LEARNING ENVIRONMENT AND LEARNING APPROACHES : STRUCTURAL EQUATION MODEL

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ABSTRACT

The purpose of this study is to explore the relationship between learning environment and learning approaches among engineering students. A total of 527 final semester engineering students at technical institute in Malaysia were involved in this study. Data were collected using two sets of questionnaire namely: 1) Course Experience Questionnaire (CEQ) to measure learning environment and ii) Revised Two-Factor Study Process Questionnaire (RSPQ-2F) to measure learning approach. The Structural Equation Model (SEM) was tested using AMOS 18 software. The findings supported the hypothesized relationship between learning approaches and learning environment where by two relationship paths can be concluded: (i) learning environment showed a significant positive relationship with the deep-learning approach and (ii) learning environment showed a significant negative relationship with the surface-learning approach.

Keywords*: learning environment, Course Experience Questionnaire, Revised Two-Factor Study Process Questionnaire*

1. Introduction

The learning environment plays important roles in the cognitive, effective and social students. Reviewing the learning environment is given due attention to this day because of its importance in helping to improve learning outcomes. In order to become the best TVET provider in higher education level, all the parties involved need to understand the general objective for higher education whereby to teach, facilitate, and encourage students to learn. To achieve these objectives, factors that affect student learning should be explored. A review of the literature revealed that there is a relationship between learning environment factors and learning approaches. Learning approaches referred to the way students deal with academic tasks that were related to their learning outcomes. Learning approaches is a behavior of students affected by their learning environment and consisted of two type namely deep approach and surface approach. In general, the deep approach entails a dynamic effort to understand the overall meaning, clarify the evidence and relate it to the conclusion with the intent to comprehend (Al-Qahtani, 2015). On the other hand, the surface approach entails an effort to memorize unrelated facts or information with the intent to fulfil course requirements (Al-Qahtani, 2015).. Previous studies found that learning environment has a positive relationship with the deep learning approach and a negative relationship with the surface learning approach (Lizzio et al. 2002; Goh, 2005; Kember & Leung, 1998; Karagiannopoulou & Christodoulides, 2005; Gijbels & Dochy, 2006; Kember, Leung & Ma, 2007; Ramsden, Prosser, Trigwell & Martin 2007; Seri Bunian et al, 2011; Seri Bunian et al, 2012, Siti Mistima et al, 2010; Rajaratnam & D'cruz, 2016).

Therefore, this present study aims to extend current literature by examining how learning approaches interact with student learning environment. Whilst available research has demonstrated the relationship between those variables but research regarding its specific impact on student learning approaches is relatively rare. Based on previous empirical

evidence, it's hypothesized that there is a relationship between learning approaches and learning environment. From a conceptual standpoint, one might also expect that conducive learning environment will plays a stronger role in predicting high deep learning approaches for students compare with surface learning. The hypothesized relations in the current paper are also in accordance with Biggs' (1999) 3P model, in which student learning is considered to be a function of a causal relationship between presage (student characteristics and course/departmental learning context), process (students' perception of context and approaches to learning), and product (students' learning outcomes in terms of performance and understanding). To sum up, the current article will primarily address the following problems:

- *The structural and causal relationships between approaches to learning (deep and surface) and learning environment.*

Thus, the objective of this study was to develop a model explaining how learning approaches and learning environment are related directly. In the past, attempts have been made to test relationships between elements of such a model. For instance, an important area of research has been involved with the relationships between learning approaches and learning environment (i.e. Goh 2005; Lizzio 2002). However, modelling these relationships into a comprehensive model for Malaysia's technical student learning approaches and learning environment has, to our knowledge, never been attempted. The following variables were included into the model: learning approaches and learning environment in terms of deep learning and surface learning. It is expected that the student learning environment will encourage students to develop learning approaches. This theory concerning the relationship between learning approaches and learning environment skills was tested on a large sample of technical students, using structural equation modelling (SEM). This statistical technique enabled us to estimate the relative contribution of the variables involved and to study the nature of their interactions. SEM makes it possible to test whether theoretically plausible models provide a good fit to data collected.

2. Methods

2.1 Sample

A total of 600 questionnaires were distributed to eight technical institutions in the country. The percentages of questionnaires that can be used were 527 (88%). Samples were adequate based on the recommendations of Hair, Anderson, Tathan and Black (2006), in utilizing the Structural Equation Model (SEM) technique, the number of samples must exceed 500 if the number of constructs is more than six, some of constructs measured has less than three items and the communalities are low. Researchers are also suggested to increase the number of samples if they encounter any of these conditions (1) data displays abnormal characteristics, (2) using alternative estimation procedure, and (3) anticipating more than 10% of missing data. The participants were 527 final semester diploma students (337 males, 190 females) from eight technical institutions in the country. All participants belonged to the same cohort and were all enrolled in engineering programme. They were selected randomly to complete the questionnaires and the measures were administered during regular class sessions coordinated with help from lecturers. Students were briefed on the nature of the questionnaires and confidentiality was confirmed. They were allowed as much time as they needed to complete the questionnaires, typically requiring 35 to 45 minutes.

2.2 Instruments

This study used a questionnaire that consists of three parts. Part A contains demographic information. Part B contains 20 items measuring learning approaches (LA) adapted from the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001). The questionnaire used was the revised version of the study process questionnaire (R-SPQ-2F, Biggs et al., 2001). The original SPQ is a 42 items self-report instrument developed by Biggs (1987) to evaluate student approaches to learning (SAL) in the higher education context. The study process questionnaire conceptualizes student approaches to learning in terms of the two approaches to learning (deep and surface). The revised SPQ by Biggs et al.

(2001) was developed in order to obtain a short questionnaire that could allow teachers to evaluate the learning approach of their students using fewer items than other questionnaires. The Cronbach's alpha values for the resulting scales in their study were 0.73 for deep approach, and 0.64 for surface approach: these are considered to be acceptable. The revised SPQ focused on two main approaches: deep and surface. In this study the first stage the original items from the deep and surface scales were examined, changing and rewording those that were considered unsuitable.

Part C contains the learning environment factors (LE) adapted from the Course Experience Questionnaire (CEQ). The Course Experience Questionnaire (CEQ; Ramsden 1991) appears to be the most widely used instrument designed to assess learning environment at higher education institution. The CEQ was primarily designed as a performance indicator for learning environment which assesses a range of student perceptions related to teaching and learning.

2.3 Reliability and Validity

In this study a reliability scale test was carried out for all three instrument in order to assess the internal consistency of variables. According to Babbie (1992), the value of Cronbach's Alpha was classified based on a reliability index in which 0.90 - 1.00 is very high, 0.70 - 0.89 is high, 0.30 - 0.69 is moderate, and 0.00 – 0.30 is low. The Cronbach's alpha values for the resulting scales in this study were all above 0.70; these are considered to be acceptable and indicating high or very high reliability.

Further, the data was evaluated using AMOS (Arbuckle & Wothke, 1999). AMOS (Analysis of Moments Structure) is a statistical program to perform structural equation modeling (SEM), a form of multivariate data analysis, that can test for goodness-of-fit between research data and hypothesised models. AMOS calculates maximum likelihood (ML) estimates from a covariance matrix using several goodness-of-fit indices between the data and the specified model. A number of indicators of goodness-of-fit have been recommended by Hair et al (2006) to test a hypothesised model. Assessment of model fit was based on multiple criteria including both absolute misfit and relative fit indices. The absolute misfit indices included the root mean square error of approximation (RMSEA; Hair et al. 2006) and the relative goodness-of-fit indices were the comparative fit index, Tucker Lewis index and incremental-fit-index (CFI, TLI, IFI; Hair et al., 2006). Arbuckle and Wothke (1999) states that a model is fit when the indices shows that (i) the value of CMIN/df is between 1 and 5, considered acceptable or acceptable fit between model and data, (ii) indices of CFI, IFI and TLI approach 1.00, and (iii) the RMSEA index of 0.08 or less indicates a reasonable error and can be accepted. The present study has followed the recommendation of Hair et al. (2006) who suggest the use of 5 indices for evaluation of model fit, these being: $\chi 2/df$, CFI, IFI, TLI and RMSEA.

3. Results

The overarching goal of this research was to test the structural equation model (SEM) describing the six main latent variables of LE and two latent variables of LA. Figure 1 shows the standardised parameter of the structural model depicting the relationship between LE and LA. The AMOS statistical estimates results revealed that the χ 2/df indice was less than 5 (CMIN/df = 1.717). The values of CFI, TLI, and IFI were all above 0.9 and the RMSEA was less than 0.08. These statistical estimates showed that the hypothesized model fulfilled the model fit indicators employed in this study based on the indicators recommended by Arbuckle (1997); Arbuckle and Wothke (1999); and Hair et al., (2006). This result indicated that data from the sample fit with the model.

The parameter estimates of the model showed that all of the paths between the latent variables were statistically significant (Table 1). Two relationship paths can be concluded: (i) learning environment showed a significant positive relationship with the deep-learning approach and (ii) learning environment showed a significant negative relationship with the surface-learning approach.

Table 1: *Path coefficients* and hypothesis test

Hypotheses	Variable Relationship			P Value	Coefficient	H null
1	deep approaches	<-- -	Learning environment	***	0.62	Rejected
2	surface approaches	<-- -	Learning environment	***	-0.39	Rejected

Note: *p< 0.05; ** p <0.01; *** p < 0.001.

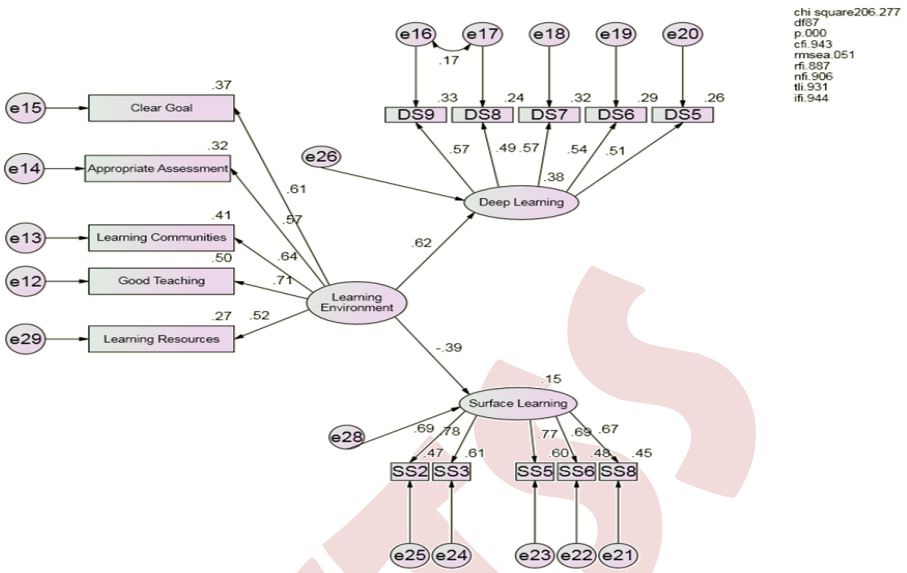

Figure 1: Structured Equation Model for LA and LE

4. Discussion

The findings of this study support the hypothesised relationships between learning environment. This study supported previous studies by Lizzio et al. (2002), Goh (2005), Kember & Leung (1998), Karagiannopoulou & Christodoulides (2005), Gijbels & Dochy (2006), Kember, Leung & Ma (2007) and Ramsden, Prosser, Trigwell & Martin (2007). The present findings add to the body of research by documenting the precise interactions between learning environment and student learning approaches. Ramsden (1992) suggests that it is not possible to train students to adopt deep approaches when the educational environments give them the message that surface approaches are rewarded. In other words, unsuitable assessment procedures may put pressure on students to take the wrong approach to learning tasks. Engineering educators should ensure that assessment procedures are appropriate. Clear goals and standards allow students to know where they are headed and encourage them to take responsibility for their own learning. Engineering educators should ensure that it is made clear to students what is expected of them in the course.

5. Conclusion

This study provides evidence that students' approaches to learning in an engineering subject are related to their perceptions of the learning environment. As such, it highlights various aspects of the learning environment that might be enhanced so as to help improve students' approaches to learning. As positive changes are made, it is expected that they will be reflected in the adoption of deep approaches to learning and result in better learning outcomes. Therefore, it can be concluded that efforts to improve the practice of a deep-learning approach among engineering students must be supported by giving adequate emphasis to learning environment factors. Surface approaches are seen as being motivated by the learner's desire to meet minimum requirements with minimum effort. The use of surface

approaches results in study behaviors that enable students to reproduce material in a required form without analysis or integration, leading to low quality learning outcomes. Deep approaches, on the other hand, are characterized by an intention to understand the material being studied. Resultant behaviors include the active integration of new information with old, or with information derived from other sources. Therefore, there is an association between student approaches to studying and student perceptions of their learning environment. Accordingly, it is important to vary the teaching styles, strengthen the rapport between teachers and students, promote positive feedback, and build a relaxed learning environment that encourages students to adopt the deep approach to learning and dispense with the detrimental superficial learning approach.

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