Exploring the combined relationships of student and teacher factors on learning approaches and self-directed learning readiness at a Malaysian university

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This paper presents the findings of a study of the interrelationships between students' individual characteristics, self-efficacy beliefs, parental involvement, university and classroom learning environments; and teachers' individual characteristics, teaching efficacies, university and classroom learning environments, teacher outcomes and approaches to teaching on approaches to learning (deep and surface learning) and self-directed learning readiness. The study was guided by a two-level integrated theoretical framework, designed to examine 'student and teacher ecological systems' and their influences on student learning and outcomes. Data was drawn from 392 students and 32 teachers situated in 44 problem-based learning classrooms from three study levels at a Malaysian private medical university. The analyses, through hierarchical linear modelling (HLM), revealed what and how personal, family, learning environment and teacher factors directly influenced approaches to learning and self-directed learning readiness. Implications for teaching in higher education are discussed.

Keywords: learning environments, parental involvement, approaches to learning, self-directed learning, approaches to teaching, hierarchical linear modelling

Introduction

In the context of a rapidly changing and unstable world, many countries strive to remain competitive through national education strategies. Malaysia has also initiated major changes in its higher education system in order to remain competitive (Zakaria 2000). The impetus to these changes was the Malaysian government's strategic initiative *Wawasan 2020*, also known as Vision 2020. Vision 2020 was initiated in Malaysia in 1991 to achieve the status of an industrialised and developed country in terms of its economy, national unity, social cohesion, social justice, political stability, system of government, quality of life, social and spiritual values, national pride and confidence (Mahatir 1991). Under Vision 2020, education was positioned as the key engine to drive the nation from an economy based on labour-intensive and lower-end manufactured products to an economy based on knowledge by the year 2020.

From 1997 onwards, Malaysian higher education, which was once a closed system with only a few public universities, has been transformed into an education landscape where private education is thriving and strongly encouraged by the government (Zakaria 2000; Lee 1999). This is particularly the case for the ethnic minority Chinese (30% of the population), which in turn can partly be explained by the Malaysian government's socio-economic and educational policies, which are characterised by affirmative action, and which have thus always given preference to the development of the ethnic majority Malay (60% of the population) as indigenous people by reserving quotas in public universities for them (Agadjanian and Liew 2005; Segawa 2007; Sohail and Saeed 2003).

The Malaysian private higher education enterprise is set to grow further, as it collectively aims to be a centre of educational excellence in the region (Lee 1999; Rao 1997). However, these private higher educational institutions are perceived by the public as being 'for-profit' institutions, in that the private sector tends mainly to offer programs that provide

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high financial returns but few social benefits (Wilkinson and Yussof 2005). This perception dovetails with another public perception: that the private higher education sector provides 'poor quality education' compared to the public universities (Wilkinson and Yussof 2005). This public perception may be somewhat entrenched due to the early years after independence in 1957, when the private sector education in Malaysia catered to "dropouts" (Wilkinson and Yussof 2005).

In order to provide education, all private higher educational institutions, in addition to having to register with and be approved by the Ministry of Education, must abide by Parliamentary Acts such as the Private Higher Educational Institutional Act 1996 and the Education Act 1996. In addition, the government of Malaysia established the National Accreditation Board (NAB) regulated under The National Accreditation Board Act 1996, as a national quality assurance agency responsible for governing the standard and quality of courses offered by the private higher educational institutions. These measures assist to counter the negative perceptions that the quality of teaching and learning in private higher education is inferior.

While it is clear that private higher education will remain a permanent feature in Malaysia, if private higher education is to gain greater status and standing in society, there is a critical need to consider and understand the contextual factors that can foster the aims of the nation. What then are these contextual factors that can enhance student learning, and in particular how they approach their learning in meaningful ways? What are the characteristics of learning environments that may influence related outcomes such as the intellectual capacity, well-being, and lifelong learning capacity of students? In short, how do learning environments influence student learning and outcomes?

These are the main questions this study addresses. Specifically, the study focuses on the influence and impact of personal, family, and learning and teaching environments on students' approaches to learning – whether they adopt a deep or surface approach, and how that relates to the outcome measure of self-directed learning readiness. This paper presents a multivariate analysis, and focuses on direct effects, rather than cross-interactional effects. The latter would provide very rich information, but is beyond the scope of this paper. Instead, we concentrate here on the contextual components of higher education. Even though these components are sourced from a case study that looks at one Malaysian private medical university, they form the generalisable components that are transferable to any other higher education context. These components are the learning environments, family environments, approaches to learning, and approaches to teaching, and this paper provides a framework for the analysis of the interrelationships between these components.

Literature Review

Learning environments

Learning environment refers to the social and psychological contexts of learning and determinants of learning that affect student achievement and attitudes (Fraser and Walberg 1991; Fraser 1994, 1998). Many learning environment studies have focussed on the conceptualisation, assessment and examination of the determinants and effects of the social and psychological aspects of the school and classroom settings (Fraser 1994; McRobbie and Ellett 1997; Fraser 1998, 2003). Many of these studies have also established that student learning is affected by the social and psychological climate, by drawing on the perceptions of not only students, but also other significant persons involved in education, such as teachers, parents, and administrators (Walberg 1982). Another distinctive tradition in learning environment research has been to investigate the relationships between students' perceptions of their classrooms and their cognitive and affective learning outcomes (Fraser 1998, 1994).

Such investigations have examined the correlations of environmental properties with causal antecedents and consequences (Fraser and Walberg 1991). Many of these studies have found large and strong associations and have been descriptive, multivariate, and correlational in nature (Fraser 1991). Another distinctive aspect of these studies has been the development of a wide array of robustly validated environment instruments, such as the Learning Environment Inventory (LEI), Constructivist Learning Environment Survey (CLES), and the School Climate Scale (SCS) (Fraser 1998).

In addition, Fraser and Rentoul (1982) and Genn (1984) have suggested that it would be useful to differentiate between levels of learning environments – institution and classroom. However, the classroom-level research has largely focused on elementary and secondary schools rather than on higher education, whereas the institution-level research, while involving higher education institutions, has been characterised by an emphasis on educational administration, as schools were viewed as formal organisations. Fraser and Rentoul (1982, p. 212) noted that "it was rare indeed for either empirical studies or literature reviews to encompass both institutional and classroom environments".

In this study, both the university and classroom learning environments are used to examine the relationships between learning environments on student learning and outcomes.

Family environments

An early theoretical orientation in the development of family environment research can be traced to Murray's theory of personality (Murray 1938). However, it was not until the influential studies of Bloom (1964) and his doctoral students in which he examined the correlates between family and children's affective and cognitive learning outcomes, that a whole research field emerged to assess the alpha press of family environments.

After Bloom's studies, there were other significant developments such as Coleman's concept of family social capital (1990; 1988), Bourdieu's (1984, 1988) proposition of a two-dimensional model of family social space, and Marjoribanks' (2002) theory of social context, where family background was defined by economic and human capital, parents' aspirations, and cultural contexts, and the more immediate or proximal family settings were characterised by aspects of social capital such as parenting style and practices, and by cultural capital through availability of cultural resources. Marjoribanks (2002) more recently proposed the idea of family educational capital, as a combination of social and cultural capital.

As with learning environment research, many studies that have examined the relationships between family and student outcomes have also focused on the primary and secondary school contexts. Particularly, Marjoribanks' studies have shown how the environments of the home and school interact and co-determine school achievement (Fraser 1998). Evidence of impact of the family on children's academic outcomes and successes across the world has been widely reported (Marjoribanks 1994; Hung and Marjoribanks 2005; Marjoribanks and Mboya 2001; Marjoribanks and Kwok 1998; Marjoribanks 1995, 1991). Hence, Marjoribanks (2002, p.1) claims that "it is generally agreed that if parents are involved positively in activities associated with children's learning then the school outcomes of those children are likely to be enhanced". This study examines whether the influence of family support is extended to university students' learning and outcomes.

Approaches to learning

Since the introduction of the constructs of deep and surface approaches to learning by Marton and Saljo (1976), the study of approaches to learning has become a strongly theorised area of research in higher education (Tight 2003). A vast body of research findings has indicated that the differences in students' conceptions of learning (Saljo 1979; Van Rossum, Deijkers, and

Hamer 1985), perceptions of assessments (Marton and Saljo 1976; Thomas and Bain 1984), learning and teaching contexts in different academic departments (Ramsden 1979; Entwistle and Ramsden 1983; Ramsden and Entwistle 1981), and enduring personality characteristics such as gender, age, years of study and faculty differences (Biggs 1978, 1985; Biggs 1987; Watkins and Hattie 1981), as well as motivation (Laurillard 1979, 1984) all influence students' approaches to learning.

Research has also consistently shown that learning approaches of students are associated with qualitatively different outcomes (Van Rossum and Schenk 1984; Trigwell and Prosser 1991). Overall, Ramsden (1992, p. 59) concluded that when all these studies were taken together, the powerful relationships between learning approaches and learning outcomes could be summed up as follows: "surface approaches are usually more strongly linked to poor learning than deep ones are to effective learning, and the connections between grades and learning approaches are less marked than those between measures of learning quality and approaches".

Research has so far indicated that relationships exist between students' individual characteristics, perceptions of the learning and teaching contexts, approaches to learning on the one hand and learning outcomes on the other. However, the evidence is less clear on the patterns or inter-play of relationships among these variables. The more commonly used statistical techniques such as factor and correlational analyses are limiting in that they are not conducive to testing the direct and mediating relationships between the variables. More recent studies have attempted to examine the causal relationships among the many influences of approaches to learning, perceptions of the immediate learning context, and different measures of outcomes. For example Lizzio, Wilson and Simons (2002) first used structural equation modelling techniques to investigate the causal relationships between learning environments measured, and approaches to learning and academic outcomes; they subsequently used linear multiple regression analyses to predict approaches to learning and academic outcomes. Others have also used structural equation modelling techniques to examine the relationships between various presage factors on learning approaches and outcome measures of academic achievement (Diseth and Martinsen 2003; Roman, Cuestas, and Fenollar 2008; Nijhuis, Segers, and Gijselaers 2007). A recent study with multiple variables Kek, Darmawan and Chen (2007) uses single-level partial least square path analysis to explore the inter-relationships among university students' individual characteristics and motivation, family, university and classroom learning environments, curriculum, approaches to learning and ultimately learning outcomes.

This study attempts to use a multi-level statistical modelling technique to predict student learning approaches and self-directed learning readiness as the data are conceptually situated at different levels. In this way, this technique is able to produce more precise results, with each level estimating the effect of every variable in the model on the students' approaches to learning and related outcomes. Furthermore, it is able to show the interaction effects between variables at two levels –student and teacher. However in this paper, only direct effects are reported.

Approaches to teaching

Similar to the studies of approaches to learning, early studies on approaches to teaching also established that teaching was context dependent. Prosser and Trigwell (1997) suggested that the adoption of a student-focused approach to teaching was associated with the perception that teachers had control over what was taught and how it was taught, as well as perceptions that the department valued teaching and that class size was not too large. In a separate study, Trigwell, Prosser, Ramsden and Martin (1999) reported similar findings.

Early studies that have established a relationship between teachers' reports of their approaches to teaching and student learning outcomes are limited. Most studies are correlational in nature and show that student-focused approaches to teaching are associated with deep learning, whereas teacher-focused approaches to teaching are associated with surface approaches to learning by students (Trigwell, Prosser, and Waterhouse 1999; Trigwell et al. 1999).

Research indicates that the interrelationships between teachers' conceptions of teaching, perceptions of the teaching context and approaches to teaching are more illuminating than the relationships between teacher factors and student factors, such as approaches to learning and learning outcomes. Attempts to examine the relationships between approaches to teaching, approaches to learning and different measures of student learning outcomes in a single study are now emerging (Gibbs and Coffey 2004; Vermetten, Vermunt, and Lodewijks 1999). One of the reasons for the relative scarcity of data on the interplay between student learning and teaching can be attributed to the fact that most studies on learning and teaching are carried out separately. This observation is also highlighted by Richardson (2005, p. 678), who argues that "future research needs to aim at illuminating the interplay between student learning and teaching".

Hence, this study incorporates teacher and teaching factors that influence student learning and outcomes to further illuminate the effects of teaching on learning The other reason for limited studies of the interplay between student learning and teaching could be due to the statistical limitations of many early educational research studies. Many of these studies had recognised but failed to attend to the hierarchical or multi-level characteristics found in many educational research data analyses until recently, with the inadequacy of the traditional statistical techniques for modelling hierarchy can now be removed (Raudenbush and Bryk 2002; Bryk and Raudenbush 1992; Raudenbush and Bryk 1997). Therefore, the present study aims to show that teacher and approaches to teaching factors, directly and indirectly, influence students' learning approaches and related student learning outcomes. The central aim is thus to develop a model that allows us to combine and link the components discussed in this literature review, and to analyse their interrelationships, so that we can ultimately arrive at a more holistic understanding of not only *what* influences student learning, but also *how* and *to what extent* various factors influence student learning. It is expected that this in turn can help to develop more effective teaching methods that take such factors into account. This paper presents a step into that direction.

Theoretical framework

The study was guided by Kek's (2006) proposed two-level theoretical framework, designed to examine the student and teacher ecological systems and their influences on student learning and outcomes in higher education. This theoretical framework for analysis, depicted in Figure 1, was used to examine the manifold relationships between individual characteristics, and distal or proximal environments on the one hand, and processes such as approaches to teaching and approaches to learning on the other hand. This was then related to student outcomes in the Malaysian private higher education context. Thus, the theoretical framework attempts to integrate separate constructs from three related fields: family and learning environments, approaches to learning, and approaches to teaching underpinned by Bronfenbrenner's (1979) Ecological Theory of Human Development.

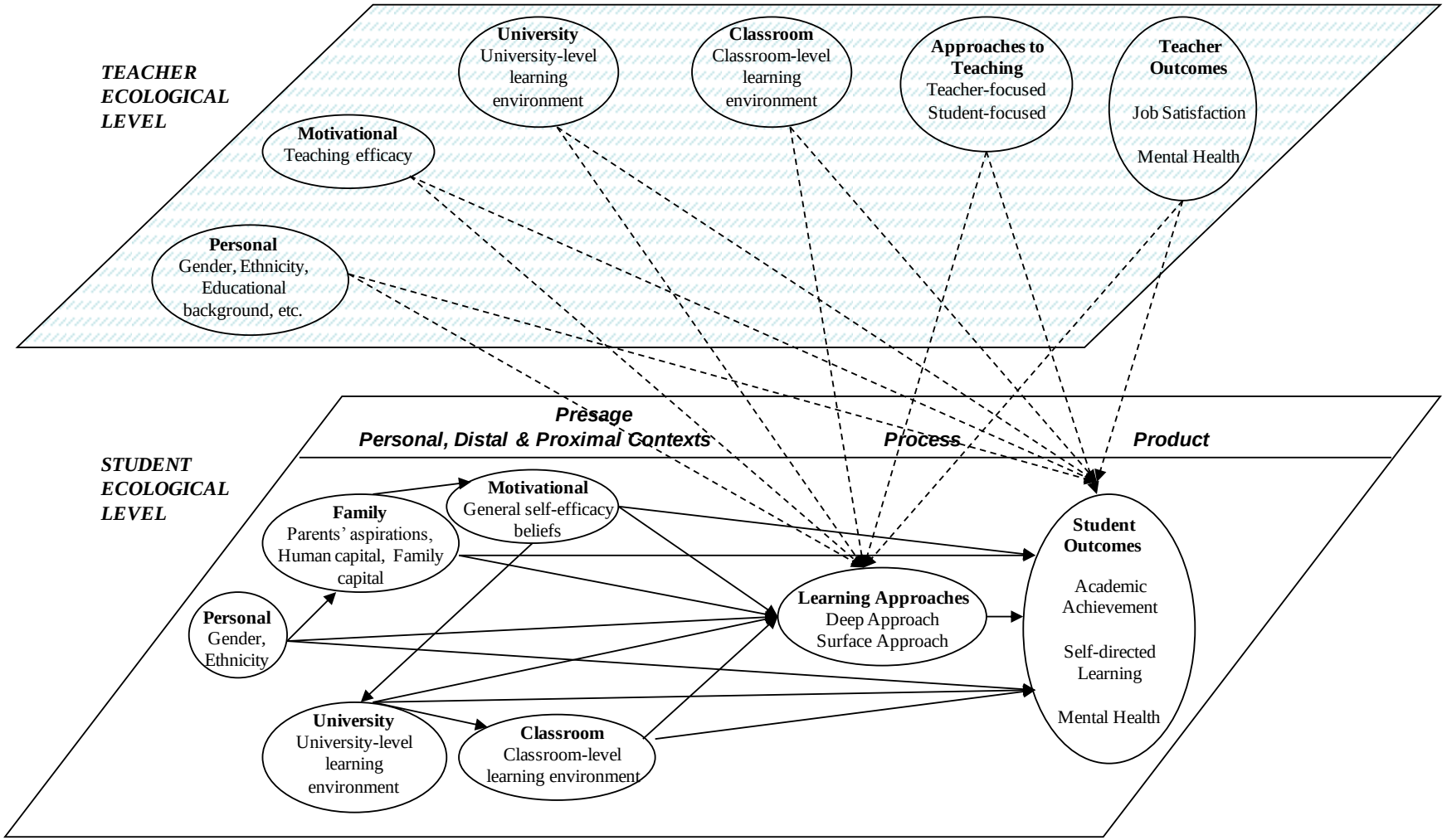
Bronfenbrenner's Ecological Theory of Human Development (1979) emphasised the importance of specific contexts and person-environment interactions. Overall, he proposed a 'whole ecology' that included both a multitude of factors influencing a university student's development in the present time, but which also significantly included factors pre- and post-today's context. Furthermore, within his 'ecological environment system' (see Figure 2),

Bronfenbrenner distinguishes between four different systems: micro-systems (classrooms, student-teacher), meso-systems (family and peers), exo-systems (institutional culture), and macro-systems (cultural background). These systems are linked in complex ways, but distinguishing them allows for an emphasis on the realisation that both proximal and distal contexts and processes can help explain the impacts on university students' learning and outcomes. Later, Bronfenbrenner and Ceci (1994) proposed a further refinement of Bronfenbrenner's Ecological Environment System.

Biggs' 3 P Model of Learning (2003) can be combined with Bronfenbrenner's theory, because Biggs' model concentrates on higher education students, and the systems approach of his model is consistent with Bronfenbrenner's (1979) nested ecological environments. Bronfenbrenner's Bio-Ecological (1979; 1994) and Biggs' 3 P (2003) concepts are in our model here (see Figure 1) applied to establish the interrelationships between students' individual characteristics, distal and proximal contextual factors (*presage*), approaches to learning (*process*) and outcomes (*products*) of higher education at the students' ecological level. At the students' ecological level, it is hypothesised that there are direct and mediated relationships between the students' individual characteristics, distal contexts (family, self-efficacy, university-level learning environment), proximal contexts (classroom-level learning environment), learning approaches and self-directed learning readiness outcomes. These interrelationships are depicted in the unbroken lines. The advantage of incorporating Biggs' 3 P model for our purposes here, relates most significantly to the third P (product), as this allows us to focus on the outcomes of a learning situation, for example on whether high quality learning outcomes (in the form of a deep learning approach, rather than a surface learning approach) have been achieved. The latter is of course particularly important in a higher education context. Combining this model with Bronfenbrenner's allows for more depth in terms of potential factors of influence.

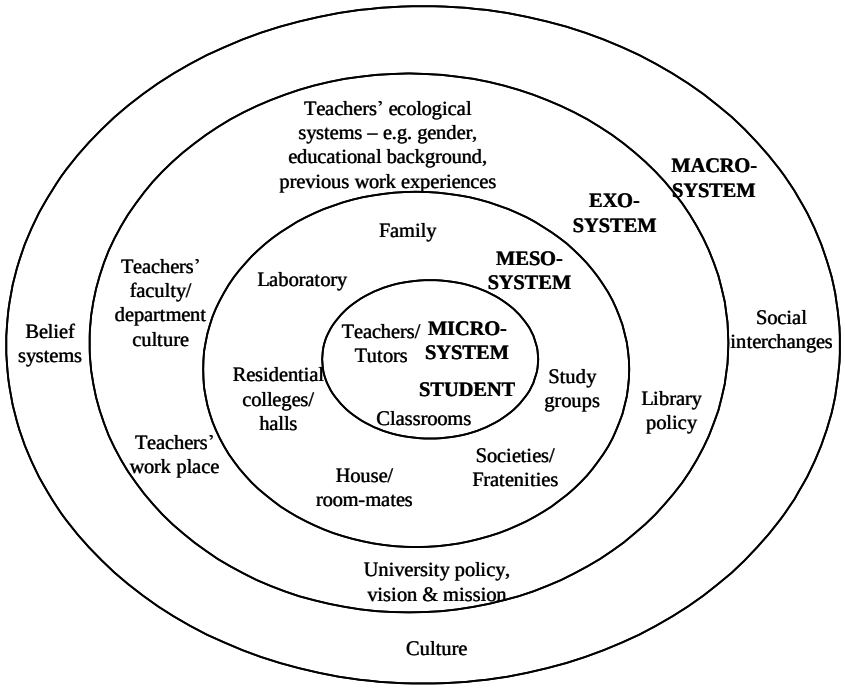
Similar to Biggs' 3 P model, Prosser, Ramsden, Trigwell and Martin's Model of Teaching (2003) was selected for incorporation in our model due to its emphasis on approaches to teaching in higher education, and their influences on student learning approaches. At the teacher's level, our model asserts that the teachers' ecology is composed of the approaches to teaching and the teacher factors, borrowed from Prosser at al.'s Model of Teaching (2003). The proposed variables at the teacher's level are the individual characteristics, motivational factors (perceptions of teaching efficacy), university (perceptions of university-level learning environment), classroom (perceptions of classroom-level learning environment), approaches to teaching, teachers' job satisfaction and mental health outcomes, and their impacts on students' learning approaches and self-directed learning readiness. The interrelationships at the teachers' levels are depicted in the broken-lines.

Overall then, these different but related theoretical constructs and approaches have been combined into an integrated theoretical framework for analysis that aims to take as many potential impact factors into account as possible, but which also allows for a focus on the relative influence of specific factors. More importantly, the two-level integrated model recognises multi-level characteristics in teaching and learning, and facilitates the testing of the interplay relationships between teaching and learning in *a single study*, thereby overcoming a methodology limitation found in many early educational research studies.



Source: Applied from Bronfenbrenner's Theory of Human Development (1979) and Bronfenbrenner & Ceci's Bio-Ecological Model of Human Development (1994), Adapted from Biggs' 3P Model of Learning (2003, p. 19), and Prosser, Ramsden, Trigwell & Martin's Model of Teaching (2002, p. 39)

Figure 1. Framework for study



Source: Applied from Bronfenbrenner's Ecological Theory of Human Development (1979)

Figure 2. Bronfenbrenner's Ecological Environment System as Applied to the Development of Students' Outcomes in Higher Education

Method

Data

Evidence for this study was derived from questionnaires administered to both students and teachers at the International Medical University (IMU), Malaysia in 2004 and 2005. A breakdown of the participants can be found in Table 1.

Medical and Problem-based Learning Context

In 2007, there were 21 medical schools in Malaysia, 10 public and 11 private, many focusing on five-year undergraduate medical programs with the first two years designated as "pre-clinical" and the latter three as "clinical" (Lim 2008). IMU, established in 1992, has international links with 26 partner medical schools in Australasia, the United Kingdom, Ireland, Canada and the United States (International Medical University 2005). It offers a unique credit-transfer program where the students spend the first two and half years in Malaysia and then transfer to a partner medical school and graduate with the degree of the partner medical school. IMU also offers its own medical program where these students are transferred to the local clinical school instead.

At IMU, problem-based learning as the teaching methodology was adopted. The type of problem-based learning adopted would be termed as "classic problem-based learning" (Hmelo and Evensen 2000) where teachers facilitate students in small groups or tutorials to encourage teamwork, to problem solve, to learn and integrate knowledge acquired using simulated clinical problems, to do self-directed learning and to become life-long learners. Each student had to attend small group PBL sessions with a teacher, commonly known as the PBL tutor or facilitator, twice a week for a period of one and a half hours for each session. In the PBL sessions or classrooms, the students learnt about medical sciences, and

integrated the knowledge acquired through simulated clinical problems, known as the PBL triggers. The rest of the time, students continued to attend lectures and practicums.

Table 1. Breakdown of Student and Teacher Sample

Student Level								
Study Level	**Gender**			**Ethnicity**				
	Male	**Female**	**Total**	**Chinese**	**Malay**	**Indian**	**Others**	**Total**
1	78	87	165	115	29	20	1	165
2	47	93	140	95	28	14	3	140
3	45	42	87	73	5	8	1	87
Total	**170**	**222**	**392**	**283**	**62**	**42**	**5**	**392**

Teacher Level						
Study Level	**Gender**			**Age**		
	Male	**Female**	**Total**	**>39 yrs**	**<39 yrs**	**Total**
1	5	8	13	5	8	13
2	5	5	10	4	6	10
3	6	3	9	3	6	9
Total	**16**	**16**	**32**	**12**	**20**	**32**

Instrumentations

Students and their teachers completed a questionnaire each so as to obtain two different levels of data for analysis. The saliency of all the instruments guided the selection of scales and items, and the re-wording of the items.

The students completed a questionnaire which asked for personal background information such as parents' highest educational attainment levels and questions asking their perceptions of the role of their families (using Marjoribanks' (2002) Perceived Family Environment Scale), motivation (using Schwarzer and Jerusalem's (2002) General Self-efficacy Scale), university learning environment (using Dorman's (1999) University-Level Environment Questionnaire), classroom learning environment (using Johnson and McClure's (2004) newly modified version of the Constructivist Learning Environment Survey), approaches to learning (using the two-factor Study Process Questionnaire (SPQ-2F) by Biggs, Kember and Leung (2001)), and self-directed learning readiness (using the Self-directed Learning Readiness Scale (SLDRS) by Fisher, King and Tague (2001)). Appendix 1 provides details of the instruments deployed at the student level.

Meanwhile, the teachers completed a questionnaire which asked for their personal background and for their perceptions of teaching and school efficacy (using the Ohio State Teacher Efficacy Scale (OSTES) by Tschanen-Moran and Woolfolk-Hoy (2001), the Collective Teacher Efficacy Instrument-12 (CTEI-12) by Goddard (2002), and 9-item from Caprara, Barnanelli, Borgogni and Steca 's (2003) school efficacy scale), university learning environment (using Dorman's (1999) University-Level Environment Questionnaire), classroom learning environment (using Johnson and McClure's (2004) newly modified version of the Constructivist Learning Environment Survey), approaches to teaching (using Trigwell and Prosser's (2004) new Approach to Teaching Instrument-25) and outcome measures of job satisfaction (used a 4-item scale selected from the items used in Caprara et al.'s study (2003) and finally mental health (using the Goldberg and Williams' (1988) General Health Questionnaire-12). Appendix 2 provides details of the instruments used at the teacher level.

Students and teachers took about 20 to 30 minutes to complete the respective questionnaires. Before the administration of the questionnaires, both the students and teachers were thoroughly briefed to ensure that the self-reported data were valid (DeNisi and Shaw 1977; Converse and Presser 1989; Bradburn and Sudman 1988; Brandt 1958). Students and staff were informed of the purpose and importance of the study, they were given information about the items on the questionnaires, and they were assured that the items were not threatening or embarrassing to them, and that their participation was voluntary, while responses would remain anonymous.

Validation of Instruments

Prior to performing the statistical analyses, the validity and reliability of the instruments at the student and teacher levels were established. Appendix 1 and 2 provide the validation results for all the instruments used in the questionnaires.

Hierarchical Linear Modelling Analyses

For the purpose of examining the impacts of teachers at the teacher level on student approaches to learning and related outcomes at the student level, hierarchical linear modelling (HLM), a multilevel statistical modelling technique was employed (Goldstein 2003). The HLM procedures made it possible to analyse variables at the student and teacher levels simultaneously. The simultaneous analyses enabled the estimation of the factors that affected the students' approaches to learning and related outcome variables and the interrelations among them (Raudenbush and Bryk 1997).

In this way, the HLM was able to produce better results, with each level estimating the effect of every variable in the model on the students' approaches to learning and related outcome variables. Moreover, the HLM procedures not only provided the direct effects from the various levels but were also able to show the interaction effects between variables at the two levels – student level and teacher level. However, in this paper for reasons of scope, only the direct effects are reported. The HLM Version 6 program (Raudenbush et al. 2004) was used for this study.

Statistical Procedure in HLM

The first step in the HLM analysis was to conduct a null model or a fully unconditional model, in which no predictors were specified at either student or teacher level, to obtain an indication of the amount of variance explained by the predictor variables at each level (Raudenbush and Bryk 2002). In this way, the variability between student and teacher levels can be estimated and examined to consider if HLM analyses were necessary for the outcome specified.

For this study, the null model analyses revealed that the reliability estimates for a surface approach to learning was low at 0.02 and the teacher intercept was not significantly different from zero at the five per cent level with a probability value of more than 0.05. The Chi-square test for variance indicated that there was not enough variance left to be explained for a surface approach to learning. Therefore, it was considered inadequate to continue with the HLM analyses for a surface approach to learning.

The null model analyses for a deep approach to learning and self-directed learning indicated that HLM analyses could be pursued. The reliability estimate for a deep approach to learning was 0.34, markedly above 0.05, indicating a relatively low degree of error. Furthermore, intercept 2 was significantly different from zero at the 5% level, with a probability of 0.000. The p-value was large enough for the intercept to be considered different from zero, and the Chi-square test for variance indicated that there was enough

variance to be explained. For the outcome, self-directed learning readiness, the reliability estimate was 0.46, also indicating a low degree of error. The intercept 2 was significantly different from zero at the 5% level, with a probability of 0.000. Again, the p-value was large enough for the intercept to be considered different from zero, and the Chi-square test for variance indicated that there was enough variance to be explained.

The next step was to build a student level model by adding student level predictors to the model, without entering predictors at the teacher level through a step-up approach to examine how much of the variance could be explained by the individual level (student) predictors (Bryk and Raudenbush 1992). Results were then examined and those coefficients found not to be significant at $p < 0.05$ were removed from the model (Darmawan and Keeves 2002, 2006). The next potential variable was then entered into the equation. The input was altered accordingly and the data re-analysed. These steps were repeated until a final Level 1 model with only significant effects was obtained.

The third step was to build a Level 2 intercept model, which involved adding teacher predictor variables into the model using the step-approach, and predictors with a significant influence (at $p < 0.05$) on the outcome variables were retained in the model. Interaction effects with a significant influence (at $p < 0.05$) on the outcome variables were retained in the model. These retained interaction effects indicate a possible causal relationship of a particular teacher variable on the relationship between a student level variable and outcome variables (learning approaches and self-directed learning readiness). In this paper, only the direct effects are discussed.

To indicate the power of the final model, the estimates of variance are indicated (Raudenbush and Bryk 2002). The goodness-of-fit was evaluated through a reduction in the deviance value. If the deviance value of the final model decreased significantly in comparison with the null model, this indicated improvement in fit. Thus, a fit test is a comparative one, involving a reduction of deviance value because the estimation was not based on a least squares procedure but on a maximum likelihood procedure.

Results

Deep approach to learning

As shown in Figure 3 and Table 2, the results of the hierarchical linear modelling provided evidence for the hypothesised interrelationships conducive to a deep approach to learning.

The results indicate that students whose parents' educational attainment levels are low report higher deep approaches to learning scores in comparison to students whose parents' educational attainment levels are high. However, the parental involvement in students' studies compensate for the parents' educational attainment level. Students whose parents' involvement is high in their university studies are estimated to achieve higher deep approaches to learning scores when compared to students whose parents' involvement is low. Students who have a high sense of general efficacy beliefs to cope with challenging environmental demands have higher deep approaches to learning scores in comparison to those with low perceived general self-efficacy beliefs. Students who have a high sense of membership in the university community and are actively engaged in the classroom through questioning, explaining, justifying, and evaluating their own and their peers' ideas in the classroom, are estimated to employ more deep approaches to learning when compared to students with low sense of membership in the university community and low engagement in the classroom. Students are more likely to achieve high deep approaches to learning scores when they are in classes with full-time teachers rather than in classes instructed by part-time

teachers. In addition, students whose teachers employ a student-focused teaching approach are more likely to achieve high deep approaches to learning scores.

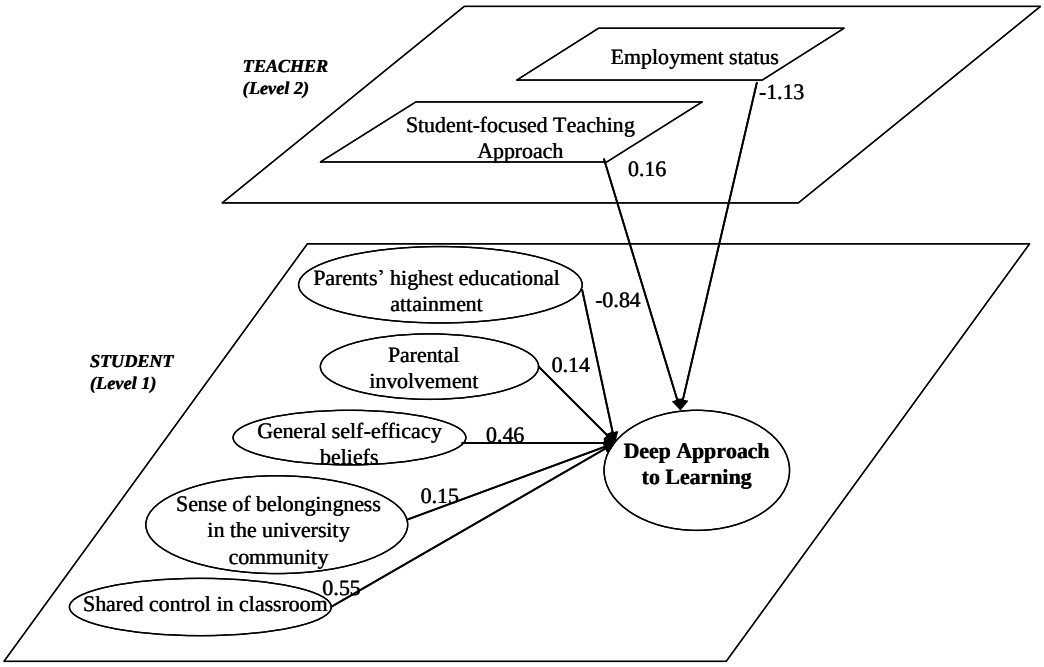


Figure 3. Results of the final hierarchical model for deep approach to learning

The total amount of variance explained by the final model for deep approaches to learning was 44 per cent. Most of the variance (94%) is found between students and 6 per cent occurred between teachers. The final model explained nearly half (42%) of the variance available at the student level and more than two-thirds (73%) of variance at the teacher level. The large percentages of variance explained at the teacher level indicate that there are few factors influencing deep approaches to learning at the teacher level that have not been included in this model. In terms of the final model's goodness-of-fit, the deviance is reduced substantially by 112.3, from 1769.6 in the null model to 1657.3 in the final model.

In summary, the results show that we can expect students to employ a deep approach to learning when they: (a) are from families with parents highly involved in their university studies; (b) are from families with low educational attainment levels; (c) demonstrate a greater deal of general self-efficacy; (d) have a high sense of membership in the university; (e) are in classrooms where they are able to participate in questioning, explaining, justifying, and evaluating their own and their peers' ideas; (f) are taught by full-time teachers; and (g) are taught by teachers who employ a student-focused teaching approach.

Table 2. Final HLM model results for deep approach to learning

Final Estimation of Fixed Effects					
Fixed Effect	**Coefficient**	**Std. Error**	**t-ratio**	**d.f.**	**p-value**
For INTRCPT 1, B0					
INTRCPT2, G00	32.62	0.31	106.28	29	0.000
Employment status, G01	-1.13	0.47	-2.42	29	0.022
Student-focused teaching approach, G02	0.16	0.04	4.21	29	0.000
For Parents' highest educational attainment Slope, B1					
Intrcpt2, G10	-0.84	0.26	-3.30	31	0.003
For Parental involvement Slope, B2					
Intrcpt2, G20	0.14	0.06	2.39	31	0.023
For General self-efficacy beliefs Slope, B3					
Intrcpt2, G30	0.46	0.08	5.90	30	0.000
Teacher-focused teaching approachP, G31	-0.02	0.01	-2.71	30	0.012
For Sense of membership in university Slope, B4					
Intrcpt2, G40	0.15	0.05	3.03	31	0.005
For Shared control in classroom Slope, B5					
Intrcpt2, G50	0.55	0.13	4.38	31	0.000

Random Effect	**Reliability Estimates**	**Standard Deviation**	**Variance Component**	**df**	**Chi-square**	**p-Value**
INTRCPT1, U0	0.08	0.73	0.54	27	35.90	0.12
Parents' educational attainment Slope, U1	0.08	0.64	0.41	29	32.27	0.31
Parental involvement Slope, U2	0.21	0.21	0.05	29	30.64	0.38
General self-efficacy beliefs Slope, U3	0.11	0.22	0.05	28	28.01	0.46
Sense of membership in university Slope, U4	0.12	0.14	0.02	29	28.03	>0.50
Shared control in classroom Slope, U5	0.09	0.34	0.12	29	35.42	0.19
Level 1, R		4.35	18.94			
Statistics for Current Covariance Components Model						
Deviance	1657.29					
Number of estimated parameters	22					

Self-directed learning readiness

The results in Figure 4 and Table 3 provide evidence for the hypothesised interrelationships that would stimulate self-directed learning readiness.

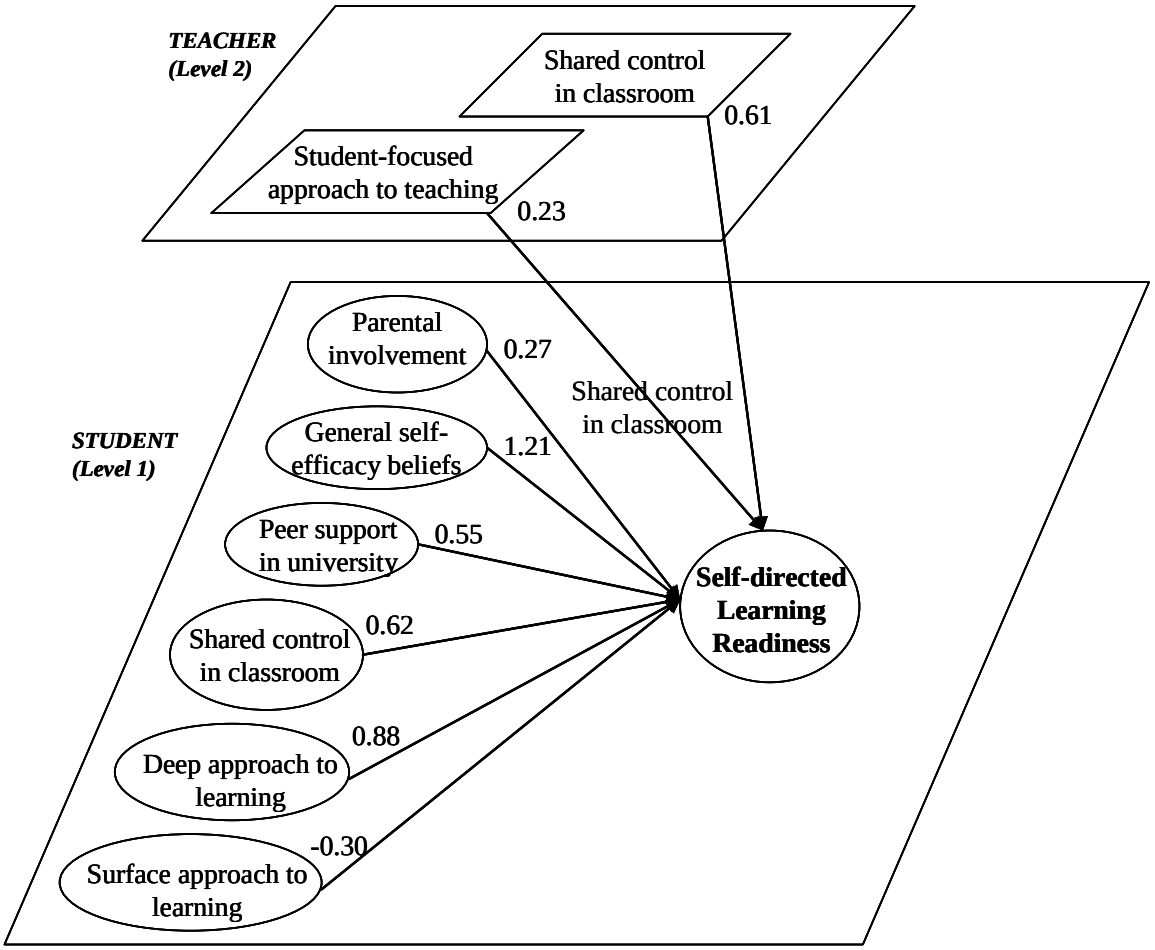


Figure 4. Results of the final hierarchical model for self-directed learning readiness

Students whose parents were highly involved in their university studies were estimated to have high self-directed learning readiness scores in comparison to students whose parents' involvement was low. Students who had high general self-efficacy beliefs to cope with and manage challenging environmental demands reported higher self-directed learning readiness scores in comparison to those who were less self-efficacious. In terms of students' perceptions of the learning environments, the results revealed that students who perceived that they had peer support in the university community and had actively participated in questioning, explaining, justifying, and evaluating their own and their peers' ideas in the classroom were also highly self-directed in their learning. In addition, students who employ deep approaches to learning rather than surface approaches reported to be more ready for self-directed learning. Students who were in classes with teachers who engaged their students by getting them to question, explain, justify and evaluate their ideas in the classrooms were estimated to be more self-directed learners. When the teachers employed a student-focused teaching approach, these students were also likely to use more self-directed learning strategies.

The total amount of variance explained by the final model was 71.5%. Most of the variance (90.9%) was found between students and 9.1% occurred between teachers. This means that the final model explained more than half (69.3%) of the variance available at the student level and most (94.1%) of the variance at level 2. The large percentages of variances explained at the teacher level (94.1%) indicate that there were few factors influencing self-directed learning readiness at level 2 that were not included in this model. In terms of the

final model's goodness-of-fit model, the deviance was reduced by 272.05, from 2284.14 in the null model to 2012.09 in the final model.

The results show that we can expect students to be more ready for self-directed learning when they: (a) come from families with highly involved parents in their university studies; (b) are highly self-efficacious; (c) have supportive peers in the university-level environment; (d) are actively engaged in the classroom through questioning, explaining, justifying, and evaluating their own and their peers' ideas; and (e) employ deep approaches to learning, rather than surface approaches to learning.

Table 3. Final HLM model results for deep approach to learning

Final Estimation of Fixed Effects					
Fixed Effect	**Coefficient**	**Std. error**	**t-ratio**	**d.f.**	**p-value**
For INTRCPT 1, B0					
INTRCPT2, G00	137.83	0.44	314.46	29	0.000
Teachers' perception of shared control in classroom, G01	0.61	0.17	3.52	29	0.002
Student-focused teaching approach, G02	0.23	0.07	3.48	29	0.002
For Parental Involvement Slope, B1					
Intrcpt2, G10	0.27	0.09	3.18	31	0.004
For General self-efficacy beliefs Slope, B2					
Intrcpt2, G20	1.21	0.15	8.13	30	0.000
Teachers' perception of uncertainty in classroom, G21	-0.12	0.05	-2.31	30	0.028
For Peer support in university commuity Slope, B3					
Intrcpt2, G30	0.55	0.18	3.01	31	0.006
For Shared control in classroom Slope, B4					
Intrcpt2, G40	0.62	0.26	2.41	31	0.022
For Deep approach to learning Slope, B5					
Intrcpt2, G50	0.88	0.10	8.53	29	0.000
Self-teaching efficacy in managing students in classroom TEF2FCM, G51	-0.05	0.01	-4.07	29	0.000
Teachers' job satisfaction level, G52	0.08	0.03	2.74	29	0.011
For Surface approach to learning Slope, B6					
Intrcpt2, G60	-0.30	0.09	-3.38	31	0.002

Random Effect	**Reliability Estimates**	**Std. error**	**Variance Component**	**df**	**Chi-square**	**p-Value**
INTRCPT1, U0	0.05	1.11	1.23	25	23.51	>0.500
Parental involvement Slope, U1	0.07	0.24	0.06	27	32.97	0.200
General self-efficacy beliefs Slope, U2	0.06	0.37	0.14	26	31.45	0.212
Peer support in university Slope, U3	0.18	0.74	0.55	27	52.98	0.002
Shared control in classroom Slope, U4	0.07	0.66	0.44	27	28.97	0.362
Deep approach in learning Slope, U5	0.06	0.25	0.06	25	32.61	0.141
Surface approach to learning Slope, U6	0.15	0.30	0.09	27	37.60	0.084
Level 1, R		7.94	63.09			

Statistics for Current Covariance Components Model	
Deviance	2012.09
Number of estimated parameters	29

Discussion

This study shows the early work of examining the influences of family involvement, joint university and classroom learning environments, and effects of students and teachers on learning approaches and self-directed learning readiness in a higher education context. This study was conducted through hierarchical analyses, which recognises the multi-level characteristics that many early educational research data analyses have recognised as important.

This study has provided empirical support for the idea that the variabilities in a deep approach to learning and self-directed learning can be attributed to differences at both the student and teacher levels. A surface approach to learning can more likely be attributed to differences at the student level. Conversely, there are teacher factors which directly influence students' adoption of a deep approach to learning and self-directed learning readiness.

The most surprising finding here is that parents with low educational attainment levels appear to still influence university students to employ deep approaches to learning. However, this finding is consistent with Biggs' large sample data study which found that students of parents with post secondary education were low on surface and high on deep approaches, but the highest of all in terms of deep approaches were university students whose parents had primary education only (Biggs 1985; 1987). At the same time, it was found that the more involved parents are in their children's university studies, the more likely they are to adopt deep approaches to learning. Thus, there appear to be some compensatory effects between parental involvement and parents' educational attainment. Active involvement of parents who show great interest and support in their children's university studies significantly influences how the students approach learning in higher education.

In terms of family environment, it is generally accepted that if parents are positively involved in their children's activities, the school outcomes of those children are likely to be positive (Marjoribanks 1991; Marjoribanks 2002, 1979; Marjoribanks 1994, 1995; Hung and Marjoribanks 2005). This is of continuing importance in the higher education context, where parental involvement continues to provide the necessary resources that contribute to university student learning and outcomes. Parental involvement benefits students in their sense of efficacy for coping well in the university, how they approach learning and in the development of self-directed learning readiness. Therefore, formalising parental participation programs in university education policy, for example through university units such as student affairs (McInnis 2001) where mutual dependence and interactions between university and families can be established, would provide a significant response to this finding. It is common to find parental participation or involvement programs in pre-university schooling such as in the primary and secondary schools. However, the findings in this study reveal the importance of parental involvement in the development of university students' self-directed learning and adoption of deep approaches to learning.

The strong relationship found between a classroom environment and deeper approaches to learning in this study lends support to Biggs' proposition of a constructively aligned education system (Biggs 1999). Accordingly, when students encounter a classroom-level learning environment that is aligned with instructional elements that promote deep approaches to learning, they are adequately stimulated to adopt deep approaches to learning and their scores for a deep approach to learning are likely to be high. That is, when the students are in learning and teaching situations which demand higher-order level of teaching and active learning activities and conditions, they are likely to employ deep approaches to learning. Conversely, when the students are in learning and teaching situations that demand

superficial learning, they are likely to employ surface approaches to learning. To develop self-directed learning readiness among students, teachers must actively engage students in the classroom through encouraging their students to participate in questioning, explaining, justifying and evaluating ideas in the classroom and by employing a student-focused teaching approach. Suggestions on how to do this effectively are beyond the scope of this paper, but the results of this study clearly indicate that such an approach is worth pursuing. This study provides evidence for the proposition that the development of self-directed learning skills among students requires students to employ deep approaches to learning which are more likely to occur when the teaching and learning activities and conditions support deep learning.

As most university teachers in medical programs in Malaysia enter academia with little or no teaching qualifications (Lim 2008), the establishment of a formal and systemic professional training and development program for both full-time and part-time academic staff to equip teachers with student-focused educational theories concepts, and teaching strategies and to develop student-focused approaches to learning appears to be inevitable. In addition to how a teacher 'teaches', the way the learning environments are created also plays a key role in whether students use deep approaches to learning and whether self-directed learning outcomes are developed. The creation of a classroom environment which actively engages students and where students feel a sense of belonging and peer support can develop deep approaches to learning among students and subsequently develop their self-directed learning outcomes.

The hierarchical analyses have revealed how a teacher as a person, and his or her approach to teaching and classroom environment play key roles in influencing a student to adopt deep approaches to learning and develop self-directed learning. The teacher factor with the most significant and direct influence on students employing deep approaches to learning and self-directed learning is the use of student-focused teaching approaches. This HLM finding corresponds to and provides empirical evidence to support the general theoretical proposition by Prosser and Trigwell (1999) and Prosser, Ramsden, Trigwell and Martin's Model of Teaching (2003) that approaches to teaching influence students' approaches to learning, which in turn influence students' learning outcomes.

Overall, this study has provided important insights into the influences and impacts of distal and proximal contexts on student learning and related learning outcomes. However, several considerations need to be taken into account when interpreting the findings of the present study. First, this study only involved students undertaking a pre-clinical medical program in a private university, which could limit the generalisation of the findings to non-medical programs as well as public higher education. Future studies could be carried out in a variety of universities and with a more varied sample of students and teachers. Second, this study is a large cross-sectional study. Future studies could adopt a longitudinal design. However, this design limitation was outweighed by the simultaneous data collection involving students from the first, second and final year of pre-clinical studies in Malaysia, which allows for a longitudinal or time dimension to the study (Lietz and Keeves 1997). Third, owing to the sensitivities of the information involved, certain information could not be obtained that could have broadened the spectrum of the study. For example, we could not access assessment questions or examination papers and were not allowed to conduct participant observations of students and teachers in the PBL classrooms. The absence of assessment questions or examination papers limited us in performing a measurement test that could have examined for example the level of difficulty, or ethnic and gender bias in the questions. The measurement test of the assessment or examination questions could have provided a better picture of its psychometric properties. The absence of the participant

observation thus limited us to gauge the non-verbal behaviours of students and teachers; and compare them to the information provided by students and teachers.

However, despite such limitations, this study provides a useful starting point to build on for future research, and it has provided important empirical data to begin to empirically support a series of now widely accepted theoretical ideas and concepts. More importantly, this study also demonstrates the utility of the two-level integrated theoretical model which can be transferred to other educational contexts of study involving teachers and students, and teaching and learning.

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Appendix 1

Summary of the Variables, Instruments and Reliability Values at Student Level

THEORETICAL MODEL	ORIGINAL STUDY				PRESENT STUDY		
Variable	**Instrument**	**Sub-Scale**	**No. of Items**	**Cronbach Alpha Reliability**	**No. of Items**	**Factor Analyses/ Coding**	**Cronbach Alpha Reliability**
Gender	Not applicable				1	1 = Male 0 = Female	Not applicable
Ethnicity	Not applicable				1	1 = Chinese 0 = Others (Malay + Indian ethnic groups)	Not applicable
Parents' educational attainment	Not applicable				2	1 factor = Human capital	Overall= 0.73
Parents' aspirations	Not applicable				2	1 = Parents 0 = Others 2 items: One to identify parents' desire to pursue program One to identify parents' desire to succeed in education	Not applicable
Parents' involvement	Family Capital Scale by Marjoribanks (Marjoribanks 2002)	Unidimensionality	12	Not available	12	1 factor = Family capital All 12 items	Overall = 0.91
Self efficacy	General Self-Efficacy Scales (GSE) by Schwarzer and Jerusalem (1995)	Unidimensionality	10	Overall = 0.86	10	1 factor extracted All 10 items	Overall = 0.86

University learning environment	University Level Learning Environment Questionnaire (ULEQ) by Dorman (1999)	1. Academic freedom 2. Concern for undergraduate learning 3. Concern for Research and Scholarship 4. Empowerment 5. Affiliation 6. Mission Consensus 7. Work Pressure	42	Academic Freedom = 0.74 Concern for Undergraduate Learning = 0.72 Concern for Research and Scholarship = 0.65 Empowerment = 0.82 Affiliation = 0.87 Mission Consensus = 0.78 Work Pressure = 0.78	21	2 factors extracted 21 items 1= Sense of membership 2= Peer support	Sense of membership = 0.77 Peer support = 0.75
Classroom learning environment	Constructivist Learning Environment Survey 2 -20 (CLES 2(20)) by Taylor, Fraser & Fisher (1997)	1. Personal relevance 2. Uncertainty 3. Critical voice 4. Shared control 5. Student negotiation	20	Personal relevance = 0.89 – 0.90 Uncertainty= 0.75 – 0.81 Critical voice = 0.87 – 0.88 Shared control = 0.72 – 0.76 Student negotiation = 0.87 – 0.81	20	5 factors extracted All 20 items 1. Personal relevance 2. Uncertainty 3. Critical voice 4. Shared control 5. Student negotiation	Personal relevance = 0.86 Uncertainty = 0.62 Critical voice = 0.80 Shared control = 0.70 Student negotiation = 0.80
Curriculum	Not applicable				1	0 = Insufficient 6 = Sufficient 10 = Excellent	Not applicable

Approaches to learning	Revised Study Process Questionnaire (R-SPQ-2F) by Biggs, Kember & Leung (2001)	1. Deep motive 2. Deep strategy 3. Surface motive 4. Surface strategy Deep approach = Deep motive + deep strategy Surface approach = Surface motive + surface strategy	20	Deep motive = 0.62 Deep strategy = 0.63 Surface motive = 0.72 Surface strategy = 0.57 Deep approach = 0.71 Surface Approach = 0.64	20	4 factors extracted 20 items 1. Deep motive 2. Surface motive 3. Deep strategy 4. Surface strategy	Deep motive = 0.72 Deep strategy = 0.72 Surface motive = 0.74 Surface strategy = -.68 Deep approach = 0.83 Surface approach = 0.83
Self-directed learning readiness	Self-directed Learning Readiness Scale (SDLRS) by Fisher, King & Tague (2001)	1. Self-management 2. Desire for learning 3. Self-control	40	Self management = 0.92 Desire for learning = 0.85 Self-control = 0.83	37	3 factors extracted 37 items 1. Self-management 2. Desire for learning 3. Self-control	Self-management = 0.78 Desire for learning = 0.92 Self-control = 0.68

Appendix 2

Summary of the Variables and Instruments at Teacher Level

THEORETICAL MODEL	ORIGINAL STUDY				PRESENT STUDY		
Variable	**Instrument**	**Sub-scale**	**No. of items**	**Reliability Value**	**No. of items**	**Factor Loadings/ Coding**	**Reliability Value**
Gender	Not applicable				1	1= Male, 0= Female	Not applicable
Age	Not applicable				1	1= More than 39 years old (Senior) 0= Less than 39 years old (Junior)	Not applicable
Employment status	Not applicable				1	1= Part time, 0= Full-time	Not applicable
Education background	Not applicable				1	1= Medicine, 0= Not Medicine	Not applicable
Highest education level	Not applicable				1	1= Diploma 2= Bachelor's 3= Master's 4= Doctorate 5= Others	Not applicable
Formal teacher training	Not applicable				1	1= Yes, 0= No	Not applicable
Prior PBL experience	Not applicable				1	1= Yes, 0= No	Not applicable
PBL training preparation	Not applicable				1	1= Yes, 0= No	Not applicable
Teach non-PBL class experience	Not applicable				1	1= Yes, 0= No	Not applicable

Work experience	Not applicable				1	1= Less than 1 year 2= More than 1 year to less than 3 years 3= More than 3 years to less than 5 years 4= More than 5 years to less than 7 years 5= More than 7 years to less than 10 years 6= More than 10 years	Not applicable
Self teacher efficacy	Ohio State Teacher Efficacy Scale (OSTES) by Tschanen-Moran and Woolfolk-Hoy (2001)	1. Student engagement 2. Instructional strategies 3. Classroom management	12	Student engagement = 0.81 Instructional strategies = 0.86 Classroom management = 0.86 Overall = 0.90	8	Items loading in excess of 0.30 in two factors. 1= Classroom management 2= Student engagement	Classroom management = 0.83 Student engagement = 0.81
Collective teacher efficacy	Collective Teacher Efficacy Scale - 12 (CTES - 12) by Goddard (2002)	1. Group competence 2. Task analysis	12	Overall = 0.94	10	Items loading in excess of 0.30 in two factors. 1= Group competence 2= Task analysis	Group competence = 0.72 Task analysis = 0.75
Collective School Efficacy	Selected items from Perceived Collective School Efficacy Study by (Caprara et al. 2003)	One scale	9	Overall = 0.82	9	Items loading in excess of 0.30 in one factor.	Overall= 0.89

University learning environment	University Level Learning Environment Questionnaire (ULEQ) by Dorman (1999)	1. Academic freedom 2. Concern for undergraduate learning 3. Concern for Research and Scholarship 4. Empowerment 5. Affiliation 6. Mission Consensus 7. Work Pressure	42	Academic Freedom = 0.74 Concern for Undergraduate Learning = 0.72 Concern for Research and Scholarship = 0.65 Empowerment = 0.82 Affiliation = 0.87 Mission Consensus = 0.78 Work Pressure = 0.78	29	Items loading in excess of 0.30 in five factors. 1= Concern for learning (6 items) 2= Empowerment (5 items) 3= Affiliation (6 items) 4= Mission consensus (6 items) 5= Work pressure (6 items)	Concern for learning = 0.62 Empowerment = 0.73 Affiliation = 0.69 Mission consensus = 0.76 Work pressure = 0.71
Classroom learning environment	Constructivist Learning Environment Survey 2 -20 (CLES 2(20)) by Taylor, Fraser & Fisher (1997)	1. Personal relevance 2. Uncertainty 3. Critical voice 4. Shared control 5. Student negotiation	20	Personal relevance = 0.89 – 0.90 Uncertainty= 0.75 – 0.81 Critical voice = 0.87 – 0.88 Shared control = 0.72 – 0.76 Student negotiation = 0.87 – 0.91 Overall = 0.93 – 0.94	20	Items loading in excess of 0.30 in five factors. 1= Personal relevance 2= Uncertainty 3= Critical voice 4= Shared control 5= Student negotiation	Personal relevance = 0.90 Uncertainty = 0.70 Critical voice = 0.64 Shared control = 0.77 Student negotiation = 0.80

Approaches to teaching	Approach to Teaching Inventory (ATI-22) by Trigwell, Prosser and Ginns (2005)	<u>Intention:</u> Information Transmission (IT) Conceptual Change (CC) <u>Strategy:</u> Teacher-focus (TF) Student-focus (SF) Teacher-focus approach = IT + TF Student-focus approach = CC + SF	22	Teacher-Focus Approach to Teaching (ITTF) = 0.83 At 95% CI 0.80-0.85 Student-Focus Approach to Teaching (CCSF) = 0.86 At 95% CI 0.84-0.89	19	Items loading in excess of 0.30 in two factors. 1= ITTF 2= CSSF	ITTF = 0.78 CSSF = 0.81
Job satisfaction	Selected items from Perceived Collective School Efficacy Study by Caprara et al (2003)	1 factor	4	Overall = 0.82	4	All items loading in one factor.	Overall = 0.88
Mental health	General Health Questionnaire – 12 (GHQ-12) by Goldberg and Williams (1988)	1 factor	12	NA	12	All items loading in one factor.	Overall = 0.92