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SELF-REGULATED LEARNING: GENDER DIFFERENCES IN MOTIVATION AND LEARNING STRATEGIES AMONGST MALAYSIAN SCIENCE STUDENTS

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Abstract

Understanding the self-regulated learning amongst students has been given much prominence because it helps explain achievement differences among students and serves as a means to improving student achievement. A self-regulated learner engages in self-generated thoughts, actions, and feelings while pursuing his/her academic goals. Research indicates that successful learners have better self-regulatory learning, maintaining high levels of motivation and learning strategies. This article reports the gender differences in self-regulated learning amongst 185 Malaysian science students (84 males and 101 females) as a whole, and by groups (e.g., students taking science, mathematics, and additional mathematics). Dataset collected using the MSLQ-R, the revised version of the Motivated Strategies for Learning Questionnaire was analyzed using Multivariate Analysis of Variance (MANOVA). The results indicated that the gender effect was not significant across the two dimensions (i.e., motivation and learning strategies) in the group taken as a whole, in mathematics group and in additional mathematics group. However, gender effect was significant across the two dimensions in the science group where the girls reported a markedly higher level of self-regulatory learning.

Keywords: self-regulated learning, gender differences, motivation, learning strategies, Malaysia

Abstrak

Pemahaman pembelajaran kawalan kendiri dalam kalangan pelajar telah diberikan penegasan kerana pemahaman tersebut membantu untuk menerangkan perbezaan pencapaian dan juga merupakan satu kaedah untuk meningkatkan pencapaian pelajar. Seseorang pelajar yang berkawalan kendiri terlibat dalam fikiran, tindakan, dan perasaan yang dijana kendiri semasa mengejar matlamat-matlamat akademiknya.

Kajian telah menunjukkan bahawa pelajar-pelajar yang berjaya lumrahnya mempunyai pembelajaran kawalan kendiri yang lebih baik, dan pengekalan tahap motivasi serta strategi pembelajaran yang lebih tinggi. Artikel ini melaporkan perbezaan-perbezaan jantina dalam pembelajaran kawalan kendiri dalam kalangan 185 orang pelajar sains di Malaysia (84 lelaki dan 101 perempuan) secara keseluruhan, dan secara berkumpulan (yakni, pelajar yang mengambil mata pelajaran sains, matematik, dan matematik tambahan). Set data yang diperoleh melalui pentadbiran MSLQ-R, versi semakan semula untuk Soal Selidik Strategi Bermotivasi untuk Pembelajaran ("Motivated Strategies for Learning Questionnaire") dianalisiskan menggunakan Multivariate Analysis of Variance (MANOVA). Dapatan menunjukkan bahawa kesan jantina adalah tidak signifikan merentas dua dimensi (yakni, motivasi dan strategi pembelajaran) berdasarkan kumpulan yang diambil secara keseluruhan, kumpulan matematik, dan kumpulan matematik tambahan. Namun demikian, kesan jantina adalah signifikan merentas dua dimensi tersebut dalam kumpulan sains di mana perempuan melaporkan satu tahap pembelajaran kawalan kendiri yang lebih tinggi berbanding dengan lelaki.

Kata Kunci: Pembelajaran kawalan kendiri, perbezaan jantina, motivasi, strategi pembelajaran, & Malaysia

INTRODUCTION

Learning process is a part of students' life which occurs in a formal and non formal situation. Formally, teacher should have the knowledge and skills not only in identifying the types of student motivation, but also in employing compatible learning strategies so as to optimise the effectiveness of the teaching and learning. In fact, motivated strategy for learning is an important aspect of students' academic performance in the classroom. The theoretical framework on motivated strategies for learning, labelled as Self-Regulated Learning (SRL), was propounded by McKeachie et al. (1986), Pintrich (1988, 1989), Pintrich and DeGroot (1990), and Pintrich and Garcia (1991).

Self-regulated learning, according to Zimmerman and Schunk (2001), refers to the way in which a learner cognitively, motivationally and behaviorally promotes his/her own academic achievement. Pintrich et al. (1991) viewed SRL as having two separate dimensions, namely motivation and learning strategies.

The motivation dimension is further divided into two components; the first being adhered value component that encompasses students' intrinsic goal orientation, extrinsic goal orientation and task value, while the second being expectancy component that comprises control of learning beliefs, self-efficacy for learning & performance, and test anxiety. The learning strategies dimension, by contrast, has three components, namely cognitive and metacognitive strategies, resource & management strategies, and trouble shooting.

Accordingly, understanding the self-regulated learning of students is crucial because it helps explain achievement differences among students and serves as a means to improving student achievement. A self- regulated learner engages in self-generated thoughts, action, and feelings while pursuing his/her academic goals. The body of research indicates that gender is one of the variables that has been related to differences found in self-regulated learning. For instance, the existence of different attribution in males and females where females tend to give more emphasis to effort when explaining performance (Lightbody et al., 1996). Furthermore, while males have outperformed females in cognitive tasks requiring mechanical reasoning or visual-spatial processing, females have done better in tasks requiring verbal abilities (Stumpf, 1995). In relation to the academic goals pursued by males and females, several studies have shown that males show a greater degree of extrinsic motivational orientation (Anderman & Anderman, 1999), while females show a greater intrinsic motivation (Meece & Holt, 1993). However, other studies have not found differences in the type of goal pursued as a function of gender (Ryan & Pintrich, 1997).

In the Malaysian context, the study on gender differences had been given prominence since Malaysia gained her independence more than five decades ago. In the 70s, the trend in academic performance indicated that males generally achieved better than females. However, in the 1990s, the trend seemed to show otherwise so much so that the underachievement of males had been an issue and such phenomenon has perpetuated into the 21st century. While there are many studies conducted which show the marginalisation of males in academic achievement, one such study was reported by Yoong Suan and Aminah Ayob (2005) who found that, amongst the Form Four (16-year-old) arts-based (i.e., taking core science and mathematics) and science-based (i.e., taking physic, biology, chemistry and additional mathematic) students, female students tend to perform significantly better than male students, and that proportionally more female students than male students are entering tertiary level education.

BACKGROUND OF STUDY

In this section, MSLQ-R -- the revised version of the Motivated Strategies for Learning Questionnaire will be succinctly discussed. Given that MSLQ-R has two dimensions, the sub-dimensions for each of the dimensions will also be judiciously elaborated.

Motivated Strategies for Learning Questionnaire-Revised (MSLQ-R)

MSLQ-R, an acronym for the revised version of the Motivated Strategies for Learning Questionnaire, is a valid and reliable instrument that is used to measure and understand the self-regulated learning amongst Malaysian students. The revised subscales in the 74-item MSLQ-R do differ from the original 81-item MSLQ. The overall internal reliability, established using Cronbach's coefficient alpha, was measured at 0.838, which can be claimed as a high value and is indicative of high internal consistency (Sadiah et al., 2009). In the MSLQ-R, there are five coherent factors (e.g., adhered values, expectancy components, the cognitive and metacognitive strategies, resource management and trouble shooting). Table 1 summarizes the revised constructs in the MSLQ-R and their corresponding items, while the subsequent paragraphs briefly describe the factors/subscales/sub-dimensions which subsume under each of the two dimensions

Table 1: *The Constructs within the MSLQ-R*

Dimension	Subscales	Items
Motivation	**1. Adhered Value**	
	a) Intrinsic Goal Orientation	1, 13, 19, 21
	b) Extrinsic Goal Orientation	6, 9, 27
	c) Task value	8, 14, 20, 23, 24
	2. Expectancy Components	
	a) Control of learning belief	2, 7, 15, 22
	b) Self-Efficacy for learning and Performance	4, 5, 10, 12, 17, 18, 26, 28
	c) Test Anxiety	3, 11, 16, 25

Learning strategies	**1. Cognitive and Metacognitive Strategies**	
	a) Rehearsal	33, 37, 46, 55
	b) Elaboration	41, 48, 50, 52, 53, 59
	c) Organization	29, 35, 39, 49
	d) Critical Thinking	32, 38, 40, 51, 54
	e) Metacogncitive Self–Regulation	30r*, 31, 34, 36, 42, 43, 44, 45r, 47, 56, 57, 58
	2. Resource and Management Strategies	
	a) Time and Study Environment	
	b) Effort Regulation	63, 67r*, 70, 72, 73r*, 74r*
	c) Peer Learning	62r*, 65, 69r*,
	d) Help Seeking	60, 66,68
	e) Trouble shooting	61, 64, 71

Note: * 'r' indicates a reverse coded item

Motivational Dimension

This dimension consists of two subscales, namely adhered value and expectancy components. Adhered value subscale is an amalgamation of *intrinsic goal orientation* (that concerns the degree to which a student perceives himself/herself to be participating in a task for reasons such as challenge, curiosity and mastery), *extrinsic goal orientation* (that concerns the degree to which a student perceives himself/herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by others and competition), and t*ask value* (that refers to the student's evaluation of the how interesting, how important, how useful the task is, and the reasons why s/he is participating in the task).

Expectancy component, by contrast, is a composite of c*ontrol of learning belief* (that refers to a student's belief that his/her effort to learn will result in positive outcomes and that belief is contingent on his/her own effort in contrast to external factors such as the teacher), *self-efficacy for learning and performance* (that gauges one's expectancy for success and self-efficacy), and *test-anxiety* (that concerns one's worry in cognitive and emotional realms).

Learning Strategies Dimension

This dimension consists of three subscales, namely cognitive and metacognitive strategies, resource and management strategies, and trouble shooting. Cognitive and metacognitive strategies subscale encompasses *rehearsal* (e.g., basic rehearsal strategies which are commonly used in reciting or naming items to be learned, and these strategies are best used for simple tasks and activation of information in working memory rather than acquisition of new information in long-term memory), e*laboration* (e.g., paraphrasing, summarizing, creating and connecting new information with prior knowledge, and taken together, it helps students store information into long-term memory by building internal connections between items to be learned), *organization* (e.g., this strategy helps students select appropriate information and also construct connections among information learned. Organization strategies include clustering, outlining and selecting main ideas), c*ritical thinking* (e.g., this strategy refers to the degree to which students apply previously learnt knowledge to new situations in order to solve problems, reach decisions or make critical evaluations), and *metacognitive self-regulation* (e.g., refers to the awareness, knowledge, and control of cognition, and the activities include planning, monitoring, and regulating).

Resource and management strategies, the second subscale, is a composite of *time and study environment* (e.g., this involves scheduling, planning and managing one's study time, and it includes not only setting aside blocks of time study, but also the effective use of that study time and setting realistic goals), e*ffort regulation* (e.g., a student's ability to self-regulate and control his/her effort and attention in the face of distractions and uninteresting task), *peer learning* (e.g., collaborating and interacting with one's peers), and *help seeking* (e.g., this includes both peers and instructors. Good students know when they don't know something and are able to identify someone to provide them with some assistance).

The third subscale is trouble shooting. This subscale measures the students' proactiveness in using the environment and friends to solve the problems in achieving their goals.

PURPOSE OF STUDY

This article reports the gender differences in self-regulated learning amongst 185 Malaysian science students as a whole and by groups (e.g., students taking science, mathematics, and additional mathematics). The first establishes if there is any significant difference in SRL between gender while the second determines if there is any significant gender difference in SRL amongst students taking science, mathematics, and additional mathematics. This information would be useful and meaningful to course and curriculum designers and developers as well as academic staff of relevant subject departments whereby appropriate assistance and guidance could be intelligibly given to students and teachers in their motivated strategies for learning process.

Inasmuch as the purpose of this study was to gauge gender differences in self-regulated learning of science students as a whole, and by subject uptake, this study addressed the following questions:

1. What are the levels of motivation and learning strategies by gender for: (a) the group as a whole (i.e., overall group), and (b) each different group by subject uptake?

2. Are there any significant differences between gender in terms of linear combination of motivation and learning strategies for (a) overall group, (b) science group, (c) mathematics group, and (d) additional mathematics group?

METHOD

This research adopts the causal-comparative design which is essentially a quantitative approach. The revised version of the Motivated Strategies for Learning Questionnaire (MSLQ-R) (Sadiah et al., 2009), psychometrically refined from the original Motivated Strategies for Learning Questionnaire (MLSQ) (Pintrich et al., 1991), was used as the main instrument. Dataset was analyzed using Multivariate Analysis of Variance (MANOVA).

SUBJECT AND PROCEDURE

The participants of this research comprised 185 Form Four (16-year-old) science students: 84 (45%) males and 101 (55%) females from a government secondary school in the state of Perak, Malaysia. This school was randomly selected and the administration of the questionnaire was carried out by the respective class teachers. Respondents were given 30 minutes to answer the questionnaire. Responses to the items were based on a seven-point Likert Scales anchored by one (not at all true of me) through seven (very true of me).

DATA ANALYSIS PROCEDURE

MANOVA is carried out to test whether there are significant group differences on a linear combination of the dependent variables. Gender was divided into two levels (males and females) and the subject uptake was divided into three levels (science, mathematics, and additional mathematics). Pillai's Trace criterion is considered to have acceptable power and to be the most robust statistics against violations of assumptions.

RESULTS

As indicated in Table 2, the overall group (N=185) means of motivation and learning strategies for males are 143.30 and 198.90 respectively while for females, the corresponding means were 146.92 and 206.40. By subject uptake, the means for science group (N=33) on motivation and learning strategies for males are 122.00 and 160.00, while for females, the means are 147.00 and 195.07. For the mathematics group (N=120), the means of motivation and learning strategies for males are 148.80 and 209.80, while for females, the means are 145.75 and 204.51. In the additional mathematics group (N=32), the means for motivation and learning strategies of males and females are 150.03 and 208.53, and 151.18 and 224.06 respectively.

Table 2: *Descriptive Statistics Between Gender Across Two*

Factors	Dimensions	Gender	Mean	Std. Deviation	N
As overall groups	Motivation	Males	143.30	24.66	84
		Females	146.92	19.84	101
		Total	145.28	22.17	185
	Learning Strategis	Males	198.90	43.28	84
		Females	206.40	34.86	101
		Total	202.99	89.98	185
Science group	Motivation	Males	122.00	24.26	18
		females	147.47	27.54	15
		Total	133.58	28.46	33
	Learning Strategies	Males	160.00	41.56	18
		Females	195.07	44.47	15
		Total	175.94	45.79	33
Mathematics Group	Motivation	Males	148.80	22.09	51
		Females	145.75	19.14	69
		Total	147.05	20.41	120
	Learning Strategies	Males	209.80	42.01	51
		Females	204.51	33.01	69
		Total	206.76	37.06	120
Additional Mathematics Group	Motivation	Males	150.13	20.08	15
		Females	151.18	14.50	17
		Total	150.69	17.10	32
	Learning Strategies	Males	208.53	15.01	15
		Females	224.06	27.42	17
		Total	216.78	23.49	32

A MANOVA was computed to examine if there were any significant differences in SRL between gender for the overall group, and for each subject uptake, the results are given in Table 3.

Table 3: *Results of Multivariate Analysis of Variance*

Gender Effect	Pillai's Trace Value	F	Hyphothesis df	Error df	p	Eta Squared
Overall Group	.010	.910	2	182.00	.404	.978
Science Group	.215	4.097	2	30.000	.027*	.215
Mathematics Group	.007	.387	2	117.00	.680	.007
Additional Mathematics Group	.122	2.013	2	29.00	.152	.122

* Significant at p<.05

As shown in Table 3, Pillar's Trace = 0.910, p= 0.404 > 0.05, indicates that there is no significant gender effect across two dimensions (i.e., motivation and learning strategies in MSLQ-R) from the group taken as whole. However, when the dataset was analysed by gender within different groups (e.g., science, mathematics, and additional mathematics), there was a significant difference between male and female students (F = 4.10, p=.027 < .05) across the motivation and learning strategies dimensions within the group of students who studied science. Here, female students rated markedly higher than that of male students in terms of motivation (Female = 147.47, Male = 122.00) and learning strategies (Female = 105.07 and male = 160.00). Nevertheless, there was no significant difference between the male and female students who studied mathematics (p=.680) and additional mathematics (p=.152) across the two dimensions in MSLQ-R.

CONCLUSION AND DISCUSSION

Given that this study aimed to investigate gender differences in the use of self-regulated learning strategies amongst Malaysian science students, the results indicated that there was no gender effect when the group was analysed as a whole. However, when it was analysed within different groups of students, the results indicated that only significant gender difference was found amongst students who studied science where females self-regulatory learning was markedly higher that the males across the two dimensions, namely motivation and learning strategies. There was no difference between the males and females in self-regulatory learning in mathematics and additional mathematics groups.

These findings are consistent with previous research that indicates female students tended to surpass male students in terms of strategy use (e.g., Wolters, 1999). Maria and Pedro (2004) theorised that females show a more adaptive cognitive motivational pattern than males. In Malaysian context, such theorisation could be supported by the fact that, females' achievement is higher than males in the National Standardised Examinations such as *Penilaian Menengah Rendah* (PMR) and *Sijil Pelajaran Malaysia* (SPM). From the qualitative research that examines whether gender can be differentiated with respect to the use of self regulatory learning strategies, it was found that, across the two dimensions of self-regulated learning, females showed more inclination towards task or learning strategies, whereas males emphasized more on performance goals (Anderman & Young, 1994; Zimmerman & Martinez, 1990).

These findings have some implications for the teachers. Firstly, teachers should be aware of the differences in self-regulatory learning between the males and the females, and subsequently, plan to address this situation in terms of curriculum restructuring and implementation. We strongly suggest that students, particularly the males, should be provided with more training on learning strategies, lest they become further marginalised in terms of academic achievement. In terms of pre- and in-service science and mathematics teacher education, teachers should be equipped with a repertoire of pedagogical skills so as to enable them to teach self-regulated strategies more effect

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