An Investigation on the Factors Affecting Teaching Effectiveness of Undergraduate Engineering Programmes

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Abstract
Teaching effectiveness has been a key concern for universities since it pertains to the achievements of skills required for the competitive job market. This study aims to identify the factors that might influence teaching effectiveness. For the purpose of the study, data were collected from the seventh semester students of manufacturing engineering programme and product design engineering programme of one university in the northern Peninsular of Malaysia. A structured questionnaire was used and the responses were gathered with a five point Likert Scale. 130 set of questionnaires were collected and were then analysed with partial least square structural equation modelling (PLS SEM) method. The PLS findings revealed that lecturers' ability, course characteristics and teaching methods & materials are strong predictors of teaching effectiveness. The outcome of this PLS analysis may pave the way for universities to develop new guidelines so as to improve teaching effectiveness. Consequently, this effective teaching will equip the university graduates with the necessary knowledge and skills required by employers.

Key words: Teaching effectiveness, lecturers' ability, course characteristics and teaching methods and materials.

Introduction

Traditionally, teaching means imparting knowledge or skill. It is used interchangeably with Pedagogy (Diamond, 2013). Effective means efficient or successfully producing desired result or outcome. Teaching Effectiveness (TE) encompasses imparting relevant knowledge and skills efficiently or successfully to the point where students can demonstrate mastery over the subject or courses taught (Van der Marwe, 2012). Scholars have defined "Teaching Effectiveness" according to different objectives and teaching characteristics. For the teaching characteristics of engineering colleges, teaching effectiveness is also connoted as follow: effective teaching is teaching activities the teacher applies, at the optimal pace, effectively and efficiently to encourage or allow the students to achieve "three dimensions objectives", encompassing (i) knowledge and skills, (ii) process and methods, and (iii) attitudes and values while sustaining progress and development in order for the students to meet the education standards of the society and the students' own personal needs (Li et al., 2013). Van der Marwe (2012) asserts that the ultimate result of effectiveness of teaching is the student learning and mastering the content of specific courses. Over the course of the last decade, the public, along with many disciplinary organizations have increased the pressure on institutions of higher learning to evaluate student learning and instructional effectiveness (Dunn et al., 2007; Diamond, 2008; Dunn et al., 2011). Therefore, teaching effectiveness at institutions of higher learning (IHL) has been the focus of many researchers (Cohen, 1981; Lewis et al., 1988; Mukherji & Rustagi, 2008).

In order to assess the validity of student evaluation of teaching, one must first arrive at an adequate definition of teaching effectiveness (TE). Teaching is multidimensional in nature and there are many possible indicators of teaching effectiveness (TE). For instance, in addition to examining student achievement, other factors such as student motivation, interest in subject matter and career aspirations can be impacted by teaching (Stark-Wroblewski et al., 2007).

The quest for excellence in college and university teaching is a worldwide concern and institutions of higher learning (IHL) pay more and more attention to the quality of the teaching practiced in their classrooms and to assessing how effectively professors are teaching (Ovando, 1989). Educators believe that the act of teaching creates an intimate and inseparable relationship between teacher and student (Ovando, 1989). This symbiotic relationship must be considered an important element in the process of evaluating and improving instruction in

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higher education, especially since the ultimate result of effectiveness of teaching is student learning and their mastering of the content of specific courses. Therefore, students' feedback and perceptions of teaching should play a role in improving the quality of education (Van der Marwe, 2012). This quality education should also guarantee the employability of the graduates. Students' evaluation of teaching effectiveness (SET) is the mostly used method of evaluating teaching outcome so far (Hooper & Page, 1986; Cranton & Smith, 1990; Holtfreter, 1991; Toby, 1993). Researchers around the world are using this SET approach to study TE. Researchers use lecturers' ability, course characteristics and teaching methods & materials as measurements for teaching effectiveness (Marsh & Dunkin, 1992; Shevlin et al., 2000; Masood et al., 2006).

In higher education, the measurement of perceived service quality from the students' perspective is increasingly becoming important (O'Neill & Palmer, 2004; Stodnick & Rogers, 2008). However, some issues relating to the construct and its measurement from the students' perspective need to be examined. For instance, the determinant dimensions of TE are still not clear. Though there are some measures of TE, it has to be designed based on the measurement instrument. Research literature shows that there is lack of consensus on the attributes and dimensions that influence TE (Shevlin et al., 2000). Moreover, there is paucity (inadequate) of empirical studies regarding the factors that constitute TE and to what extent TE is influenced by the existing factors (Abrami et al., 1997; Marsh & Roche, 1997). Debate also exists regarding the merits of using an overall evaluation model versus using a multidimensional framework for evaluation of TE relating to personnel decisions. According to Abrami et al. (Abrami, 1985, 1989; Abrami & d'Apollonia, 1997; Abrami & d'Apollonia, 1999), a single overall assessment of TE should be employed by considering average responses across several global attributes to overcome the limitations of a one-dimensional analysis approach for summative decisions. Though there are some valid measures of student evaluation of TE, it is yet to be investigated how much these measures can influence TE at university level graduate education. Thus, there is ambiguity on whether the determinant variables are dominant because they are measurable. It is also unclear how much the dimensions of student evaluation of teaching effectiveness (SET) can influence TE construct (Abrami et al., 1997; Marsh & Roche, 1997). In essence the debate is about the factors affecting TE. Therefore, research applying PLS needs to be conducted to explore the factors influencing teaching effectiveness on engineering programmes. Moreover, there is hardly any study applying PLS analysis method conducted in Malaysia regarding the determinants of TE in engineering programmes. Hence this study aims to identify the factors that might influence TE in engineering programmes.

Literature Review

Although student evaluations have become the primary tool used to evaluate the teaching effectiveness of their faculty (Seldin, 1989), Simpson (1995) found that student evaluations were the most consistent but most controversial source of information used to evaluate TE. Despite some dissent among higher education professionals, a large body of research evidence indicates that student evaluation of teaching is valid. This opinion is partly based on evidence from the research showing a positive correlation between student evaluations of faculty members and objective measures of student achievements (Yunker & Yunker, 2003).

Hamid and Pihie (2004) stated that service quality factors in teaching comprised five measures: Lecturer factor, Teaching methodology, Course relevance, Facilities, and Support services. However, Hamid and Pihie (2004) conducted analysis on the quality of teaching using only the measures for Lecturer factor, Teaching methodology, and Course relevance because these were the only dominant factors assumed to be directly under the control or influence of the Faculty and lecturers. Though researchers are using lecturers' characteristics, course characteristics and teaching methods & materials as the measures for teaching outcome, researches applying PLS have not been done yet to identify the factors significantly influencing TE in undergraduate engineering programmes. All the studies have been done in discrete ways that call for uniting the determinants of TE in a single framework. The next section discusses all these constructs.

Lecturers' Ability

Educators believe that the act of teaching creates a symbiotic relationship between teacher and student (Ovando, 1989). This intimate and inseparable relationship must be considered an important element in the process of evaluating and improving instruction in higher education, especially since the ultimate result of teaching effectiveness is student learning and mastering of the content of specific courses. Therefore, students' feedback and perceptions of teaching should play a role in improving the quality of education (Van der Marwe, 2012).

Evaluating a faculty member's teaching ability is one of the most difficult and contentious tasks faced by administrators. Although teaching ability is regarded one of the primary factors in promotion and

tenure decisions, there is little agreement on how teaching effectiveness should be measured (Lewis et al., 1988; Mukherji & Rustagi, 2008; Van der Marwe, 2012). Smith (1995) stated that in education, teachers are the main resource in creating high-quality opportunities for the students. Sometimes teachers do good things and do bad things. Teachers should understand what they do and their willingness to share all this will have an effect on students.

According to Bates (2012), great communication between students and teachers are the building blocks of the best educational relationship that a teacher and student should have. The good instructors are noted by how they explain the information to their students. How well they provide feedback to express ideas and questions freely between learners and educators. With the advent of the latest technology in education, teachers and lecturers can promote themselves as modern educators. They can connect positively to students every time and at varied ways.

According to Ihmeidah et al. (2010), teachers are collecting, sorting, analyzing and explaining information to students. Teachers should have good communication skills to be successful in their jobs. Teachers need listening, interpersonal, written and oral communication skills to facilitate teaching. The outcome of the attitudes toward communication skills can make both teachers and their students become more prepared for their classroom environment and improve effective communication. Therefore this study hypothesizes that;

H1: Lecturers' Ability positively influences teaching effectiveness.

Course Characteristics

The course characteristics are related to academic programmes given to students (Le Blanc & Nguyen, 1997; Kwek et al., 2010). Considerable evidence exists that the subject matter of a course affects students' evaluation of teaching effectiveness (SET) (Neumann & Neumann, 1983; DeBerg & Wilson, 1990). Some authors suggested that the nature of the subject might explain the variation in SET results (Cranton & Smith, 1986; DeBerg & Wilson, 1990; Clark, 1993; Langbein, 1994). The course content, service given by the lecturers and the faculty, course assessment, instruction medium, concern for students and facilities constitute the course characteristics of the program (Peng & Samah, 2006). The assessment dimension of teaching is related to the standards and academic assessment system applied by the university (Peng & Samah, 2006). Academic score – for formal educational institutions – is an outcome indicator of the success of an educational program (Sang, 2007). Achievement of a university student is generally measured by his or her academic score or grade point average (GPA). Research by Lagrosen et al. (2004) shows that internal evaluation, including course evaluation, is one of student perceived service quality which denotes the teaching outcome. Hence the course characteristics are being used as a standard measure for teaching effectiveness.

Lizzio et al. (2002), proposed good teaching, clear goals and standards, appropriate workload, appropriate assessment, emphasis on independence and generic skills, and an overall satisfaction item that can be used as a simple means for the criterion-related validity checking of these scales.

In many articles, curriculum is also known as course content (Peng & Samah, 2006; Kwek et al., 2010), subject content (Athiyaman, 1997), program issues (Ford et al., 1999), and academic concerns (Russell, 2005). Several articles show that curriculum is overall student perceived outcome determinant (Athiyaman, 1997; Sohail & Shaikh, 2004). Other research shows that curriculum has a positive relationship with overall student perceived quality or teaching outcome (Le Blanc & Nguyen, 1997; Kwek et al., 2010). Previous literature indicates that curriculum has a positive influence on overall student perceived service quality, and was referred to as a student perceived service quality determinant (Athiyaman, 1997; Sohail & Shaikh, 2004). The assessment system also has a positive significant effect on overall teaching outcome. This means that any improvement in the assessment dimension will result in improved perceived service quality. Thus, the assessment system is also an important issue for making teaching effective and its importance is increasing. Therefore this study hypothesizes that;

H2: There is positive association between course characteristics and teaching effectiveness.

Teaching Methods & Materials

Universities all over the world are using teaching methods and materials as ways to increase teaching outcome. Their teaching methods & material include both academic and extra curricula activities that include teaching and student involvement in curriculum; joint consultation; work expertise placements, computing facilities, library service, university bookshop, careers service; counseling welfare; financial service; health service; accommodation services, students' union; catering service; physical education and travel agency (Hill, 1995). Athiyaman (1997) also mentioned that

teaching capability, staff availability, library service, computing facilities; class sizes, subject content, student workload and recreational facilities might bring forth better teaching outcome of university graduates.

Lizzio et al. (2002) proposed good teaching, clear goals and standards, appropriate workload, appropriate assessment, emphasis on independence and generic skills, and an overall satisfaction item that can be used as a simple means for teaching effectiveness. On the other hand, Lagrosen et al. (2004) stated that teaching outcome can be improved by corporate collaboration, information and analysis, courses offered, internal evaluations, computer facilities, collaboration and comparisons and finally library resources. Therefore, this study hypothesizes that;

H3: Teaching methods & materials are positively correlated with teaching effectiveness.

Methodology

This study is exploratory in nature since it attends to an area of study where there have been previous studies conducted, but yet required further exploratory study to answer other questions that are yet to be addressed. Through the literature review, lecturers' ability, course characteristics and teaching methods & materials have been identified as the measurements for teaching effectiveness.

The nine (9) Course Characteristics (CC) Items in the structured questionnaire is listed in Table 1 derived from literature review. The nine (9) Lecturers' Ability (LEC) Items in the structured questionnaire is listed in Table 2 derived from literature review. The five (5) Teaching Methods & Materials (TM) Items in the structured questionnaire is listed in Table 3 from literature review. The seven (7) Teaching Effectiveness (TE) Items in the structured questionnaire is listed in Table 4 derived from literature review.

For the purpose of this study, data was collected from the seventh semester students of manufacturing engineering programme and product design engineering programme of one university in the northern part of Peninsular Malaysia. A structured questionnaire with a total of thirty (30) items listed in Table 1, Table 2, Table 3 and Table 4 was used and the responses were gathered with a five point Likert Scale. 130 set of questionnaires were collected and were then analysed with partial least square structural equation modeling (PLS SEM) method. In the PLS SEM measurement model, the quality criteria were assessed before testing the structural model. After that, the PLS SEM structural model was run and the output was used to test the hypotheses of the study.

The structural model is multi items, complex with many structural relations, and many indicators in order to reduce PLS-SEM bias (Hair et al., 2014). The PLS path model was broadly used for its suitability in determining complex relationship (Fornell et al., 1990). Hence, PLS path model has been the common choice to researchers for studies in complex models having latent variable. The description of PLS model can be divided into two models. The first model is measurement model linking the manifest variables (MVs) to their latent variables (LVs). The items listed in Table 1, Table 2, Table 3 and Table 4 are the Manifest Variables (MVs). Lecturers' Ability (LEC), Course Characteristics (CC), Teaching Methods & Materials (TM) and Teaching Effectiveness (TE) are the latent Variables (LV). This model is attributed to the outer model.

Table 1: Course Characteristics (CC) Items

Course Characteristics (CC)	
C1	The courses objectives were clearly explained
C2	The course outline provided the accurate description of the courses.
C3	The topics of each course were dealt in sufficient depth (detail).
C4	Course requirements (assignments, exams & others) were adequately explained
C5	The courses fulfilled the students' expectations
C6	The program has instilled the ability to solve complex engineering problems
C7	Workloads (assignments, reports, exams) were appropriate
C8	Assessment methods were appropriate and effective
C9	The grading policy was clearly explained

Table 2: Lecturers' Ability (LEC) Items

Lecturers' Ability (LEC)	
L1	The lecturers have adequate communication skill
L2	The lectures presented materials in an organized and systematic (coherent) way.
L3	The lecturers always made the class enjoyable.
L4	The lecturers were able to explain difficult concepts in a clear and straightforward way
L5	The lecturers made use of examples and illustrations in his or her explanations of concepts
L6	The lecturers were successful in presenting the subject matter in an interesting way
L7	The lecturers successfully encouraged students to think independently and do supplementary reading in the subject matter.
L8	The lecturers have in depth knowledge in the respective subject taught.
L9	The lecturers were responsive to students' needs.

Table 3: Teaching Methods & Materials (TM) Items

Teaching Methods & Materials (TM)	
TM1	The teaching methods were effective
TM2	The course materials were up to date, well prepared and useful
TM3	The use of information technology made the teaching style easier and effective.
TM4	The course materials were adequate for learning the subject matter.
TM5	The assignments were relevant and useful.

Table 4: Teaching Effectiveness (TE) Items

Teaching Effectiveness (TE)	
TE1	I learned a lot from the courses taught in my class
TE2	I would recommend others to do the program here.
TE3	I am confident enough to materialize the knowledge (gained from the courses) in my professional life
TE4	Now I can explain to others what I learned from the program/courses
TE5	I have achieved the outcome that I need
TE6	The study materials were suitable to achieve the outcome
TE7	Overall, I am satisfied with the courses taught here.

The second model is a structural model that relates endogenous LVs to other LVs. In PLS, this model is termed as the inner model. In this study, the inner model consist of three (3) relationships, between Lecturers' Ability (LEC) to Teaching Effectiveness (TE), Course Characteristics (CC) to Teaching Effectiveness (TE), and Teaching Methods & Materials (TM) to Teaching Effectiveness (TE). A number of criteria suggested by Chin (1998) are commonly used to measure partial model structures. All these criteria are applicable for assessing both the outer model and the inner model.

Among variance-based SEM methods, partial least squares (PLS) path modeling is regarded as the "most fully developed and general system" (McDonald, 1996) and has been called a "silver bullet" (Hair et al., 2011). PLS is widely used in information systems research (Marcoulides & Saunders, 2006), strategic management (Hair et al., 2012), marketing (Hair et al., 2012), and beyond. Its ability to model both factors and composites is appreciated by researchers across disciplines, and makes it a promising method particularly for new technology research and information systems research. Whereas factors can be used to model latent variables of behavioral research such as attitudes or personality traits, composites can be applied to model strong concepts (Höök & Löwgren, 2012), i.e. the abstraction of artifacts such as management instruments, innovations, or information systems. Consequently, PLS path modeling is a preferred statistical tool for success factor studies (Albers, 2010).

Recent research confirms that PLS serves as a promising technique for prediction purposes (Becker et al., 2013). Both measurement models and structural models can be assessed with regard to their predictive validity. Blindfolding is the standard approach used to examine if the model or a single effect of it can predict values of reflective indicators. It is already widely applied (Hair et al., 2012; Ringle et al., 2012). Henseler et al. (2016) anticipate that once business and social science researchers' interest in prediction becomes more pronounced, PLS will face an additional substantial increase in popularity.

The core of PLS is a family of alternating least squares algorithms that emulate and extend principal component analysis as well as canonical correlation analysis. The method was invented by Wold, H.O.A. (cf. 1974, 1982) for the analysis of high-dimensional data in a low-structure environment and has undergone various extensions and modifications. In its most modern appearance (cf. Dijkstra & Henseler, 2015), PLS path modeling can be understood as a full-fledged SEM method that can handle both factor models and composite models for construct measurement, estimate recursive and non-recursive structural models, and conduct tests of model fit.

There are two steps in PLS SEM analysis, namely measurement model and structural model. PLS path models are formally defined by two sets of linear equations: the measurement model (also called outer model) and the structural model (also called inner model). The measurement model specifies the relations between a construct and its observed indicators (also called manifest variables) by measuring the reliability and validity of the data, whereas the structural model specifies the relationships between the constructs and provides the findings for hypothesis testing.

The structural model consists of exogenous and endogenous constructs as well as the relationships between them. The values of exogenous constructs are assumed to be given from outside the model. Thus, exogenous variables are not explained by other constructs in the model, and there must not be any arrows in the structural model that point to exogenous constructs. In contrast, endogenous constructs are at least partially explained by other constructs in the model. Each endogenous construct must have at least one arrow of the structural model pointing to it. The relationships between the constructs are usually assumed to be linear. The size and significance of path relationships is typically the focus of the scientific endeavors pursued in empirical research.

The PLS-SEM approach is a good and flexible tool for statistical model building as well as prediction (Ringle et al., 2012). The PLS technique was used in this study for the following reasons:

(i) Structural equations models have been demonstrated to be superior models that perform estimations better than regressions

(Iacobucci et al., 2003; Preacher & Hayes, 2004). This technique is most appropriate when the sample size is relatively small (Lei & Lomax, 2005). Nevertheless, Lei and Lomax (2005) found that standard errors decreased at larger sample sizes and recommended sample sizes of 100 or more for accurate parameter estimates. For this study, data was collected from the seventh semester students of manufacturing engineering programme and product design engineering programme of one university located in the northern part of Peninsular Malaysia Perlis. 130 sets of questionnaires were collected and analysed.

(ii) PLS path modeling becomes more appropriate for real world applications and more advantageous to use when models are complex (Hulland, 1999). The soft modeling assumptions of PLS technique (i.e., ability to flexibly develop and validate complex models) gives it the advantage of estimating large complex models (Akter et al., 2011).

(iii) Data tend to have normality problem in most social science studies (Osborne, 2010) but PLS path modeling does not necessarily require data to be normal (Chin, 1998). In other words, PLS treats non-normal data relatively well. By and large, PLS path modeling was selected for this study to help avoid any normality problem that might arise in the course of data analysis for the current study.

(iv) PLS-SEM offers more meaningful and valid results, while other methods of analysis such as a software package like SPSS often result in less clear conclusions and would require several separate analyses (Bollen, 1989). Furthermore, Tabachnick and Fidell (2007) stated that PLS-SEM is one of the most powerful statistical tools in social and behavioural sciences that have the ability to test several relationships simultaneously.

(v) Smart PLS path modeling was used in this study to establish measurement and structural models. The PLS path modeling is more suited to complex models such as those with hierarchical constructs (with a complete disaggregation method), mediating and moderating effect (Chin et al., 2003). The PLS modeling has to be employed in the initial stage of theoretical development to assess and validate exploratory models.

Findings

This study used PLS SEM as a technique to analyse the data; and at first the measurement model output is analysed. Table 5 shows the output of measurement model.

Reliability Test

In this study reliability test was done and evaluated using Cronbach's alpha values. Table 5 depicted the Cronbach's alpha values for the constructs as; 0.874 for course characteristics (CC); 0.901 for lecturers' ability (LEC); 0.840 for teaching methods & materials (TM); and 0.899 for teaching effectiveness (TE). All the Cronbach's alpha values are above 0.7 which is considered as acceptable reliability values (Nunally, 1969). In addition to the Cronbach's alpha values, composite reliability (CR) was also tested and the acceptable value of CR is 0.7 and above (Hair et al, 2010). In this study all the constructs had composite reliability of more than 0.70. Therefore, the data in this study shows good internal consistency.

Convergent Validity Test

Convergent validity is tested to see whether the items represent the constructs or not. In this study convergent validity was tested by evaluating the values of items loading and average variance extracted (AVE). Usually the acceptable values of item loading are 0.50 and above (Hair et al, 2006). However, item loading 0.40 is also acceptable if the average variance extracted or AVE values are above 0.50. Table 5 shows that all the items loading are above 0.50 (except TM2) which gives convergent validity at indicators levels. On the other hand all the AVE values for the constructs are above the minimum threshold level which is 0.5. Therefore, it can be concluded on the basis of the findings that the values of AVE and item loadings are good enough for the validity of the data.

Discriminant Validity

Discriminant validity was also tested using smart PLS 2.0M3 software. Table 6 shows the discriminant validity output of the study. According to Compeau et al. (1999), the average variance shared between each construct and its indicators should be greater than the variance shared between the construct and other construct. When the AVE is higher than the estimated correlations among each pair of constructs, discriminant validity is established. The measurement model also demonstrates good discriminant validity since the square root of the AVE for each construct was higher than its correlation with other factors.

Therefore, the above description indicates that the values of Cronbach's alpha are above the minimum level, composite reliability values for all the constructs are above the acceptable range, item loading, AVE and square root of AVE are also within the acceptable range. Therefore, it can be concluded

that the data of this study have good reliability and validity.

Predictive Relevance (Q^2)

The predictive sample relevance technique (Q^2) can effectively be used as a criterion for predictive relevance (Stone, 1974; Geisser, 1975; Fornell & Cha, 1994). Based on blindfolding procedure, Q^2 evaluates the predictive validity of a large complex model using PLS. While estimating parameters for a model under blindfolding procedure, this technique omits data for a given block of indicators and then predicts the omitted part based on the calculated parameters. Thus, Q^2 shows how well the data collected empirically can be reconstructed with the help of this model and the PLS parameters (Fornell et al., 1990). According to Chin (1998), the Q^2 values of 0.02, 0.15 and 0.35 stand for small, medium and large predictive relevance. The Q^2 value of this study is 0.633 for teaching effectiveness which is an indication of a good predictive relevance capability of the model.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) value indicates how much variation in endogenous variable is caused by the exogenous variables. The present study got a R^2 value of 0.950 for teaching effectiveness (TE) which indicates that the dependent variable is influenced by the independent variables by 95%. Therefore, the three (3) independent variables namely course characteristics, lecturers' ability and teaching methods & materials considered in this study have substantial effect on the teaching effectiveness.

Goodness of Fit (GOF)

Goodness of Fit (GOF) index is crucial to assess the global validity of a PLS based complex model (Tenenhaus et al., 2005). It is the geometric mean of the average communality and average R^2 for all endogenous constructs. The GOF index is bound between 0 and 1. Wetzels et al. (2009) suggest using 0.50 as the cutoff value for communality (Fornel & Larcker, 1981) and different effect sizes of R^2 (Cohen, 1988) to determine GOF small (0.10), GOF medium (0.25) and GOF large (0.36). These may serve as baselines for validating the PLS based complex models globally. This study obtained a GOF value of 0.747 for teaching effectiveness which exceeds the cut-off value of 0.36 for large goodness of fit (Cohen, 1988). Therefore, the GOF value indicates a good model fit for the study.

Structural Model Output

In the structural model of PLS analysis, hypotheses testing can be done. Here the path coefficient, t-statistics, average estimate and error are considered. Table 7 shows the structural model output for hypothesis testing.

Hypothesis 1: There is a positive relationship between lecturers' ability and teaching effectiveness. The present study proves this hypothesis. The path coefficient here is 0.553 with a positive sign and this value is significant at 1% level (t value = 6.016; $p < 0.01$). Therefore, it is accepted that lecturers' ability is positively and significantly correlated with teaching effectiveness. This is consistent with the findings of Wei Hong & Shen (2002) and Yunker & Yunker (2003).

Hypothesis 2: There is a positive significant relationship between course characteristics and teaching effectiveness. This hypothesis is supported as the path coefficient value is 0.018 (t value = 1.929; $p < 0.05$) indicating a 5% significance level. Therefore, it is accepted that course characteristics positively influences teaching effectiveness. This is consistent with the findings of Le Blanc & Nguyen, (1997); Kwek et al., (2010); Athiyaman (1997) and Sohail & Shaikh (2004) who also found a positive relationship between course characteristics and teaching effectiveness.

Hypothesis 3: Teaching methods & materials positively influence teaching effectiveness. The finding shows that this variable is significantly and positively correlated with teaching effectiveness. The path coefficient for this variable was 0.419 (t value = 5.280; $p < 0.01$). Therefore, the findings reveal that teaching methods & materials are a significant factor that positively influences teaching effectiveness which leads to the-conclusion that hypothesis 3 is accepted. This supports the findings of Lizzio et al. (2002) and Sang (2007).

Discussion and Conclusion

Universities should design the courses or programmes in a way so that students can achieve the required skills necessary for the competitive job market. For this reason teaching effectiveness has become a key issue for the educational institutions. Through extensive literature review this study tested lecturers' ability, course characteristics, and teaching methods & materials as the determinants of teaching effectiveness. This empirical study revealed that lecturers' ability is the most important factor followed by teaching methods & materials, and course characteristics for teaching effectiveness. Lecturers are the ones who might exhort great influence on their students. This is due to the fact that lecturers have direct contact with the students. Educators believe that the act of teaching creates an intimate

and inseparable relationship between teacher and student (Ovando, 1989). This mutually beneficial relationship must be considered an important element in the process of evaluating and improving instruction in higher education, especially since the ultimate result of teaching effectiveness is student learning and mastering of the content of specific courses. It is also proven in this study that lecturers' ability is the most significant factor that might ensure teaching effectiveness. If the lecturers have strong command on their subject knowledge and they are good enough to make things clear to students, it would surely yield better teaching outcome which is the expectation of both graduates and employers. Better teaching outcome also improves the chances of graduates' employability. Therefore, universities should emphasize on the lecturers' ability to ensure teaching effectiveness.

Course characteristics obviously influence the learning process of the university students. The course content, service given by the lecturers and the faculty, course assessment, instruction medium, concern for students and facilities constitute the course characteristics of the program (Peng & Samah, 2006). Educational researchers think that course characteristics are important issues to the success of any teaching programs (Lagrosen et al., 2004). The present study found that course characteristics are significantly related to teaching effectiveness. It implies that teaching effectiveness can be gained by providing the students a clear guideline of course structures, specific strategies of teaching to achieve learning goals and setting proper schedule. From the beginning of the courses, students should be given the syllabus which is a guideline of information about the course schedule, test dates, due dates for assignment, the policy for grading of the subject, specific classroom rules and etc. If they get this earlier in the semester, it will help them to make plans for the whole academic semester. This clear guideline regarding the courses might help the students to grasp the comprehensive knowledge of a particular subject. Hence universities should put forth efforts to develop an effective course curriculum and provide it to the students so that the best teaching outcome can be achieved.

Teaching Methods & Materials also play an important role in imparting knowledge to university students. The process of teaching and physical facilities that support both academic and non-academic activities are expected to generate positive effect on teaching outcome (Joseph et al., 2005; Peng & Samah, 2006; Kwek et al., 2010). The empirical data in this study also reveal that teaching methods & materials are positively and significantly correlated to teaching effectiveness. This finding calls for the enhancement of academic and non-academic facilities like physical evidence, computing facilities, joint consultation, work expertise placements, library service, university bookshop, careers service, counseling welfare, financial service, health service, accommodation services, students' union; catering service, physical education staff availability, class sizes, and recreational facilities which might bring forth better teaching outcome of university graduates.

The empirical data in this study proves that there is a positive significant relationship between lecturer's ability, course characteristics, and teaching methods & materials with teaching effectiveness. This is shown to be consistent with the findings of previous researchers. Thus, the present study generates a number of practical implications.

The outcome of this study might pave the ways for universities to develop new guidelines so as to make their teaching effective. Effective teaching will equip the university graduates with the necessary knowledge and skills required by the employers. The study revealed that teaching effectiveness can be gained by good lecturers, well designed course characteristics and sufficient supports related to teaching materials and methods. Students' rating on teaching effectiveness of courses taught at universities or other institutions is widely accepted in order to evaluate their teaching quality.

It is expected that this type of evaluation provides constructive feedback on the dimensions of teaching effectiveness construct which might help them make a difference in their teaching achievements. Previously, researchers only focused on developing and validating the measures of teaching effectiveness; but issues relating to the specific constructs that might influence teaching effectiveness still remained unaddressed. Moreover, research literature indicated lack of consensus on the attributes and dimensions that influence teaching effectiveness and there is an ongoing debate about the psychometric qualities of the measurement instruments deployed (Shevlin et al., 2000).

There is still lack of consensus about the number of dimensions that constitute TE and to what extent TE is influenced by the existing factors (Abrami et al., 1997; Marsh & Roche, 1997). This study provides strong support for all these gaps as it explored the significant predictors of teaching effectiveness. By doing so, this study substantially reduces the literature gap in this field.

Table 5: Output of Measurement Model

Variable	Items	Loadings	Cronbach's alpha	Composite Reliability	Average Variance Extracted (AVE)
Course Characteristics (CC)	C1	0.737	0.874	0.900	0.536
	C2	0.750			
	C3	0.723			
	C4	0.535			
	C5	0.864			
	C6	0.803			
	C7	0.550			
	C8	0.827			
Lecturers' Ability (LEC)	L1	0.810	0.901	0.919	0.561
	L2	0.647			
	L3	0.773			
	L4	0.760			
	L5	0.699			
	L6	0.689			
	L7	0.826			
	L8	0.679			
	L9	0.833			
Teaching Methods & Materials (TM)	TM1	0.861	0.840	0.889	0.633
	TM2	0.475			
	TM3	0.900			
	TM4	0.819			
	TM5	0.822			
Teaching Effectiveness (TE)	TE1	0.876	0.899	0.922	0.624
	TE2	0.707			
	TE3	0.824			
	TE4	0.788			
	TE5	0.774			
	TE6	0.686			
	TE7	0.891			

Table 6: Discriminant Validity Output

Constructs	CC	LEC	TM	TE
Course Characteristics (CC)	**0.732**			
Lecturers' Ability (LEC)	0.509	**0.748**		
Teaching Methods & Materials (TM)	0.625	0.705	**0.795**	
Teaching Effectiveness (TE)	0.624	0.732	0.715	**0.781**

Table 7: Structural Model Output

Hypotheses	Variables	Path Coefficient	Standard Error	t-value	p-value	Level of Significance
H1	LEC -> TE	0.553	0.092	6.016	0.000	Acceptable
H2	CC ->TE	0.018	0.041	1.929	0.027	Acceptable
H3	TM ->TE	0.419	0.079	5.280	0.000	Acceptable

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