THE IDENTIFICATION OF LEARNING APPROACHES AND REFLECTIVE THINKING AMONG FORM SIX BIOLOGY STUDENTS

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DECLARATION

I hereby declare that the work in this dissertation is own except for quotation and summaries which have duly acknowledged.

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ABSTRACT

This quantitative non-experimental study examined two major purposes involve students approaches to learning, reflective thinking and academic achievement in pre-university biology students. The primary purpose of this study was to evaluate the learning approaches and the progression of reflective thinking levels among pre-university biology students as well as gender factor. The secondary purpose was to study the relationship between learning approaches, reflective thinking levels, and prior academic achievement on the current academic achievement. The sample consisted of 36 students enrolled in an urban public secondary school in Ipoh. An independent-sample *t*-test and a paired-sample *t*-test were conducted to examine students' learning approaches and students' reflective thinking levels respectively. A one-way ANCOVA was conducted to examine the effect of gender on their reflective thinking. For the relationship determination, a correlation analysis was used to examine the relationship between students' learning approaches, students' reflective thinking levels, and prior academic achievement on their current academic achievements. Results indicated that there was significant difference in surface motive [$F= 0.02$, $t(34)= –2.55$, $p< .05$] and habitual action, [$t(35)=2.79$, $p< .01$] among students. Through the correlation test, it revealed that there was a negatively correlation between surface learning approach ($r= –.424$, $p= .01$) and the current academic achievement. However, there were strong positive correlation between habitual action ($r= .620$, $p< .001$) and prior academic achievement ($r= .556$, $p< .001$) on the current academic achievement.

ABSTRAK

Kajian kuantitatif bukan eksperimen ini adalah untuk mengkaji dua tujuan utama yang melibatkan pendekatan pembelajaran pelajar, pemikiran refleksi dan pencapaian akademik pelajar biologi pra-universiti. Tujuan utama adalah untuk menilai pendekatan pembelajaran pelajar dan kemajuan pemikiran refleksi antara pelajar biologi pra-universiti. Tujuan sekunder adalah untuk mengkaji hubungan antara pendekatan pembelajaran, tahap pemikiran refleksi, dan pencapaian akademik sedia ada terhadap pencapaian akademik semasa. Sampel untuk kajian ini terdiri daripada 36 pelajar dalam sebuah sekolah menengah di bandar Ipoh. Ujian *t* sampel tak bersandar dan ujian *t* sampel berpasangan dijalankan untuk menguji pendekatan pembelajaran pelajar dan tahap pemikiran refleksi pelajar masing-masing. Ujian ANCOVA sehala dijalankan untuk menguji pengaruh jantina terhadap pemikiran refleksi. Bagi penentuan hubungan pula, analisis korelasi digunakan untuk menguji hubungan antara pendekatan pembelajaran pelajar, tahap pemikiran refleksi pelajar dan pencapaian akademik sedia ada terhadap pencapaian akademik semasa. Keputusan menunjukkan terdapat perbezaan signifikan dalam motif permukaan [F= 0.02, t(34)= –2.55, p< .05] dan aksi habitual [t(35)=2.79, p< .01] dalam kalangan pelajar. Melalui ujian korelasi, ia mendedahkan bahawa terdapat korelasi negatif di antara pendekatan pembelajaran permukaan (r= –.424, p= .01) dengan pencapaian akademik semasa. Walau bagaimanapun, terdapat korelasi positif yang kuat di antara aksi habitual (r= .620, p< .001) dan pencapaian akademik sedia ada (r= .556, p< .001) terhadap pencapaian akademik semasa.

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CHAPTER 1

INTRODUCTION

1.1 Overview

This paper comprises of five main chapters and contains three empirical studies, levels of reflective thinking, learning approaches and academic performance. The research described in this paper is concerned with the identification and developmental of levels of reflective thinking and the learning approaches throughout the course. Following this Introduction, Chapter 2 provides a review of the professional development, effectiveness, and reflective thinking literature as well as the learning approaches. Chapter 3 describes a methodology to determine the levels of reflective thinking and the approaches of learning in STPM Biology students and practices were researcher carried out to develop the reflective thinking levels. The academic performances of students were measured by a series of well-structured questions throughout the course. Findings were analysed, presented and reported in Chapter 4.

Chapter 5 describes the discussion for the result obtained from this study and the conclusion made based on the findings.

1.2 Research background

"Yes, I did it without thinking". We often perform actions such as walking to school, tying our shoes and doing simple mathematics questions and our response is almost involuntary without thinking when the same or similar situation occurs. Consequently, we tend to process information the same way over and over again without searching for alternative ways. In contrast, the great scientists Darwin, Archimedes, Mendel, Newton, Einstein and Galileo are great thinkers. They experienced, observed, thought deeply and experimented carefully to generate their important theories that greatly influence today's world. Thinking therefore is the special characteristic in human beings to seek for solution when we are confronted with a problem, perplexity or uncertainty. Thinking is not driven by answers but by questions. To think through or rethink anything, one must ask questions that stimulate our thought. This kind of thinking, power of dealing with perplexity, directed towards the solution of a problem is known as reflection.

Reflection is commonly referred to as reflective thinking (Phan, 2009), critical thinking (Dewey, 1933; Norris and Ennis, 1989), reflective learning (Moon, 2004), reflective practice (Schön, 1983; 1987), transformative learning (Mezirow, 1991), careful thought about something (Hornby, 2005). Reflection is a form of mental processing and being a part of learning and thinking. We reflect in order to learn something, or we learn as a result of reflecting. Confucius (500BC/2012) states that "Study without thought is labor lost; thought without study is perilous." The term

"reflection" or "reflective learning" in an academic context emphasises the deliberation and intention to learn something to achieve an outcome or for some purposes from current experience or further processing and understanding prior experience or knowledge that we already possess (Moon, 2004).

In the context of learning, when a student studies chapter photosynthesis about photophosphorylation and Calvin cycle in C_3 plant, the student is manipulating and reprocessing his or her prior knowledge obtained in previous level. Therefore, reflection could be seen as a tool that facilitates personal learning towards the outcome of personal development, which ultimately leads towards empowerment and emancipation (Moon, 1999). Students can reflect within and/or after the teaching and learning process as described by Schön (1983). Higher school students mostly learn automatically through the experiences, realities and needs of their daily lives by reflection. However, not many of them can link new learning material with their experiences and daily lives.

Von Glasersfeld (1995) describes knowledge is not transferred from teacher to student, but rather constructed by the student with the help of the teacher. Recently, teachers play a role as facilitators rather than knowledge transmitter. Therefore, ideas can be understood at different levels and in different ways by different students or at different times by the same student. While applying to the context of teaching, Van Manen (1991) suggests that reflection can be applied in four different situations: (1) day-to-day application in thinking and acting, (2) reflecting on specific events, (3) reflection on personal experience and experience of others through interpretation (interpretive enquiry of Habermas), and (4) reflecting on reflection, understanding the nature of knowledge and possible emancipation (emancipatory interests of Habermas).

Most people think learning is something like formal schooling in a classroom setting in which teachers teach students in a more or less attractive way so that students can learn. Hence, learning is frequently seen as a result of paying focused attention to a particular topic in order to memorize it and examination is used to assess the outcome of learning. Research on learning indicates that individuals have different learning approaches. Those who prefer to learn facts and data are best suited for the traditional classroom setting. Those who need to experience, to experiment, to involve not only the mind but the feelings do not fit easily into the traditional classroom learning approach.

John Dewey, one of the most influential educators and philosophers in experiential learning, explored the process of learning and highlighted the importance of experience in guiding our present actions. Ghaye and Ghaye (1998) suggest reflection is closely related to experience in which reflecting on something is our experience and reflecting on experience is a way of interrogating our actions and thinking in particular ways. The former describes we apply our knowledge to solve new problem and the latter describes we ‘look back’ what we have done during solving the problem. Most of this experience processing happens in an automatic way or we are only partially aware (Rimanoczy and Turner, 2008).

1.3 Problem statement

One of the objectives of the Malaysian national education system is to enhance the thinking ability of students through a curriculum that emphasises thoughtful learning. This enables students to analyse, evaluate and apply knowledge and ideas in a critical manner to solve problems and make decisions on biology-related issues. However, Malaysian Examination Council (MEC, 2010; 2011; 2012) reports students' performance in biology was decreased from 76.17% (2009) to 72.93% (2010) to 71.86% (2011). According to Malaysian Examination Council, MEC (2009, 2010, 2011 and 2012), only few STPM candidates managed to answer accordingly and systematically in STPM Biology paper 2. Most candidates only could answer knowledge level of the Bloom Taxonomy. For the questions which were required to answer in details, most candidates either wrote a very general answer or they failed to answer accordingly by mentioning all the facts in their answer without constructing thought answers. For example, the answer required was only on the involvement of hormones in apical dominance, but they described the roles of all hormones in apical dominance as well as in seed dormancy, senescence and fruit ripening (MEC, 2010). Most of the candidates possess basic knowledge but their degree of understanding was not satisfactory. This phenomenon also occurred in the research participating school where most candidates unable to answer higher-level thinking questions. Based on the academic achievement, some candidates score consistently during examination throughout the course so far.

Although the content covered in examination is more and more from exam I to II and to III, the candidates only can answer low-level thinking questions and scored consistently. They still stick at a certain level of learning process and reflective thinking. In order to achieve higher score in exam, they should enhance their

reflective thinking skill and proceed to the next level. Otherwise, they will struggle when they attend to university where higher thinking order is most needed.

Since STPM candidates are postsecondary students, each of them has his/her own preferred learning approach and this might influence his/her ongoing approach to learning as well as the conception of learning and finally, the learning outcome. According to the Presage-Process-Product (3P) model (Biggs, 1987a; 1993a; 1993b), the Process factor is influenced by Presage factor (student factors and teaching context) and this Process factor will determine the Product or learning outcome. The change in Product may influence the next Presage factor to learning.

1.4 Purpose of the study

The general purpose of this study was to identify the student approach to learning and examine the developmental levels of reflective thinking in STPM Biology students during teaching and learning process in school. In the research school, students are exposed to a variety of teaching methods based on the need of a particular chapter. The environment of classroom is maintained as naturally as possible in order to preserve the actual classroom setting conditions. Then the study will discuss about the development of reflective thinking's level in students and how these changes relate to their academic achievements. Therefore, the secondary purpose of this study is to examine the relationship between the learning approaches, the levels of reflective thinking and the academic achievement among STPM Biology students.

1.5 Research questions

The purpose of the study is to understand the levels of reflective thinking and the Biggs' Learning approach among STPM Biology students and its relationship on academic achievement. This study addresses the following questions:

1. Does gender determine the learning approach?
2. Does student's reflective thinking level change over the period of study?
3. Does gender determine the levels of reflective thinking?
4. Is there a relationship between students' learning approaches, the levels of reflective thinking and prior academic achievement on the academic achievement?

1.6 Hypothesis statement

The hypotheses were as follows:

H_{o1}: There is no significant difference between the learning approaches among gender.

H_{o2}: There is no significant difference change in the levels of reflective thinking among STPM biology students over the period of study.

H_{o3}: There is no significant difference between the levels of reflective thinking and the gender among STPM biology students.

H_{o4}: There is no relationship between students' learning approaches, the levels of reflective thinking and prior academic achievement on the academic achievement among STPM biology students.

1.7 Significance of the research

"Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime". The purpose of this study is to identify the learning approaches and the reflective thinking's level of students. Reflection is closely linked with learning approaches (Biggs, Kember and Doris, 2001). Reflection makes a person to challenge their prior knowledge, explore an experience, and create and clarify their understanding in order to develop their lifelong learning skills. This enhances self-awareness of students to their own thinking and learning processes. Hence, students assist themselves to learn more effectively in order to achieve learning outcome. Students who achieve well are more often students who are aware of their own learning processes (Moon, 2004).

In this study, teacher acts as a facilitator to help students involved in meaningful learning and reflective thinking where they are seeking to make sense by relating prior knowledge and understandings to the new idea. Thus, this study could provide educators especially school science teachers with valuable information about students' learning approach towards their academic achievements. The findings also provide information whether students with high academic achievement could have high level of reflective thinking. Finally, this study provides an information about which learning approaches and levels of reflective thinking are most required in STPM Biology subject to achieve good academic achievement by investigating the relationship between students' learning approaches, the levels of reflective thinking on the academic achievement for STPM Biology subject.

1.8 Limitations of the research

This study has a limited population from which data was obtained. The data was collected from form six students of an urban public secondary school in Ipoh. The participants consist of 36 students who have completed the SPM in secondary school and now further their studies in STPM.

1.9 Definition of terms

For the purpose of this study, there are several terms that should be understood in context as to their relationship with Malaysia Education System and reflection. The terms, along with definitions and concepts, are provided in the context in which they were studied.

Reflection

Reflection is an active mental process of thinking (Dewey, 1933) in the process of learning by relating, checking and examining ideas cautiously and critically (Moon, 1999a).

Habitual action

Habitual action is a mechanical and automatic activity that is performed with little conscious thought or through frequent use of prior knowledge (Kember *et al.* 2000; Mezirow, 1991).

Academic Achievement

Academic achievement is referred as how well a student performs in an academic course. In this study, academic achievements will be assessed were students' pre academic scores and post academic scores in a semester.

MEC

Acronym for Malaysian Examination Council. MEC is a statutory body under the Ministry of Education (MOE). It holds the function to conduct specific examinations and all matters crucial or related to such examinations. The two examinations gazetted under MEC jurisdiction are Sijil Tinggi Persekolahan Malaysia (STPM) and the Malaysian University English Test (MUET).

Reliability

The reliability of a scale indicates how free it is from random error. Internal consistency is one of the aspects of reliability that can be used. It refers to the degree to which the items that make up the scale are all measuring the same underlying attributes (Pallant, 2005). Internal consistency of a test's result over a period of time and is usually determined in a number of ways and the commonly used statistic is Cronbach's alpha.

SPM

Acronym for Sijil Pelajaran Malaysia (Malaysian Education Certificate). It is a national examination taken by all fifth-year (form five) secondary school students in Malaysia. It is set and examined by the Malaysian Examinations Syndicate (*Lembaga Peperiksaan Malaysia*) of Ministry of Education. SPM is equivalent to the O-Level.

STPM

Acronym for Sijil Tinggi Persekolahan Malaysia (Malaysian Higher School Certificate). STPM which began in 1982, was conducted to replace the Higher School Certificate (HSC) examination which were conducted by the University of Cambridge Local Examinations Syndicate (UCLES). It is a national examination taken by all upper six students in Malaysia. It is set and examined by the Malaysian Examination Council (MEC) and is equivalent to the A-Level.

Validity

It refers to the degree to which a test measures its intended attributes or desired outcomes. There is no one clear-cut indicator of a scale's validity (Pallant, 2005).

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