

Engineering Technology Students' Perceptions of their Learning Experiences in Studying Mathematics

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ABSTRACT: *The objective of this study is to understand and examine the Engineering Technology (ET) students' perceptions of their learning experiences or strategies in studying the mathematics subject at the Faculty of Engineering Technology (FTK), Universiti Teknikal Malaysia Melaka (UTeM). In the study, a mini survey method, with quantitative research methods, was utilized. A total of 260 first year ET students at FTK, UTeM were asked to complete a set of questionnaires administrated during the final week of semester one and 2013/2014 session. Two parts of questions on the students' perceptions about learning experiences or strategies in studying the mathematics subject were asked in this survey, which are Part A on the application of active learning strategies, and Part B on the application of passive learning strategies, by the mathematics lecturers during the teaching and learning processes. From the findings, conclusion has been drawn regarding the strategies and methods used by the lecturers in teaching mathematics from the students' perceptions about their learning experiences. The result shows that most of the mathematics lecturers have applied both the active and passive learning strategies in the processes of teaching and learning as far as the mathematics subject is concerned.*

KEYWORDS: *active learning, engineering technology, learning experiences, passive learning, perceptions*

I. INTRODUCTION

The objective of this study is to understand and examine ET students' perceptions of their learning experiences or strategies for the mathematics subject. Their learning experiences or strategies through active or passive teaching and learning processes are revealed by the ET students' perceptions. In learning mathematics, students frequently encounter mathematics problems involving calculations, understanding of concepts, principles, and mathematical relationships with other subjects, especially for ET students, who have a lot of subjects that are related to mathematics. This is supported by the study conducted by Afza *et al.*, (2007), where the students experienced difficulties in studying mathematics since they had to understand the theories and memorize the formulae. It has also been found that it is difficult to study mathematics because of the attitudes of the students themselves (Yushau, 2006). According to Biggs (1989), the conceptual of the teaching and learning processes as an interacting system of the three sets of variables, which are 'presage', 'process' and 'product', which is called as the 3P model. The second stage of 3P model, which is the Process, is an important stage where it describes how the students use the approaches or strategies in their learning. The approaches or strategies used by the students in the teaching and learning can be divided into two basic approaches or strategies, which are 'deep' and 'surface' approaches. 'Deep' approach learning focuses more on active teaching and learning that is described as striving for improved understanding by applying and comparing ideas. Conversely, 'surface' approach learning focuses more on passive teaching and learning that involves reproductive strategies with limited attempt to integrate information (Marton & Saljo, 1976; Thomas & Bain, 1984). In addition to this, the teaching and learning processes that promote active participation among students is when the lecturers applied the Student-centred Learning (SCL) approach. However, passive participation was observed among students in the teaching and learning processes when the lecturer used the traditional method; the Teacher-centred Learning (TCL) approach (Ernest, 2012). The TCL approach is characterized by the predominant use of traditional methods of teaching where the lecturer provides structured materials during lectures, while students listen and take notes (Sablonnierie *et al.*, 2009).

The SCL approach, however, is designed to provide students with opportunities to take more active roles in their learning by shifting the responsibilities of organizing, analyzing, and synthesizing contents from the lecturer to the learner (Means, 1994). Normally the teaching and learning practices in the universities use the TCL approach (Arco-Cobbah, 2004). The impact of the teacher related factors as a source of knowledge on the students learning and their performance are discussed from several studies (Aubrey, 1997; Ball, 1991). The combinations of active and passive learning strategies are beneficial to the students to structure their learning by following the lecturers' instructions and also taking responsibility for their own learning by actively participating in the teaching and learning processes (Lim, 2007). Most of the students have a positive attitude towards their teachers as a source of knowledge in teaching and learning and the impact of the teaching methods on their learning experiences (Ahmed & Aziz, 2009). The result echoes Ernest's (2012) assertion that most of the students' perceptions of their learning experiences agreed that their lecturers applied the active and passive learning strategies. The objective of this study, therefore, is to understand and examine the ET students' perceptions of their learning experiences or strategies in the mathematics subject at FTK, UTaM.

II. METHODOLOGY

Two hundred-sixty ET students who took Calculus for Technology, which is one of the mathematics subjects at FTK, UTaM for the first year students, were involved in this study. They were given a set of questionnaire that is divided into two parts. The first part, which is Part A, consists of five questions that assess the ET students' perceptions of their learning experiences regarding how they learn mathematics, which is Calculus for Technology subject, in their respective classrooms that focused on active learning experiences or strategies. The second part, which is Part B, has five questions to assess the ET students' perceptions of their learning mathematics experiences that applied passive learning strategies. The results were then analyzed using the Microsoft Excel to obtain the statistics for each question. This semi-structured questionnaire was adopted from prior studies conducted by Ernest (2012).

III. RESULTS AND DISCUSSION

From the objective of the study, which is to understand and examine the perceptions of ET students' on learning mathematics experiences, the students answered the questionnaire that was divided into two parts. The first part; Part A, focuses on active learning experiences or strategies, and the second part; Part B, focuses on the passive learning experiences or strategies from the perceptions of ET students'. As a result from Part A, most of the respondents agreed with the statements that their learning mathematics experiences were with active learning or strategies, as shown in Table 1. However, the respondents disagreed when they had to create their own questions and methods. One hundred-twelve out of the two hundred-sixty respondents, which is 46.9% only, agreed with this statement. It shows that most of the students obtained the questions and followed the methods in solving mathematics problem from their mathematics lecturers and not themselves.

Table 1: Students' Perceptions of their Active Learning Experiences

Statement	Percentage (%)	
	Agree	Disagree
I discuss my ideas in a group or with my colleagues	92.7	7.3
I compare different methods used to solve questions	80.8	19.2
I ask the lecturer questions when I do not understand	88.8	11.2
I look for different ways to solve problems	72.3	27.7
I make my own questions and methods	46.9	52.1

Specifically, the results revealed that most of the respondents discussed their ideas in groups or with their colleagues and these statements are in its highest agreement, which is 92.7%. This shows that ET students were very active during the group discussions, as reflected by the result. This supports the education style of the ET students who focus more on applications and implementations that allow them to brainstorm with their colleagues about their ideas. On the other hand, Table 2 shows the ET students' perceptions of their learning experiences or strategies, which is applied in the passive teaching and learning processes.

Table 2: Students' Perceptions of their Passive Learning Experiences

Statement	Percentage (%)	
	Agree	Disagree
I listen while the lecturer explains	95.4	4.6
I copy down the method from the board or textbook	91.4	4.6
I attempt easy problems first to increase my confidence	91.5	8.5
I only attempt questions I am told to do	68.1	31.9
I work on my own	52.3	47.7

Generally, most of the respondents, as shown in Table 2 above, agreed with the statements that their learning mathematics experiences or strategies focused more on passive learning. The statement that was agreed most by the ET students on passive learning experiences or strategies is "I listen while the lecturer explains", which is 95.4%. It shows that the ET students respected their mathematics lecturers very much and believed that the source of knowledge comes from their lecturers. That is the main reason for this statement to be agreed most compared to other statements. Due to this reliance on their mathematics lecturers, the ET students did not really work on their own. This is proven by the result from Table 2, where only one hundred and thirty six respondents out of two hundred-sixty, which is 52.3%, agreed with the statement "I work on my own" and this is the least agreed by the respondents. The most common experiences or learning strategies that the ET students responded could be described as passive by comparing the results from Table 1 and Table 2. From the ET students' perceptions about their learning experiences, they listened and followed their lecturers' instructions or lectures, and appreciated working in groups in order to digest new knowledge and also better understanding in mathematics. The combination of active and passive learning strategies is applied by the ET students in learning mathematics.

IV. CONCLUSION

Understanding the ET students' perceptions of their learning mathematics experiences or strategies is the main objective of this study. Learning strategies are very important in the process of teaching and learning in order to get a better understanding for the students', especially in studying mathematics, since they have to understand the theories and memorize the formulae. In conclusion, the findings of this study infer that the ET students' perceptions of their learning mathematics experiences involved both active and passive learning strategies. In general, ET students' perceptions on their learning experiences or strategies show that they respect their lecturers very much as a guidance and source of knowledge, and the lecturers were not underestimated or ignored. The ET students always discussed their ideas in groups or with their colleagues. This situation may happen because of the limited time with their lecturer, and so they were able to fill the time with group discussions. The findings of this study can give some information for the mathematics lecturers in order to comprehend the trends in mathematics subject, which involves the mixing of active and passive teaching and learning processes. This is a new way for the lecturers to check and balance their teaching practice in the class by using the feedbacks from the students. The voices of students provide valuable information in order to improve and promote effective teaching and learning processes in universities. Overall, the results of this study support these researchers' claims and findings, however, the results of this study need to be interpreted by relative to the limitations of the study. The external validity is compromised by the small sample size; hence the findings of this study have limited generalizability. In the future, larger samples should be collected where all first year ET students should be included, so that a conclusion may be derived at for the all the first year ET students as the population sample.

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