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Self-regulated learning and academic achievement in Malaysian undergraduates

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This study is an investigation of the ability of self-regulated learning (SRL) as measured by the Motivated Strategies for Learning Questionnaires (MSLQ) to predict academic achievement among undergraduates in Malaysia. A total of 460 second-year engineering undergraduates from the Universiti Teknologi Malaysia participated in the study. Academic achievement was measured by the students' grade point average. The results show that the MSLQ is a reliable tool and SRL is a significant predictor of Malaysian undergraduates' academic achievement. Significant relationships between SRL and academic achievement were found, nevertheless differences in the composition of significant predictor sub-scales are also found between achievement groups.

Self-regulated learning, academic achievement, higher education, metacognitive learning strategies, Malaysia

INTRODUCTION

Self-regulated learning (SRL) is an important area of research in college learning and teaching (Pintrich, 1995), and has gained more attention in higher educational research. Zimmerman (1989) defined self-regulated learning strategies as "actions and processes directed at acquiring information or skill that involve agency, purpose, and instrumentality perceptions by learners" (p. 329). Self-regulated learning involves the use of motivational and learning strategies to the degree that students are motivationally, meta-cognitively, and behaviourally active participants in their own learning processes (Zimmerman, 1989; Pintrich, 1995). Students learn self-regulation through experience and self-reflection (Pintrich, 1995). Therefore, self-regulated learning is a good target for student intervention since students are able to learn to become self-regulated learners.

In Pintrich and his colleagues' (Garcia and Pintrich, 1994; Pintrich and DeGroot, 1990) model, there were essentially two important aspects of self-regulated learning, namely, motivational strategies and learning strategies. The motivational strategies were those strategies students used to cope with stress and emotions that are sometimes generated when they tried to overcome failures and become good learners (Garcia, 1995), while the learning strategies were methods that students used to improve their understanding, integration, and retention of new information in the learning process (Cross and Steadman, 1996). A self-report measure called the Motivated Strategies for Learning Questionnaires (MSLQ) was developed (Pintrich, et al., 1986) to tap three motivational strategy components (value, expectancy and affective) and two learning strategy components (cognitive and metacognitive strategies, and resource management strategies).

Research investigating the relationship between self-regulated learning and academic achievement has generally found self-regulated learning to be positively related to academic achievement across education levels and subject areas (e.g. Lindner and Harris, 1992; Van Den Hurk, 2006). The positive role of self-regulated learning has been demonstrated in various studies

for both the motivational as well as the learning strategy aspects of self-regulated learning. Research into the motivational aspect of self-regulated learning normally has shown that academic achievement was associated with internal motivation (Pintrich, Smith, Garcia and McKeachie, 1993), self-efficacy (Bong, 2001), internal locus of control (individual's beliefs that the outcomes of their actions were dependent on what they did) (Haidt and Rodin, 1999), and low levels of test anxiety (Musch and Broder, 1999). Positive relationships between academic achievement and cognitive and metacognitive strategies (Rebovich, Brooks and Peterson, 1998), environment management (Zimmerman and Martinez-Pons, 1986), time management (Britton and Tessor, 1991), effort regulation (Chen, 2002), and help seeking (Rebovich, Brooks and Peterson, 1998) have also been found.

This study investigated the ability of SRL as measured by the MSLQ to predict academic achievement among undergraduates in Malaysia. Results from this study could indicate the suitability of the MSLQ for intervention purposes in Malaysian universities. Although the instrument had been widely used in investigating students' motivation and learning strategies in the United States as well as many other countries such as Australia (Fuller, 1999) and Hong Kong (Rao, Moely, and Sachs, 2000) little was known about its reliability and ability to predict university students' academic achievement in Malaysia. Similar to most findings, SRL as measured by the MSLQ was expected to be able to predict Malaysian university students' academic achievement. This study also looked at the differences of SRL in predicting academic achievement between high and low achievers. SRL was expected to predict academic achievement in both groups.

METHOD

Participants

In order to avoid extraneous variables due to variances in courses as well as experience in higher education, this study was done by focusing on a specific group of students from the same degree program. A total of 460 second-year electrical engineering students from a major University in Malaysia (Universiti Teknologi Malaysia) were involved in the study. The participants were between 18 to 21 years old, in which 315 (68.5%) were males and 145 (31.5%) were females. The Malay and Chinese students were the majority.

Measures

Academic achievement was measured on the basis of the students' grade point average (GPA) scores for the semester in which the study was carried out. Students' self-regulated learning was measured by the Motivated Strategies for Learning Questionnaire (MSLQ) (McKeachie, Pintrich, Lin, and Smith, 1991). It is a self-report instrument designed to assess college students' motivational orientations and their use of different learning strategies. Students rated themselves on a seven point Likert scale from 'not at all true of me' to 'very true of me'. The internal consistency reliability indexes for the 15 sub-scales based on data gathered from a sample of 380 Midwestern college students in the United States (Pintrich, 1996), ranged from 0.52 to 0.93. The questionnaire was translated into the Malay language.

Procedure

Data collection took place three weeks after the opening of semester in the academic year 2001/2002. The questionnaire was administered to complete classes during tutorial hours. Participants' grade point average (GPA) for that semester was obtained before the start of the following semester.

RESULTS

The internal consistency reliability coefficients for the MSLQ (Malay version) sub-scales varied, ranged from 0.19 to 0.91 (Table 1). In order to get robust variables, only sub-scales with reliability indexes above or close to 0.7 were used. The cognitive and metacognitive component was divided into two sub-scales: cognitive (α = 0.87) and metacognitive sub-scales (α =0.78); and the resource management strategies component (α = 0.80) was used in the analyses instead of its sub-scales, due to lack of internal consistency in the sub-scales. Although the reliability indexes for control of learning behaviour (α = 0.50) and test anxiety (α = 0.63) sub-scales were low, they were retained. The lack of internal consistency in these sub-scales could be because this study was carried out at the beginning of a semester, and the participants were not yet familiar with the semester's courses.

Table 1. Internal consistency reliability coefficients of the MSLQ (Malay version) sub-scales

Subscale	α	α (Pintrich et al., 1991)
Motivation scale		
1. Value Component		
Intrinsic Goal Orientation	0.66	0.74
Extrinsic Goal Orientation	0.72	0.62
Task Value	0.77	0.90
2. Expectancy Component		
Control of learning behaviour	0.50	0.68
Self-efficacy for learning and performance	0.91	0.93
3. Affective Component: Test Anxiety	0.63	0.80
Learning strategies		
1. Cognitive and Metacognitive Strategies		
Rehearsal	0.55	0.69
Elaboration	0.71	0.76
Organisation	0.62	0.64
Critical Thinking	0.73	0.80
Metacognitive Self-Regulation	0.78	0.79
2. Resource Management Strategies		
Time and Study Environment	0.67	0.76
Effort Regulation	0.48	0.69
Peer Learning	0.41	0.76
Help Seeking	0.41	0.52

Pooled as well as split data were analysed. The data were split by achievement level to obtain high and low achieving student groups by splitting the cumulative grade point average CGPA scores at the median (3.01). The lower achievement group consisted of 249 participants while the higher achievement group consisted of 248 participants.

ARGUMENT TO SUPPORT THE MEDIAN SPLIT TECHNIQUE

The median split technique is a common technique in research to create two groups. Although there are arguments against the median split method, criticisms are aimed mainly at dichotomising continuous predictor variables in one-way or factorial designs, where two groups are formed and then compared on some dependent variables. This is because doing a median split reduces statistical power, primarily due to the reduction in the inherent variability of the predictor. Cohen (1983) stated that breaking subjects into two groups leads to the loss of 1/5 to 2/3 of the variance accounted for by the original variables.

In the present study, the median split technique is done to split the first year cumulative grade point average in order to form two achievement groups. The main objective is to investigate whether the predictor variables relate to academic achievement in the same manner between the two achievement groups. Although the size of sample in each group is reduced, the sample sizes

are still large. The technique results in two groups of equal size, making comparison between the two groups more statistically appropriate.

Participants with CGPA scores equal and above the median score are classified as higher achievers or upper division students while participants with CGPA scores below the median score are classified as lower achievers or lower division students. The median point is in fact, close to the Universiti Teknologi Malaysia's (UTM) distinction marking (CGPA = 3.00) between upper division level (first class and second upper class) and lower division level (second lower class and below). Findings may be very helpful in understanding the variables that can predict academic achievement for each group.

DATA ANALYSES AND FINDINGS

Analyses were done on the main scales of all variables. All scores were standardised by converting them into z scores. Data were first screened prior to the main data analyses. Cases with too many missing values were dropped. Linearity of the relationships and normality of the data were also checked for both combined and split data.

The distribution of the CGPA scores for the two achievement groups were positively skewed for the high achievers and negatively skewed for the low achievers as a result of splitting the group based on the CGPA median score. However, this did not necessarily lead to skewed distributions of the predictor variables. The assumption of linearity for the relationship between predictor variables and criterion variables were met for all variables in combined as well as split data. Most of the variables for the combined data were normally distributed or close to normal. Although some variables were either negatively skewed, especially for the split data, this did not pose great concern since in a large sample, a variable with statistically significant degree of skew often did not deviate enough from normality to make a substantive difference in the analysis. The impact of departure from zero kurtosis also diminished (Tabachnick and Fidell, 2001).

Mean values for all MSLQ sub-scales for the two achievement groups were calculated, followed by t-tests. The results presented in Table 2, show that the mean values for the high achieving group are higher for all sub-scales. These differences are all statistically significant (p value at least <0.05), except for test anxiety and external goal orientation.

Table 2. Mean values of all MSLQ sub-scales for high and low achievers, significant differences and t values

MSLQ sub-scale	Mean value		t	p
	High achievers	Low achievers		
Internal goal orientation	17.81	16.15	-6.46	0.00
External goal orientation	23.17	22.28	-2.27	0.04
Task value	34.87	33.14	-3.95	0.00
Control of learning belief	22.96	21.82	-3.51	0.00
Self-efficacy	42.67	40.23	-3.08	0.00
Test anxiety	22.64	21.50	-1.88	0.06
Cognitive learning strategies	96.20	84.94	-7.09	0.00
Metacognitive learning strategies	82.64	71.84	-8.90	0.00
Resource management strategies	75.16	66.34	-8.21	0.00

Multiple regression tests were employed as the main analysis method. This method of analysis was used since the study involved more than one independent variable and one dependent variable. Although correlation tests could give information about the strength and direction of the relationship between variables, it could not show the combined as well as the separate effects of the variables on the dependent variable.

A stepwise multiple regression analysis was carried out on the data to see which aspects of SRL were significant in predicting academic achievement. The results show that self-regulated

learning explains 35.2 per cent of the variance in GPA (F=45.78; df=4, 326; p<0.0005). Resource management strategies, test anxiety, metacognitive learning strategies and lack of self–efficacy were the significant overall predictors (β = 0.40, 0.14, 0.28, and -0.17, p<0.01 respectively). The only variable which did not predict academic achievement was self-efficacy.

Separate stepwise multiple regression analyses were then carried out for each achievement group. The results show that self-regulated learning predicts GPA better for the high achievers (33.6% of the variance) compared to the low achievers (13.7% of the variance). The significant predictors were also different. Among the high achievers, control of learning behaviour and resource management strategies had significant positive effects on GPA (β = 0.34 and 0.53, p<0.001), while self-efficacy had a negative effect on GPA (β = -0.29, p<0.00). Among the low achievers, metacognitive learning strategies and test anxiety had positive effects on GPA (β = 0.38, p<0.001; and 0.20, p<0.01 respectively), but control of learning behaviour and task value had low negative effects on GPA (β = -0.18 and -0.17, p<0.05 respectively). Using Rcompare, a program that tests the significance of a difference between two relationships developed by A.C.Downing at the University of Newcastle upon Tyne, significant differences were found for five out of nine variables compared (or five out of six cases where at least one of the two β values compared was significant) (Table 3).

Table 3. β values of all sub-scales for each achievement group and the significant differences found using Rcompare

MSLQ sub-scales	Low achievers	High achievers	Sig. Diff.
Intrinsic goal orientation	-0.07	0.08	(NS)
Extrinsic goal orientation	-0.08	-0.09	(NS)
Task value	-0.17*	0.07	(p<0.05)
Control of learning belief	-0.18*	0.34***	(p<0.00)
Self-efficacy	0.00	-0.29***	(p<0.01)
Test anxiety	0.20**	0.05	(NS)
Cognitive strategies	0.04	0.08	(NS)
Metacognitive strategies	0.38***	0.16	(p<0.05)
Resource management strategies	0.16	0.53***	(p<0.00)

* p<0.05, ** p<0.01, ***p<0.001

DISCUSSION AND CONCLUSIONS

Summary of the results

This study supported the use of the MSLQ in measuring Malaysian university students' self-regulated learning. Although not all of the reliability scores for the sub-scales were high, the internal consistency reliability values for the main components were generally high.

Self-regulated learning was found to have a significant effect on Malaysian university students' academic achievement. This study found that high achievers were better users of self-regulated learning than low achievers. When the data were analysed using the pooled data, resource management strategies, test anxiety, metacognitive learning strategies and self–efficacy were found to be the significant predictors. All these variables had a positive influence on academic achievement, except for self-efficacy. However, differences were found when analyses were done on the split data.

Among the high achievers, those who reported more control of learning belief and more use of resource management strategies, but had lower self-efficacy achieved better. Strategies in managing resources (that is, in terms of time and study environment, effort regulation, peer learning, and help seeking) seem to be a strong predictor of success among this group. Other SRL factors were not significant in distinguishing the higher achievers, perhaps because the high achievers already had the level of skills required in a learning process so much so that they did

not appear to be a significant predictor for academic achievement for the high achievers. Within the low achievement group, those who reported more use of metacognitive learning strategies, higher test anxiety, low internal attribution of control over learning as well as low task value achieved better.

The metacognitive learning strategies would appear to be more important for the low achievers compared to the high achievers. The lower level of metacognitive strategies reported by the low achievers as compared to the high achievers indicated that the low achievers were not using metacognitive strategies enough in their studies, thus, those with better metacognitive strategies achieved better. Although findings about the effect of test anxiety on academic achievement were inconsistent and sometimes contradicting, this affective learning variable has normally been found in previous research to be detrimental. In this study, it was found to have a low positive correlation with the low achievers' academic achievement, but was not a significant predictor among the high achievers. Moreover, the influence of control of learning belief on academic achievement was found to be positive among high achievers but was found to be negative among the low achievers. This indicated that among the low achievers, they achieved better when they were slightly more worried about their examinations, thought that they had less control over their learning, and valued the learning task less than their peers within the same achievement group. Perhaps these factors made them more motivated to work harder. The differences in the relationship between the self-regulated learning variables in predicting academic achievement need to be investigated further.

This study found that self-regulated learning could explain the GPA variance better for the high achievers compared to the low achievers. SRL predicted 33.6 per cent of the variance in GPA among the high achievers, but only 13.7 per cent among the low achievers. Perhaps academic achievement could be predicted by self-regulation in learning, but other confounding factors could be more or equally important in predicting students' success, especially among the low achievement group. Various factors were interwoven and complementing each other in explaining human behaviours and outcomes. Although these factors were of a different nature, in general, high achievers were found to be on the more advantaged side, while the low achievers normally had the opposite characteristics. It was possible that the factors that were associated with academic achievement were supporting and making SRL possible. Meanwhile, the opposing factors that were normally associated with academic problems had adverse effects by interfering with students' acquisition and use of SRL skills. Moreover, the effects of the adverse factors such as family or personal problems, could be more intense, possibly strong enough to suppress the importance of SRL in predicting academic achievement. Further research needs to be done to look into these matters.

Although this study has found support to the influence of self-regulated learning (SRL) on university academic achievement as well as the MSLQ as a tool to measure self-regulated learning, a word of caution should be given when generalising the findings. These findings were based on responses made by undergraduates from an engineering course at the Universiti Teknologi Malaysia (UTM). The majority of the sample was from the Malay and Chinese ethnicity, and more than half of them were males (68.5%). Further studies should be done using a wider sample of the Malaysian undergraduate population in order to generalise the findings.

IMPLICATIONS FOR PRACTICE

Even when the results were based on UTM second-year electrical engineering students, results were consistent with most other studies done elsewhere. The findings could be used as evidence of the importance of self-regulation in the learning process. Efforts should be taken to identify and help students, especially those who were at risk of low achievement or failure by focusing on their self-regulated learning behaviour. Consequently, the MSLQ can be used to identify students

who are at risk and can also be used in general to make students aware of their learning behaviour, so that students can identify their strengths and work on their weaknesses.

Results from the separate investigations for the different achievement groups have shown the need to look at the different needs of these groups. In this study, the aspects of SRL that are important in explaining the different groups' academic success differ. One important finding that needs to be highlighted from this study is that metacognitive strategies are found to be important in influencing low achievers' achievement but such a finding is not found among the high achievers. It is assumed that metacognitive strategies are particularly important in explaining academic performance as metacognitive skills help to govern students' ability to plan, monitor and evaluate their performance. The lack of metacognitive skills may hamper students' ability to judge their potential as well as performance, thus hindering them from making effective planning and actions.

The grouping of the participants in this study may be arbitary, and findings may only apply to the particular group of students at one university in Malaysia. Nevertheless, the findings suggest that efforts need to be made to help students, especially low achieving or high risk students to improve their use of metacognitive strategies.

REFERENCES

Bong, M. (2001). Role of self-efficacy and task-value in predicting college students' course performance and future enrolment intentions. *Contemporary Educational Psychology,* 26, 553-570.

Britton, B.K. and Tessor, A. (1991). Effects of time management practices on college grades. *Journal of Educational Psychology,* 83(3), 405-410.

Chen, C.S. (2002) Self-regulated learning strategies and achievement in an introduction to information systems course. *Information Technology, learning, and performance Journal,* 20(1),11-25.

Cohen, J. (1983). The cost of dichotomization. *Applied Psychological Measurement*, 7, 249-253.

Cross, R. C., and Steadman, M. H. (1996). *Classroom Research: Implementing the Scholarship of Teaching*. San Francisco: Jossey-Bass.

Fuller, R. (1999). Do university students' conceptions of learning really influence their learning? Retrieved from http://www.herdsa.org.au/vic/cornerstones/pdf/fuller.pdf

Garcia, T. (1995). The role of motivational strategies in self-regulated learning. In P.R. Pintrich (Ed.), *New Directions for College Teaching and Learning: Self-Regulated Learning in the College Classroom* (pp. 29-42). San Francisco: Jossey-Bass.

Garcia, T. and Pintrich, P.R. (1994). Regulating motivation and cognition in the classroom: The role of self-schemas and self-regulatory strategies. In D.H. Schunck and B.J. Zimmerman (Eds.), *Self-Regulation of Learning and Performance: Issues and Educational Applications.* Hillsdale, NJ: Erlbaum.

Haidt, J., and Rodin, J. (1999). Control and efficacy as interdisciplinary bridges. *Review of General Psychology*, 3, 317-337.

Lindner, R.W. and Harris, B. (1992). Self-Regulated Learning and Academic Achievement in College Students. Paper presented at the American Educational Resesrach Association Annual Meeting (San Francisco, CA, April 20-24, 1992).

McKeachie, W.J. (1995). Learning Styles can Become Learning Strategies. *The National Teaching and Learning Forum,* 4(6).

Musch, J. and Broder, A. (1999). Test anxiety versus academic skills: A comparison of two alternative models for predicting performance in statistics exam. *British Journal of Educational Psychology, 69*, 105-116.

Pintrich, P.R. and Schunck, D.H. (1996). *Motivation in Education: Theory Research and Applications.* Englewood Cliffs, NJ: Prentice Hall.

Pintrich, P.R. and DeGroot, E.V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33-40.

Pintrich, P.R.; Smith, D.A.F.; Garcia, T. and McKeachie, W.J. (1993) Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement, 53*, 801-813.

Pintrich, P. (1995). Understanding Self-Regulated Learning. In P. Pintrich (Ed.), *Understanding Self-Regulated Learning. San Francisco*, CA: Jossey-Bass.

Rao, N.; Moely, B.E and Sachs, J. (2000). Motivational beliefs, study strategies, and mathematical attainment in high and low achieving Chinese secondary school students. *Contemporary Educational Psychology, 25*, 287-316.

Rebovich, J.S.; Brooks, G. and Peterson, E. (1998). Efficacy of an assessment instrument to measure affective and cognitive learning domains of students enrolled in food or nutrition courses. *Journal of Human Nutrition and Dietetics, 11*, 519-527.

Tabachnick, B.G. and Fidell, L.S. (2001). *Using Multivariate Statistics,* 4th Edition. Boston: Allyn and Bacon.

Van Den Hurk, M. (2006). The relation between self-regulated strategies and individual study time, prepared participation and achievement in a problem-based curriculum. *Active Learning in Higher Education*, Vol. 7, No. 2, 155-169.

Zimmerman, B.J. (1989). Models of self-regulated learning and academic achievement. In B.J. Zimmerman and D.H. Schunck (Eds.), *Self-Regulated Learning and Academic Achievement: Theory, Research, and Practice.* New York: Springer-Verlag.

Zimmerman, B.J., and Martinez-Pons, M. (1986). Development of a structured interview for assessing students' use of self-regulated learning strategies. *American Education Research Journal, 23*, 614-628.