiry training model and various group-based and students-centred teaching model (Joyce and Weil, 1972. Ruth, 2002). Cognitive processes are seen as operating on knowledge, as largely generic and therefore as relevant across subject, disciplines and problems. The educational problem is to transform individual cognitive strategies and to facilitate their transfer to many different contexts and problems (McKeough, 1991). Discussion about cognitive learning in VE, VE literature suggests that vocational educators are indeed thinking about the higher level of cognition and that this interest is not a new phenomenon. In larger scale study encompassing 893 classrooms, 2251 teachers, 120 high schools and 24 states, Weber and Puleo (1988) documented to enhance students’ cognitive learning the vocational teachers did the following:

i. Used slightly more class time for activities
ii. Spent less time lecturing and explanation or presenting material
iii. Work more with students in small group
iv. Emphasized student reading, writing and extended speaking less and other observable opportunities to practice.

v. Engaged students more in task or activities in which students exercise a degree of control such as physical demonstrations, practice and performance.

vi. Use paper and pencil test less and performance appraisals more.

4.0 Summary

Cognitive learning theories have increased steadily during the last forty years (Bruer, 1993; Mayer, 1996; Greeno, Collins and Resnick, 1996; Merrian and Caffarella, 1999). Learning from cognitive perspective is a change in person’s mental structures that provides the capacity to demonstrate different behaviours. Learning styles has been characterized in several different ways based on variety theoretical models. Classifications of learning in VE, information-processing theory, were conceptualized to include five learned capabilities: cognitive strategies, verbal information, attitudes, intellectual skills, and motor skills. Knowing how student learn can help in many ways to enhance teachers teaching. Identify learning styles of students is on way how to enhance teaching and learning (Sabine et.al, 2009). First teachers can benefit by getting information about how their students are use to learn, which provides them deeper understanding and might help when explaining or preparing learning material. Furthermore, making students aware of their learning styles and showing them their individual strengths and weakness can help students to understand why learning sometimes difficult for them and is the basis developing their weakness. In addition students can be supported by matching the teaching style with their learning style. Providing students with learning material and activities that fit their preferred ways of learning can make easier for them.
References


David R. Krathwohl (2002). A Revision of Bloom’s Taxonomy: An Overview. Theory Into Practice: The Ohio State University


International Labour Organization (ILO, 2000). Modernization in Vocational Education and Training in Latin America and Carribean Region


Tee Tze Kiong, Jailani Md Yunos, Baharom Mohamad, Widad Othman and Yee Mei Hong (2009). *Pengintegrasian Kemahiran Berfikir Aras Tinggi Menerusi Peta Minda Bagi Matapelajaran Kemahiran Hidup.* University Tun Hussein Onn Malaysia; Proceeding; 114-121
