The relationship between persistence, academic engagement and academic achievement among post graduate students of OUM

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ABSTRACT

Self directed and self manage learning is one of the pillar for lifelong learning. Learners' stamina to sustain as self directed learners is vital for their academic success. This paper examines the association between persistence, academic engagement, and academic performance among post graduate students in an Open and Distance Learning Institution. The logistic regression was used to model the relationship while the Receiver Operating Curve (ROC) curve was used to assess the sensitivity and specificity of the predictive model. In this cross sectional a total of 390 students enrolled in various Master degree programs at OUM answer a self administered questionnaire. Academic performance was compared with students' perceived engagement in academic activities, and persistence in studies.

Among the significant predictors of academic performance are classroom and cognitive emphasis (components of engagement), and academic integration, service satisfaction, academic conscientiousness and degree commitment (components of persistence). Students with favorable ratings on their academic engagement and persistence in studies tend to do better academically. The statistical model predicting these relationships is 83.33% sensitive and 91.04% specific. Using student engagement and persistence as predictors of academic achievement would enable the academic institutions to identify 'at risk' students much earlier compared to using CGPA.

Introduction:

Given the emphasis placed academic achievement of students as the criteria for successful insemination of knowledge, the way in which students acquire knowledge through the learning process has become a primary concern for all educational institutions. Several studies have highlighted the significant role that affective factors can play in learning (Mathewson, 1994; Wigfield, 1997), placing particular emphasis on student engagement. According to Newmann (1992), student engagement occurs when "students make a psychological investment in learning. They try hard to learn what the course offers. They take pride not simply in earning the grades, but in understanding the material and incorporating or internalizing it in their lives." (Newmann, 1992, pp 2-3). Student engagement has been popularly used as an indicator of successful classroom instruction and predictor of students' academic success. Students are said to be engaged when they are involved in their work, persistent with their studies despite challenges and obstacles, and take pride in accomplishing their work (Bomia .et.al (1997). Student engagement also refers to a "student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process promoting higher level thinking for enduring understanding." Willms, J.D (2003), p.i.

Early studies of student engagement often focused on time-on-task behaviors (Brophy, 1983). However, more recently, other definitions have appeared in the literature for example students' willingness to participate in routine school activities, such as attending classes, submitting required work, and following teachers' directions in class were used as indicators of student engagement. For instance, Natriello (1984) defined student engagement as "participating in the activities offered as part of the school program" (p.14).

Another definition focuses on more subtle cognitive, behavioral, and affective indicators of student engagement in specific learning tasks. According to Skinner & Belmont (1993), students who are engaged show sustained behavioral involvement in learning activities accompanied by a positive emotional tone.

Pintrich and & De Groot (1990) on the other hand associated engagement levels with students' use of cognitive, meta-cognitive and self-regulatory strategies in managing their learning processes. Students' engagement is viewed as motivated behavior which can be seen from the kinds of cognitive strategies students choose to use, and by their willingness to persist with difficult tasks by regulating their own learning behavior.

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Persistence on the other hand is defined as adults staying in programs for as long as they can, engaging in self-directed learning, temporarily leave the program, and returning to a program as soon as the demands of their lives allow (Beder, 1990). Persistence is a continuous learning process that lasts until an adult student meets his or her educational goal. A key difference between adult and child learners is that adults choose to participate in their educational activities while children participate because of legal mandates and strong social and cultural forces that identify schooling as part of the child's developmental process (Cross, 1981). Adults learners make informed decision whether to participate or not in each class session and often must overcome significant barriers in order to attend classes.

Factors Affecting Retention

Academic institutions have traditionally used academic variables such as grade point average (GPA), college admissions tests, and high school coursework (Tinto, 1997) to identify at-risk students.

However evidence from the literature indicates that non-academic factors often have an even greater impact on undergraduates' persistence decisions. A review of the literature identified the following sets of non-academic variables related to retention: institutional and degree commitment, academic and social integration, support services satisfaction, finances, social support, and personality and psychological adjustment (Tinto, 1997).

Institutional commitment is the extent to which students identify themselves with their college or university and their perception on the institution's provision of the academic services.

 Degree commitment is the level of importance students attach to earning the degree. The crucial elements in degree commitment are students' plans to finish the degree, estimates of the likelihood or certainty that a college diploma will be achieved, and their self-appraised commitment to earn the degree.

Whereas institutional commitment refers to a particular college or university, degree commitment reflects the value the student places on obtaining a diploma from any school. Sometimes institutional commitment and degree commitment coexist in students, but

sometimes they do not. For example, a student may see the importance of obtaining a college degree, but feel that his or her current school is not the right one. Other students may enjoy the college they attend, but may not be certain about the value of a college degree. Consequently, it is important to consider and measure the two types of commitment.

Academic and social integrations are included in almost every contemporary causal model of student retention. In addition to their impact on retention, academic and social integration have been studied as outcome measures. For example, Strahan (2003) examined the effects of social anxiety and social skills on social integration.

Tinto's (1997) theory of student departure proposed that successful student adjustment depends on the sequential steps of separation, transition, and integration into the academic and social realms of college life. This model suggests that persistence is related to the ability of the student to leave his or her previous life and become incorporated into the academic and social life of the institution. This is often a particular challenge for commuter students. Tinto (1997) proposed that students who continue to live at home may be unable to take full advantage of those (institutional) communities for integration into the social and intellectual life of the college. .

Social integration is hypothesized to have a positive effect on grades when students interact with individuals who have strong academic orientations. Tinto (1997) contended that higher degrees of amalgamation into social and academic environments also contributes to higher degrees of institutional and goal commitment leading to higher graduation rates, and lower levels of attrition. Although academic and social integration are regarded as critical to understanding retention, there is little consistency regarding the operationalization or measurement of these constructs.

The relationship of support services to student retention has been extensively studied (Pascarella & Terenzini, 2005). Parker (2003) found that the efficiency with which rules or regulations are communicated, the fairness of policies, and the amount of student participation in institutional decision making significantly affects retention rates. In a study by Habley and McClanahan (2004), the following three categories of retention efforts were deduced from survey respondents: first-year programs, academic advising, and learning support. Among the most cited efforts were integrating academic advising into some type of first-year program, such as freshman orientation; advising interventions with selected student populations; academic

advising centers; centers that combine academic advising with career/life planning; and learning assistance centers (Habley & McClanahan, 2004).

Social support variables address students' interpersonal networks and the extent to which the networks facilitate their decision to pursue a college degree. The following social support measures have been shown to be important influences on retention: encouragement from friends or family members (Stage & Rushin, 1993), the students' belief that family members expect them to obtain a degree (Munro, 1981), the caring of faculty (Lundquist, Spalding, & Landrum, 2002-2003), and the availability of people within the institution with which to discuss personal problems (Mallinckrodt, 1988).

Financial variables have been the focus in several causal models of retention (St. John, Paulsen, & Starkey, 1996). Financial and investment issues are important because many students must pay bills and juggle financial priorities. A central construct of most investment models is that people consider the rewards, costs, and alternatives that are associated with choices. Hatcher, Kryter, Prus, and Fitzgerald (1992) demonstrated that this idea extends to college students' enrollment decisions.

Personality and adjustment variables have also received increased attention over the last decade. Bean and Eaton (2000) proposed a psychological model of retention that combines strategies students use to deal with stress. This model includes variables that are important in the field of personality such as self-efficacy (e.g., Bandura, 1997), coping strategies (e.g., Aldwin, 2007), and personal control (e.g., Perry, 2003). Recent retention research on individual differences supports the role they play in persistence decisions. Bray, Braxton, and Sullivan (1999) found that positive and negative coping techniques were associated with integration and commitment. Other investigations have also shown personality characteristics are related to attrition. For example, students who are higher in conscientiousness are less likely to drop out of college (Tross, Harper, Osher, & Kneidinger, 2000).

Student perceptions of the academic and social environments have also been associated with retention and other education indices. Davidson, Beck, and Silver (1999) took this approach in identifying six academic orientations (structure dependence, creative expression, reading for pleasure, academic efficacy, apathy, and mistrust of instructors) that develop as a result of their college experiences. Combinations of those orientations are associated with students' stress

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levels (Davidson & Beck, 2006), grades (Beck & Davidson, 2001), persistence (Davidson & Beck, 2006-2007), and self-actualization (Davidson, Bromfield, & Beck, 2007).

Measuring Student Engagement

There are various methods used in measuring students' engagement in academic activities amongst these, the self report is the most common method. Other methods include ratings by teachers, observations of the class dynamics, work sample analyses, and case studies.

In self-reports students are asked to complete surveys or questionnaires regarding their level of task engagement in various aspects such as cognitive, behavior affective, and goal orientation. In measuring the cognitive aspects of engagement students are asked to report on factors such as their attention during class, the mental effort they expend on these tasks, and task persistence. As for the behavior aspect, students are normally asked to report their response levels during class time for example interaction. Affective engagement questions typically ask students to rate their interest in and emotional reactions to learning tasks and , goal orientation revolves around their achievement goal orientations (Covington, 2000). Although self-report scales are widely used, the validity of the data yielded by these measures will vary considerably with students' abilities to accurately assess their own cognitions, behaviors, and affective responses (Assor & Connell, 1992).

Although self-report scales and teachers' ratings are widely used, the validity of the data yielded by these measures will vary considerably with students' abilities to accurately assess their own cognitions, behaviors, and affective responses (Assor & Connell, 1992).

Checklists and Rating Scales and direct observations are often used to confirm students' reported levels of engagement in learning tasks. Using specially designed checklist and rating scales, teachers' assess their students' willingness to participate in school as well as their emotional reactions to the tasks given.

Direct observations are often used to confirm students' reported levels of engagement in learning tasks. In this method, the observer records whether a behavior was present or absent at a particular moment during a specific time period. Most of these observational studies use some form of momentary time sampling system

In Work Sample Analyses evidence of higher-order problem-solving and metacognitive learning strategies are gathered from sources such as student projects, portfolios, performances, exhibitions, and learning journals or logs (e.g., Royer, Cisero, & Carlo, 1993). The efficacy of this method hinges on the use of suitably structured tasks and scoring rubrics.

When the focus of an investigation is restricted to a small group of target students, it is often more useful to collect detailed descriptive accounts of engagement rates. Case studies allow researchers to address questions of student engagement inductively by recording details about students in interaction with other people and objects within classrooms. This might include, for example, the behavior of peers, direct antecedents to the target student's behaviors (e.g., teacher directions), as well as the student's response and the observed consequences of that response (e.g., reactions from teachers or peers). Case studies generally attempt to place observations of engagement within the total context of the classroom and/or school, and are concerned as much with the processes associated with engagement as they are in depicting engagement levels.

Measuring Students' Persistence

Davidson, Beck & Miligan (2009) developed a short instrument, *College Persistence Questionnaire, Version 1 (CPQ-V1),* that would allow college personnel to: (a) identify students at-risk of dropping out, (b) discover why a given student is likely to leave the institution, and (c) determine the variables that best distinguish undergraduates who will persist from those who will not persist at a particular college or university. The CPQ – V1 has 53 items covering six factors; Academic Integration, Social Integration, Supportive Service Satisfaction, Degree Commitment, Institutional Commitment, and Academic Conscientiousness. The six identified factors are very much in line with the variables within the retention literature.

Academic integration reflects the ways students feel about their learning in the institution with regards to their intellectual growth. Students form their perception base on their interactions with the campus environment especially academic related issues.
Social integration

Institutional commitment is the extent to which students identify themselves with their college or university in terms of academic service provided.

Degree commitment is the level of importance students attach to earning a diploma. The crucial elements in degree commitment are students' plans to finish the degree, estimates of the likelihood or certainty that a college diploma will be achieved, and their self-appraised commitment to earn the degree

The responses are captured on a 5-point Likert-type scale. Verbal labels for the response scales depended on the wording of the questions (i.e., if a question asked "how satisfied" students are with an aspect of the college environment, the response scale ranged from *very satisfied* and *very dissatisfied*. If the question asked "how much" students liked an aspect of the college environment, the end pegs were *very much* and *very little*). The answers are converted to 5-point "favorability" scores, based on whether the response indicated something positive or negative about the student's college experience.

Research Design

The dimensions for the persistence in studies and engagement in academic activities was developed based on a through review of the existing literature whilst the focus group interviews were used to generate the specific indicators to assess the students' perceived engagement in academic activities and their persistence in studies. The instruments were translated into a questionnaire and the data collected from the samples of post graduate students was used to establish the psychometric properties of the instrument as well as testing the relationship between students' engagement in academic activities and their persistence in studies.

Population

The population for this study is all the post graduate students at OUM enrolled in the Masters degree programs and actively taking service during the September 2010 semester. This study include only students who are in the blended mode. All international students, purely online

students, and students in the MIDT program is not included in this study. Table 1 shows the information of the Masters student population at OUM as of September 2010.

Program	New Intake in Sept 2010	Senior Students	Total
MBA	61	266	327
MES	-	11	11
Med	66	431	497
MHRM	13	57	70
MIDT	2	6	8
MIS(CI)	0	10	10
MIT	5	47	52
MM	21	66	87
MMC	2	22	24
MN	9	47	56
MPM	24	57	81
MSC	-	2	2
MSC(BA)	-	1	1
MSE (E)	-	6	6
MSE	1	16	17

Samples

As this study utilizes statistical inference, random sampling was used. First the student list was obtained from the Center for Graduate Studies.   The multistage technique was employed to select the programmes and the classes, some programmes have more than one class. All students from the selected classes were the samples for this study.

Sample Size Considerations for Hypothesis Testing

Since the conclusion of the study will be derived from the selected subjects and later inferred to the population, sufficient sample size is important in justifying any decision concerning the hypotheses. The three major factors that were considered in determining the

minimum sample size are the alpha value, power, and the effect size. This is consistent with the requirement proposed by Cohen (1977). The following are the detailed description of the factors:

Alpha is the probability of rejecting the Null when the Null is indeed true. Since the focus of hypothesis testing is to minimize the errors in making the decision, an adequately small value of alpha is essential for the results to be meaningful. For the purpose of this study the researcher set alpha at 0.05.

Power is the probability of correctly rejecting the Null. Since power refers to correct rejection, for the rejection to be meaningful, the power should be set substantively high. For this study, the power is set at 0.95.

Effect size (ES) is the degree of association between the variables under investigation. The larger the value, the greater the degree to which the phenomenon under study is manifested (Cohen, 1977). For this particular study, the researcher has decided on a small effect size because he is interested in detecting even a small degree of association between teaching and learning environment, motivation to learn, attitude towards learning, and self directed learning readiness.

Hence, for the purpose of the present study, the researcher set α at 0.05, power at 0.95 and effect size medium (r = 0.3) and for these values the minimum sample size of 300 is deemed appropriate (Cohen, 1977). This sample is also adequate for the structural equation modelling that is used to establish the causal relationships between the constructs. According to Hair, Anderson, Tatham and Black (1995), a sample size between 150 and 300 is recommended for maximum likelihood estimation (MLE), the method used in structural equation modelling (Hair et al., 1995, p.637). Table 3.2 shows the samples in the study.

Variable	Frequency	Percentage (%)	Variable	Frequency	Percentage (%)
Gender			**Ethnicity**		
Female	148	37.6	3.75 and above	46	11.8
Male	242	62.4	3.67 to 3.74	33	8.5
Total	390	100.0	3.00 to 3.67	194	49.7
Program			Below 3.00	56	14.4
MBA	112	28.7	Missing	61	15.6
Med	231	59.2	Total	390	100.0
MHRM	5	1.3	**Learning Center**		
MM	16	4.1	Ipoh Greenhill	43	11.0
Nursing	26	6.7	Johor Bharu	34	8.7
Total	390	100.0	Kedah	30	7.7
SEMESTER			Kelantan	41	10.5
1	59	15.1	Kuala Lumpur	42	10.8
2	98	25.1	Kuching	37	9.5
3	73	18.7	Melaka	37	9.5
4	35	9.0	Miri	18	4.6
5	47	12.1	NS	13	3.3
6	18	4.6	Pahang	17	4.4
7	13	3.3	Penang	33	8.5
8	7	1.8	Sabah	18	4.6
Missing	40	10.3	Terengganu	27	6.9
Total	390	100.0	Total	390	100.0
Ethnicity					
Malay	189	48.5			
Chinese	117	30.0			
Indian	66	16.9			
Others	18	4.6			
Total	390	100.0			

Instrumentation

The procedure used to develop the instrument followed the eight-step process of instrument development suggested by DeVellis (2003). The instrument development process consists of: defining the construct, identifying the domain, generating items, collecting preliminary data (piloting), purifying the instrument, collecting fresh data, further purifying the instrument, and evaluating the reliability, validity and dimensionality of the instrument.

Based on literature and focus group interviews, students' engagement in academic activities was defined as a three factor construct comprising of *classroom behaviour*, *cognitive emphasis*,

and *academic contribution*. While students' persistence in studies was defined as a five factor construct comprising of *Academic Integration*, *Service Satisfaction*, *Degree Commitment*, *Academic Conscientiousness*, and *Institutional Commitment*.

Two focus group interviews Masters' students of OUM were carried out to gauge their perspective on *Engagement in Academic Activities* and *Persistence in Studies*. The results of the focus group interviews were later transformed into a questionnaire that was used to gauge students' perception on *Engagement in Academic Activities* and *Persistence in Studies*. A total number of 102 students responded in the first wave of data collection. The exploratory factor analysis and reliability analysis using Cronbach Alpha were carried out and the instrument was improved.

The subsequent data collection involves a sample of … postgraduate students of OUM mostly masters students from the faculty of business and faculty of education. The data from the second wave was subjected to confirmatory factor analysis to establish the psychometric properties of the instrument and other inferential analysis to test the relationship between students' persistence in studies and their engagement in academic activities.

Results : Psychometric properties of instrument.

The psychometric properties of instrument refer to the soundness of the instrument in measuring the intended construct. This is one of the major concerns in social science studies since most constructs are difficult to be measured objectively. The psychometric properties of the instrument was evaluated in terms of validity, and the reliability.

a)   Validity

The validity of the instrument refers to its' ability to measure what it purports to measure. Since the validity of the study very much depends on the validity of the instrument used, it is an important issue to be addressed. Broadly, validity refers to how accurately a particular construct is translated into measurable behaviours. Among the types of validity discussed in this paper are: face and content validity, convergent validity, concurrent validity, and dimensionality.

i   Face and Content Validity

Clearly specifying the domain of the construct, generating items that exhaust the domain, and purifying the resulting scale should produce a measure, which is content or face valid and reliable (Churchill, 1976, p. 70). Since a thorough review of the literature was carried out to determine the constructs, and focus group discussions were used to generate specific indicators to measure the defined construct, necessary steps had been taken to establish sound face and content validity. The factor analyses, both exploratory and confirmatory shows that students' ratings converge with the theoretical description of the construct. Table 1 illustrates the items that were assigned theoretically and the items that load statistically to the common factors.

Table 1 : Instrument for measuring students' academic engagement and their persistence in studies

Dimension	No. of items assigned based on theory	No. of items that converged as expected	Theoretical explanation
Students' Engagement in Academic Activities			
Factor 1 (Classroom Behaviour)	8	5	Students' behaviour with regards to learning.
Factor 2 (Cognitive Emphasis)	8	5	Students' assessment on the course emphasis on mental activities.
Factor 3 (Academic Contribution)	8	5	Students' assessment on the contribution of the course to their academic progression.
Students' Persistence in Studies			
Factor 1 (Academic Integration)	6	6	Positive views of instruction, instructors, and own intellectual growth; awareness of connections between academics and careers.
Factor 2 (Service Satisfaction)	6	4	Level of social support a student feels that the institution provides.
Factor 3 (Degree Commitment)	6	4	The personal importance and value that students and their supportive network place on degree completion; sense of certainty in degree attainment.
Factor 4 (Academic Conscientiousness)	6	4	Timely performance of academic responsibilities.
Factor 5 (Institutional Commitment)	8	5	Level of confidence in and satisfaction with institutional choice.

ii   Convergent Validity

Some researchers claimed that each of the items in the instrument can be treated as different indicators to measure the same construct. To determine on which dimension the items in the questionnaire load, an exploratory factor analysis was performed. Items that were statistically loading to the common factors were then compared with the relevant theories (refer to Table 1). After dully considering the theory as well the statistical outcomes, items that load to factors that cannot be explained theoretically were dropped and the second level exploratory factor analysis was performed on the reduced number of items to determine the factor structure.

Whilst factor loadings indicates the convergence of the items to the respective factors (of dimensions), the strength of the convergence i.e how closely all the items in the said factor (or dimension) clustered together is determined by computing the Bentler Bonnet Coefficient.

According to Ahire et.al (1996), the convergent validity of the instrument can be determined using Bentler Bonnet coefficient (delta), a delta value of 0.90 or greater demonstrates strong convergent validity.

Table 2 shows the components and the number of items for the dimensions as well as the Bentler-Bonnet Coefficient for the Student' Persistence in Studies and Engagement in Academic Activities.

Table 2 : The convergent validity of the Instrument for measuring students' academic engagement and their persistence in studies

Dimension	Number of Items	Bentler-Bonnet Coefficient
Students' Engagement in Academic Activities		
Factor 1 (Classroom Behaviour)	5	0.87
Factor 2 (Cognitive Emphasis)	5	0.88
Factor 3 (Academic Contribution)	5	0.89
Students' Persistence in Studies		
Factor 1 (Academic Integration)	6	0.91
Factor 2 (Service Satisfaction)	4	0.88
Factor 3 (Degree Commitment)	4	0.89
Factor 4 (Academic Conscientiousness)	4	0.91
Factor 5 (Institutional Commitment)	5	0.89

iii   *Dimensionality:*

Dimensionality is a process of evaluating the "belongingness" of the items to certain dimensions in the construct. For the instrument to be dimensionally sound, items should only measure the dimensions that they theoretically belong to. The confirmatory factor analysis (CFA) is used if the dimension for the construct is supported by a sound theory and the researcher has a reasonably good knowledge of the number of dimensions while the exploratory factor analysis (EFA) is used when the researcher is uncertain about the relationship between the items and latent factors (Ahire at.al, 1996).

a)   Student Engagement in Academic Activities

The construct Student Engagement in Academic Activities was defined using both existing literature and focus group interviews, both the EFA and CFA were used. The exploratory process was used to explore the relationship between the latent factors (dimensions) and the observed variables (items), while the CFA was used to confirm the relationship (Sureshacandar et al., 2002). The principal component analysis was used as the extraction method for the EFA and the factors were rotated using the Varimax rotation method with Kaiser normalization. Prior to that, a reliability test was performed and only items with an index greater than 0.4 were considered for factor analysis.

The EFA provides a three -factor solution with 71.70% total variance explained. However factor 3 and 4 measures similar domains, behavior with regards to learning, thus these two factors were combined and defined as *classroom behavior* for further analysis. The Bartlett Test of Sphericity gives a very small p-value (0.000), indicating that there is a statistical probability that the correlation matrix has a significant correlation among at least some of the variables (Hair, Anderson, Tatham & Black 1995). Furthermore the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is also very high, 0.871, indicating that the latent constructs can predict the variability of the responses in the observed variables. Table 3 shows the result of the factor analysis.

Table 4 : Factor analysis: Student Engagement in Academic Activities

Rotated Component Matrix[a]				
	Component			
	Cognitive	Academic	Classroom Behavior 1	Classroom Behavior 2
SEa1				.845
SEa2				.827
SEa3			.582	.451
SEa4			.869	
SEa5			.780	
SEb2	.754			
SEb3	.755			
SEb4	.812			
SEb5	.802			
SEb6	.771			
SEc2		.753		
SEc3	.435	.772		
SEc4	.433	.750		
SEc5		.777		
SEc6		.727		
Variance Explained	24.36	21.50	13.22	12.58
Extraction Method: Principal Component Analysis.				
Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 6 iterations.				

The confirmatory factor analysis was performed to complement the result of the exploratory factor analysis. The CFA was performed by carrying out path analysis using structural equation modeling. A measurement model was specified and the model's overall fit was assessed to determine how well the empirical data fit the theoretical model. The CFA is a procedure to assess the discrepancy between the variance-covariance structures of the data set with the model implied variance-covariance structure. Figure illustrates the factor structure for the CFA.

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Figure 1 : The factor structure for Student Engagement Questionnaire

CMIN/Df = 5.817
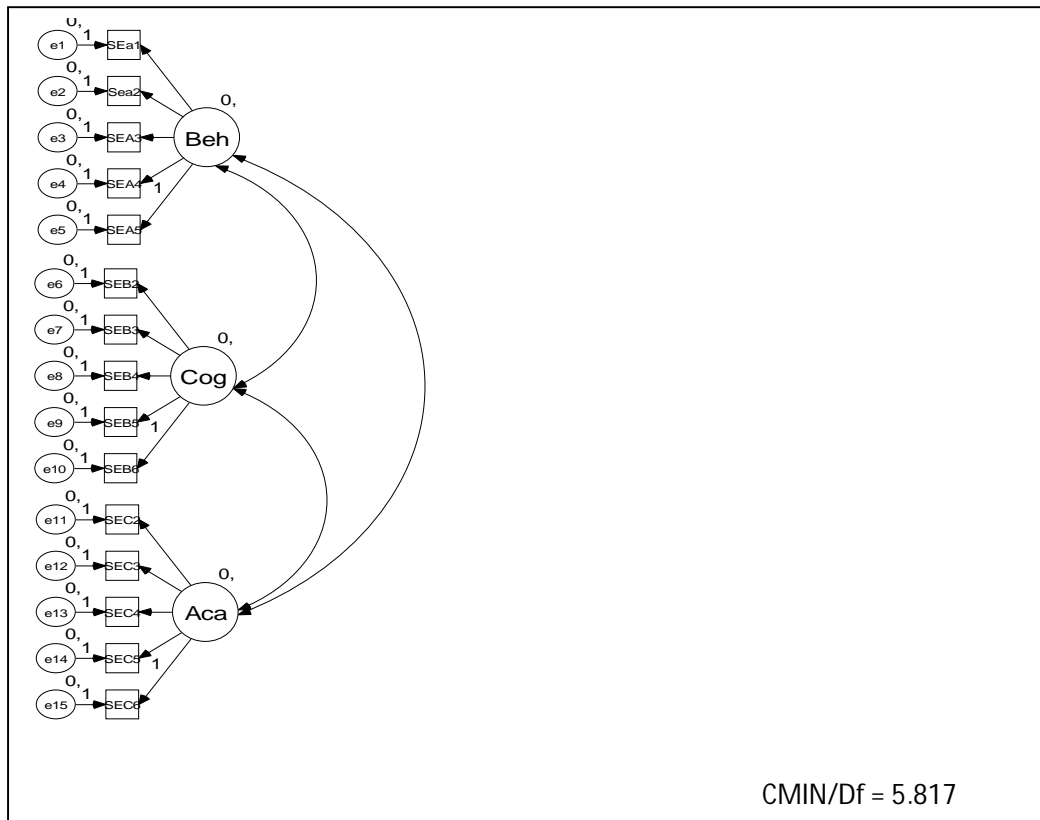
A wide range of goodness-of-fit indices was used to assess the model fit. The fit indices are categorized into the following categories: (1) overall fit (absolute fit), (2) comparative fit to a base model (incremental fit), and (3) model parsimony. In this paper, several goodness-of-fit indices from the three categories of indices in assessing the measurement were used. The selected indicators include the χ^2, GFI, RMSEA, AGFI, NFI, CFI, PNFI and PGFI.

In the confirmatory factor analysis procedure, the number of factors and the items loading to each factor were specified and the hypothesized measurement model was then tested for model fit. In assessing students' engagement in academic activities the following models were tested: i) three-factor oblique, ii) three-factor orthogonal model, and iii) one factor model. The three-factor oblique model is a measurement model that hypothesized complete correlations between all the dimensions. On the other hand, the three-factor orthogonal model assumes that the dimensions are not correlated with one another. The one-factor model is a uni-dimensional model where all the observed variables are linked directly to one common factor.

Table 4 shows the fit indices for the proposed models. All the fit indices indicate that the three-factor oblique model is the superior model. The three-factor oblique model provides a better fit to the data compared to the three-factor orthogonal model, and the one-factor model. The parsimonious indices also suggest that the three-factor oblique model gives the most parsimonious fit to the data.

Table 4: Fit indices comparing the three models

Model	χ^2	df	GFI	AGFI	RMSEA	NFI	CFI	PNFI	PGFI
3-factor oblique	506.095	87	0.88	0.87	0.061	0.88	0.89	0.77	0.84
3-factor orthogonal	529.48	89	0.81	0.78	0.080	0.70	0.79	0.61	0.69
One factor	769.45	89	0.68	0.63	0.11	0.54	0.61	0.49	0.58

Reliability

Reliability refers to the consistency of the instrument. In this paper, the Cronbach alpha was used to evaluate the consistency of the responses for items with the corresponding dimensions. An alpha value of 0.7 to 0.8 is considered satisfactory for social science researches (Nunally & Bernstein, 1994). The Alpha values for the various items of the instruments are shown in Table 5.

Table 5 : The reliability index for Student Engagement Instrument

Dimensions	Cronbach Alpha
Classroom Behaviour	0.780
Cognitive Emphasis	0.895
Academic Contribution	0.879

a)   Students' Persistence in Studies

The dimension of the construct Students' Persistence in Studies was defined based on literature whilst the specific items were developed and focus group interviews. In determining the validity of this instrument both the EFA and CFA were used. The exploratory process was used to explore the relationship between the latent factors (dimensions) and the observed variables (items), while the CFA was used to confirm the relationship (Sureshacandar et al., 2002). The principal component analysis was used as the extraction method for the EFA and the factors

were rotated using the Varimax rotation method with Kaiser normalization. Prior to that, a reliability test was performed and only items with an index greater than 0.4 were considered for factor analysis.

The EFA was carried out with the minimum eigen-value for valid factors is defined as 0.9. A slightly reduced eigen-value was used because the conventional value of 1.0 produce factor structure that deviates very much from the theoretical factor structure. The EFA provides a four - factor solution with 69.48 % total variance explained. The Bartlett Test of Sphericity gives a very small p-value (0.000), indicating that there is a statistical probability that the correlation matrix has a significant correlation among at least some of the variables (Hair, Anderson, Tatham & Black 1995). Furthermore the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is also very high, 0.904, indicating that the latent constructs can predict the variability of the responses in the observed variables. Table 6 shows the result of the factor analysis.

Table 4 : Factor analysis: Student Persistence in Studies

	Component				
	Academic Integration	Service Satisfaction	Degree Commitment	Academic Conscientiousness	Institutional Commitment
PS1	0.682				
PS2	0.618				
PS3	0.597				
PS4	0.776				
PS5	0.726				
PS6	0.548				
PS7					0.793
PS8					0.610
PS9					0.687
PS10					0.711
PS11		0.700			
PS12		0.816			
PS13		0.862			
PS14		0.810			
PS15		0.423		0.561	
PS16				0.836	
PS17				0.737	
PS18				0.728	

|					
PS19			0.664		
PS20			0.561	.491	
PS22			0.782		
PS23			0.765		
PS24			0.724		
Variance Explained	17.43	15.03	13.34	12.99	10.69

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

The confirmatory factor analysis was performed to complement the result of the exploratory factor analysis. The CFA was performed by carrying out path analysis using structural equation modeling. A measurement model was specified and the model's overall fit was assessed to determine how well the empirical data fit the theoretical model. The CFA is a procedure to assess the discrepancy between the variance-covariance structures of the data set with the model implied variance-covariance structure. Figure 2 illustrates the factor structure for the CFA.

Figure 2 : Factor Structure for Student Persistence
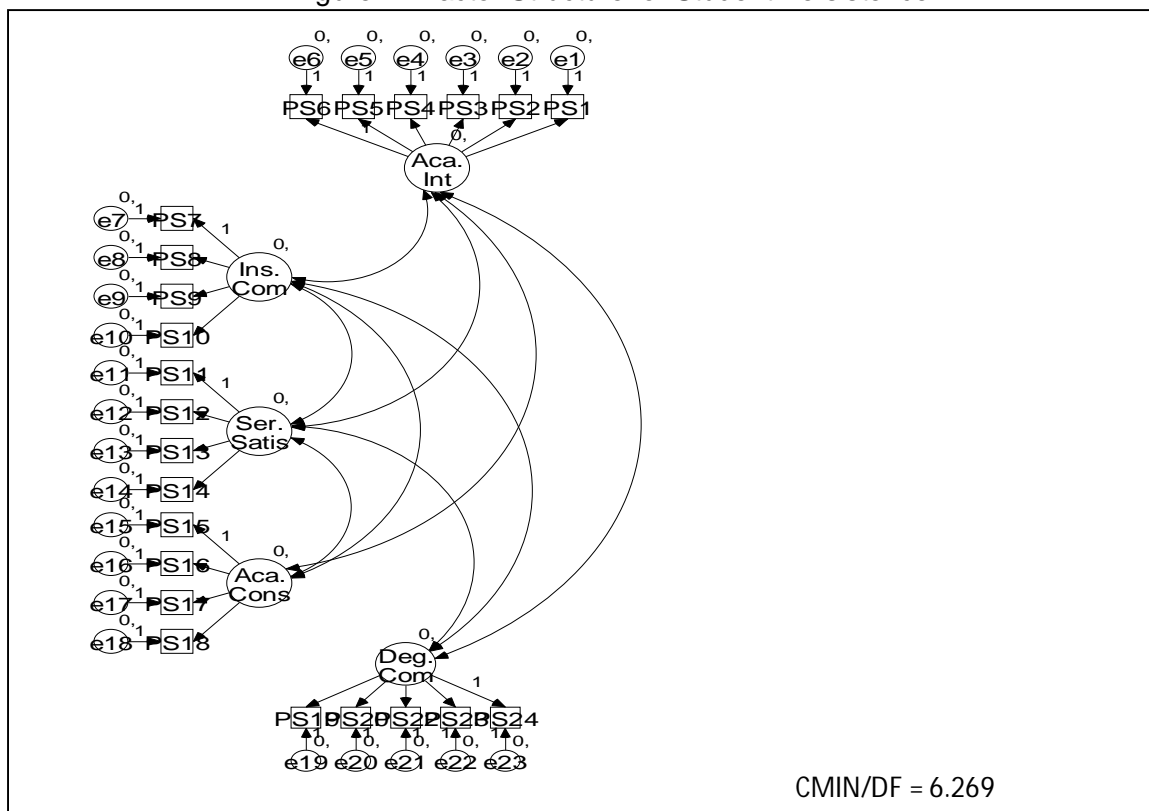
CMIN/DF = 6.269

20

In the confirmatory factor analysis procedure, the number of factors and the items loading to each factor were specified and the hypothesized measurement model was then tested for model fit. In assessing students' persistence in studies the following models were tested: i) five-factor oblique, ii) five-factor orthogonal model, and iii) one factor model. The five-factor oblique model is a measurement model that hypothesized complete correlations between all the dimensions. On the other hand, the five-factor orthogonal model assumes that the dimensions are not correlated with one another. The one-factor model is a uni-dimensional model where all the observed variables are linked directly to one common factor.

Table 4 shows the fit indices for the proposed models. All the fit indices indicate that the five-factor oblique model is the superior model. The five-factor oblique model provides a better fit to the data compared to the three-factor orthogonal model, and the one-factor model. The parsimonious indices also suggest that the five-factor oblique model gives the most parsimonious fit to the data.

Table 4: Fit indices comparing the three models

Model	χ^2	df	GFI	AGFI	RMSEA	NFI	CFI	PNFI	PGFI
5-factor oblique	1260.88	220	0.91	0.90	0.053	0.93	0.91	0.89	0.93
5-factor orthogonal	1335.63	228	0.84	0.82	0.089	0.86	0.79	0.78	0.74
One factor	2135.54	228	0.61	0.60	0.11	0.56	0.52	0.42	0.51

Reliability

Reliability refers to the consistency of the instrument. In this paper, the Cronbach alpha was used to evaluate the consistency of the responses for items with the corresponding dimensions. The Alpha values for the various items of the instruments are shown in Table 5.

Table 5 : The reliability index for the E-Learning Instrument

Dimensions	Cronbach Alpha
Academic Integration	0.928
Service Satisfaction	0.835
Degree Commitment	0.786
Academic Conscientiousness	0.866
Institutional Commitment	0.840

Results

In comparing the perception of male and female students with regards to their academic performance the Chi Square test of association was used. The students were first grouped according to the CGPA (less than 3.00 and 3.00 and above). The percentage of the male and female student fall into these categories were reported and the differences in the proportion of male and female in terms of the CGPA groupings were test for significance using the Chi Square test at the alpha level of 0.05. The result shows that there is no significant association between students' gender and their academic performance. Greater percentage of both male and female students obtained CGPA 3.00 and above.

Similar analysis was carried out to ascertain the association between students' ethnicity and the academic performance. Again the results show that there is no significant association between ethnicity and academic performance. However the percentage of students obtaining CGPA 3.00 and above is the highest for Indian followed by Chinese, Malays, and Others.

Analysis for association between age and academic performance revealed that there is no significant association between age and academic performance. Table ( ) displays the results.

Table ( ) : The association between selected demographic variables and academic performance

		CGPA Category		P- value
		Less than 3.00	3.00 and above	(based Chi-Square test)
Gender	Female	21 (16.9%)	103 (83.1%)	0.943
	Male	35 (17.2%)	168 (82.8%)	
Ethnicity	Malay	31 (20.1%)	123 (79.9%)	0.164
	Chinese	12 (12.2%)	87 (87.9%)	
	Indian	6 (10.3%)	52 (89.7%)	

	Others	7 (38.9%)	11 (61.1%)		
Age	30 and below	14 (25.5%)	41 (74.5%)		0.079
	31 to 40	26 (20.0%)	104 (80.0%)		
	41 to 50	11 (12.9%)	74 (87.1%)		
	Above 50	5 (9.3%)	49 (90.7%)		

Students' engagement according to the three dimensions (classroom behaviour, cognitive emphasis, and academic contribution) was compared with their academic achievement which is classified based on the CGPA (less than 3.00, and 3.00 and above). The mean scores and standard deviations were reported to describe the level of engagement in terms of classroom behaviour, cognitive emphasis, and academic contribution as well as the overall student engagement, whilst the Mann Whitney test was used to examine significant differences between the students with CGPA less than 3.00 and those with CGPA 3.00 and above The non-parametric test was preferred since the two groups had unequal sample sizes. The results show that students with CGPA 3.00 and above gave significantly higher ratings on the cognitive and academic dimensions of engagement. However for the engagement construct as a whole there was no significant difference between these two groups (CGPA less than 3.00 and 3.00 and above). Table 1 summarizes the results.

Table 1: Comparing Student Engagement with regards to academic achievement

Variable and Construct	CGPA	N	Mean	Std. Deviation	p-value
Classroom Behavior	Less than 3.00	56	2.86	0.46	0.490
	3.00 and above	271	2.83	0.57	
Cognitive Emphasis	Less than 3.00	56	2.92	0.50	0.011
	3.00 and above	271	3.12	0.60	
Academic Contribution	Less than 3.00	56	3.05	0.57	0.010
	3.00 and above	271	3.28	0.58	
Student Engagement	Less than 3.00	56	2.94	0.43	0.061
	3.00 and above	273	3.08	0.46	

The p-values were computed using the Mann-Whitney U statistics.

Similar analysis comparing students' persistence according to the five dimensions (Academic Integration, Institutional Commitment, Service Satisfaction, Academic Conscientiousness, and Degree Commitment) with their academic achievement was carried out. The mean scores and standard deviations are reported to describe the level of persistence in terms of Academic Integration, Institutional Commitment, Service Satisfaction, Academic Conscientiousness, and Degree Commitment as well the overall persistence whilst the Mann Whitney test was used, to look for significant differences between the students with CGPA less than 3.00 and those with CGPA 3.00 and above. The results show that students with CGPA 3.00 and above gave significantly higher ratings on the Service Satisfaction, Academic Conscientiousness, and Degree Commitment dimension of persistence. However for the persistence construct as a

whole there is no significant difference between these two groups (CGPA less than 3.00 and 3.00 and above). Table 2 summarizes the results.

Table 2 : Comparing Student Persistence with regards to academic achievement

Variable and Construct	CGPA	N	Mean	Std. Deviation	p-value
Academic Integration	Less than 3.00	56	3.91	0.61	0.124
	3.00 and above	273	4.06	0.44	
Institutional Commitment	Less than 3.00	56	3.81	0.73	0.673
	3.00 and above	271	3.84	0.60	
Service satisfaction	Less than 3.00	56	4.09	0.83	0.005
	3.00 and above	273	4.43	0.59	
Academic Conscientiousness	Less than 3.00	56	4.11	0.71	0.022
	3.00 and above	273	4.34	0.57	
Degree Commitment	Less than 3.00	56	3.84	0.61	0.011
	3.00 and above	273	4.09	0.61	
Persistence	Less than 3.00	56	3.95	0.63	0.069
	3.00 and above	273	4.15	0.41	

The p-values were computed using the Mann-Whitney U statistics.

Apart from assessing the association between the predictor variables (student engagement and persistence) and academic performance, this paper also modelled the relationship between these factors to predict academic performance. The multiple logistic regression was used for this purpose. In this logistic regression model the dependent variable was defined as the CGPA of students (either less than 3.00 or 3.00 and above), while the independent variables were those dimensions of engagement and persistence. A step wise regression model was built using the backward LR technique where the independent variables were included in hierarchical fashion and the likelihood ratio test was used to test the differences between the initial model and the various nested models which are subsets of the first model. Each regression coefficient indicates the effect of the variable on CGPA after controlling for the other variables listed.

The results (Table 3) show that the factors that significantly contribute to students' attainment of CGPA of 3.00 and above are Classroom Behaviour, Cognitive Emphasis, Academic Integration, Institutional Commitment, Academic Conscientiousness, and Degree Commitment. The first two factors belong to the engagement construct whilst the later four are the dimensions of persistence in studies.

Table 3 : Logistic Regression model prediction academic performance

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	**Classroom Behavior**	**0.784**	**0.348**	**5.075**	**1**	**0.010**	**2.190**
	Cognitive Emphasis	**0.693**	**0.355**	**3.811**	**1**	**0.041**	**2.000**
	Academic Contribution	0.409	0.352	1.350	1	0.246	1.505
	Academic Integration	**1.324**	**0.54**	**6.012**	**1**	**0.008**	**3.758**
	Institutional Commitment	**1.122**	**0.461**	**5.924**	**1**	**0.015**	**3.071**
	Service satisfaction	0.353	0.323	1.194	1	0.144	1.423
	Academic Conscientiousness	**0.648**	**0.326**	**3.951**	**1**	**0.032**	**1.912**
	Degree Commitment	**0.734**	**0.368**	**3.978**	**1**	**0.046**	**2.083**
	Constant	-20.78	6.673	18.601	1	0	

a. Variable(s) entered on step 1: Behavior, Cognitive, Academic, Academic Integration, Institutional Commitment, Service Satisfaction, Academic Conscientiousness, Degree Commitment.

The logistic regression model is a predictive model. As such, the sensitivity and the specificity of the model are important indicators to reflect the goodness of the model. Taking all the components of engagement and persistence into account, the sensitivity of the model is 83.33% while the specificity is 91.04%. In other words this logistic regression model can predict the occurrence of a CGPA of 3.00 and above with an accuracy of 83.33%. Whilst, the ability of the model to predict students getting a CGPA less than 3.00 is 91.04 % when using the engagement and persistence as predictor variables. The Cox & Snell R-Square is 0.181 while the Nagelkerke R-Square is 0.234. Both values show that the three predictor variables account for about 20 percent of variation in the CGPA of students. Based on the analysis of the Logistic Regression model, the predictive equations explaining the relationship between CGPA and the predictive variables is as follows:

CGPA = f(Classroom Behaviour, Cognitive Emphasis, Academic Integration, Institutional Commitment, Academic Conscientiousness, Degree Commitment)

CGPA 3.00 and above = -20.78 + 0.78 (Classroom Behaviour) + 0.693(Cognitive Emphasis) + 1.324 (Academic Integration) + 1.122 (Institutional Commitment) + 0.648 (Academic Conscientiousness) + 0.734 (Degree Commitment)

DISCUSSION

The results show that students' assessment on how well the course emphasises mental activities (measured as cognitive emphasis) as well as students' assessment on the contribution of the course to their academic progression (measured as academic contribution) had significant association with academic performance. This is corroborated by studies that found that students with greater level of engagement in academic activities tended to be more successful in their courses (Laird, Chen & Kuh, 2008). This is attributed in part to effective educational practices such as active and collaborative learning and student-faculty interaction (Kuh et.al, 2005; Pascarella and Terenzini, 2005).

Whilst for the second construct (students' persistence in studies), the results of this study show that the positive views of instruction, instructors, and students' own intellectual growth as well as their awareness of relationship between academic and career (measured as Academic Integration), level of confidence in and satisfaction with the choice of institution (measured as Institutional Commitment), timely performance of academic responsibilities (measured as Academic Conscientiousness) and the personal importance and values that students and their supportive network place on degree completion and sense of certainty in degree attainment (measured as Degree Commitment) have significant contribution to academic performance. This finding is consistent with that of recent research indicating that students' academic preparation, psychosocial, socio-demographic, situational, and institutional factors contribute positively to their degree outcome (Porchea et al 2010).

Finally it can be concluded that using student engagement and persistence, a process measure, as predictors of academic achievement would enable the academic institutions to identify 'at risk' students much earlier compared to using CGPA, which is a product measure. Student engagement and persistence should ideally be used in conjunction with CGPA to identify 'at risk' students. This would enable academic institutions to formulate more effective intervention strategies to reduce attrition rate.

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