

A CASE STUDY OF THE EFFECTS OF A TEACHING METHOD ON STUDENTS' ACADEMIC ACHIEVEMENT IN LIFE SCIENCE AND THE USE OF SELF-REGULATED LEARNING STRATEGIES

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Abstract. The purpose of this study was to examine the effects of a teaching method on academic achievement in life science and on students' use of self-regulated learning (SRL) strategies by grade eight students at Bangkok Christian International School. The method of teaching was adapted from Zimmerman's cyclic model of self-regulated learning. Strategies for promoting students' self-regulated learning strategies were identified through the literature review and applied into the study group: meta-cognitive strategies such as planning, monitoring, and regulating, and resource management strategies such as time management and study environment management. One sample and paired sample t-tests were used to analyze the effects of the teaching method on students' academic achievement in Life Science and use of self-regulated learning strategies respectively. The results of the study and recommendations to incorporate SRL more into traditional classrooms are discussed.

Keywords. Academic achievement, Life science, self-regulated learning strategies.

Introduction

The attainment of educational goals, whether it be getting good test scores, academic attendance or motivation for learning, is not exclusively under the control of teachers and schools. Teachers are just one factor in a learning process that involves many others. Therefore, by shifting more responsibility for their learning process back to the students, it would be empowering them to become, not only effective learners at school, but also learners for life.

Each student learns in different ways and styles that are best suited to his or her needs. The methods the students use for learning enables them to be successful at school. While there are some students that are very successful at school, there are a few who have never experienced success in school. It is not uncommon to see students with bad habits, such as procrastinating, skimming reading assignments, and most commonly, cramming for exams. Bangkok Christian International School students are no exception. The habits the students that develop over the years become a part of their learning process. Although some students change and become effective learners later in their educational life, there are some students who never develop the essential study skills (time management, classroom note taking, test preparation, text comprehension and summarization) to be successful (Zimmerman et al, 2002).

The student population of Bangkok Christian International School (B.C.I.S.) is predominantly English-as-second-language (ESL) learners. Although all the students go through the same system of studying, the rate at which the students become successful in their science classes is vastly different. While some students become successful in their science class at some point in an academic year, there are some students that cannot seem to find a way to be successful at any time during the year. These differences in ability or other personal factors of the students, preventing them from being successful in their life science class, has often resulted in a lower overall class average.

Researchers have compared successful and less successful students of similar intellectual ability (Dembo, 1997, and Borkowski and Thorpe, 1994). In their study, Dembo and colleagues (1997) found that when given a learning task, successful learners monitor and control their behavior by setting goals, or considering alternative strategies. Furthermore, there is evidence that a major cause of under achievement is the inability of students to control themselves effectively (Krouse and Krouse, 1981). In this research, this implication, the ability or inability for students to self-regulate their learning, will be considered as one of the major factors of academic achievement in Life Science.

An issue that teachers at Bangkok Christian International School (B.C.I.S.) often encounter is the lack of parental supervision of students. By the time students are in junior high and senior high school,

most parents expect them to be responsible for themselves academically. Yet, they are given limited or no tools to learn on their own. A number of students at B.C.I.S. do their school work alone without adult supervision at home. This means that the students are left to take control of their own learning environment. This sometimes resulted in students sleeping late (consequently coming to school late or sleeping during the lessons), chatting with their friends, surfing the net unsupervised, and not completing their school work. But with no tools or guidance provided, students find themselves in a situation beyond their control. The world demands that individuals become more and more self-sufficient. Self-regulated learning strategies provide a tool that students need in order to succeed in their learning environment.

The students at Bangkok Christian International School spend about fifty percent of their waking hours at school during the week. Since most of these students do not get to spend much time with their parents or friends, school has become a place they develop their social skills and habits. Some of the students spend more time with their teachers than with their parents. Despite the common preconception that the home is a place where children learn values and form habits, inadvertently school is becoming that place and teachers are playing a bigger role in the development of a child. It, therefore, seems logical that teachers should have the means to help students form academic habits that are adaptive in nature and beneficiary for their future.

Although there are many factors associated with academic achievement, this research attributed the failure to integrate self-regulated learning strategies into their learning process as one of the main causes of poor achievement. Several factors such as, educational level of the mother, number of siblings and prior achievement of the student are associated with student achievement, but these factors are outside the control of the educators and are thus difficult to change. Therefore, this research limited its studies to only two variables, namely, students' use of self-regulated learning strategies and their academic achievement in Life Science. This research attempted to find out if this teaching method would effect the academic achievement in Life Science and use of self-regulated learning strategies of the eighth grade students at Bangkok Christian International School and if so, to what degree.

The objectives that guided the study were:

1. To determine the effect of the teaching method of self-regulated learning on students' academic achievement in Life Science.
2. To determine the effect of the teaching method of self-regulated learning strategies on students' use of self-regulated learning strategies.

Method

Participants

Bangkok Christian International School (B.C.I.S) is a small school and has one class per each grade level. Therefore, the sample for the study was all twenty eighth grade students from the researcher's own life science class. Of the twenty students, thirty-five percent were girls and sixty-five percent were boys. The average age of the students was fourteen years between thirteen to fifteen years of age. For the study, there were no experimental and control group. All twenty students were exposed to the same teaching conditions.

Instrumentation

In this study, two sub-scales of learning strategies from the Motivated Strategies for Learning Questionnaire (MSLQ) were used as an instrument to measure the use of self-regulated strategies by eighth grade students. The MSLQ was designed and developed by a team of researchers from the National Center for the Research to Improve Postsecondary Teaching and Learning (NCRIPTAL) and the School of Education at the University of Michigan. The research was led by Paul Pintrich, David Smith, Teresa Garcia, and Wilbert McKeachie (1991). The questionnaire had nineteen items and was self-reported and all the items were rated on a 7-point scale ranging from "not at all true of me" (1) to "very true of me" (7). To collect the data for the academic achievement in Life science, the researcher followed the protocol of the school. The final average scores that were collected for the sample, included a combination of assessments, ranging from assignments and ten point quizzes to quarterly exams.

Procedure

The study used a pre-test/post-test design. The questionnaire was given to the students before and after the teaching of the self-regulated learning strategies. The teaching plan for this teaching method was based on Zimmerman's cyclic model of self-regulated learning (2002).

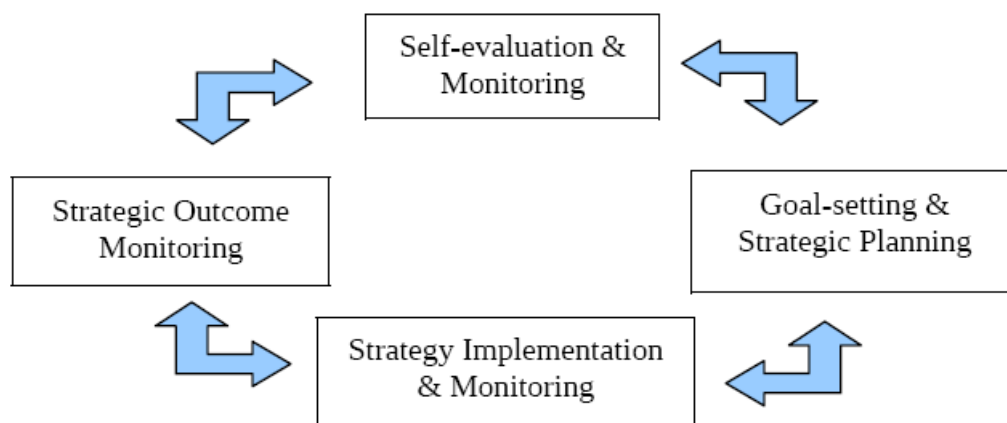


Figure 1. A cyclic model of self-regulated learning
(Adapted from Zimmerman, 2002)

The teaching method of self-regulated learning strategies was adapted from Zimmerman's *Developing Self-regulated Learners* (2002). This was then incorporated into the traditional Life science class. The students were taught to use the self-regulated learning strategies along with the Life science content over a period of eight weeks.

Table 1. Teacher's plan for developing students' use of SRL strategies

Week	Metacognitive strategies	Goals
0	x	<ol style="list-style-type: none"> 1. Plan/prepare for time management activities /forms/ feedback forms 2. Prepare materials for Life Science to go with self-regulatory model of instruction 3. Administer the questionnaire (MSLQ)
1	<ol style="list-style-type: none"> i) Task analysis (planning) and monitoring ii) goal-setting 	<ol style="list-style-type: none"> 1. Introduce SRL / goal-setting 2. Explain how to record data on STSF 3. Give students time to practice using their regular time management techniques 4. Model strategy selection 5. Day 5 – Students will write strategy for achieving their goals 6. Give daily HW assignments that elicit time management skills 7. Prepare and administer quiz at the end of the lesson
2	Regulating and monitoring	<ol style="list-style-type: none"> 1. Continue giving HW assignments 2. Prepare and administer quiz at the end of every lesson 3. Daily feedback on the goals 4. Daily monitoring of the goals / strategy
3	Monitoring and planning (Goal-setting)	<ol style="list-style-type: none"> 1. Monitor process 2. Daily feedback 3. Set new goals (beginning of the week)
4	Monitoring and planning (Goal-setting)	<ol style="list-style-type: none"> 1. Monitor process 2. Daily feedback 3. Set new goal (beginning of the week) 4. Write new strategy for achieving the goal

5-8	Monitoring and planning (Goal-setting)	<ol style="list-style-type: none"> 1. Monitor process 2. Daily feedback 3. MSLQ – posttest (on the last day of week 8)
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Adapted with permission from Dr. Barry Zimmerman

Different self-regulated learning strategies were introduced to the students every week and were then repeated. In the first week, task analysis and monitoring were implemented, along with goal setting. In the second week, regulating and monitoring, and in the fourth week, monitoring and planning. This was repeated in a cyclical manner as suggested by Zimmerman (2002).

The collected data were analyzed using one sample t-test for the average scores of the students in Life science for the period of eight weeks and paired sample t-test for the pre-test/post-test of the students' responses on the MSLQ.

Results

The findings of the study are presented for each of the research hypothesis and are summarized as follows.

Hypothesis 1: The students' achievement of Life Science should be at an average of at least 70 percent.

One sample t-test was used to test this hypothesis. The test mean against the criteria was used as an indicator. The result showed that most of the students' achievement in Life Science met the criterion at seventy percent. Fifteen percent of the class did not meet the criterion. Of these fifteen percent, one student had a sixty-eight percent, just a few percent below the criterion, and two students had about sixty-four percent. The cut-off grade for the students to be considered “pass” at Bangkok Christian International School is *sixty percent*. The population mean of seventy percent was established from this baseline of sixty percent and from the researcher's previous Life Science class average. From the researcher's past experience with the same age group, having eighty-five percent of the class meeting the criterion at seventy percent was considered to be significant. The result was found to be very significant because none of the twenty students from the study group failed the course. From the table below, one can see the class average at 80.62 % and the standard deviation at 10.02.

Table 2. One sample t-test statistics

Assessment	n	x	SD
	20	80.62	10.02

Hypothesis 2: There is a significant difference between the pre-test and post-test scores of students' using self-regulated learning strategies.

The results showed that the average scores improved significantly when students' used self-regulated learning strategies. The mean of both sub-scales; meta-cognitive self-regulation strategies and time management strategies, were at about 5 on a scale of 1 to 7. This indicated a positive increase. According to the creators of the questionnaire MSLQ (Pintrich et al, 1999), if a student's score for each scale is 3 or above, then the student is doing well in terms of self-regulation. A high score in the sub-scale of meta-cognitive self-regulation means that the student tries to plan his or her work and checks whether he or she understands the course material. In the sub-scale of resource management (specifically time and space), a high score means that the student has a method for managing the time and study schedule, and also has a place chosen to study.

Conclusions

There are three conclusions that can be drawn from the findings. First, the specific intervention chosen for this study was effective in improving the use of self-regulated learning strategies in a Life science class. The finding for the first hypothesis on achievement is supported by previous literature that suggests student

academic achievement will improve by utilizing self-regulated learning strategies (Schunk, 1994 and Zimmerman, 2008). Research done by Cooney (2007) provides evidence for the second hypothesis, that explicit instructions and practice, promoted adolescents' acquisition and habitual use of self-regulated learning strategies.

A second conclusion that be drawn from the findings is regarding the goal setting. The participants in this study were given opportunities to set goals for their learning. According to Zimmerman (2008), when goals are self-set, students are more likely to complete their goals. Schunk (1994) also suggested that teaching students to set goals that are attainable and measurable could promote student learning.

Recommendations

The purpose of this study was to examine the effect of a teaching method on students' use of self-regulated learning strategies and their academic achievement in Life science in a traditional classroom setting. Therefore, two recommendations for future research will be discussed. These include: discovering a methodology to train parents and carrying out more studies in a traditional classroom.

Although there were improvements in the students' use of self-regulated strategies, not all of the students were able to sustain their interest in the usage. One of the difficulties in this study was that while the intervention was carried out at school, the students were responsible to independently use the self-regulated learning strategies at home. This posed a difficulty, because the researcher did not have any influence over the students' decision making at home. Another difficulty was the fact that the parents were not trained and were thus were not directly involved in the process of developing self-regulated learners.

With regard to the above, specific points need to be emphasized to parents. First, students tend to waste study time, read and take notes inefficiently, and sometimes are ill-prepared for tests. Most junior high students are not systematic about their studying and often rely on methods they devised from previous years (Zimmerman et al, 2002). Self-regulated learning strategies can help them to be more aware of their strengths, as well as limitations, and will aid them in recognizing a strategy that will work for them. Second, parents should be told how self-monitoring and recording will better assist their youngsters to observe and evaluate their own learning. Third, parents should be encouraged to help set aside a regularly scheduled time for their children to do their homework and self-recording. This can also provide them an opportunity to participate in their children's learning process.

More studies need to be carried out incorporating self-regulated learning in a traditional classroom setting. A study such as this seems to be best done under isolated conditions where the researcher can train and observe the students. In the light of this, teachers in a traditional classroom need to be able to function as models, consultants and coaches. They must be capable of demonstrating the use and effectiveness of self-regulated learning strategies.

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