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Research paper

Comparison of Higher TVET Education and 'Normal' Academic Education: the Determinants of Electrical Engineering Students' Performance

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Abstract

Previous studies have argues that performance should depend on intelligence, maturity, motivation and background. The majority of studies about performance use endogenous factor as potential determinants for success rate. Students' perception of quality of teaching and the environment linked to their approaches play a pivotal role in their learning outcomes [1]. Academic performance of students in higher educations has been an important topic for universities [2]. Discovering the possible determinants of academic success of students is vital for universities and lecturers as well as to students themselves in various areas. It could have many implications on admission policies, teaching performance and modification in teaching styles. The main aim of this study is to search for the potential determinants of performance of normal electrical engineering degree students in the compulsory / core modules and comparing with the Higher Technical and Vocational Education and Training (HTVET) approach. This study will also help to explore and link factors that are believed to influence the students' performance factors that will help to improve overall university teaching and quality. Findings based from extrinsic factors in this research can provide some recommendations about University student admissions and budgeting policies and the different exogenous factors influencing students' performance for different programme structure.

Keywords: *component; formatting; style; styling; insert*

1. Introduction

The performance of students in academic either at universities or high school become a popular topic in education. Discovering the determinants of students to success in academic is vital to the institutions, lecturers and students themselves. It will give effect on admission policies, teaching performance, learning process and so on. This issue has been under intense scrutiny by academics since the performance of students very poor in their studies. A study stated that the highest number of students that graduated on 2001 at University Queensland from electrical engineering course prefer only to pass every subjects taken rather than pass with flying colours [1,2,3]. This is due to their capability, scrupulousness and commitment in studies. In the real situation, having a good result is important in order make themselves marketable and a reflection of their grasp of the subject matter, their ability in soft skills and critical thinking. In Malaysia, before entering degree level, the students must undergo either diploma programmes (min 3 years) or foundation programmes (min 1 year). Another study find that foundation students outnumbered diploma students in most degree programs in Malaysia. In addition, the authors reported that foundation students tend to achieve better results and are more likely to graduate on time [4]. Based on this current issues this paper is focused at universities in Malaysia in electrical engineering courses which involves Bachelor of Engineering Technology in Electrical (BET) and Bachelor of Engineering in Electrical (BEng) courses. BET programme is using the Higher Technical and vocational education and training approach (HTVET) while BEng programme is the normal academic approach [5]. The duration to complete degree level is about 4 years..

The focus of this paper is to examine the influence of exogenous factors ranging from teaching delivery to lecturer commitment. Although incorporating the endogenous elements into the analysis would constitute fundamental variables, the absence of exogenous factors could only give an incomplete picture of the examination of academic performance [6]. The hypothesis for exogenous variables contain 12 different factors, which clarify the relationship between student performances. The first hypothesis is the expertise of lecturer in each subjects. The teaching process is very important in order to ensure the students understand on each of the topic discussed. Next for the punctuality of the lecturers, time is gold and it is the major discipline for all lecturers and students. It will be an idol if someone always punctual and the students will follow the example of lecturers. Lecturer`s punctuality and consistency inspires students to work harder [7].

2. Literature Review

The relevance of exogenous factors is also implied in the framework of interaction among student`s learning outcomes, their learning approaches, and the context of higher education institute (HEI) learning. Ramsden`s research implies that a heavy workload, bad teaching and improper evaluation procedures might discourage students from having positive learning approaches and

instead encourage surface learning [8]. Alternatively, effective and quality teaching, genuine commitment by lecturers to subjects and their good attitude towards students are reported to be important factors that make students want to adapt a deep study approach also higlight`s the students of participation that may lead to deep learning. Using his 3P model (presage, process, product) the author argues that lecturers can affect the outcomes or products of learning [9].

Moreover, the number of students keep increasing every semester, the size of class will increase too. Measuring the size of lecture`s classes that will clarify whether affect the performance of students or not. Student life can be full of late night outs which may in turn affect their attendance the next morning. The attendance thus would not be satisfactory. The time of class is also included in order to justify whether the time of classes will affect the performance of student. Then, the students will easily get bored if the duration of class get longer. Lecturers could also focus on finishing quickly rather than focusing on the understanding of the students. Lastly, every courses will be related with the programme but the approach and quality of lecturers will determine the performance of studens.

3. Methodology

The measurement of the dependent variable is based on endogenous and exogenous factors. To address what affects academic achievement in Electrical Engineering (BEngs & BET) by using following model. It is assumed that the potential factors associated with students - endogenous factors [10].

Academic Performance = constant + γ [Explanatory] (1)

Equation (1) is used to estimate the academic performance. The dependent variable is the student performance, γ[Explanatory] are a vector of additive expalanatory variables. The constant and are the unknown parameters need to be estimated. is the error term in the model. The model is estimated using a standard OLS estimation technique is. There are 3 factors for explanatory factors as follows [11, 12, 13] :

- Lecturer & Assessment
- Teaching material
- Teaching environment

The research is conducted at UniKL BMI by distributing the questionnaires to BEngs and BET students. UniKL is an ideal place for this study as it provides the best environment for both Beng and BET stuidents About 200 students picked randomly to do the questionnaires. R software is used since it able to provide a wide variety of statistical and graphical techniques, and highly extensible. It also provides an Open Source route to participation in that activity. This software is a language and environment for statistical computing and graphics. The data collected from the questionnaires is used to form equation based on the mathematical model [14, 15].

Then, Bartlett test is used to verify the assumption [16]. Likert Scale is used to measure the attitude of student towards the lecturers. Likert Scale is widely used by asking the people to respond to a series of statements about a topic, in terms of the extent to which they agree with them, and so tapping into the cognitive and affective components of attitudes. Likert-type or frequency scales used fix choice response format and designed to measure attitudes or opinions [17]. Besides, factor analysis method (data reduction) is used to collect the data for exogenous factor from the questionnaires. It is also to analyse the data and reduce some error from Likert Scale and to perform some numerical number for Regression method. This is done by seeking underlying unobservable (latent) variables that are reflected in the observed variables (manifest variables). Varimax rotation is applied too in this research. It able to reduce the Factor analysis value from exogenous factor. Basically, in statistics, varimax rotation is used to simplify the expression of a particular sub-space in terms of just a few major items each. The actual coordinate system is unchanged and it is the orthogonal basis that rotated to align with those coordinates [18]. Kaiser Meyer Olkin (KMO) is a measure of sampling adequacy to indicate the appropriateness of Factor Analysis [19] for exogenous factor. It is also to reduce the best form for Exogenous factor`s value.

Regression is the statistical approach to forecast the change in a dependent variable on the basis of change in one or more independent variables. Regression analysis equation can be used in fitting a curve or line to data points, in a manner such that the differences in the distances of data points from the curve or line are minimized [20]. This method used to measure the regression on the impact of exogenous factors. Stepwise Regression includes regression model in where the choice of predictive variables is carried out by an automatic procedure which involves with all candidate variables, testing the deletion of each variable using a chosen model comparison criterion, deleting the variable (if any) that improves the model the most by being deleted, and repeating this process until no further improvement is possible [21]. This method is used to reduce the best form from Regression method for both variables [22].

4. Results And Discussions

The Table 1 shows the definition for each of variables from the hypothesis that has been made.

5. Conclusions

This study examines the determinants of performance of Electrical Engineering students. This research provides an investigation at the exogenous variables that affect the performance of Electrical Engineering students at UniKL BMI. We find that all three factors: lecturers assessment and teaching, teaching material as well as teaching environment play an important role for academic performance for overall of electrical engineering students. Evaluating student performance separately, we find that BEng students performance are dependent on the lecturers' assessment and teaching as well as teaching material whilst independent of teaching environment. However, for BET students, the lecturers' assessment and teaching does not influence academic performance. These students' academic performance is determined by the teaching material as well as teaching material. Thus, we conclude that both differing approaches (a more theoretical approach versus a more applied approach) has similar as well as different factors which determine student .

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Table 1: Variable Definitions

VARIABLE	DEFINITION
1. Teaching Material	i) Lecturer`s Expertise ii) The punctuality of lecturer
2. Lecturer`s Assessment	i) Teaching`s delivery ii) Clarity of exam iii) The consultation iv) Structure of Exam v) Time exam & test vi) The usefulness text book vii) Time of class
3. Teaching Environment	i) The size of lecture ii) The period of class iii) The course related to student`s future

Table 2: Results for factor analysis utilising principal component analysis

SCALE	FACTOR LOADINGS				
	Factor 1	**Factor 2**	**Factor 3**	**Communality**	**Cronbach Alpha**
A. LECTURER ASSESMENT					0.891
1) Lecturer Expertise	0.814			0.744	
2) Punctuality	0.892			0.721	
3) Delivery	0.893			0.804	
4) Clarity of Exam	0.794			0.698	
5) Consultation	0.749			0.631	
6) Structure of Exam	0.614			0.531	
B. TEACHING MATERIAL					0.822
1) Time Exam & Test		0.552		0.431	
2) Usefulness Test & Study		0.677		0.559	
3) Size of Lecture		0.578		0.481	
C. TEACHING ENVIRONMENT					0.789
1) Time of the Class			0.689	0.605	
2) Class Length			0.594	0.482	
3) Future			0.586	0.469	

Eigenvalue	2.645	1.972	1.048		
Explained variance by factors (%)	42.0	16.4	8.7		
KMO Statistics	0.863				
Bartlett Test (p-values)	135.84 (0)				

Note: Principle Component Analysis with Varimax Rotation was used to identify underlying dimensions. KMO is the Kaiser – Meyer – Olkin measure sampling adequacy to indicate the appropriateness of factor analysis. Bartlett`s test of sphericity test the null hypothesis that the original correlation matrix is an identify matrix. Total variance extracted by the 3 factors is 67.1%. Item loading below 0.45 were omitted.

Table3: Regression results on the determinants of engineering student performance

	Predicted Sign	**MODEL 1**	**MODEL 2**	**MODEL 3**	**MODEL 4**	**MODEL 5**
LA	+	1.34***	0.4600	-	1.1918***	1.2890***
		(0.2904)	(0.43951)	-	(0.3126)	(0.4181)
TM	+/-	6.8213***	2.7877***	3.1825***	3.4506***	3.8627***
		(1.3208)	(0.9134)	(1.2088)	(1.3138)	(1.4233)
TE	+	6.8658***	5.6538***	6.1901***	0.5608	-
		(1.9809)	(0.8299)	(0.9890)	(1.3422)	-
Adjusted R^2		0.4322	0.2894	0.3422	0.3244	0.3691
F - STAT		18.53***	37.76***	41.24***	34.45***	42.38***
Sample size		200	100	100	100	100

Note: Model 1 reports results for all engineering students. Model 2 and 4 report the results for BEng students and BEt students respectively. Model 3 and 5 exclude the insignificant variable as a measure of robustness based on the reverse step-wise regression method. Figures reported are coefficients whilst Whilte (1980) standard errors are reported in parentheses.