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Generated Formula based on Index Learning Style among Engineering Students towards Academic Achievement at Polytechnic Malaysia

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Abstract

The aim of establishment polytechnic in Malaysia is to produce excellent and quality graduates to cater the needs of human capital in our country. However, the achievement of the graduates is still at a less satisfactory level. The failure among students to achieve outstanding academic achievement is due to not understanding the process and their learning style. This study is conducted to explore and examine the depth of learning style practice among students using Felder-Silverman learning style model (FSLSM) with their academic achievement in engineering study at polytechnic Malaysia. The method of data collection was in the form of survey using questionnaire. There are 36 polytechnics in Malaysia and 8792 students were involved for the study. The results of data analysis obtained among engineering students using Index Learning Style (ILS) were upon four dimensions of FSLSM which are processing, perception, input, and understand. A formula is generated based on ILS referring to the received results as a preliminary measurement of student intake into engineering field at polytechnic Malaysia.

Keywords: Index Learning Style (ILS), Felder Silverman Learning Style Model (FSLSM), Polytechnic Malaysia, Engineering Students

Introduction

Polytechnic in Malaysia is an institution that responds to the government's call in strengthening the field of TVET in line with the objectives of its establishment. The establishment of a polytechnic in Malaysia began in 1969 with the establishment of the first polytechnic of Ungku Omar Polytechnic (PUO) at Ipoh under the United Nations Development Plan (UN).

Malaysian Polytechnic has its own vision of being an industry led TVET institution. The direction or mission of Malaysian polytechnics is to provide access to quality and recognized TVET programs, develop industry led curriculum and increase graduates' readiness through a coordinated industry involvement, producing balanced and entrepreneurial graduates

through a dynamic and sustainable program of study and gain international recognition through collaboration and active participation in the TVET community (JPP, 2016). Therefore, students need to master all the knowledge and competent of all the skills learned in polytechnics. This includes the transformation of the teaching and learning aspects so that it attracts the focus of the students in the classroom (Matore & Khairani, 2014).

In this context, learning styles play an important role in the effort of students to acquire knowledge. Various ways can be adapted by students so that the learned knowledge becomes easier to understand. By mastering the learning style that suits them, the students can indirectly master the fields that are more effective where their academic potential can be maximized. Polytechnic students require the right learning skills to get excellent results before they go to work. The system of learning at polytechnics is more burdensome in terms of difficulty level as the study is more deep and thorough. According to Kob *et. al*, (2016), there is no difference between successful people and those who fail. The difference between these two groups is the level of personal acquaintance. One aspect of personal acquaintance is the tendency of learning style practice. Therefore, the students should know their tendency of learning style practice so that the learning method used is correct with the tendency of dimension of self-learning style dimensions (Felder, 1996). Learning in engineering and non-engineering should be seen from the various dimensions of learning (Kamaruddin & Mohamad, 2011). Basically, the practice and tendency learning in engineering require specific skills to enable students in mastering their knowledge and skills well through various dimensions such as understanding, perception, input and processing.

Furthermore, graduates from Malaysia polytechnics are said to face difficulty in academic success when pursuing their graduate studies (Husain et al., 2008). It is also supported by the Management Review Research from Seberang Perai Polytechnic in the year of 2012 stated that the overall achievement in engineering is still unsatisfactory and is below the level it should be compared to the achievement of students in other fields. Abu et al., (2007) related that one of the root cause in lack of ability for academic achievement was due to the failure of students to adapt the right learning style. Hereby, this study examines the practice of learning styles among engineering students in polytechnic Malaysia which is one of the causes for the failure to obtain good academic achievement. The study of student learning style practice will explain the strengths and weaknesses within the student's own practice relating to student's academic achievement.

This study is conducted using FLSM as the model was initially developed and aimed to measure the practice of student learning style in engineering. The ILS is used as a measurement of instrument for student learning style practice and they are then randomly selected based on academic achievement and the highest ILS score to be interviewed.

Problem Statement

The role of polytechnic Malaysia is to produce excellent graduates to cater the needs of human capital for the country. But, polytechnic graduates are said to have difficulties in academic success when pursuing their graduate studies (Husain et al, 2008). The ability of polytechnics in Malaysia to produce graduates every year cannot meet the goals of the establishment if the students are unable to attain high quality in academic achievement. In

addition, the failure of students to achieve excellent academic achievement is because they do not understand the process and learning styles (Kolb, 1971). Therefore, this study is to examine and deeply study the learning styles of students according to the FLSM (1988) with their academic achievement at polytechnic Malaysia across various engineering programs offered.

Research Objective

To generate a formula based on FLSM upon students learning styles in their academic achievement pursuing engineering studies at polytechnic Malaysia.

Research Design

This study uses quantitative method which is a survey based on descriptive research with questionnaire to collect data. The questionnaire used was to measure the characteristics or variables from the large number of samples identified earlier consisting of students who are pursuing engineering studies at polytechnic Malaysia. A general picture on the level of learning style that became the practice of high achievers in polytechnic Malaysia were obtained via questionnaire distribution. The population in this study was selected from students studying at polytechnic Malaysia having engineering courses from 34 polytechnics including in Sabah and Sarawak where 30 polytechnics were involved. Program of study in engineering consist of mechanical, civil and electrical engineering fields. The population of this study is specific to those who are pursuing engineering only and academic achievers of PHNM 3.50 and above have undergone academic assessment at least one semester of study.

Research Instrument

The ILS questionnaire developed by Felder (1991) was used. ILS was developed as a learning style inventory to identify learning styles based on the FLSM (1988). It contains 44 items to classify students into four dimensions of learning style and each dimension determines student learning style which are processing (active/reflective), perception (sensing/intuitive), input (visual/verbal), and understanding (sequential/global).

Data Analysis

Table 1: Respondents' Demographic Data

Variable	Category	Frequency	Percentage (%)
Gender	Male	6254	71.2
	Female	2528	28.8
Race	Malay	7010	79.8
	Chinese	450	5.1
	Indian	1270	14.5
	Others	52	0.6
Department	JKM	2845	32.4
	JKE	4211	48.0
	JKA	1726	19.7

Table 1 shows the findings of respondents' demographic data in engineering studies at polytechnic Malaysia. The number of male respondents were more with 6254 (71.2%) compared to female respondents with only 2528 (28.8%).

In terms of race, 7010 respondents with 79.8% are Malay students, 1270 (14.5%) are Indians, 450 (5.1%) are Chinese respondents and only 52 (0.6%) from other races. Data of respondents

according to the department of study recorded that 4211 (48.0%) were from Electric Engineering Department (JKE), 2845 respondents with 32.4% from Mechanical Engineering Department (JKM), while 1726 (19.7%) from Civil Engineering Department (JKA). The total number of respondents involved were 8782.

Table 2: Learning Style tendency according dimension

Learning Style		Frequency	Percentage (%)
Dimension	Element		
Processing	<i>Active</i>	7321	83.4
	<i>Reflektive</i>	1461	16.6
Perception	<i>Sensing</i>	6154	70.1
	<i>Intuitive</i>	2628	29.9
Input	<i>Visual</i>	8161	92.9
	<i>Verbal</i>	621	7.1
Understanding	<i>Sequential</i>	5527	62.9
	<i>Global</i>	3255	37.1

The findings from Table 2 displays 7321 respondents with 83.4% having tendency towards active learning style while 1461 respondents with 16.6% having reflective learning style. For perception dimension (sensing/intuitive) recorded 6154 (70.1%) respondents having more tendency towards sensing learning style and the rest 2628 (29.9%) having intuitive learning style.

As for input dimension (visual/verbal) there were 8161 respondents with 92.9% more likely to visual learning style and only 621 (7.1%) respondents tend to have verbal learning style. Finally, the dimension of understanding (sequential/global) found that 5527 respondents with 62.9% were sequential learning style and 3255 with 37.0% global learning style. Overall, the learning style among engineering students in these four dimensions is more likely have active, sensing, visual and sequential learning styles and for visual learning style has the highest record at polytechnic Malaysia.

Generated Formula of Learning Style

The generated formula of learning style is based on FLSM that was identified through a survey conducted on 8782 respondents from engineering students with good academic achievers at PHNM 3.50 and above. The tendency of learning style among these students has become a measure for the formulation. Generalized learning styles of each dimension are identified as seen in Table 3. The determination of formula is in the scale of 12 by looking into high tendency in the ILS scale of Felder & Silverman. The learning styles formulation for each dimension shows that the learning style for active is moderate in dimension processing, the perception dimension having balanced level at sensing, input dimension at high level for visual learning style, and dimension of understanding having sequential learning style at balanced level among engineering students in polytechnic Malaysia.

Dimension	Scale of Learning Style Level											
	-11	-9	-7	-5	-3	-1	1	3	5	7	9	11
ILS												
Processing	1	2	3	4	6	7	9	10	12	11	8	5
Perception	1	2	4	5	7	10	11	12	9	8	6	3
Input	1	2	3	4	5	6	7	8	9	10	12	11
Understanding	1	2	3	5	8	10	11	12	9	7	6	4

Learning Style Formula

$$[FB_{nAR}]_{FSnAR} + [FB_{nSI}]_{FSnSI} + [FB_{nVB}]_{FSnVB} + [FB_{nSG}]_{FSnSG} = X_p$$

X_p – Skor Pencapaian

Generated Formula

FB_{nAR} - Dimensi Pemrosesan

FB_{nSI} - Dimensi Persepsi

FB_{nVB} - Dimensi Masukan

FB_{nSG} - Dimensi Pemahaman

Felder & Silverman Scale

$FSnAR$ - Dimensi Pemrosesan

$FSnSI$ - Dimensi Persepsi

$FSnVB$ - Dimensi Masukan

$FSnSG$ - Dimensi Pemahaman

Achievement Potential Score

40-48	Very High
28-39	High
16-27	Moderate
04-15	Low

This generated new formula is able to measure the potential achievement among students referring to tendency practice of learning styles

High achievement potential among students planning to pursue engineering in polytechnic Malaysia are those who can be active to participate in classes, practical work or field work where students need to have high self-reliance capability as well as adapt to learning that requires reflective skills. In addition, students need to have a balanced sensing and intuitive learning styles. In line with the engineering field, not only requires students to use facts but also emphasize imagination skills. From the aspect of input dimension, the student's learning style emphasizes on the visualization ability. This is because field of engineering always uses graphs, illustrations and other visual aids in its learning. Finally, the dimension of understanding, requires students to be balanced in sequential and global learning style.

Conclusion

The formulation of engineering students' learning styles in polytechnic Malaysia shows that the practice of excellence in key of achievements under engineering is referring to a moderate active learning style, high learning style of visual and balanced learning style for sequential as the basis for the high achievement formulation of engineering students at polytechnic Malaysia. Thus, this formulation can help students to develop an outstanding learning practice by selecting better practices of their learning styles. The polytechnics in Malaysia are able to use this as a preliminary measurement of student intake into engineering to ensure the suitability of student practices of learning styles and achievements.

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