The 5th PSU-UNS International Conference on Engineering and Technology (ICET-2011), Phuket, May 2-3, 2011
Prince of Songkla University, Faculty of Engineering
Hat Yai, Songkhla, Thailand 90112

A CASE STUDY OF STUDENT PERFORMANCE IN ELECTRIC CIRCUIT 2 SUBJECT

Zaiton A. M.[1]*, Kamarul A. M.[2]*, Mohd Soufhwee A. R.[3], Haeryip Sihombing[4], Mohd Yuhazri Y.[5]
[1]University Teknikal Malaysia Melaka, Faculty of Electronics and Computer Engineering, Malaysia
[2,3,4,5]Universiti Teknikal Malaysia Melaka, Faculty of Manufacturing Engineering, Malaysia
* email: zaiton@utem.edu.my; kamarulamir@utem.edu.my

Abstract: *Institution of Higher Learning plays an important role [to produce high quality graduates. The most important factor that determines graduates quality shown in their CGPA. In order to maintain high CGPA, students should perform well especially in their examination where it contributes the most in the assessment. Students should mastered basic subject in order to maintain their grades. This survey is to study the reasons for poor performance of the students in Electric Circuit 2 subject. Findings have shown that student's performance was not only influence by the lecturer but also interrelated to student's ability and how they see the learning process it either they are a surface or deep learner.*

Key Words: ***student performance / learning style/ teaching methods***

1. INTRODUCTION

The demand for multi-skilled engineers in the society is crucial and to meet these requirements has stressed out the engineering students. To cope with the demand, the condition for engineering education is also changing and become more and more challenging. Engineering students must equip themselves not only with the scientific knowledge but also various soft skills to be able to become an excellent engineer. Educators and education institution are aware that they play an important role and need to respond to these needs. [1][2]

As most of Institution of Higher Learning (IHL) in Malaysia adopting Outcome Based Education (OBE) in order to be accredited by Engineering Accreditation Council (EAC), Universiti Teknikal Malaysia Melaka (UTeM) also implements OBE in all of subjects offered. OBE is an educational process that stress on achieving specified outcome in terms of individual study learning. The specified outcome relates knowledge, skills and attitudes which are measured throughout individual and group assessment. The outcomes for each subject were set based on Bloom's Taxonomy level.[3][4][5]

These also have change the way lecturers in UTeM teach. A conventional lecture is classified as an outmoded form of conveying knowledge and building up student knowledge and skills. Thus, various teaching and learning strategies were developed in order to produce better quality engineers. Interactive teaching strategies with the support of the use of technology had dominated engineering education these days. Unfortunately, not all the hard works and efforts done portrays the desired results. Student performance may also be influences by many factors other than academic talent and concerned with creating the best possible learning environment for them. Furthermore, student should not depend on lecturers to gain understanding and build their theoretical knowledge as well as to enhance their skills through practical session and design project.

2. BACKGROUND

This case study was carried out to determine the reasons for poor academic achievement in engineering subjects especially in Electric Circuit 2, and looking for a suitable instructional approach and teaching philosophy that would results in at least the most optimal student performances.

Electric Circuit is a compulsory basic engineering subject for Bachelor of Electronic Engineering in Universiti Teknikal Malaysia Melaka (FKEKK). This subject is divided into two parts; part 1 named Electric Circuit 1 covers direct current (DC) circuit analysis and part 2, Electric Circuit 2 introduces alternating current (AC) circuit analysis. This subject was taught in the first semester of Year 2. It is important for Electronic Engineering students to have strong basic engineering knowledge so that they can make reasonable progress in their engineering program.

This subject discuss about capacitors and inductors, series and parallel circuits of capacitors and inductors; first and second-order circuits, step response of the circuits; steady-state analysis; AC power analysis,

average power, RMS values, power factor; frequency response, transfer function and Bode Plot, series and parallel resonance and filters. The learning objectives for this subject were set until cognitive level 4 (Analysis), where student need to be able to explain the concept of capacitors and inductors (C2), solve first order and second order circuit problems (C3), apply knowledge of power condition for AC circuits (C3), analyze sinusoidal steady-state condition (C4) and analyze the performance and response of an AC circuit (C4).

Each class is divided into sections which contain approximately 60 students. Students meet two times a week for a 1 hour and 2 hours lecture delivered by regular faculty lecture room. A 2 hours tutorial session were conducted four times per semester and each tutorial group were limits to only 30 students for better interaction between lecturer/tutor and students.

The subject has been offered six times previously and from observation, had followed quite a traditional pedagogical techniques - traditional teacher-directed approaches. The use of easy-to-implement tools, resources, and strategies were dominated the lecture session for the subject. Although, lecturer try to implement new teaching concept, lack of student's feedback and interaction through this method obviously refrain the lecturers from continuing their new kind of teaching and learning experience. Most of them would turn back into the conventional method.

In measuring the performance of the program, Faculty has set that in each subject 65% of the students should exceed 50% of the total marks. If less than 65% of student could not obtain 50% marks, the subject shows a poor performance. Thus something should be done for improvement. According to previous data, lecturers felt that the student's learning performance had been poor compared to other subjects taken. This shows that the student's motivation to put effort into their learning had appeared low. The approach taken by the students to learn a particular task were also important. If the student took a surface approach, their aim is just to pass the assessment requirement. Thus they did not perform well. In contract with the student who took deep approach to learning, they engaged and actively involved with the subject matter. Besides, the approach taken by the lecturer to teach also plays an important factor in determining the performance based on the learning outcomes.[6][7]

This paper presents the key factors affecting student achievements in Electric Circuit 2 subject and suggesting the best teaching methods that could be apply in order to enhance student's performance for the subject.

3. METHODOLOGY

In this paper, the performance of 61 respondents from different batches who has taken this subject in Year 2 is investigated. The student performance is only measured by their grade at the end of the semester. For this subject, 85% of the assessment was an individual assessment and only 15% were for group assessment. Individual assessment was assessed through quizzes (5%), tests (30%) and final examination (50%). While for the group assessment the performance were measured through group assignment.

3.1. Survey

In order to evaluate the student performance/ achievement, the relevant criteria through questionnaires are identified based on the basic attributes regarding the courses, such as lecturer competency, lecturing methods and delivery, as well as students effort and preparation required. Table 1 shows the 9 of survey questions based on the basic attributes that will be generated by functional and disfunctional requirements of Kano model. Each characteristic were asked twice in a set of functional and dysfunctional question because students tend to have confused idea about each factor asked. In a functional set, the questions were to examine the student satisfaction when the characteristic is present. In the dysfunctional set, the questions were to investigate the student satisfaction when the characteristic is absent. Thus, by using each pair of functional and dysfunctional question, their ideas can be made understandable and thus each requirement shows the actual feeling when the characteristics is present or absent. Example question are as shown in Table 1.

Table 1. *Example Question*

Example of functional question	The lecturers maintain one teaching method. The examination/ test questions scope are covered in the syllabus.	1. I like it that way 2. It must be that way 3. I'm neutral 4. I can live with it that way 5. I dislike it that way
Example of dysfunctional question	The lecturers use various teaching methods. The examination/ test questions are not covered in the syllabus scope.	1. I like it that way 2. It must be that way 3. I'm neutral 4. I can live with it that way. 5. I dislike it that way

The Kano Model of customer satisfaction provides a conceptual framework for identifying, measuring, and increasing student satisfaction. These are classified into ‘attractive’ (A), ‘must-be’ (M), ‘one-dimensional’ (O), ‘reverse’(R), 'indifferent’ (I) and ‘’questionable’ (Q) characteristic evaluation as shown in Table 2.

Table 2. *Basic Attributes/ Criteria required for Lecturing Course*

Attributes/ Criteria	Background
Competence	• The measurement required of instructors in order to enhance the teaching quality are clarity of lecture; vividness of teaching mate-rial; enthusiasm of instructors; methodical course arrangement [8] • The personal needs of the students and the professional skills of the instructors will also greatly affect the learning outcomes
1. The lecturer competence	
Methods & Delivery	
2.Various teaching methods	
4.Provides the course	

materials	[9].
6.Example and exercise	• Qualified instructors should be able to up-grade students' capability effectively, enhance their knowledge and skills, improve their behaviour and attitude, and encourage them to make contributions to the organizational goal [10].
7.Discussing in the class	
8.Scope and the syllabus	
Required from Student	• The design of course and interaction between the instructors and the students can effectively enhance the learning outcomes [11].
5.Student preparation	
9.Ability to solve the problem	

* Notes: no.3 Lecture is interesting (is to cover no.2,4,6,7)

Table 3. *Kano Evaluation* [12]

Quality Attributes		DISFUNCTIONAL				
		1.Like	2.Must-be	3.Neutral	4. Live with	5.Dislike
FUNCTIONAL	1.Like	Q	A	A	A	O
	2.Must-be	R	I	I	I	M
	3.Neutral	R	I	I	I	M
	4. Live with	R	I	I	I	M
	5.Dislike	R	R	R	R	Q

The classification types of Kano evaluation are interpreted refers to impact differently in Table 3. For instance, the "one-dimensional" classification implies that the factor's presence will increase customer satisfaction but its absence will hurt it [13].

Table 4. *Classification Evaluation* [13]

Classification Evaluation	Impact of Factor Presence on Customer Satisfaction	Impact of Factor Absence on Customer Satisfaction
Questionable	Increase or Decrease	Increase or Decrease
Atrractive	Increase	Decrease
One-Dimensional	Increase	Strong Decrease
Reverse	Decrease	Increase
Indiffirent	No Impact	No Impact
Must-be	Strong Increase	Strong Decrease

Here, classification of the evaluation rule is *M*>*O*>*A*>I. This is to describe that if the individual requirements not unambiguously assigned to the various categories [14]. While for customer satisfaction (whether satisfaction can be increased by meeting a product requirement, or whether fulfilling this requirement merely prevents the customer from being dissatisfied), the customer satisfaction coefficient is defined by as follow [12]:

- Extent of Satisfaction (CS): $\frac{A + O}{A+O+M+I}$
- Extent of Dissastifaction (DS): $\frac{M + O}{A+O+M+I} \times (-1)$

The survey is based on Kano's model, where there are nine factors to be evaluated in this survey, such as lecturer competency, teaching methods, lecturer's delivery, material delivery, student preparation, exercise and tutorial, examples during lectures, scope of exam questions and question requirements.

3.2. Data Analysis

Each of the factors was tabulate in Table 5. The results show that students believe that in teaching and learning process the delivery method and lecturer's competency were not affecting their performance. Further, for lower grade students, they gives an idea that more solved exercises given is an attractive point in teaching and learning. This is shown from the first maximum value according to customer's satisfaction and dissatisfaction. Since the value is indifferent, the next maximum value was taken to strengthen the result. This is to study the underlying reasons for the indifferent answers. [12]

According to Kano evaluation in Table 5, all students' feels the lecturer competency, lecturing methods & delivery, and what is required from them in the course are in Indifferent (I). While based on grade/score achievement between students that is classified as the Higher (>C+) and the Lower (≤C+) achievement, Table 6 shows that the attractive and reverse criteria are more onto the lower achievement students (<50%). This is opposite to the higher achievement students whereby they are more prefer to the criteria of attractive (A), must-be (M), indifferent (I), and questionable (Q) (>50%).

Table 5. *The Kano Evaluation and Coefficient of Satisfaction (CS and DS) for 1st and 2 MAX.*

		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	6	4	1	5	3	15	10	5	3
One Dimensional	O	10	11	14	11	2	9	6	14	6
Must-Be	M	6	5	6	11	15	7	12	11	10
Indifferent	I	35	35	32	32	35	25	28	28	34
Reverse	R	3	6	6	2	5	3	5	1	6
Questionable	Q	1	0	2	0	1	2	0	2	2
MAX 1st		35	35	32	32	35	25	28	28	34
Kano		I	I	I	I	I	I	I	I	I
CS Value		0.28	0.27	0.28	0.27	0.09	0.43	0.29	0.33	0.17
DS Value		-0.28	-0.29	-0.38	-0.37	-0.31	-0.29	-0.32	-0.43	-0.30
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	6	4	1	5	3	15	10	5	3
One Dimensional	O	10	11	14	11	2	9	6	14	6
Must-Be	M	6	5	6	11	15	7	12	11	10
Indifferent	I	0	0	0	0	0	0	0	0	0
Reverse	R	3	6	6	2	5	3	5	1	6
Questionable	Q	1	0	2	0	1	2	0	2	2
MAX 2nd		10	11	14	11	15	15	12	14	10
Kano		O	O	O	O	M	A	M	O	M
CS Value		0.73	0.75	0.71	0.59	0.25	0.77	0.57	0.63	0.47
DS Value		-0.73	-0.80	-0.95	-0.81	-0.85	-0.52	-0.64	-0.83	-0.84

Table 7 shows the distribution of Functional and Dysfunctional requirements for Higher and Lower Grade students' achievement. Here, all of the average values of Functional and Dysfunctional requirements for Higher and Lower Grade students' achievement is < 3 and >3 respectively.

The distribution of the Kano evaluation against the Higher and Lower Grade student's achievement shows in Table 8a and Table 8b. Here, all the Kano evaluation for 1st MAX is totally different to the 2nd MAX. However, the Kano evaluation on 1st MAX of the Higher Grade Student's achievement (Table 8a) is exactly identical (same) to the Kano evaluation result (Table 5). While against the Kano evaluation on 1st MAX of the Lower

Grade Student's achievement, the different is only toward the question no.6. Furthermore, all of the Kano evaluation for 2nd MAX is identical for the questions no.1, 2, 3, 4, 5, 6, and 9, that are O; O; O; O; M; A; M.

Table 6. *The Grade Students' Achievement Distribution vs. Kano Evaluation*

GRADE		KANO						Total
		A	O	M	I	R	Q	
HIGHER	A	13	14	19	**60**	2	36	144
	A-	1	9	5	**17**	4	12	48
	B+	1	**12**	1	8	5	9	36
	B	1	1	8	**26**	0	12	48
	B-	6	11	16	**50**	5	32	120
LOWER	C+	*13*	*13*	*10*	***35***	*0*	*25*	*96*
	C	*7*	*2*	*9*	***30***	*5*	*19*	*72*
	C-	*2*	*9*	*6*	***20***	*5*	*18*	*60*
	D+	*2*	*5*	*1*	*1*	*0*	*3*	*12*
	D	*3*	*7*	*8*	***25***	*8*	*21*	*72*
	D-	*3*	*0*	*0*	***12***	*3*	*6*	*24*
Total		52	83	83	**284**	37	193	732
HIGHER (%)		42.3	***56.6***	***59.0***	***56.7***	43.2	***52.3***	54.1
LOWER (%)		***57.7***	43.4	41.0	43.3	***56.8***	47.7	45.9

Table 7. *Higher and Lower Grade Distribution Based on Functional and Dysfunctional Requirements*

HIGHER GRADE	FUNCTIONAL									DISFUNCTIONAL								
	No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9
Mode	3	3	3	2	3	1	2	2	2	3	3	5	3	3	3	3	5	3
Median	2	3	2	2	3	2	2	2	2	3	3	4	4	3	3	3	4	4
Freq-1	10	8	10	8	2	10	6	10	7	2	3	1	0	3	1	1	0	2
Freq-2	7	7	7	13	9	10	11	11	12	6	4	5	2	4	3	3	3	2
Freq-3	13	15	11	9	17	10	9	11	10	11	15	10	13	10	13	13	9	11
Freq-4	2	2	3	2	5	3	6	1	4	5	3	5	6	6	6	5	6	9
Freq-5	1	1	4	1	2	1	2	2	4	7	8	9	10	8	6	7	12	8
Average	2.3	2.42	2.39	2.24	2.76	2.18	2.55	2.09	2.33	3.39	3.27	3.67	3.85	3.48	3.64	3.67	4	3.64
Std Dev	1.07	1.03	1.2	1	0.79	0.98	1.09	0.88	0.96	1.25	1.23	1.22	1	1.3	1.11	1.14	1.06	1.14
Min	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1
Max	5	5	5	5	4	4	5	4	4	5	5	5	5	5	5	5	5	5

LOWER GRADE	FUNCTIONAL									DISFUNCTIONAL								
	No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9
Mode	3	2	2	3	3	1	1	2	3	3	3	5	5	3	4	3	5	3
Median	3	2	3	2	3	1	2	2	3	3	4	3.5	4	3	4	3	4	3
Freq-1	7	7	6	8	3	16	10	9	3	2	2	2	0	1	3	2	1	4
Freq-2	6	8	7	8	7	5	7	10	7	0	0	3	1	0	0	3	0	1
Freq-3	12	8	7	9	15	5	7	3	11	16	10	9	8	14	9	10	11	11
Freq-4	2	4	4	2	1	1	2	4	3	3	8	5	9	5	10	6	4	4
Freq-5	1	1	4	1	2	1	2	2	4	7	8	9	10	8	6	7	12	8
Average	2.43	2.43	2.75	2.29	2.71	1.79	2.25	2.29	2.93	3.46	3.71	3.57	4	3.68	3.57	3.46	3.93	3.39
Std Dev	1.07	1.14	1.35	1.08	0.98	1.1	1.24	1.27	1.18	1.1	1.12	1.26	0.9	1.02	1.17	1.2	1.09	1.34
Min	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Max	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Table 8a. *Kano Evaluation based on 1st and 2nd MAX of the Higher Grade Students' Achievement*

		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	4	2	0	2	1	6	2	3	2
One Dimensional	O	6	6	9	6	1	4	4	7	4
Must-Be	M	3	2	3	6	9	6	7	8	5
Indifferent	I	18	19	18	18	19	16	18	15	20
Reverse	R	2	4	2	1	3	1	2	0	1
Questionable	Q	0	0	1	0	0	0	0	0	1
MAX 1st		18	19	18	18	19	16	18	15	20
Kano		I	I	I	I	I	I	I	I	I
CS Value		0.32	0.28	0.30	0.25	0.07	0.31	0.19	0.30	0.19
DS Value		-0.29	-0.28	-0.40	-0.38	-0.33	-0.31	-0.35	-0.45	-0.29

		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	4	2	0	2	1	6	2	3	2
One Dimensional	O	6	6	9	6	1	4	4	7	4
Must-Be	M	3	2	3	6	9	6	7	8	5
Indifferent	I	0	0	0	0	0	0	0	0	0
Reverse	R	2	4	2	1	3	1	2	0	1
Questionable	Q	0	0	1	0	0	0	0	0	1
MAX 2nd		6	6	9	6	9	6	7	8	5
Kano		O	O	O	O	M	A	M	M	M
CS Value		0.77	0.80	0.75	0.57	0.18	0.63	0.46	0.56	0.55
DS Value		-0.69	-0.80	-1.00	-0.86	-0.91	-0.63	-0.85	-0.83	-0.82

Table 8b. *Kano Evaluation based on 1st and 2nd MAX of the Low Grade Students' Achievement*

		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	2	2	1	3	2	9	8	2	1
One Dimensional	O	4	5	5	5	1	5	2	7	2
Must-Be	M	3	3	3	5	6	1	5	3	5
Indifferent	I	17	16	14	14	16	9	10	13	14
Reverse	R	1	2	4	1	2	2	3	1	5
Questionable	Q	1	0	1	0	1	2	0	2	1
MAX 1st		17	16	14	14	16	9	10	13	14
Kano		I	I	I	I	I	A	I	I	I
CS Value		0.23	0.27	0.26	0.30	0.12	0.58	0.40	0.36	0.14
DS Value		-0.27	-0.31	-0.35	-0.37	-0.28	-0.25	-0.28	-0.40	-0.32

		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Attractive	A	2	2	1	3	2	9	8	2	1
One Dimensional	O	4	5	5	5	1	5	2	7	2
Must-Be	M	3	3	3	5	6	1	5	3	5
Indifferent	I	0	0	0	0	0	0	0	0	0
Reverse	R	1	2	4	1	2	2	3	1	5
Questionable	Q	1	0	1	0	1	2	0	2	1
MAX 2nd		4	5	5	5	6	9	8	7	5
Kano		O	O	O	O	M	A	A	O	M
CS Value		0.67	0.70	0.67	0.62	0.33	0.93	0.67	0.75	0.38
DS Value		-0.78	-0.80	-0.89	-0.77	-0.78	-0.40	-0.47	-0.83	-0.88

3.3. Discussion

Based on Table 5, we find that Kano evaluation for all the students is indifferent criteria (I). This is means that the result neither in satisfaction nor dissatisfaction, whether fulfilled or not. This is also shown similar for the Higher Grade students' achievement. However, there is found that no. 6 in attractive criteria (A) for the Lower Grade students' achievement. This is means that the student feels regarding the exercise and example given in the lecturing session as something that interesting to them. The absence of its does not cause dissatisfaction because they are not expected. However, strong achievement in this attribute will delight them in which leads them to a better satisfaction of lecturing.

In addition, since the no.3 regarding '*the lecturing is interesting*' for student in indifferent criteria (that we assume covering for no. 2,4,6,7), we found that Kano criteria for this attribute is a little bit ambiguity due to all of no. 2,4,6,7 are in indifferent criteria (I). Therefore we make 2nd of maximum calculation [15] whereby all the result no.6 is in attractive criteria (A) that relate to no. 3, that is one-dimensional criteria (O).

Here, one-dimensional result in customer satisfaction when is fulfilled and dissatisfaction when not fulfilled. The better the attributes are, the better the customer likes them. A *One-dimensional* attribute fulfillment helps enhance the satisfaction and vice versa.

By manipulate the no.6 into attractive criteria (A) as to figure the latent need [15] of student that need to be fulfilled in the lectures (for improvement), therefore the no.7 for 2nd maximum of the Higher Grade student become in must-be criteria (M). This also occurred to the no.8 whereas the criteria in one-dimensional (O).

Against that finding (to mapping what are actually the improvement needs), therefore we need to find the correlation and validate between the needs in order to determine the reasons of poor academic achievement and looking for a suitable instructional approach and teaching philosophy that would results in at least the most optimal student performances by the matrix correlation (MKA) between the results of Kano evaluation (Ke) (Table 9a), Functional (F) (Table 9b), and Dysfunctional (DF) (Table 9c) requirement as follows [15]:

$$MKA = Ke \cap F \cap DF$$

Table 9a. *Kano Correlation*

KANO CORRELATION

	KA-1	KA-2	KA-3	KA-4	KA-5	KA-6	KA-7	KA-8	KA-9
KA-1		**	**	*		*		**	
KA-2	**		**	**	*	**			*
KA-3	**	**		*		**			
KA-4	*	**	*						
KA-5		*					**		
KA-6	*	**	**					**	*
KA-7					**			**	*
KA-8	**					**	**		**
KA-9		*				*	*	*	

* Correlation is significant at the 0.01 level (2-tailed)

** Correlation is significant at the 0.005 level (2-tailed)

Table 9b. *Functional Correlation*

FUNCTIONAL CORRELATION

	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-9
F-1		**	**	**		**		*	
F-2	**		**			**		*	**
F-3	**	**		**		**			*
F-4	**		**					**	
F-5									
F-6	**	**	**					**	
F-7								**	
F-8	*	*		**		**	**		*
F-9		**	*					*	

* Correlation is significant at the 0.01 level (2-tailed)

** Correlation is significant at the 0.005 level (2-tailed)

Table 9c. *Dysfunctional Correlation*

DISFUNCTIONAL CORRELATION

	DF-1	DF-2	DF-3	DF-4	DF-5	DF-6	DF-7	DF-8	DF-9
DF-1		**	**	**	**		*	**	**
DF-2	**		**	**	**		*	*	*
DF-3	**	**		**	**	*	**	**	**
DF-4	**	**	**		**	*	*	**	**
DF-5	**	**	**	**		*	**	**	**
DF-6			*	*	*		**	**	*
DF-7	*	*	**	*	**	**		**	*
DF-8	**	*	**	**	**	**	**		**
DF-9	*	**	**	**	**	*	*	**	

* Correlation is significant at the 0.01 level (2-tailed)

** Correlation is significant at the 0.005 level (2-tailed)

Table 10. *Matrix Correlation for Kano Evaluation*

	MKA-1	MKA-2	MKA-3	MKA-4	MKA-5	MKA-6	MKA-7	MKA-8	MKA-9
MKA-1		**	**	*				**	
MKA-2	**			**					*
MKA-3	**	**		*		**			
MKA-4	*								
MKA-5									
MKA-6			**					**	
MKA-7								**	
MKA-8	**					**	**		**
MKA-9		*						*	

4. CONCLUSION

The survey result shows that the student performance is not solely depend on the lecturer teaching method but also depend on the student ability and attitude towards the subject. Strong foundation in mathematics and electric circuit 1 concept is the most important factor that influences student grade. Student with strong foundation, performed well as they can relates the AC circuit analysis concept with simpler DC analysis and apply mathematical concept to solve any problems given. For the lower grade scorer, there is no difference between the first and second maximum value. This is due to they do not realized and considered the factors of lecturing methods and lecturer's ability to give lectures. They don't consider this as a factor that influences their performance in this subject. More solved examples and exercises given will become the attractive values for the student's especially from the lower grade student's and the latent need for the higher grade. Besides, suitable teaching methods and teaching aids will also influence student's performance as this could attract them to like the subject and perform well

According to the results, the way on how to improve student academic achievement can be determine, specifically the scores in tests/examination that enable lecturers to alter and improve his/her teaching methods. Lecturers should also investigate the most suitable learning approaches and make a shift in pedagogical techniques as well as to prepare the students to perform well during examination.

Knowledge of student learning preferences can also aid lecturers in class preparation, designing class delivery methods, choosing appropriate technologies, and developing sensitivity to differing student learning preferences.

It is hoped that the findings of the factors that influencing the student performance will help to identify the most suitable teaching and learning approaches to ensure continuous student improvement.

5. ACKNOWLEDGEMENT

The authors wish to thank Universiti Teknikal Malaysia Melaka for providing funding (PJP/2010/FKEKK (33G) S773) in support of this research.

6. REFERENCES

*[1]*J. Biggs, "Teaching for Quality Learning at University", *Open University Press*, Buckingham, UK, 2000.

[2] The Green Report, "Engineering Education for a Changing World", *Amer. Soc. Eng. Educ. (ASEE 1994)*, Wash. DC, 1994

[3] ABET 2000 Criteria (1998), "Criteria for Accrediting Engineering Programs", 1998

[4] Zaiton Abdul Mutalip, Norihan Abdul Hamid, Nurmala Irdawaty Hassan, "Emphasising OBE in UTeM Subjects to Develop Human Capital", *Proc of the 2nd Inter. Conf. on Eng.g Edn: ICEED 2009*, Kuala Lumpur, Malaysia, Dec 7th – 8th, 2009

[5] Rozeha AR., Razimah A., Azami Z., Hamzah AG., Saidfudin M., "Engineering Students Performance Evaluation of Generic Skills Measurement: ESPEGS Model", *5th WSEAS/IASME Inter. Conf. on Eng. Edn. : EE'08*, Heraklion, Greece, July 22-24, 2008

[6] P. Ramsden, "Learning to teach in Higher Education". London, UK: Routledge, 1992.

[7] Eduardo Montero, Maria Jesus Gonzalez, "Student Engagement in a Structured Problem-Based Approach to Learning: A First Year Electronic Engineering Study Module on Heat Transfer", *IEEE Transactions on Education*, Vol. 52, No 2, May 2009.

[8] Louden, W., "Standards for Standards: The Development of Australian Professional Standards

For teaching", *Australian Journal of Education*, Vol. 44 No. 2, 2000, pp. 118-34.

[9] Honore, S., "Learning to Lead with E-learning", *Training Journal*, January, 2003, pp. 16-22.

[10] Rueda, M., "How to Make e-learning Work for Your Company", *Workspan*, Vol. 45 No. 12, 2002, pp. 50-53.

[11] Kekkonenoneta, S. and G.B. Moneta, "E-learning in Hong Kong: Comparing Learning Outcomes in Online Multimedia and Lecture Versions of an Introductory Computing Course", *British Journal of Educational Technology*, Vol. 33 No. 4, 2002, pp. 423-433.

[12] Berger, C., Blauth, R., and D. Boger, "Kano's Methods for Understanding Customer Defined Quality", *The Journal of the Japanese Society for Quality Control*, Fall 1993, , pp. 3-35.

[13] Aggarwal, A.K., and R. A. Phelps, "MBA Students Wants and Needs: A KANO Approach." *Southeast Decision Sciences Institute Conference*, 21 – 23 February 2007 , the Savannah Marriott Riverfront Hotel, Georgia - USA

[14] Matzler, K., Hinterhuber, H.H., Bailom, F.,and E. Sauerwein, "How to Delight Your Customers", *Journal of Product & Brand Management*, Vol. 5 No. 2, 1996 pp. 6-18

[15] Sihombing, H., Yuhazri, M.Y., and A.R. Jeefferie,"Analyze the Latent Needs of Customer Satisfaction by Using 2nd Maximum Criteria and Matrix Kano Correlation", *Journal of Customer Behavior* , 2010, (KIV).