Study on the Impact of Motivation, Self-Efficacy and Learning Strategies of Faculty of Education Undergraduates Studying ICT Courses

Mahmud Bin Hj Abd Wahab[1]

International Islamic University Malaysia

The purpose of the study is to validate the survey instrument on its reliability and validity. The process is done through the use of statistical tool SPSS and the usage of principal component analysis. The sample population consists of 150 in-service teachers from Institute of Education, International Islamic University Malaysia. The analysis further utilized advance statistical method – structural equation modeling (SEM). The use of SEM is done through the confirmatory factor analysis to validate the psychological and learning strategy construct only. This study is a pilot study and will be used for further research on computer-aided studies in a full causal analysis.

Keywords: ICT, self-efficacy, motivation, prior knowledge, learning strategy

The purpose of the study is mainly to validate the existing instrument using principal component analysis. The predictors are motivation, self-efficacy, prior knowledge and learning strategies. These predictors are the dimensions that influence the undergraduate when using ICT at university level. The study manage to gather 150 sample who are the undergraduate students studying Bachelor in Education under PKPG program in INSTEAD, IIUM. It is actually a pilot test done to validate the dimensionality of the items typically in themes such as motivation, self-efficacy, learning strategies and prior knowledge as they were self-constructed items questionnaires. The data were collected using 4 main themes, where some of the themes have sub-items/themes. All the items were constructed by using 7 Likert Scales which indicates point 1 = Strongly Disagree; 2 = Somewhat Disagree; 3 = Disagree; 4 = Neutral; 5 = Somewhat Agree; 6 = Agree and 7 = Strongly Agree respectively. The method employed by this research is by way of a survey questionnaires of 45 items coupled with some demographic data.

Theoretical Framework

The study is based on various theoretical assumptions to validate the factors that influence the use of ICT and how these factors influence each other. Cognitive theorists recognize that much learning involves associations established through contiguity and repetition. They also acknowledge the cognitive theorists view learning as involving the acquisition or reorganization of the cognitive

[1] Postgraduate student, Institute of Education, International Islamic University Malaysia, Kuala Lumpur, Malaysia

importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator. However, even while accepting such behavioristic concepts, structures through which humans process and store information (Good & Brophy, 1990). Constructivist believed that learning is intimately associated with others; it is a social activity. Learning is also contextual where one cannot isolate facts and theories. We learn in relation to what else we already know, believe, out prejudices, fears and at least the knowledge of the language. This theory is built on the basis of assimilation of new knowledge from having some structure developed and based from previous knowledge. Learning is not instantaneous; it takes time to ponder, revisit ideas, play and use them. Thus, constructivist believed that motivation is a key component in learning.

Motivation is a crucial component in determining students' achievement. Motivation refers to the process whereby goal-directed behavior is instigated and sustained (Schunk, 1990). It could be extrinsically (externally) or intrinsically enforced. Schunk and Zimmerman (2004) studied how motivation particularly the self and learners' attempt to manage their achievements. Bandura (1977) studied the relationship between motivation and goals orientation. This lead to more research that showed setting of achievement goals influence task persistence and problem-solving efforts. (Dweck & Leggett, 1988; Elliot & Dweck, 1988; Meece, 1994; Graham & Golan, 1991; Nolen & Haladyna, 1990). The study adapted the ARCS Model of Motivation (Keller, 1984) and makes changes to suit the focus of ICT/Computer Design specifically. The model focuses on the attention (A); relevance (R); confidence (C) and satisfaction (S). Keller found that students' motives together with expectation influence the degree of attention and effort they will put in to a learning task. These in turn are being translated into achievement.

The next component which attracted many researchers is *self efficacy*. Since self-efficacy is a contextual in nature and one cannot assumed efficacy to be true in all situation, the ICT or computer self-efficacy would narrow down the scope. Self-efficacy is a state of system of belief and confidence level of oneself that he or she is able to perform a specific task (Bandura, 1977). This general understanding is rooted by Bandura's social cognitive learning theory. It has its root of self-esteem, motivation and self-regulation (Bandura, 1992). Self-efficacious learners feel confident about solving problem as they have developed an approach to problem solving that worked in the past. They attributed from their own effort, strategies and believe of their own ability to improve and recognize error as part of learning process.

The development of learners' self-efficacy in successfully completing a task is closely related to the effective use of learning strategies (Zimmerman, 1990). Zimmerman and his associates have been instrumental in tracing the relationships among self-efficacy perceptions, self-efficacy for self-regulation, academic self-regulatory processes, and academic achievement (Risemberg & Zimmerman, 1992; Zimmerman & Ringle, 1981; Zimmerman, 1989, 1990, 1994, 1995; Zimmerman & Bandura,1994; Zimmerman & Martinez-Pons,1990). Zimmerman, Bandura, and Martinez-Pons (1992) found that academic self-efficacy mediated the influence of self-efficacy for self-regulated learning on academic achievement. Academic self-efficacy influenced achievement directly as well as indirectly by raising students' grade goals. Other researchers have found that self-efficacy is related to self-regulated learning variables (e.g., Feather, 1988; Fincham & Cain, 1986; Paris & Oka, 1986; Pintrich & Schrauben, 1992; Pokay & Blumenfeld, 1990; Schunk, 1982b, 1985). Findings in this area suggest that students who believe they are capable of performing academic tasks use more cognitive and meta-cognitive strategies and persist longer than those who do not (see Pintrich & Garcia, 1991).

Having the right *learning strategy* will help students to higher expectations of learning success and students with greater meta-cognitive awareness understand the similarity between new learning task and precious task. They will know how to adapt the best strategies required for problem solving or learning thus employ appropriate strategies that will lead to success (Paris & Winograd, 1990). Literature on learning strategies explores different ways of learning (Pintrich & Johnson, 1990; Cross & Steadman, 1996; Weinstein & Meyer, 1991). Literature on learning strategy assumes that students' motivation and use of learning strategies can be controlled by learners and changed through teaching. According to Cross and Steadman (1996), cognitive learning strategies are behavioral skills learners can use to improve their understanding, integration, and retention of new information. Learning strategies include a wide variety of cognitive processes and behavioral skills (Weinstein & Meyer, 1991). General learning strategy components include rehearsal, elaboration, organization, comprehension, meta-cognition, and resource management (Cross & Steadman, 1996; Weinstein & Meyer, 1991).

Miller (1997b) identified 12 learning strategies used by the students studying agriculture through videotapes. By pausing the tape while viewing and taking notes was the learning strategy that the students used most. Miller (1997b) defined learning strategies as "the techniques or skills used by an individual in accomplishing a learning task (p. 21)." His definition is different and not as broad as the definition in Mayer's study (1988). Mayer (1988) defined learning strategies as "behaviors of a learner that are intended to manipulate a person's cognitive processes during learning (p.11)."

Chamot et al. (1999) argues that two domains of current learning theory and research provide a rationale for learning strategies instruction. These are cognitive learning models, which focus on learners' mental processes, and social or social-cognitive models, which investigate the roles of interaction between individuals and group processes in learning. Weinstein and Mayer (1986) argue that an interest in learning strategies is the natural outgrowth of a change in orientation from behaviorist theories to cognitive theories of learning. The behaviorist approach to learning focuses on how presentation of material influences behavior. The cognitive approach to learning seeks to understand how incoming information is processed and structured in memory.

In Programme for International Student Assessment (PISA), three different instruments are used to measure learning strategies; *Memorisation*, *Elaboration* and *Control strategies*. According to Wienstein and Mayer's (1986) typology as previously presented, the first construct can be classified in the category "Basic Rehearsal Strategies"or "Memorization Strategy". The second construct is classified in the category *Complex Elaboration Strategies* or "Relational strategy" according to Weinstein and Mayer's (1986) typology. The third construct is called *Control strategies*. The construct *Control strategies* has elements that belong in several of the six categories of learning strategies as outlined by Nisbet and Shucksmith: *Monitoring*, *Checking*, *Revising* and *Self-testing*. All these categories are related to the concept *Macro-strategies* in the hierarchical system. The construct could be classified in the category *Comprehension Monitoring Strategi*es according to Weinstein and Mayer's typology. The construct *Control strategies* is strongly related to the concept of meta-cognition (Flavell, 1976, 1979; White, 1988).

One of the most common factor that existed within all the three main learning theories; behaviorism, cognitivism and constructivism is *prior knowledge*. Behaviorist Skinner called it "operant conditioning" where prior experience and knowledge of reinforcement determines one's behavior. Cognitivist such as Bruner's Discovery Learning theory, Ausubel's Subsumption theory, and Garne's Theory of learning hierarchies; all of them mentioned the impact and role of prior learning. Constructivist such as Dewey, Piaget, and Vigotsky noticed the importance of prior knowledge in learning environment and they believed that learning is a process through which one's experience is translated into constructing meaning or constructing system of meaning. Studies on prior knowledge and its impact on achievement were done by Schwarm (2003); prior knowledge and concept construction, Weibelsahl (2002) Adapting prior knowledge approach to learning; Pazzzani (1992) found that prior knowledge can hinders learning if the initial prior knowledge was established to be wrong; Chen (2002) studies self-regulated learning strategies and achievement, and finally, Taboada (2006) examine the impact of prior knowledge, students' questioning and knowledge construction.

Research Questions

The study therefore aims at address the following research questions:

1. Does motivation influence the engineering undergraduates' learning outcome?

2. Does the students' confidence level (self-efficacy) of using computers have any impact to their achievement?

3. Does learning strategy has any impact of students' achievement? If so, which learning strategy has the highest impact when learning CAD courses?

4. Have prior knowledge influence the engineering students' achievement?

5. Do motivation, self-efficacy and learning strategy have indirect impact on learning outcome?

Methodology

Based on the literature, this study hypothesized a model including the observed variables such as motivation, IT efficacy, learning strategies and readiness. The methodology section outline the participants, instrument, the data analysis procedure and presents the stages necessary to obtain a model compatible with the hypothesized model.

Instrument

This study involved the use of four instruments for collecting data from the respondents. Three of the instrument the Students' Self-Efficacy Questionnaire (SSEQ), Intrinsic/Extrinsic Motivation Questionnaire (IEMQ), ICT and Design Prior Knowledge Questionnaire (IPKQ)) was self-developed while the other one instrument (Students Learning Strategies Questionnaire (SLSQ) was adapted form research literature.

The instrument is divided into two sections. The first section is questionnaire containing 45 items and a seven-point Likert scale. The table below shows the breakdown of the number of items and the themes they purportedly measure. The researcher decided to use a 7-point Likert scale so as to allow the respondents to have more choices in their responses towards the items.

Table 1
Breakdown of Items according to Themes Investigated

Item numbers	Themes measured
1 to 10	IT-efficacy
11 to 17	Readiness
18 to 24	Learning strategy 1 – Memorization
25 to 29	Learning strategy 2 – Elaboration
30 to 34	Learning strategy 3 – Control
35 to 45	Motivation

A detailed description of the purposes, contents, response categories, and number of items for each instrument, and evidence of the psychometric properties of the instruments are presented as follows:

Students' Self - Efficacy Questionnaire (SSEQ)

The SSEQ is a 10-item instrument which was developed by the researcher in order to examine the students' level of self confidence toward ICT and the study of CAD application software. The SSEQ contain items assessing expectancy of success and self-appraisal of one's ability to master a task. Although self-efficacy does has a linkage to motivation, the study would like to see the impact of self-efficacy directly to the learning outcome. The SSEQ will undergo content, internal and items validity which will be conducted through pilot study.

Intrinsic/Extrinsic Motivation Questionnaire (IEMQ)

The IEMQ is a 11-item instrument which was developed by the researcher in order to examine the students' motivation towards studying CAD application software. The IEMQ is sub-divided into intrinsic and extrinsic motivation. The intrinsic sub-division will have 6-items questions whereas the extrinsic sub-division will have 5-item questions. The intrinsic motivation will yield result on the internal enforcements like self-gratitude and sense of achievement whereas the extrinsic motivation will yield result on the external enforcement in learning CAD application software such as rewards or threat of a punishment. The IEMQ will undergo the content, internal and items validity which will be conducted through pilot study.

ICT and Design Prior Knowledge Questionnaire (IPKQ)

The IPKQ is a 7-item instrument which was developed by the researcher in order to examine the students' prior knowledge in ICT and designing using drawing/designing software prior from taking the course. Studying this course requires student to fully utilize the usage of computers and no prior training was introduced on the basic utilization of computers. The CAD application software is sophisticated software with 2-D and 3-D graphic requirement. The computer must have the minimum specification which is o the high-end of the personal computing capabilities. The assumption that all engineering undergraduate students have the prior knowledge in basic computer operations can be deceiving. The researcher is being approach to study this dimension by the Deputy Dean of the faculty.

Students Learning Strategies Questionnaire (SLSQ)

The SLSQ is a 17-item instrument which was adopted by the researcher in order to examine various students' learning strategies when studying CAD application software. The research would like to adapt the "Programme for International Student Assessment (PISA) survey. In PISA, three different instruments are used to measure learning strategies; *Memorization*, *Elaboration* and *Control strategies*. Questions in the student questionnaire are used to measure the three concepts.

The first sub-construct is Memorization, which has 7 item questions. The reliabilities, as measured by Cronbach's alpha, a method based on item co-variances (Crocker & Algina, 1986), are above 0.7 in most of the countries in PISA.

The second construct is named *Elaboration* (5 item questions) and the third construct is *Contro*l Strategies (5 item questions). Like the other strategies, all the three strategies; Memorization, Elaboration and Control Strategies have been tested and yield a reliability of 0.7 by Cronbach's Alpha.

Validation of the Survey Instrument Questionnaires

Prior to its use for the main study, the psychometric properties (i.e., validity and reliability) of the Survey Instrument Questionnaires which consists of four main sub-constructs namely Students' Self Efficacy Questionnaire (SSEQ), ICT and Design Prior Knowledge Questionnaire (IPKQ) and Students Learning Strategies Questionnaire (SLSQ) were examined. More precisely, the content and construct-related validity and measures of reliability estimates were established in a pilot study.

Validity refers to "degree to which a measures what it is intended to measure" (Gay, 1987, p.128). In this study, only two types of validation were undertaken. These are (1) content validity, and (2) construct validity. Gay (1987) also defines content validity as "the degree to which a test measures the intended area" (p.129). This process involved the selection and solicitation of expert judgments of 5 lecturers and 5 PhD students of Institute of Education and Department of Psychology, Kulliyyah of Islamic Reveal Knowledge were sought on whether the items represent 'instrumental' values. For construct-related validity, item analysis and the technique of Principal Component Analysis (PCA) were employed. To estimate reliability measures, alpha reliability was run on the items comprising the hypothesized dimensions.

Participant

The participants in this study were the undergraduates studying at Institute of Education, International Islamic University Malaysia. All of them were from "Teaching of English as Second Language" (TESL). Reasons for this selection are as follows:

i. all of them are homogeneous – undergraduates taking IT courses;

ii. they are easily available in responding to the survey instrument;

iii. similarity in taking ICT courses will validate the instrument better.;

iv. adequate sample size to run principle component analysis.

Data Analysis Procedure

Principal component analysis is a statistical approach that can be used to analyze inter-relationships among a large number of variables and to explain these variables in term of their common underlying dimensions or factors (Hair et al., 1998). The aim of this procedure is to find a way of condensing the information contained in a number of original variables into a smaller set of variates (factors) with a minimum loss of information. By providing the empirical estimates of the "structure" of the variables considered, this analysis becomes an objective basis for creating summated scales. With factor analysis, the researcher can first identify the separate dimensions of the structure and then determine the extent to which each variable are determined. Once the dimensions and the explanation of each variable are determined, summarization and data reduction is achieved.

Once the dimensions/factors are identified, the next step in the analysis is to test the reliability of each of the construct. This is done by analyzing the data using data reliability analysis; Cronbach alpha (α). The cut-off of 0.70 of the alpha reading is considered to be a good and reliable factor (Hair et al., 1998).

In order to analyze the hypothesized model, multivariate data analysis is employed. Hair, Anderson, Thatham and Black (1998) explained that multivariate data analysis seems to be the prominent too in today's educational research. Statistician Hardyick and Petronovich (1976) affirmed this to be the future trend coupled with other advance modeling techniques. In arriving to the conclusion, the study undertook a confirmatory factor analysis using AMOS – Analysis of Moment Structure – a model-fitting program (Arbuckle, 1989, 1999). The program could assess a full structural equation modeling (SEM) that serves as a tool to validate the underlying structures of the hypothesized model. In other words, SEM is a technique that combines both the features of multiple regressions and factor analysis, which enable the study not only to assess the complex interrelated dependent relationships but simultaneously incorporates the effects of measurement error on the structural variables. The advantages of using SEM to answer the given research questions were multiple.

First, it facilitated a simultaneous estimation of dependence relationships among the exogenous (the language of the learning-cycle text, students' English language proficiency and prior achievements in Science and UPSR) and endogenous (students' meaningful understanding) variables in the proposed model. Second, it enabled the identification of underlying non-observable constructs, the latent variables which were not measured directly in the study. This capability would substantially contribute to theory building because a theory, in general, aims at describing relationships among latent variables. Finally, the ability of the SEM to extract latent variables on the basis of the observed covariance among the measured (manifest) variables allowed the researcher to estimate the measurement error; hence, the reliability of the data.

Model Specification and Assessment

The hypothesized model was estimated using the covariance matrix derived from the data. To evaluate the adequacy of the estimated models, the analysis used the conventionally accepted criteria for assessing its goodness of fit (MacCallum & Austin, 2000). Given that the model was substantially and methodologically "fit," it was revised when the need arose.

To assess the fit of the 45-item measurement model the analysis relied on a number of descriptive fit indices, which includes the 1) minimum value of the discrepancy between the observed data and the hypothesized model divided by degrees of freedom (CMIN/df); 2) comparative fit index (CFI); 3) Tucker-Lewis Index (TLI) and 4) root-mean-square error of approximation (RMSEA). Arbuckle and Wothke (1999) point out that CMIN/df with the value of less than 5 is considered acceptable. Second, the possible value of CFI, TLI ranges from zero to 1, with the value close to one demonstrating a good fit. Finally, a value of RMSEA of 0.8 or less shows a reasonable error of estimation.

On the basis of the preceding framework, the study identified a model of interrelated dependence relationships. It contained the 5 manifest or observed variables. One measurement model which attempted to extract a latent variable, labeled "prior achievement" was established in the specification.

To estimate the hypothesized models, the study used AMOS data-fitting program (Arbuckle & Wothke, 1999). The program adopted maximum likelihood estimation in generating estimates of the full-fledged model. In addition, since the program analyzed covariance matrices, the estimation procedure satisfied the underlying statistical distribution theory, and thereby yielding estimates of desirable properties.

Once the model was estimated, the study applied a set of measures to evaluate its goodness of fit. The measures, guided by the conventionally accepted criteria for deciding what constitutes good fit, assessed (i) the consistency of the hypothesized model with the empirical data, and (ii) the reasonableness of the estimates. The consistency of the model with the data was determined using four measures that reflected the overall model fit. The first measure was the minimum value of the discrepancy between the observed data and the hypothesized model (χ^2). An insignificant χ^2 test represented the reasonableness of the hypothesized model. The second index was the root mean square error of approximation (RMSEA). A value of RMSEA, approximating the discrepancy that could be expected in the population, of less than .08 was judged reasonable for a fitting model. Third, the study examined the AGFI which is an index for assessing the adjusted goodness of fit of the model. The measure of AGFI is analogous to the adjusted coefficient of determination in multiple regression. The AGFI index should range from approximately zero to 1, with the value of at least .90 reflecting good fit of the model to the data. A value higher than .90 would thus be more desirable.

The study also examined the magnitude and direction of individual parameter estimate to determine its usefulness. This examination sought for offending estimates, such as negative error variances and theoretically inconsistent coefficients, which could undermine the validity of the model.

Analysis

The analysis used is Principal Component Analysis (PCA) where *varimax rotation* was conducted to determine the construct validity of the data collected from both undergraduate and postgraduate students. The analysis adopted an exploratory approach where no assumed structure is to be confirmed.

In identify the underlying dimensions by the variables, the factors analysis was conducted on the inter-variable correlations matrix. This is a data reduction technique used to determine if there is a smaller number of underlying dimensions which account for the major sources of variation in the students' responses.

Prior to assessing assumptions, a visual inspection was done by looking at the Correlation Matrix to see patterns of relationship among the items. The table shows that a considerable number of correlations were greater than 0.3, which means that the matrix was suitable for factoring and suggested the appropriateness of the principal component analysis for the data.

In assessing assumptions for correlated variables in the initial solution, three tests were conducted. First, for *Bartlett's Test for Sphericity*, it was found that χ^2 (150) = 4654.13, p =.001. The result shows statistically significant correlation among items.

Secondly, the overall *Keiser-Meyer-Olkin (KMO)* measure of sampling adequacy was 0.883, demonstrating that the sample was sufficient to support PCA and since it is greater than 0.7, it shows that there was good correlation among the items.

Table 2
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	3876.348
	df	528
	Sig.	.000

Thirdly, the *Anti-Image Correlation Matrices* were analyzed to measure individual variables Measure of Sampling Adequacy (MSA). The results demonstrates that all individual items were greater than 0.5. They ranged from 0.67 and 0.92. This shows that all or most of the items were clearly constructed and proved that the items does not confuse to the respondents (students) or found to be 'double-barrel' questions.

Next, the measure of *Communality* of items indicates that a majority of scores are 0.50 and greater. All the items are between 0.562 to 0.857 therefore, it can be stated that the results of all the statistically test above pointed to the appropriateness of using PCA in the study.

There are seven factors with eigenvalues greater than or equal to one were derived which accounted fro about 73.7% of the total variance. Out of seven factors generated, only *five factors* were retained for further analysis as the other factors wither have weak loading less than 0.40 or do not comprise of four or more items.

The first factor is labeled as *Motivation*, while *the second factor* is labeled *Self-efficacy*. The *third factor* was named *Learning Strategy 1 Elaboration* and the *forth factor* was labeled as *Learning Strategy 2 Memorization*. The *fifth factor* was labeled as *Learning Strategy 3 - Conceptualization*. These five factors consist of 33 items altogether which retained for further analysis which accounted for modest 64.2% from the total variance explained.

The *first rotated factor* comprises of eleven items, which accounts for *19.4%* of the variance explained. This variable was intended to draw information about *the students' level of motivation when studying ICT courses* at IIUM. The items in this factor were focused on what the intrinsic and extrinsic motivation that helps the student to develop and broaden their learning, experience and ICT skills. The items in this factor are as follows:

Factor 1	**Motivation - The student believe that;**	**Loading**
1.	I study ICT courses because I enjoy the subject.	.57
2.	I learn and practice ICT subject because I enjoy the challenge.	.52
3.	I do my assigned work because the subject I learn is really interesting.	.41
4.	Studying ICT gives me opportunity to expand my personal and professional knowledge.	.72
5.	Learning ICT can improve and initiate change in the way I do everyday tasks.	.74
6.	I learn ICT as it gives me satisfaction in accomplishing my assignment.	.68
7.	I like learning new knowledge found in ICT course.	.73
8.	I learn ICT as it gives me the career that I wish for.	.58
9.	Leaning ICT has positive impact on my education and career.	.80
10.	I learn ICT to improve my academic and professional skills.	.90
11.	Recognition for ICT skills at the work place, encourages me to acquire it.	.79

The second factor also consists of seven items, which accounts for *14.5%* of the variance. This variable was intended to draw information about *the significant of students' perception and believe on their level of competencies in using ICT at* IIUM. The items in this factor were focused on what the students' confidence level in using ICT which could develop and broaden their learning, experience and skills. The items in this factor are as follows:

Factor 2	**Self-Efficacy - The student believe that;**	**Loading**
1.	I believe that I can understand the difficult material presented in IT courses.	.69
2.	I am certain that I will receive excellent grades in the IT courses.	.78
3.	I am confident I can understand the complex material presented by my lecturer in the IT courses.	.78
4.	I am certain that I can master the IT skills taught in the university.	.77
5.	Considering the difficulty of the IT courses, I think I will do well in the courses.	.66
6.	The complexity/difficulty of IT courses is challenges that I can face.	.76
7.	For the IT courses, I have a strong commitment to do well.	.69

The third factor is Learning Strategy 1 – *Elaboration*. In this factor there were five items altogether which constitute the learning strategies of students when studying using computers. The items showed that the students tend to relate their experiences to computer lessons and application of those elaboration with the software used. The amount of variance is *11.3%*. These items refer to how student relate, connects and elaborate the materials with what they already have known. The items in this strategy are as follows:

Factor 3	**Learning Strategies 1 - Elaboration**	**Loading**
1.	I try to relate new materials to things I have learned in other subjects.	.74
2.	I figure out how the information might be useful in the real world.	.64
3.	I try to understand the material better by relating it to things I already know.	.81
4.	I figure out how the material fits in what I have already learnt.	.84
5.	When studying, I start to figure out what I need to learn.	.53

The fourth factor is *students' learning strategies 2 - Memorization* which comprises of six items. These items are amount of *11.1%* of variance explained. The items were primarily focus on students' learning strategies which is memorization. Undoubtedly, memorization is still the popular learning strategy used by the students even at university level. The six items of prior knowledge and skills are:

Factor 4	**Learning Strategies 2 - Memorization**	**Loading**
1.	I try to memorize everything that might be covered	.85
2.	I memorize as mush as possible	.89
3.	I memorize all new material so that I can recite it	.87
4.	I practice by saying the material to myself over and over again	.57
5.	When I memorize, I also write it down.	.60
6.	I read again and again so that I can remember the exact words of phrases in that chapter	.74

The fifth factor which is the final factor is students' learning strategies 3 – Control/Conceptualized which comprises of four items. These items are amount of *7.9%* of variance explained. The items were primarily focus on students' learning strategies which is conceptualization of lessons taught. Conceptualization is the final learning strategy whereby student are able to conceptualized the application and getting a bigger overall picture and ability to control the situation given. The four items of learning strategy conceptualization and control are:

Factor 5	**Learning Strategies 3 - Conceptualization and control**	**Loading**
1.	I try to identify the concepts that I have not understood	.55
2.	To see if I remember what I have learnt, I always try to recall it	.78
3.	I make sure that I remember the most important things	.56
4.	I look for additional information whenever I don't understand	.83

Table 3
Total Variance Explained

Component		Initial eigenvalues	Percent of variance	Rotated sum sq. loading % of variance	Cumulative percent
Valid	1	12.482	37.823	19.362	19.362
	2	3.650	11.060	14.539	33.901
	3	2.480	7.514	11.344	45.246
	4	2.195	6.652	11.092	56.338
	5	1.399	4.240	7.870	64.208

Extraction Method: Principal Component Analysis

In order to test the validity of those factors Cronbach alpha were tested for all the items contained in a particular factor. *Cronbach's alpha* is the most common form of internal consistency reliability coefficient. By convention, a lenient cut-off of .60 is common in exploratory research. The first factor which was labeled named as *Motivation* has alpha reading of 0.94, the second which is labeled as *Self-*

efficacy has alpha reading of 0.89, the third factor labeled Learning Strategy - *Elaboration & Relate* has alpha reading of 0.89 and the fourth factor labeled as *Learning Strategy 2 - Memorization* has alpha reading of 0.88. Finally the fifth sixth factor labeled *Learning Strategy 3 - Conceptualization and Control* has alpha reading of 0.80. Based on the convention, all 5 factors are statistically reliable to be named as factors to be considered in this research.

The research are able to gather information on motivation, self-efficacy, prior knowledge and various learning strategies used by undergraduate when studying ICT courses in IIUM especially Bachelor in Education (TESL). Since the aim of this study is to test the dimensionality of the underlying factors which is priori in nature before the final research is executed, the result has been satisfactory. The analysis using Principal Component Analysis is able of produce 5 main predictor/factors that contributed to the study of ICT utilization in IIUM settings. A further analysis was performed to determine the relationships of the 5 factors to determine the correlation between the underlying factors. Pearson's Correlation Matrix was produced as list below:

Table 4
Correlations

		Motivate	Self-efficacy	LS1 Elaboration	LS2 Memorization	LS3 Conceptualization
Motivate	Pearson Correlation	1	.560**	.593**	.221**	.47**
	Sig. (2-tailed)		.000	.000	.007	.000
	N	150	150	150	150	150
Self-efficacy	Pearson Correlation	.560**	1	.529**	.224**	.390**
	Sig. (2-tailed)	.000		.000	.006	.000
	N	150	150	150	150	150
LS1 Elaboration	Pearson Correlation	.593**	.529**	1	.310**	.620**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	150	150	150	150	150
LS2 Memorization	Pearson Correlation	.221**	.224**	. 310**	1	.298**
	Sig. (2-tailed)	.007	.006	.000		.000
	N	150	150	150	150	150
LS3 Conceptualization	Pearson Correlation	.478**	.390**	.620**	.298**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	150	150	150	150	150

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

It is noted that all the factors the learning strategies (elaboration, memorization, and conceptualization) and psychological dimension (self-efficacy and motivation) are highly correlated to each other.

Structural Equation Modeling

Structural equation modeling (SEM) is a statistical methodology that takes confirmatory (i.e., hypothesis testing) approach to the analysis of a structural theory bearing in some phenomenon. It conveys two important aspects of the procedure:

a. the causal processes under study are represented by a series of structural (i.e., regression equations); and

b. these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study.

The result extracted from the factor analysis gives us some indication on how the model would look like. The path analysis is used by using AMOS data-fitting program (Arbuckle & Wothke, 1999), to support the relationships. The study takes the approach of Confirmatory Factor Analysis confirming the Principal Component Analysis.

The hypothesized model (CFA model) is shown below:

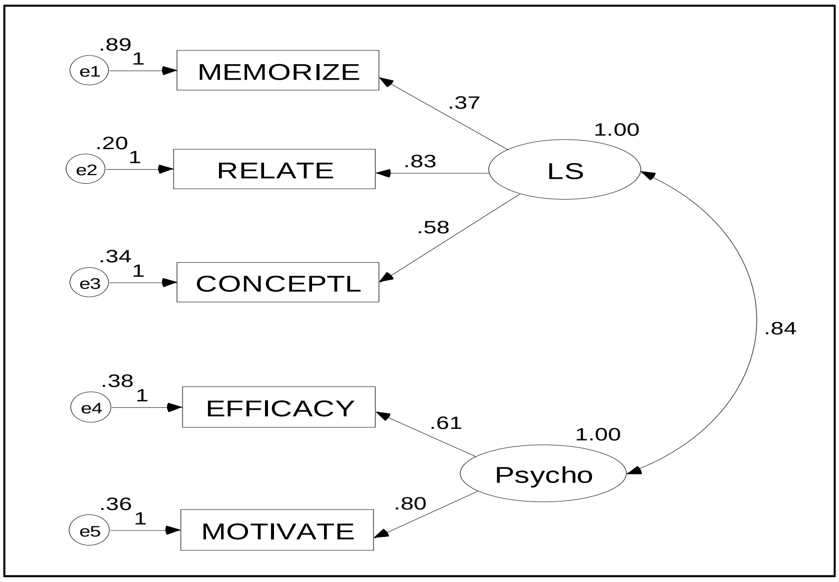

Figure 1. The relationship between learning strategies and psychological factors influencing the undergraduate's learning while taking ICT courses in university.

As seen from the model and the path coefficient, two dominant predictors namely psychological factor and the learning strategies. While examining the learning strategy, the study found that the path coefficient of relating learning strategy is the highest at 0.83, followed by conceptual learning strategy (0.58) and memorization learning strategy (0.37) consecutively.

The path coefficient of the psychological factor shows that motivation plays an important role in the study of ICT courses. The path coefficient of motivation is at 0.80 whereas the self-efficacy path coefficient is 0.61. The double-headed arrow in the hypothesized model shows the covariance between the learning strategies factor and psychological factors.

Specifically, the analysis found statistically significant path coefficients, implying the following causal links:

1. Administrators/Teachers' self-efficacy and motivation shows a contributing factor of psychological variable and has a direct impact on the learning process of ICT at university level.

2. The three main learning strategy namely, elaboration; memorization and conceptualization strategy have a positive contributing factor under the latent variable; learning strategies.

3. The study takes into account the relationship between psychological factor and learning strategies and found that they are positively co-related and statistically significant covariance coefficient at 0.84.

4. The model has to undergo certain overall fit indices and the model can only be considered as acceptable when Root Mean Square Error Approximation (RMSEA) and Normal fit Index Index is higher than 0.9. (Bentler & Bonett, 1980) The other measure for acceptable path model is the Adjusted Goodness of Fix Indexes (AGFI) is considered significant when the reading shows less than 0.10 (Kelloway, 1998; Rigdon, 1996).

Fit Measures	**Default Model**	**Recommended Index**
Adjusted GFI	0.98	> 0.90
Normal Fit Index	0.99	> 0.90
RMSEA	0.01	< 0.05

Discussion

The result of the analysis clearly established the hypothesis set forth for the study. The first research question is the relationship between motivation, self-efficacy, prior-knowledge and learning strategies. The analysis affirms that the said predictors positively influence the usage of the in-service teachers. Motivation and self-efficacy as psychological factor influence the teachers ICT usage. This result is in-line with other research done by Rogers (2002) that links motivation with teachers' expectation and self-efficacy. Other studies clarify the interest and motivation such as the importance of interest (Lore, Krapp, & Baumert, 1998), intrinsic motivation (Csikszentimihalyi et al., 1993), teachers' efficacy (Datnow & Castellano, 2000; Goddardn Hoy & Hoy, 2000; Tschannen-Moran, 1998).

The second main research question deals with the learning strategy and the analysis affirm that teachers have various learning strategy when learning and use of ICT. The CFA depict that elaboration/relation strategy is the highest among other construct, which mean that teachers try to relate to the outside world when using ICT. This strategy is followed by conceptualization strategy (58%) and memorization strategy (37%). In the use of ICT these teachers did not use memorization strategy and would rather do it practically. The use of learning specific learning strategy are found to facilitate self-management(which in this case the use of ICT) in order to achieve desired outcomes. (Weinstein & Mayer, 1986) Here, the use of relation/elaboration strategy by teachers is found to solve certain practical problems encountered or trying to relate with real life problem. (Amiran & Katims, 1985; Nisbet & Shucksmith, 1986) Consequently, a specific learning strategy one formulates consists of cognitive process, behavioral activities, and emotions to facilitate their achievement. (Derry, 1990) Another caution from the researcher is that the present study does not meant to establish any causal effect although SEM has the capability to do so. This is because the study is meant for pilot study to verify and validate the instrument. That is why the statistical tool utilized is principal component analysis as well as measurement model which is the proper tool for the exercise. Further analysis using full structural modeling technique should be employed to extend the full potential of SEM.

Conclusion

The results of the study offered adequate representation of a commonality in meaning shared by the items; there are ample supports for construct-related validity of students learning strategies are significantly related to the psychological construct when it comes to the learning of ICT courses. The calibrated items would be useful as it gives a explanation on which strategies that students are familiar and which one contributed highly when it comes to learning ICT. Finally the findings contribute to the explanation of students' self-efficacy and motivation does have an impact when it comes to their learning process especially when it comes to state-of-the-art technology i.e. computers. It clearly validates the instrument as well shed some light to the in-service undergraduate teachers when they utilized ICT in their learning environment.

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