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**NANYANG TECHNOLOGICAL UNIVERSITY
NATIONAL INSTITUTE OF EDUCATION**



Self-regulated Learning in Tertiary Students*

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Final Report

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Executive Summary

The worldwide trend towards lifelong learning assumes that learners become more independent of teachers as they mature. For adult learners to rely on a teacher for daily consultation and support is simply not economically feasible. On the contrary, many higher educators are predicting that distance learning *via* the Internet will complement, if not replace, campus learning in most universities in the Twenty-First Century. These developments imply that students need to become self-regulated learners in order to survive in the new learning environment that is emerging.

This report describes and interprets three research projects that investigated students' use of self-regulated learning strategies. The three projects were:

1. A cross-cultural study of Engineering and Teacher Education university students' level of self-regulated learning, self-efficacy and self-concept in Singapore and Australia;
2. A study of these three variables in Singaporean secondary and JC students; and
3. A study of the impact of self-regulated learning strategy training on these three variables in a sample of Singaporean Teacher Education students.

Chapter 1 outlines the cross-cultural study of Singaporean and Australian university students' self-regulated learning strategies, self-efficacy beliefs and self-concept. A sample of 460 Engineering and Teacher Education students in the two countries answered questionnaires which had been designed to measure these three self variables. It was found that Singaporean students use self-regulated learning strategies frequently in their course revision and study techniques. Both Engineering and Teacher Education students use their resources, including time, library resources, and effort, efficiently to help them learn and memorise their knowledge. Teacher education students tend to use cognitive and metacognitive strategies, such as planning, monitoring their performance and evaluating their progress more often than Engineering students. Some country differences were found, but the differences between Engineering and Teacher Education students were more profound in both countries.

In Chapter 2, the results of a study involving 831 Secondary students in 14 classes and 129 JC students in 4 classes are presented. Questionnaires administered to these students measured the same three self variables as for the first study. It was found that Singapore Secondary and JC students had above average to high scores for self-regulated learning, indicating that they were capable of purposeful learning and of monitoring their own learning processes. An examination of the results from each school showed that Express and SAP students achieved higher scores than Normal Academic and Normal Technical students most of the time. These results confirmed previous research which shows that academically more able students are more self-regulatory in their learning. The same pattern of results was obtained for the intellectual self-concept scale. The better Secondary and JC students had higher intellectual self-concept scores.

The third Chapter details an intervention study designed to increase Teacher Education university students' use of self-regulated learning strategies. Three groups of students were chosen, two groups for the control group and the third group for the experimental group which received a twenty-hour module on how to improve their independent learning strategies. While it was not possible to allocate randomly the students to the three groups, all the students were PGDE Secondary teacher trainees at NIE. So, a quasi-experimental pretest-posttest research design was implemented in this study. The results of the study demonstrated that the experimental group improved their self-efficacy beliefs, which meant they gained in confidence that they could perform the skills taught in the course. There were no differences, however, between the experimental and control groups in their use of self-regulatory learning strategies at the end of the intervention. The training module did not make a difference to the students' use of independent learning strategies. The report suggests a number of explanations for the lack of positive impact of the training module and recommends that future research implement the module with NIE DipEd. and BA/BSc students at the beginning of their training.

These three studies demonstrated that Singaporean Secondary School, JC, and Engineering and Teacher Education university students possess specific strategies for regulating their own learning. A twenty-hour module to improve student self-efficacy and use of self-regulatory learning strategies was designed and implemented. Student self-efficacy beliefs were raised as a result of completing the module, but there was little change in their self-regulatory learning strategies. The implications of these research findings for schools and for NIE, as well as suggestions for further research, are discussed in the report.

CHAPTER 1

Self-regulated Learning in Singaporean and Australian Tertiary Students

Introduction

The enhancement of self-regulated learning in tertiary graduates is a high priority in Singapore. In his 1996 Teachers' Day address, Prime Minister Goh Chok Tong referred to an MOE survey which found that Singaporean university graduates were perceived by employers as competent and analytical thinkers, but were not considered to be strong on creative and innovative thinking or in solving problems that were not well-defined. This concern is being addressed in the schools by an increasing emphasis by teachers on critical and creative thinking and by the increasing use of IT in teaching and learning in order to make use of IT's flexibility, access to rich resources of knowledge, and infinite patience.

This Chapter will discuss the use of self-regulated learning strategies in university students in Teacher Education and Engineering in Singapore and Australia. Its aim is to investigate cultural and discipline differences in the use of various strategies when students attempt to study courses independently, whether there are discipline differences in the use of those strategies, and if there are interactions between culture and discipline in the use of such strategies.

Self-regulated learning is a relatively new field in the study of academic achievement. Until recently student achievement was studied primarily from the perspective of how to maximise student abilities by exposure to teaching. These abilities were believed to be relatively stable. The student was assumed to be the passive recipient of teacher knowledge by means of a top-down instructional model. Self-regulation theory, on the other hand, assumes that students are active organisers of their own learning, using strategies that will optimise their learning outcomes. Self-regulated learners are typically purposeful, strategic and persistent in their learning. They possess declarative knowledge in knowing what is the phenomenon being studied and procedural knowledge which involves applying their knowledge in the appropriate context. Through experience in a wide variety of problem-solving situations they have developed the ability to evaluate their progress in terms of the goals they set themselves and to believe in their efficacy to regulate their learning activities in difficult subjects (Bandura, 1993; Zimmerman, 1995). Self-regulation theorists explain how students activate, alter and sustain their learning in specific contexts (Zimmerman, 1986).

There are wide individual differences in the use of self-regulated learning strategies (Snow, Corno and Jackson, 1997). Some students are much better independent learners than others. Three questions arise:

- 1) Can we measure individual differences in self-regulated learning strategies?
- 2) Are these strategies related to other mediating variables, such as self-efficacy and self-concept?
- 3) Are their cultural differences in these variables between Singaporean and Australian university students, discipline differences between teacher

education and engineering students and/or interactions between culture and discipline in self-regulated learning, self-efficacy and self-esteem?

This section of the report will provide preliminary answers to each of these questions.

There is evidence that Asian students adopt different self-regulated learning strategies from non-Asian students. Chye, Walker and Smith (1997) found that Singaporean university students used more time management and effort strategies in studying a particular course than did Australian students. Furthermore, they reported that student self-efficacy beliefs were moderately correlated with self-regulated learning strategy use and with academic achievement. In a study of 9th grade American students, Eaton and Dembo (1997) found that Asian American students reported lower levels of self-efficacy beliefs than their non-Asian peers, yet outperformed them on a novel achievement task. Asian American students' fear of the consequences of failure best explained their performance on the task, whereas non-Asian students' achievement was best predicted by their level of self-efficacy. This Chapter will report on the relationships between self-regulated learning strategies, self-efficacy and self-concept in a sample of Singaporean and Australian Teacher Education and Engineering university students in order to examine the influence of culture and discipline on these important variables which mediate educational achievement.

Method

Sample

The sample consisted of 460 final year Singaporean and Australian teacher education and engineering university students, enrolled at either Nanyang Technological University or at the University of Sydney, as outlined in Table 1.

Table 1. Sample of university students by country and discipline

Country	Discipline		Sub-totals
	Education	Engineering	
Singapore	151	98	249
Australia	111	100	211
Sub-totals	262	198	460

Instruments

(i) Self-regulated learning

A shortened form of the Motivated Strategies for Learning Questionnaire (MSLQ) was administered to all students. The MSLQ was constructed by Pintrich, Smith, Garcia and McKeachie (1991) to assess students' use of various learning strategies, which were classified into three types: cognitive, metacognitive and resource management strategies. The original 81-item scale was reduced to a total of 42 items, including 16 cognitive items, 10 metacognitive items and 16 resource management items. Cognitive strategies

included organising course materials, revising course notes and readings, writing summaries of main ideas and memorising key concepts. Metacognitive strategies involved reflecting on the most appropriate study methods to revise course materials and resource management strategies included making time, effort and space resources for study. Cronbach alpha internal reliability coefficients for the cognitive, metacognitive and resource management strategies were .82, .63 and .71, respectively.

(ii) Self-efficacy

The self-efficacy scale consisted of five items, which had been used by Chye, Walker and Smith (1997) in their Australian study. The items were re-worded to make them specific to the particular course being studied in the class in which the questionnaire was administered, in line with Bandura's position that self-efficacy beliefs are situation specific. A Cronbach alpha coefficient of .86 was obtained from this sample, indicating that student responses to this short scale were internally consistent.

(iii) Self-concept

The self-concept scale used in this study was the 60-item Chinese Adolescent Self-esteem Scales (CASES), developed by Cheng (1997). This scale was preferred to other self-concept scales because it was developed in an Asian country to reflect some of the important sources of self-evaluation used by Asian students. While it was based on the widely employed Marsh Self Description Questionnaire (SDQ) it included items on filial piety which were not part of the SDQ. CASES consists of seven sub-scales: Social (.86), intellectual (.77), physical attractiveness (.84), moral (.83), general (.84), family (.78), and sports/physical (.91). The Cronbach internal consistency coefficients in parentheses indicate it is a highly reliable, multidimensional self-concept scale for use in both Asian and Western cultures.

Procedure

The self-rating questionnaire was administered to the various teacher education and engineering students in their tutorial groups. The senior author secured the cooperation of the Dean of Engineering at the University of Sydney, who readily agreed to have it administered in her Faculty. All testing occurred in the first half of 1998. While the two authors conducted the testing in their teacher education tutorials at NIE, Singapore, the engineering students were tested by tutors in the Faculty of Engineering at NTU, as occurred in Australia. The questionnaire included detailed instructions on the cover page, which also asked for respondents to give their University, Faculty/School, course and gender, but not their name. All respondents were assured that their answers would remain confidential.

Results

(i) Can we measure individual differences in students' use of self-regulated learning strategies?

From the experience in administering the shortened form of the MSLQ in Australia and Singapore, the short answer to this question is "Yes". It appears that students differ in their use of various cognitive, metacognitive and resource management strategies. Their responses are internally consistent on each of the three sub-scales, as described in the

previous section of this paper. It seems that the cognitive and resource management strategies are more homogeneous than the metacognitive strategies, whose internal consistency coefficient is lower, though still at an acceptable level.

(ii) Are self-regulated learning strategies related to the other mediating variables of self-efficacy and self-esteem?

Table 2 indicates that there are moderate relationships with the other two self variables, which shows there is overlap among the three variables, but also considerable independence between them. It appears that there is a closer relationship between self-efficacy and self-esteem than there is between the various self-regulation strategies and either self-efficacy or self-esteem.

Table 2. Relationships between self-regulation (SR), self-efficacy and self-esteem

	Cognitive SR	Metacog. SR	Resource Man. SR	Self-esteem
Self-efficacy	.44	.35	.33	.50
Cog. SR		.65	.56	.29
Metacog. SR			.56	.30
RMSR				.35

(iii)(a) Are there cultural differences between Singaporean and Australian university students in their self-regulated learning strategies, self-efficacy and self-esteem?

Cultural differences in self-efficacy ($X_a=19.80$, $X_s=17.68$, $F=45.20$, $p<.01$) occurred, as well as in most of the self-esteem sub-scales, in favour of the Australian students. The one exception to this trend is that the family self-concept of the Singaporean students is significantly higher than that of the Australian students ($X_s=32.36$, $X_a=30.01$, $F=20.96$, $p<.01$). The only significant difference in self-regulated learning strategies was the more frequent use of metacognitive strategies by Singaporean students.

(iii)(b) Are there discipline differences between teacher education and engineering students in their self-regulated learning strategies, self-efficacy and self-esteem?

Some discipline differences were found, generally in favour of the teacher education students when compared with the engineering students. The teacher education students expressed higher self-efficacy beliefs ($X_t=19.15$, $X_e=17.99$, $F=12.33$, $p<.01$) and more positive self-esteem in most dimensions (e.g., for general self-esteem, $X_t=228.30$, $X_e=223.35$, $F=4.50$, $p<.05$). They also cited more frequent use of cognitive and metacognitive self-regulated learning strategies, but not resource management strategies, than the engineering students.

(iii)(c) Are there interaction effects between the views of students when both country and discipline are considered?

The country and discipline findings must be interpreted cautiously because many interaction effects were found between country and discipline on the three variables. Table 3 indicates that there were interaction effects on all three variables, except in the use of resource management self-regulated learning strategies, where the trend did not reach significance. In most cases, the Teacher Education students in Australia had the highest means, followed by the Singaporean Teacher Education students, the Australian Engineering students and the Singaporean Engineering students. The exception to this trend was in relation to family self-esteem where both groups of Singaporean students were higher than the Australian students' scores. In summary, the country differences interacted with the discipline differences in self-esteem, self-efficacy and self-regulation.

Table 3. Means, SDs and interaction effects on three self variables

	Mean	SD	F value	p level
<u>Self-efficacy</u>				
Sing. (t. ed.)	18.30	3.30	21.91	<.01
Sing. (eng.)	16.72	3.82		
Aust. (t. ed.)	20.31	3.04		
Aust. (eng.)	19.24	3.03		
<u>Self-esteem (family)</u>				
Sing. (t. ed.)	32.90	5.07	8.52	<.01
Sing. (eng.)	31.53	5.90		
Aust. (t. ed.)	29.70	5.66		
Aust. (eng.)	30.36	5.38		
<u>Self-regulating Strategies</u>				
(i) Cognitive				
Sing. (t. ed.)	54.15	9.40	3.78	<.05
Sing. (eng.)	52.54	8.78		
Aust. (t. ed.)	54.86	9.64		
Aust. (eng.)	51.03	8.62		
(ii) Metacognitive				
Sing. (t. ed.)	34.19	5.50	5.55	<.01
Sing. (eng.)	32.77	5.10		
Aust. (t. ed.)	33.48	4.76		
Aust. (eng.)	31.50	4.81		
(iii) Resource Management				
Sing. (t. ed.)	54.09	7.41	1.76	>.10
Sing. (eng.)	55.16	7.85		
Aust. (t. ed.)	55.82	9.07		
Aust. (eng.)	53.62	7.29		

Interviews with three Singaporean Teacher Education students produced qualitative evidence of the use of self-regulating strategies in their studies. They had all developed resource management learning strategies which they used to revise their course materials when preparing for examinations. Time management was a skill they had refined over many years of studying. They had learned to balance the requirements of the various courses in their programme in order to complete the assignment and examination requirements on time. They also used cognitive strategies to organise their study plan and to revise course materials and readings. Metacognitive strategies helped them reflect on the progress of their studies and to monitor their study revision, adapting their learning strategies if necessary.

Discussion

Several interesting findings emerged from this study. Some of the findings confirmed earlier results from previous studies, while others were inconsistent with previous research. One finding which is consistent with cross-cultural research into self-concept is the finding that family relationships are very important sources of feedback and support for Asian students. In a previous study conducted by the author (Smith, 1999) in Thailand, adolescent Thai students were generally less positive in their self-evaluations in all dimensions, except parent relationships. There is a growing body of evidence to support the finding that Asian students believe their relationships with their parents are strong and supportive. While students from other countries, such as Australia, are also positive about parent relationships, they are not ranked as highly as they are by Asian students in comparison with the other dimensions on which self-concept is measured.

A second finding that was consistent with previous research was the trend for Singaporean students to be less efficacious about their course achievements than non-Asian students. In other words, their level of self-efficacy about their performance in the course for which they were currently studying was significantly lower than that of the Australian students. The self-efficacy level of the Singaporean Engineering students was particularly lower than the other three groups. While some authorities might view this finding with concern, Eaton and Dembo (1997) expressed little concern, because they found that Asian American 9th grade students outperformed their non-Asian peers on an achievement task, despite reporting lower levels of self-efficacy. They found that fear of academic failure better explained achievement motivation for Asian American students than did self-efficacy beliefs. They concluded that "a major implication of this investigation is that motivational beliefs elicit different responses in different cultural-ethnic groups" (Eaton and Dembo, 1997, p. 433). In other words, Asian students rely less on their efficacy beliefs when they approach a learning task. Rather, they rely more on their desire to please significant others, especially their parents, and not to disappoint them by failing the task (Hess, McDevitt and Chang, 1987).

The major inconsistency between the findings of this study and that of a previous study (Chye, Walker & Smith, 1997) was the finding that Singaporean students did not use effort and time management strategies to regulate their study behaviour any more than did Australian students. This finding did not confirm the earlier finding that there was a cultural difference in the use of these resource management strategies (Chye, Walker &

Smith, 1997). Rather, the Singaporean students did use metacognitive strategies more frequently than Australian students, but there was an interaction effect in that Singaporean teacher education students used metacognitive strategies more often than did the other three groups of students. The ability to identify the discipline of the student was a methodological improvement of this study over the previous study, where the students were studying in a variety of disciplines.

Conclusion

In conclusion, the research reported in this Chapter found that there are interaction effects of culture and discipline of study in terms of student beliefs in their efficacy, their self-esteem and their use of self-regulated learning strategies. The cultural differences in these three variables interact with students' choice of discipline. In general, Teacher Education students have more positive self-esteem, higher efficacy beliefs in their ability to succeed in their studies and use cognitive and metacognitive strategies more often to regulate their learning than Engineering students. Whether these variables may be improved will be the focus of Chapter 3. An intervention designed to change students' motivational beliefs will be implemented. The impact of this intervention will then be assessed.

CHAPTER 2

Self-regulated Learning in Singapore Secondary School Students

Introduction

One of the expressed key desired outcomes of education at all levels in Singapore is that students should become independent, lifelong learners. In a speech entitled "Thinking Schools, Learning Nation" delivered at the 7th International Conference on Thinking on 2 June 1997, PM Dr Goh Chok Tong strongly emphasised the need for every citizen to see himself as a lifelong learner in order to meet the challenges in the new millennium.

Singapore students have been perceived with great respect worldwide as high achievers who have successfully attained top results in cross-national academic competitions. But within our own nation, they are perceived as examination-smart mark chasers who rely heavily on teachers' notes and tutors. While only a small number of our top students have participated in international competitions, there are many more students in the different streams in our schools. Hence, what are our Singapore students really like? Are they capable of independent learning? In short, are they self-regulated learners? This Chapter investigates whether:

1. Singapore secondary students are self-regulated learners;
2. self-regulated learning is related to academic achievement;
3. intellectual self-concept is related to self-regulated learning; and
4. intellectual self-concept is related to academic achievement.

Self-regulation theory assumes that students are active organisers of their own learning, using strategies that will optimise their own learning outcomes. Self-regulated learners are typically, purposeful, strategic and persistent in their learning. They possess the skills for knowledge acquisition and are capable of applying the knowledge acquired in the appropriate context. Through experience, they have also developed the ability to monitor and evaluate their progress in term of their goals and to believe in their efficacy to regulate their own learning (Bandura, 1993; Zimmerman, 1995).

Research has shown that the attainment of educational goals, such as academic attendance, test scores and motivation, is not exclusively under the control of teachers and schools. Compared with low-achieving students, high achievers report setting more specific learning goals for themselves, using more strategies to learn, self-monitoring learning progress more frequently, and more systematically adapting their efforts on the basis of learning outcomes. High achievers feel self-efficacious and personally responsible for their own control of the academic learning (see Pintrich and De Groot, 1990; Pressley and Woloshyn, 1995; Schunk and Zimmerman, 1994, Zimmerman and Schunk, 1989).

According to Pajares and Miller (1994), self-concept can be differentiated into general, academic, emotional, physical and social self-concepts. Self-concept differs from self-efficacy in that self-efficacy is a context-specific assessment of competence to perform a

specific task. Self-concept is not measured at that level of specificity and includes beliefs of self-worth associated with one's perceived competence. Their findings confirmed that students' judgement about their own capability to solve math problems was more predictive of their ability to solve their problems than math self-concept and prior experiences.

Method

Sample

The survey was carried out by a group of 18 Postgraduate-Diploma-in-Education (Secondary) trainees as an assignment for an educational module on thinking and learning strategies. Each trainee was required to carry out the survey on two secondary classes of different academic abilities using two questionnaires. Sampled students would have to respond to the questionnaires in relation to the curricular subject taught by the trainee. Hence, the curricular subjects covered in the survey were very varied, from General Paper at Junior College level to Art at Secondary level, as illustrated in Table 1. Except for Secondary 4 and JC 2 Classes. Gifted and Normal Technical Streams, all the other classes and streams were covered in the survey.

Table 1. Schools, Levels, Streams and Curricular Subjects

<u>SCHOOL</u>	<u>LEVEL</u>	<u>STREAM</u>	<u>CURRICULAR SUBJECT</u>
14 Sec 831 students	Sec. 1, 2, 3	SAP, Express Normal Academic	English, Art, Physics Geography, Literature, Mathematics, Design & Technology
4 JCs 129 students	JC 1	Science, Arts Commerce	GP

Instruments

(i) Self-Regulated Learning

The questionnaire consists of 42 items adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) constructed by Pintrich, Smith, Garcia and McKeachie (1991) and 5 items on self-efficiency developed by Chye, Walker and Smith (1997). There are 16 cognitive items, 10 metacognitive items and 16 resource management items. Students were required to respond to the 47 items using a 5-point likert scale. Hence the maximum possible score is 235 and the minimum possible score is 47.

(ii) Self-Concept

The self-concept scale used in this study was the 60-item Chinese Adolescent Self-esteem Scales (CASES), developed by Cheng, (1997). CASES consists of seven subscales: social (10-items), intellectual (10-items), physical attractiveness (8-items), moral (8-

items), general (8-items), family (8-items) and sports/physical (8 items). Responses to the 60 items are based on a 5-point Likert scale too. For the purpose of this study, only the data on the *intellectual self-concept subscale* were used for the examination of relationships with achievement and self-regulated learning. Research has shown that subject-specific self-concept is more predictive of achievement in that subject than other aspects of self-concepts (Marsh and Shavelson, 1985; Pajares and Miller, 1994). The maximum possible score for the intellectual self-concept sub-scale is 50 and the minimum possible score is 10.

Results and Discussion

From Table 2, it can be seen that Singapore Secondary and Junior Colleges students had above average to high scores for self-regulated learning (146.7-185.18), indicating that they were capable of purposeful and strategic learning and monitoring their own learning process. An examination of the results from each school also showed that Express and SAP students achieved higher scores than Normal students most of the time. The results confirmed the observations made by Zimmerman(1995) and Bandura(1993) that better students are more self regulatory in their learning. As JC students are more homogeneous in their academic ability, the range of scores was narrower, from 150.94 to 162.15.

The same pattern was observed for the intellectual self-concept scores. The Secondary students' scores ranged from 29.2 to 43.4, with the JC students' scores ranging from 31.2 to 35.9. By and large, the better students had higher scores for their intellectual self-concept (Table 2).

A total of 12 out of 18 schools produced the predictable results of positive relationships between self-regulated learning and intellectual self-concept, between self-regulated learning and achievement, and between intellectual self-concept and achievement (Table 3). The results serve to confirm the hypothesis that students who are self-regulating in their learning strategies and learning process would be more confident of their competency in dealing with the academic subject and achieve better academic scores.

There were five schools, however, where negative relationships were found between self-regulated learning and intellectual self-concept and between intellectual self-concept and achievement. The relationship between self-regulated learning and achievement was positive. A careful analysis of these five schools showed that the subjects taught include Art and Design and Technology. These are "skills" subjects which teach different intelligences than traditional subjects, and high scores need not necessarily be achieved by students with high IQs. Pajares and Miller (1994) have also found that subject-specific self-concept is less predictive of achievement attainment in that subject than self-efficacy in that subject. It is also possible that high ability students in a competitive, high-achieving class have lower self-concept/self-esteem scores than similar students attending a less competitive school. Marsh (1990) calls this the "Big-Fish-Little-Pond Effect".

There was only one school with the unexpected results of negative relationships between self-regulated learning and intellectual self concept and between self-regulated learning

and achievement. The self-regulated learning mean score for the Normal Academic class was unusually high, 170.1. It was suspected that the Normal Academic class might not have been very honest in their responses, especially when the subject concerned was Physics.

Table 2. Range of Mean Scores for Self-regulated Learning and Intellectual Self-concept

Institution	Self-Regulated Learning (Max = 235)	Intellectual Self-Concept (Max = 50)
Sec n sch =14 n st = 831	146.2 – 185.2	29.2 – 43.4
JC n sch =4 n st = 129	150.9 – 162.2	31.2 – 35.9

Legend:

n sch = Total number of schools
n st = Total number of students

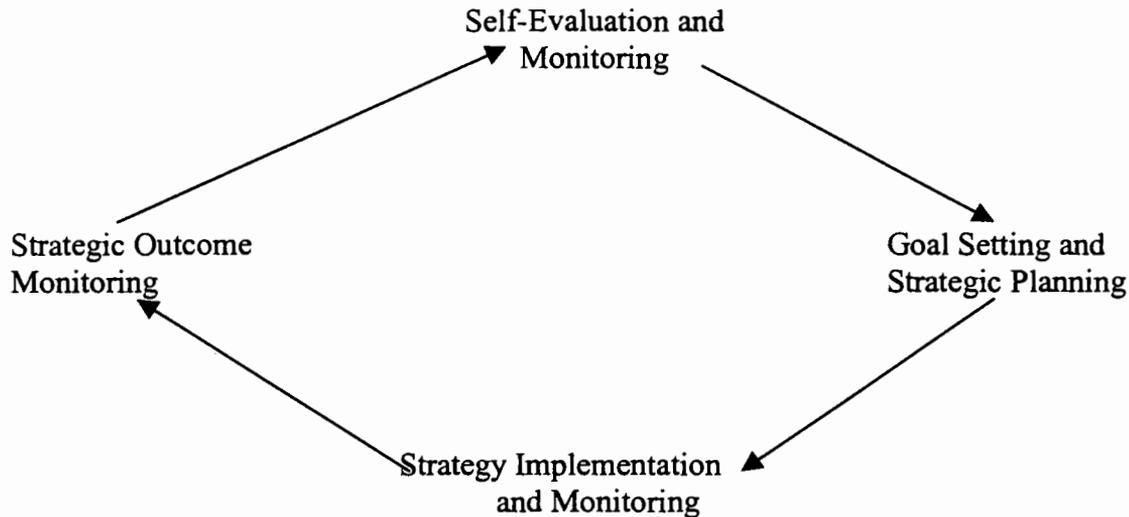
Table 3. Summary of Relationships between Self-regulated Learning, Intellectual Self-concept, and Achievement

	Institution Sec (4)	tve SE X I-SC	-ve SE X I-SC	tve SE X ACH	-ue SE X ACH	tve I-SC X ACH	-ve I-S X ACH
	8	✓		✓		✓	
	5		✓	✓			✓
	1		✓		✓	✓	
	JC (4)						
	4	✓		✓		✓	
Total	12	✓		✓		✓	
	5		✓	✓			✓
	1		✓		✓	✓	

Legend:

SE = Self-regulated learning
I-SC = Intellectual self-concept
ACH = Achievement

Figure 1
A cycle model of self-regulated learning
(Taken from Zimmerman, Bonner and Kovach, 1996)



By establishing this self-regulatory cycle teachers can help students learn to recognise and appreciate links between their study behaviour and learning outcomes. Teachers are most effective when they function as models, consultants and coaches. They can provide students with strategies and show them how to self-monitor their own learning processes accurately and accept the outcomes positively.

According to Zimmerman, Bonner and Kovach (1996), to be a self-regulated model in the classroom, the teacher must be capable of:

- demonstrating the use of various self-regulated learning techniques;
- demonstrating the effectiveness of self-regulatory techniques in ways understood by students;
- keeping records of students' academic progress;
- anticipating students' queries on self-regulated learning;
- planning for the integration of self-regulated processes within the curriculum; and
- reviewing and refining their own planning and teaching methods in the light of their experience and training.

Conclusion

The findings of this study are very encouraging, because they reaffirm the good results attained by our students in international competitions. Our students are capable of self-

regulated learning and have positive academic self-esteem. The above average scores in self-regulating learning and intellectual self-concept also correlated positively with achievement. These results augur well for the achievement of the desired outcome of education by our students in becoming life-long learners. There is also an important implication for teachers as they play an important role in developing their students into self-regulated learners. Teachers can make a difference by giving their students the confidence and skills to become independent learners.

CHAPTER 3

The Impact of Undertaking a Module on Thinking and Learning on Trainee Teachers' Use of Self-regulated Learning Strategies

Introduction

The knowledge economy of the Twenty First Century will require workers who are critical thinkers and independent learners. More of the problems they solve will be unique and not based on tried and tested solutions, because the increasing pace of change will throw up such problems. Therefore, teachers will be responsible for preparing students who are adaptable to the fast changing world around them.

The first Chapter reported the results of a correlational study of 460 Teacher Education and Engineering university students in Singapore and Australia were discussed. Briefly, we found generally high levels of independent or self-regulated learning, although the Teacher Education students typically reported higher levels of cognitive and metacognitive learning strategies than the Engineering students. There were no differences in their use of such resources as time, physical facilities, and effort. In this paper, we shall discuss the findings from an intervention study designed to increase the use of self-regulated learning strategies, as well as to increase self-efficacy beliefs and self-concept of a group of postgraduate Teacher Education students at the National Institute of Education (NIE).

The research in Singapore on increasing the use of self-regulated learning strategies by students is still in its infancy. Indeed, most of the US research to date has been correlational in linking self-regulation with other self variables, such as self-concept and self-efficacy. Nevertheless, an intervention study by Pintrich and De Groot (1990) found that junior secondary school students who were taught to increase their use of self-regulated learning strategies improved their classroom performance by increasing their self-efficacy or belief that they were capable of performing well in classroom learning tasks.

It has been found in attempts to enhance **self-efficacy** that model persistence and statements of confidence have increased students' level of self-efficacy and problem solving performance (Zimmerman & Ringle, 1981). Teachers who provide feedback about students' learning processes and progress in a problem solving task have also raised their self-efficacy and performance (Schunk, 1995).

The findings from intervention studies aimed at enhancing student self-concept have been mixed. It has been found to be difficult to change a human characteristic like self-concept, which is developed over many years of feedback from significant others in the environment. Intervention techniques have adopted one of two approaches. The direct approach has involved counselling students with low academic self-concept that they can perform well if they wish to do so and try harder (Smith, 1992). Teachers who express

confidence in students' ability and affirm their worth as individuals have often been successful in raising their students' self-concepts (Covington, 1992). Since the late 1980s in Singapore, there has been an emphasis on self-concept enhancement by teachers in the Pastoral Care and Career Guidance curriculum in secondary schools (Lui, 1999). Nevertheless, it may be a long-term process to turn around an entrenched belief that a particular student holds of being a poor performer in a given field. The other intervention approach is the indirect approach, which is favoured by social cognitive theorists who believe that "nothing succeeds like success". Advocates of the indirect approach try to increase students' experience of learning success, so that they re-align their self-concept to reflect improved performance. The indirect approach has generally been more successful than the direct approach in enhancing student self-concept (Marsh, Richards & Barnes, 1986).

Method

Sample

The sample consisted of 75 students enrolled in a one-year, full-time Postgraduate Diploma in Education (PGDE) at NIE, preparing to become secondary school teachers in Singapore. They had chosen one of three 20-hour elective modules: Strategies for effective thinking & learning (Experimental group, N=25); Instructional strategies & effective learning (Control group 1, N=25); and Guidance & counselling in secondary schools (Control group 2, N=25).

Instruments

The same three instruments measuring students' self-regulated learning strategies, self-efficacy and self-concept, as described in Chapter 1, were administered before and immediately after the intervention.

Procedure

The three instruments were administered as a single, self-rating questionnaire to the three modules by their respective course instructors at the beginning and end of the 20-hour modules. The questionnaire was introduced to the three groups of students as a research instrument, which was being trialled to test its suitability for use in Singapore. It was administered as a pretest at the beginning of each module, before the instructor introduced the module itself, and re-administered as a posttest at the end of the module.

The senior author of this report was the course instructor of the experimental group, which chose the module, entitled "Strategies for effective thinking and learning". It was a course designed to increase the cognitive and metacognitive skills of its participants, including such topics as goal-setting and monitoring learning progress, infusing critical and creative thinking skills into their teaching lessons, motivating themselves and their students, time and stress management, memory strategies and test-taking skills. Control group 1 undertook an elective called "Instructional strategies & effective learning", which included such topics as planning lessons, whole class, small group and individualised learning, infusing thinking skills into curriculum content, learning strategies, cognitive organisers and concept mapping. While its course content was similar to that received by the experimental group, the approach was different in that it

emphasised instructional design and curriculum issues. Control group 2 undertook a twenty-hour module, entitled "Guidance & counselling in secondary schools". This module explored issues of interest to school counsellors and guidance officers, such as student self-concept measurement and enhancement.

Research Design

The research design adopted for this study was a **quasi-experimental pretest-posttest design**. The three groups of subjects were matched in that they were all from the same cohort of 1999 PGDE students. It was not possible to assign the students randomly to the experimental and control groups, because they had chosen their electives according to their interests. Nevertheless, the modules were taught at the same time, twice a week for five weeks. Each session consisted of teacher-directed instruction on a given topic for approximately 50 minutes and 50 minutes of student discussion of questions and issues on the topic. Control group 1 was considered to be a "near" control group, because its content was similar to that of the experimental group, while control group 2 was designated a "far" control group, because its content was quite different from that of the experimental group.

Results

(i) Relationships between self-efficacy, self-regulated learning strategies and self-concept

The various "self" variables were all moderately correlated, as indicated in Table 1. Self-efficacy appeared to be more highly correlated with the three self-regulated learning strategies than with the seven self-concept sub-scales. The exception to this generalisation was the correlation of .55 between self-efficacy and intellectual self-concept. It appears that the cognitive dimension of self-concept is more closely related to self-efficacy than it is to the use of cognitive self-regulated learning strategies. These findings of moderate relationships between the "self" variables confirm the similar findings reported earlier (Smith & Chang, 1998).

Table 1: Correlation coefficients of the pretest scores (N=75) on the self variables.

	COG SR	MC SR	RM SR	SOC SC	INT SC	PA SC	MOR SC	GEN SC	FAM SC	S/P SC
SE	0.58	0.57	0.54	0.39	0.55	0.46	0.51	0.47	0.41	0.21
COG SR		0.75	0.61	0.47	0.39	0.29	0.62	0.42	0.33	0.26
MC SR			0.71	0.38	0.47	0.24	0.61	0.44	0.46	0.26
RM SR				0.43	0.47	0.26	0.61	0.51	0.52	0.24
SOC SC					0.54	0.52	0.58	0.71	0.45	0.47
INT SC						0.51	0.62	0.79	0.53	0.47
PA SC							0.37	0.51	0.41	0.24
MOR SC								0.69	0.62	0.46
GEN SC									0.57	0.57
FAM SC										0.37

(ii) Effects of the thinking course on the self variables

An analysis of the means of the two control groups found that there were no differences between them. So it was decided to combine the two control groups into a single control group. Secondly, there were no differences between the pretest means on the self variables of the experimental and combined control group, indicating that the two groups possessed no initial differences on these variables before the intervention treatment occurred. Despite our inability to randomise subjects into experimental and control groups, the self-selection into course modules resulted in no initial differences between the two groups on the three dependent variables.

Table 2 presents the posttest means and standard deviations of the experimental group and control group on the various self variables. While all the means of the experimental group, except for sport/physical self-concept, are absolutely higher than those of the control group, the only one which reached statistical significance was self-efficacy, as demonstrated in a repeated measures ANOVA ($F= 6.98, p<.01$). The possible explanations for this result will be outlined in the Discussion.

Table 2. Posttest means of experimental and control groups on the self variables

	Control Group (N=50)		Experimental Group (N=25)	
	\bar{x}	SD	\bar{x}	SD
SE	18.84	2.60	20.48	2.40
COG SR	55.54	8.79	57.40	11.26
MC SR	35.48	5.06	38.00	6.20
RM SR	58.26	6.36	60.00	7.47
SOC SC	38.38	5.98	39.88	6.31
INT SC	37.54	5.57	39.28	4.70
PA SC	28.36	4.77	28.96	4.33
MOR SC	33.12	3.93	33.12	4.88
GEN SC	32.74	4.86	34.52	3.37
FAM SC	32.74	5.22	33.48	4.07

Discussion

The major impact of this intervention study was on student self-efficacy. Students in the experimental group which received the module, "Strategies for effective thinking & learning, were more efficacious about their performance at the end of the module than were the students who attended two different modules. That is, they were more confident that they understood the concepts and approaches introduced in the module which was designed to improve their thinking and learning, as well as the thinking and learning of their future students.

The question arises, "Why were these students' self-efficacy influenced by the module, but not their self-regulated learning strategies or self-concept?" Four possible explanations for this discrepancy will be explored:

- (i) Self-efficacy is situation specific, while self-regulated learning strategies and self-concept are more general predispositions. It appears from these results that the 20-hour module made more impact on students' self-efficacy beliefs than on either their use of self-regulated learning strategies or their various self-concept dimensions. As Bandura maintains, self-efficacy is situation-specific. It appears that the intervention of teaching them concepts and approaches to improve their effectiveness as teachers and students of critical and creative thinking has given the members of the experimental group the confidence to take risks and learn these skills for their students' and their own benefit. On the other hand, it appears that the use of self-regulated learning strategies have been built up over many years experience of what works and what does not work for individual students in regulating their learning, and these strategies are not easy to change in a 20-hour module. Likewise, self-concept is a multidimensional construct which develops as a result of many years of feedback from significant others about an individual's personal qualities and abilities. It was not expected that a 20-hour module would have any effect upon most of the self-concept dimensions measured in the CASES scale, but it was thought possible that there may have been some impact on intellectual self-concept. This prediction was not confirmed.
- (ii) The intervention may have been too brief and not powerful enough to effect a substantial change in these self variables. It appears that the benefits of the module were limited to learning the major concepts and generalisations of the module, together with an increase in student self-efficacy to perform well in the module, rather than to increase the use of self-regulated learning strategies or to enhance their self-concepts in a number of dimensions. Perhaps the content did not focus specifically enough on the self-regulated strategies tested in the scale. While the senior author emphasised the role of the students as independent learners and the benefits to themselves and to their secondary school students of being more goal-oriented, planning their learning and revision, to reflect on what were the most important concepts, generalisations and skills taught in a particular course, and on the use of resources such as time and effort to reduce stress and achieve their goals, it did not seem to make a difference on their responses to the self-regulated learning strategies scale. One is always aware of the temptation to teach for the test, even if it is an attitude survey. So, it was decided not to focus

on raising responses to specific items in the scale. Rather, the teaching approach in the module emphasised the learning of general strategies that would make them and their students more effective and efficient learners in a variety of performance tasks, such as teaching and learning various school subjects. This generic approach may have required more time and effort in a wider variety of contexts, or more specific examples, for the students in this module to change general learning strategies they had learned over many years.

- (iii) The relatively small sample size may have worked against the finding of significant treatment effects. While the two control groups of 25 students were combined when no differences were found between their pretest scores on the three self variables, the small size of the experimental group mitigated against statistically significant results, unless it was an extremely powerful treatment. The problem is that the size of the elective groups was fixed at 25 students. The senior author was allocated only one group to teach. It was decided to include two control groups, rather than one, because it was hypothesised that a similar topic, taught from a different perspective, was a more authentic control group than was a group taught quite different material. The aim was to compare the experimental treatment with credible alternative treatments. It transpired that the two control groups' responses were not significantly different from one another on the pretest variables. Subsequently, the combined control group responses were similar to those of the experimental group, except in respect of student self-efficacy.
- (iv) The final possible explanation for the lack of significant results is a methodological one. It was decided that all students be requested to place their names on the front of the questionnaires, in order to be able to compare pretest and posttest scores for the same individuals. This decision may have influenced the frankness and truthfulness of the individual responses. It is not possible to confirm this explanation because the authors did not debrief the students about the way they responded to the questionnaire. All that can be induced is that the vast majority of students included their names accurately on both pretest and posttest, and that the data was complete in most cases. The pattern of results suggests that most students were responding honestly. There were differences in the levels of the seven self-concept dimensions and the pattern of responding was consistent with other studies. For example, family self-concept was ranked the highest of the seven self-concept sub-scales, which was consistent with previous research in Hong Kong (Cheng, 1998), Thailand (Smith, 1999), and Singapore (Smith & Chang, 1998). There is a concern, however, about the relatively high correlations between the various self variables. They were higher than the previous year's correlations with a similar sample of Singapore teacher education students (Smith & Chang, 1998). While there was no evidence of widespread response biases or automatic responding, it was noticed that some students were very fast in their completion of the questionnaire. This phenomenon may indicate a less reflective approach to each item. On the other hand, the senior author has noticed that Singapore students tend to respond to questionnaires more rapidly than he has

experienced in other parts of the world. Perhaps this phenomenon is a reflection of the fast pace of life in Singapore. Cheng (1998) commented that the Marsh SDQ 11 self-concept scale at 102 items in length was considered too long and boring by many of his adolescent subjects in fast-paced Hong Kong.

As a result of this research, the three instruments for measuring student self-efficacy, self-regulated learning strategies and self-concept were found to be generally suitable for use with two Singapore and one Australian university student sample. Each instrument will now be evaluated.

The five-point **self-efficacy** scale was designed to measure students' confidence in learning and mastering the concepts involved in the specific course being undertaken. While it is a short scale, its internal consistency reliability was found to be high at 0.86 (Smith & Chang, 1998). It is based on Bandura's belief that students' self-efficacy beliefs or their confidence to do well in a particular learning task are situation-specific, rather than a general predisposition, such as self-concept. They are based on past history of reinforcements in similar situations, persuasion by significant others, vicarious experiences by observing peers' performance on these tasks, and physiological symptoms, such as increased heart rate during the learning task. Nevertheless, the moderate correlation of 0.55 between self-efficacy and intellectual self-concept, obtained in this study, demonstrated that the two constructs are not independent of each other. Indeed, Bandura and his colleagues (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996) have been involved in developing a multidimensional measure of academic and social self-efficacy. He now argues that human beings generalise their reactions to feedback in similar situations. Otherwise, each learning task would be approached differently and confidence to master it would be low to begin with. As we learn to recognise similarities between learning tasks, we not only learn strategies to solve problems of this type, but we also believe that we are competent to solve them. This explanation accounts for the more substantial correlation between self-efficacy and intellectual self-concept than between self-efficacy and the other six dimensions of self-concept.

The moderately high correlations between the three dimensions of **self-regulated learning strategies** is a cause for concern. The figure of 0.75 between cognitive and metacognitive SR suggests that the degree of overlap between the two sub-scales is unacceptably high. This figure is, if anything, higher than the correlation of 0.65 that was obtained in the previous study with a sample of 460 university students. Nevertheless, correlations of this magnitude suggest that there is a lack of independence between the students' conceptions of these two types of learning strategies. Another explanation is that those students who use cognitive strategies, such as writing summaries of the main ideas in the course also used metacognitive strategies to reflect on the most appropriate ways of studying for examinations.

The correlations between the various sub-scales of the self-concept scale appeared to be higher than those obtained by its constructor in Hong Kong (Cheng, 1998). Nevertheless, a similar profile of average self-concept scores was obtained for this sample of Singapore university students as Cheng found in his Hong Kong sample. Family self-concept was

the highest ranked dimension by both samples, indicating its importance to young people in their lives in these two Asian societies. Another study found a similarly high rating of relationships with parents amongst Thai adolescents (Smith, 1999).

Conclusion

In conclusion, the impact of the intervention treatment of the module on effective strategies for thinking and learning was found to be limited to its positive effect on student self-efficacy. No impact was found on either student use of self-regulated learning strategies or on any of the seven self-concept dimensions. It may well be that the latter two personal constructs are more general predispositions that are resistant to change based on short-term interventions. It may need a more intensive and prolonged intervention to effect change in these domains. Previous interventions aimed at changing student self-concept have been more successful when they engineered a higher success rate in specific school subjects. More success in a specific subject brought about a reconsideration of students' attitudes about their ability to succeed in that subject. Finally, future research into students' use of self-regulated learning strategies should concentrate on ensuring that students' independent learning strategies lead to their increased performance on assignments and examinations. Only then will those students realise that these strategies lead to successful performance and adopt them enthusiastically in future courses they undertake.

CHAPTER 4

Implications for Teachers and Suggestions for Further Research

This empirical study implies that the mediating variables of self-esteem, self-efficacy and self-regulating learning strategies need to be considered by teachers and lecturers when they plan and deliver their teaching. There are reliable individual differences between students on each of these three variables. Previous research, reviewed earlier, confirms that each of the three variables is a mediator between instruction and learning, although not necessarily in the same way as occurs in the West. For instance, it appears that self-efficacy beliefs are not as important in determining Asian students' achievement as they are for American students. At the same time, self-esteem in the area of family relationships is very important to most Asian students. Pleasing one's parents by achieving good academic results is a strong motivator, whereas fear of failure drives them to work hard to achieve their learning goals. Teachers who are aware of these motivational forces avoid adding to the pressure by not reminding their students of their family obligations. Furthermore, teachers may wish to use the MSLQ, or similar instruments, to measure their students use of various self-regulating learning strategies and to determine whether some strategies are more functional than others for their particular course. For instance, some courses may require more memorising, whereas others may emphasise conceptual understanding and a metacognitive approach to studying. Lecturers who are aware of these learning goals may teach their students to apply these strategies in order to optimise their revision and deep approach to memorising.

The survey results, reported in Chapter 2, send a strong message to teachers, as they imply that the mediating variables of self-regulating learning strategies, self-efficacy and intellectual self-concept are important correlates of achievement. Students who have mastered learning strategies (e.g., time-planning and management, text-comprehension and summarisation, note taking skills, text anticipation and preparation and writing skills) and self-regulatory strategies (e.g., self-evaluation and monitoring, goal-setting and strategic planning, strategy implementation monitoring and strategic outcome monitoring) would develop higher intellectual self-concept and achieve better results. Hence, the teaching of good learning strategies and self-regulatory strategies to students should form part of classroom training. Teachers should help their students develop a self-regulatory learning cycle in order to allow them to achieve their potential. To be a self-regulated model in the classroom, the teacher must be capable of:

- demonstrating the use of various self-regulated learning techniques;
- demonstrating the effectiveness of self-regulatory techniques in ways understood by students;
- keeping records of students' academic progress;
- anticipating students queries on self-regulated learning;
- planning for the integration of self-regulated processes within the curriculum , and
- reviewing and refining their own planning and teaching methods in the light of their experience and training.

The results of the intervention study, reported in Chapter 3, demonstrate that the impact of the module designed to improve the students' use of self-regulatory learning strategies in preparing for examinations was modest. A number of possible explanations was given for the non-significant results, including the small sample size, the non-randomised research design, and the fact that the PGDE students were experienced learners who had already completed a university degree before attending NIE. Future research studies should concentrate on teaching these important learning strategies to younger, less experienced students, such as beginning Dip.Ed. or B.A./B.Sc. students. In fact, the teaching of these skills should be undertaken in Secondary Schools, so that students are introduced to them when they are becoming more independent learners in preparing for the "O" and "A" level examinations.

Conclusion

In conclusion, this series of studies has demonstrated that Singapore secondary, JC, and university students do use a variety of self-regulated learning strategies to help them revise and memorise the material they learn in class. Not only are they efficient in using the resources available to them, such as time, student facilities and their own efforts, but they also use cognitive and metacognitive strategies, such as planning, monitoring and evaluating their performance, and, if necessary, modifying their approach to learning and studying. Perhaps the main reason for the limited impact of the intervention was because most of the PGDE students already possessed the necessary self-regulated learning strategies. It is recommended that future research studies select samples of Secondary and JC students, as well as NIE Dip. Ed. and B.A./B.Sc. students for the intervention. These students are more likely to benefit from learning the skills which will enable them to become effective and efficient independent learners. In this way, they will be preparing themselves for the knowledge economy of the Twenty First Century.

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