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Students' Motivation toward Science Learning and Achievement in Biological Sciences in a Self-Regulated Learning Environment

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ABSTRACT

Motivation plays a vital role in students' learning and academic performance, particularly in Science learning achievement. It is a challenge for a teacher to keep students motivated as they go through the entire learning process. The excellent choice of teaching strategy is one of the ways that can make the students motivated to engage in the different learning activities and in turn, increase their academic performance. This quasi-experimental study used one group pretest-posttest to determine the effectiveness of self-regulating learning method and to correlate students' motivation towards Science learning and achievement in Biological Sciences. The participants of the study were 39 students from one intact group. Teacher-made Biological Science test and Student Motivation towards Science Learning questionnaire were used to determine students' achievement and motivation towards Science learning, respectively. Results revealed that although there was no correlation between student's motivation and achievement, self-regulated learning method improved students' learning in Biological Sciences and sustained students' motivation in the entire duration of the study. Findings of the study may provide teachers inputs on how to teach Biological Science effectively and other subjects by which the method can be applied.

Keywords: *self-regulated learning, Science achievement, student motivation, Biological Sciences, academic achievement, quasi-experimental, one group pretest-posttest design*

Introduction

Choosing specific teaching methods that best achieve course objectives is one of the critical decisions a teacher faces. In higher education, particularly college teaching, the lecture is the most common method of instruction (Scerbo, Warm, Dember, & Grasha, 1992). Teaching in most Asian countries is traditionally dominated by a teacher-centered method (Zhenhui 2001; Wang & Farmer 2008). Griffin and Cashin (1989) estimated that 75% of college courses include lecture as a method of instruction. Adib-Hajbaghery (2011) mentioned that some researches (e.g., Benjamin,2002; John et al., 2007; Rahmani, 2007; & Saville, 2009) pointed out that traditional lecture is still the most popular instructional method in the universities as a frequent and easy way to deliver enormous amounts of information to students. However, studies are pointing out the weaknesses of the lecture method of teaching. Charlton (2006) in his research concluded that lecture method used as the only teaching method made most of the students bored very quickly, eventually losing their enthusiasm and interest in what the instructor has to say. The passivity that goes with such kind of teaching method creates less opportunity to develop critical thinking among students. Coral (2003) pointed out that traditional strategies of teaching were not sufficient to produce meaningful understanding. Also, the lecture method is found to discourage creativity and decrease effectiveness for skill acquisition, (Buckley, 2003; Zahed & Williams, 1996). With these kinds of reported effects of lecture, more active teaching approaches and strategies are often encouraged to make learning more effective among students.

One of the active teaching strategies is self-regulated learning (SRL) method. SRL is appropriate for college students for they have great control of their schedule, and how they approach their studying and learning (Pintrich,

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2000). Self-regulated learning deals on "how individuals set learning goals and then control, monitor, and regulate their behaviors in response to specific environmental conditions to meet those goals" (Garner, 2009, p. 409). Paris and Paris (2001) mentioned that SRL "emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise, and self-improvement" (p. 89). Zimmerman and Martinez-Pons (1986) reported that students who used more significant SRL strategies were high academic achievers and high academic achievers optimized motivational, metacognitive, and environmental resources such as seeking peer/adult help to achieve their goals Likewise, studies of Schunk (1989) and Zimmerman and Martinez-Pons (1992) reported that learners' use of self-regulation strategies sustains efforts and promotes academic achievement.

In developing self-regulated learners, motivation is an essential aspect of a student's learning. Motivation, as mentioned in the paper of Pintrich and Schunk (1996), refers to "the process whereby goal-directed activity is instigated and sustained" (p. 5). It is a common idea that if students are not motivated, they will not be able to learn effectively and achieve the learning goal. Tuan, Chin, and Shieh (2005) mentioned several studies emphasizing the essential roles of motivation, such as motivation plays a vital role in students' conceptual change processes (Lee, 1989; Lee & Brophy, 1996; Pintrich et al., 1993), critical thinking, learning strategies (Garcia & Pintrich 1992; Kuyper et al. 2000; Wolters, 1999), and science learning achievement (Napier & Riley, 1985). Also, it was reported that students' attitude and motivation are two of the most important factors to predict students' Science achievement (Reynolds & Walberg, 1992).

With the constant challenge of deciding what teaching method to use and keeping students to be motivated for effective learning to take place, the researcher found it particularly desirable to study how a more active tea ching method such as SRL model can affect students' achievement and motivation towards learning Science.

Literature Review

Self-Regulation and Self-Regulated Learning

The study of self-regulation and SRL as exciting topics for research on academic learning has gone a long way since the time of the publication of Albert Bandura's (1986) Social Foundations of Thought and Action. Bandura's work on social cognitive theory heavily influenced and helped shape the direction and development of self-regulation (Dinsmore et al., 2008). Self-regulation, as defined by Zimmerman (2000), is "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (p. 14). It emphasizes the reciprocal determinism of personal, behavioral, and environmental factors. At first, it focused on behavioral and emotional regulation (e.g., Bandura, 1982, 1989) and later on, motivation became an additional regulatory area. Dinsmore et al. further mentioned that the increased focus of self-regulation on academic settings is believed to have directly contributed to the emergence of self-regulated learning (SRL) in the 1980s and gained prominence in the 1990s. As distinguished from self-regulation, SRL focuses on academic learning (Lajoie, 2008). Malpass et al. (1999) mentioned that in most definitions of SRL, the critical feature is the systematic use of metacognitive, motivational, and/or behavioral strategies.

There are already various researches conducted on different aspects of SRL. At present, conducting studies on SRL among college students is supported by the idea that SRL is appropriate for college students for they have great control of their schedule, and how they approach studying and learning (Pintrich, 1995).

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SRL Models

This study employed Zimmerman's Social Cognitive Model of Self-Regulation, which is grounded on the social cognitive theory of Bandura. The social cognitive theory explains that self-regulation emphasizes the reciprocal determinism of personal, behavioral, and environmental factors (Bandura, 1986; Zimmerman, 1989). These three factors also referred to as determinants, exert regulatory influence controlling covert (i.e., personal), behavior, and environmental processes. In the social cognitive framework, self-regulated learning occurs when the learner uses specific methods to strategically regulate behavior and the immediate learning environment (Zimmerman, 1989). This framework also assumes that SRL is changing, depending on the physical and social contexts in which learning is taking place and the varying degrees of triadic influences of each factor surrounding the learner.

SRL Strategies

Different strategies can develop self-regulatory skills. Montalvo and Torres (2004), from their review of the book on Self-Regulated Learning: From Teaching to Self-Reflective Practice by Schunk and Zimmerman (1998), identified strategies that emerged to be shared among the different interventions and programs for developing self-regulated learning. These include direct teaching of strategy, modeling, guided and independent practice using strategies, feedback, self-observation, social support, and its withdrawal at the moment when the student has reached a certain degree of responsible participation and self-reflection.

In this study, students were given the autonomy to choose their strategy on how to demonstrate their understanding of the concepts of the specific lesson. Social support from teacher and peers were provided. Teachers at first guided students, then later making them autonomous as they continue in the performance of the task. This prepares the students for the responsibility of initiating, applying, and evaluating strategies as it is being transferred from the teacher to the student (Montalvo & Torres, 2004).

Giving elaborative feedback and giving students the chance to self-evaluate their learning are also important. Feedback from teachers and peers and self-evaluation give students an idea regarding their performance and may be used to make necessary adjustments in the current and succeeding efforts. In providing feedback, the level of goal achievement and criteria or standards to which performance will be based must be clear to the students (Montalvo & Torres, 2004). In this study, giving feedback to the performance of the students was done every session.

Self-monitoring is also an essential aspect of any intervention for developing SRL. It is a critical element of self-regulation (Montalvo and Torres, 2004). Self-monitoring depends on the establishment of goals and feedback from others and oneself. Establishing short-term realistic and specific goals will guide students in the progress of their work. Self-monitoring can also be achieved by keeping a record of specific aspects related to academic tasks such as time to finish a particular learning activity.

Another important strategy that is said to promote self-regulated learning is the use of the metacognitive approach. Metacognition is essential to self-regulated learning (Kriewaldt, 2001) which involve controlling and monitoring one's thought processes and knowledge that are central to self-regulated thinking (Mcwhaw & Abrami, 2001). The use of metacognition is said to be a strong predictor of academic success and problem-solving ability (Coutinho, 2006).

Young and Konstantinos (2002) have mentioned several studies indicating the relation of SRL to certain aspects of learning. These studies include: SRL is highly related to quality learning, performance, and positive

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academic outcomes (Ames, 1984; Borkowski & Kurtz, 1987; Corno, 1986, 1989; Covington, 1987; Dweck, 1986; Paris & Oka, 1986; Patrick, 1998; Wang & Peverly, 1986; Zimmerman, 1989; Zimmerman & Martinez-Pons, 1986, 1990); high academic achievers were more likely to use SRL strategies such as goal-setting, selecting strategies, and monitoring performance than low-achieving students (Das, Naglieri, & Murphy, 1995; Naglieri, & Das, 1990); students who were reported to use more significant SRL strategies were also high academic achievers and high academic achievers optimized motivational, metacognitive, and environmental resources such as seeking peer/adult help to achieve their goals (Zimmerman & Martinez-Pons, 1986). Mcwhaw and Abrami (2001) also mentioned studies (i.e., Pintrich, 1989; Pokay & Blumenfeld, 1990; Schiefele, 1992) in which results showed that students, who have a high interest in a topic, use more self-regulated learning strategies than students with a low topic interest. Likewise, studies of Schunk (1989) and Zimmerman and Martinez-Pons (1992) reported that learners' use of self-regulation strategies sustains efforts and promotes academic achievement.

Students' Motivation toward Science Learning (SMTSL)

There are several studies conducted regarding students' motivation toward science learning. Cobb (2003) revealed that in some researches (e.g., Garcia & Pintrich, 1994; Deci & Ryan, 1985; Pintrich & Schunk, 1996), motivation plays a vital role in a student's academic performance; thus, students' motivational tendencies are positively related to students' self-regulation of learning. From these findings, students' learning goals, self-efficacy, learning strategies, and perception of Science learning values were identified as essential domains in students' science learning motivation (Tuan et al., 2005). Also, Brophy (1998) and Pintrich and Schunk (1996) revealed that individual's goals toward tasks, task value, and the learning environment dominate students' learning motivation.

The motivation of students towards learning can be measured by several questionnaires (Chen, 2002). Tuan et al. (2005) develop a questionnaire to investigate students' learning motivation specifically for Science learning. This instrument is composed of 35 items that are designed to measure six motivation factors, namely: self-efficacy, active learning strategies, Science learning value, performance goal, achievement goal, and learning environment stimulation.

In the study conducted by Tuan et al. (2005), results of the correlation between SMTSL questionnaire on Science attitude scores and Science achievement revealed that all scales have a significant relationship. In the same study, it was further shown that among the six motivation scales, self-efficacy, and active learning strategies have a higher correlation with achievement scores, with self-efficacy having the highest relationship with students' Science achievement. Learning environment stimulation has a higher correlation with science attitude.

In addition, Pintrich & Schunk (1996) reported in their study that students' motivation has a moderate and significant correlation with students' Science achievement. The significant relationship of students' motivation, with both their previous and current science achievement scores in the study, indicates the stability of motivation with students' achievement. Thus, Science achievement is often used as indirect evidence of students' motivation.

From the literature presented, the studies were conducted by foreign authors among students abroad. There was a shortage of research investigating the effect of SRL method of teaching among students in the local setting. Hence, this study was conducted to add to literature the influence of SRL method to achievement and motivation towards Science learning among Filipino college students in the local setting in one full semester.

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Conceptual Framework

Figure 1 shows the conceptual framework of the study. In this framework, the independent variable is the teaching strategy, SRL model. The dependent variables are the students' achievement in Biological Science and students' motivation towards Science Learning

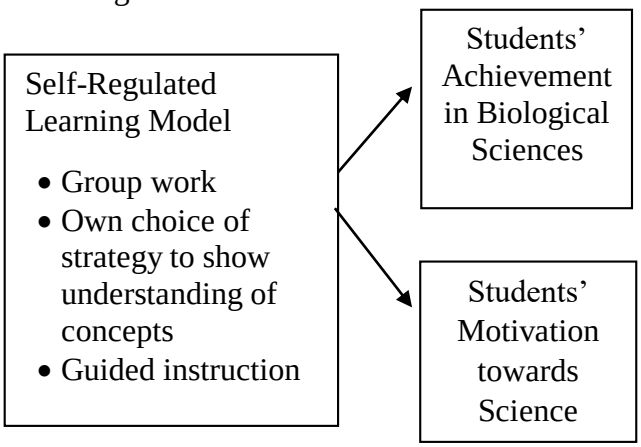

Figure 1. *Students' achievement in Biological Sciences and students' motivation towards Science learning as influenced by SRL method.*

Research Questions

This study sought to answer the following questions:

1. What are the mean pretest, posttest, and mean gain scores in Biological Sciences test of students exposed to SRL method?
2. What are the SMTSL results of the students exposed to the SRL method?
3. Are there significant differences between the mean pretest and posttest scores in Biological Sciences test of students exposed to SRL method?
4. Are there significant differences among students exposed to SRL method in their SM TSL results?
5. Is there a significant relationship between SMTSL results and students' achievement in Biological Sciences?

Methodology

Research Design

This study employed a quasi-experimental research design particularly one group pretest-posttest design. In the pretest-posttest design, an intact group was measured or observed twice. The first measurement serves as the pretest and the second as the posttest (Frankael and Wallen, 2007). The variables investi gated in the study were teaching method (SRL method), students' achievement in Biological Science, and SMTSL results.

Sampling

An intact group of one section was used, and all students were taken as participants. It was composed of 39 first-year college students enrolled in the Bachelor of Secondary Education (BSED) program in a teacher training state university.

Research Instruments

The research made use of researcher-made materials and one adapted instrument. All researcher-made materials underwent the validation. It was shown to the researcher's colleagues who have been teaching Biology for five years or more for critiquing and comments particularly in terms of content validity.

Teacher-made test. Students' achievement in Biological Science was measured using a 75-item researcher-made multiple choice test. This test was used to determine students' understanding of concepts in Biological Science. This was given as both pretest and posttest. Table of specifications was used to determine the distribution and appropriateness of the test questions. The test was tried out to BSEd Science majors who had taken Biological Sciences in their first year. The reliability coefficient was computed using the Kuder-

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Richardson formula (KR20), and the value was found to be 0.919.

Course Reader. The course reader is designed by the researcher as a resource material for Biological Science for the students. The course reader primarily contains all the topics and content that were based on the objectives stated in the course syllabus and served as an easy reference for learning Biological Science.

Course Teaching Manual. The researcher designed this as a guide in teaching lessons in Biological Science using SRL strategies. This teaching manual contains the objectives, time allotment, lesson procedure, evaluation, and assignment for each lesson. The sequence and time allotment for the lessons were based on the Biological Science syllabus. The lesson was designed in such a manner that students were given the autonomy to choose their strategy in showing their understanding of the concepts of specific lessons as guided by the objectives for each learning session.

Students' Motivation towards Science Learning (SMTSL) Questionnaire

Students' motivation towards Science learning was measured using Students' Motivation towards Science Learning (SMTSL) questionnaire developed by Tuan et al. (2005). This instrument is composed of 35 items that are designed to measure six motivation factors, namely: self-efficacy, active learning strategies, Science learning value, performance goal, achievement goal, and learning environment stimulation. In every item, students rate themselves on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

This questionnaire has been identified to have good construct validity and also criterion-related validity (Tuan et al., 2005). However, this was also pilot tested in the local setting to establish its reliability among Filipino students. The questionnaire was presented to a university psychometrician, some teachers who were teaching measurement and evaluation, and some students for their comments. Cronbach's alpha with a result of 0.715 was also computed to determine its reliability.

Preparing the Classes for the Study

The researcher handled the class for two reasons. First, training another teacher on the rationale and implementation of the various teaching strategies to be used in the study would take a considerable time. Second, the correct execution of the SRL model must be ensured. The researcher controlled teacher-bias by sticking to what was prescribed in the study.

During the orientation period of two meetings, the students were informed that the class was part of a research study and the data will be held confidential. The students were also told that the course was to be conducted using self-regulated learning model of teaching. The following essential things regarding the conduct of the class were discussed among the students in the experimental group during the orientation period:

(a) Throughout the course, they were given the freedom to show their understanding of the concepts as guided by the learning objectives for each lesson;

(b) Importance of self-regulation strategies, such as analyzing the learning task, setting of learning goals, choosing appropriate strategies to master the material and to show their understanding of the concepts, and monitoring their performance;

(c) The strategy that they were familiar with and used to exhibit their knowledge of the previous science classes that they had before could be used as they went through the lessons for the entire semester;

(d) They had to work by pair or in a group that was randomly chosen by the teacher;

(e) Rubrics were used in rating their learning outputs. The rubrics were presented to the students for comments. They were asked if there were clarifications and suggestions on the criteria to be used in rating their learning

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outputs. The rubrics beforehand had been presented to the same group of experts who evaluated the questionnaires for validity.

(f) Notebooks for the reflective journal were used in recording 22 reflective questions.

(g) They were required to keep their outputs inside an envelope to help them monitor their class performance.

Subject Matter Content

All the topics included in the course Biological Sciences were taught for the entire semester following the syllabus of the course. The sequence of the lesson was based on the course syllabus. The topics included for the study were Introduction to Biology, Chemical and Cellular Bases of Life, Taxonomy and Plants, and Human Body Systems.

Lesson Strategies

The conduct of the class was based on the teaching manual developed by the researcher. Each class session was conducted for one hour and thirty minutes. During the conduct of the lesson, students were given autonomy to choose their strategy on how they were going to present their understanding of the concepts of the specific lesson for that session. They were instructed to read in advance the course reader and were given the objectives for the next lesson as their guide. In the class, they worked in groups of five or more in which the researcher randomly chose the members. Using rubrics, each group rated the learning outputs presented except the output of their group. Feedback on the learning outputs was also given to the groups.

After the lesson was completed, the students give an oral synthesis of what they learned about the lesson. Also, the researcher orally gave specific short feedback after all presentations were made. The evaluation in the form of the quiz was administered. The objectives for the next lesson were also presented before the class ended.

Data Analysis

Students' responses to SMTSL questionnaire were scored based on the scoring manual designed by Pintrich et al. (1991). Scores on each of the subscale were determined by computing the mean of the responses on the items that made up each category.

Also, descriptive analysis was used, aided by the use of frequency and mean. For inferential analyses, t-test for dependent (paired) samples was used to determine if there are significant differences in the mean scores and the SMTSL results among the students. Pearson's Product-Moment Correlation Coefficient (Pearson's r) was utilized to determine the correlation of SMTSL res ults in students' achievement. The significance of all inferential statistics was set at alpha 0.05.

Ethical Consideration

During the orientation period, the students were briefed that the class was part of a research study and will be conducted in a natural classroom setting using self-regulated learning model of teaching. Informed consent was sought from the students. They were informed that their performance in class serves as the source of data for the study but will be reported collectively and pseudonyms will be used if there is a need to name participants to maintain confidentiality.

Results and Discussion

Students' Achievement

The data in Table 1 presents the mean pretest and posttest scores. As shown in the table, there was an increase in mean scores.

Table 1. *Pretest, Posttest, and Mean Gain Scores of Students*

Variable	Mean	S.D.
Pretest Score	31.54	5.23
Post test Score	44.97	8.66
Mean Gain Score	13.44	7.08

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The mean pretest score was 31.54, and the posttest increased to 44.97. The mean gain score was 13.44. The results suggest that SRL method increased the students' level of knowledge and, in turn, students' achievement in Biological Science. This positive result is similar to what was reported by the studies of Schunk (1989) and Zimmerman and Martinez-Pons (1992) that learners' use of self-regulation strategies sustains efforts and promotes academic achievement. In addition, the positive performance of the students may indicate the good interaction of the personal, behavioral, and environmental factors as mentioned in Bandura's Social Cognitive theory.

Standard deviation values increased from 5.23 to 8.66 for the mean pretest score and mean posttest scores, respectively. The increase in standard deviation in the mean posttest score may suggest that the pretest scores posted by the students in both groups were more homogeneous than the posttest scores.

The data in Table 2 shows the t-test result of the pretest and posttest score.

Table 2. *Paired Samples t-test on the Mean Pretest and Posttest Scores of Students*

t-value	df	p-value
11.849*	38	<0.001

*Significance at $p < 0.05$

The t-test result, showing the p-value of <0.001, indicates that there is a significant difference between the mean pretest and posttest scores in Biological Science test of the students who were exposed to SRL method. This may suggest that the SRL method was effective in increasing students' learning and, in turn, students' achievement in Biological Science.

Students' Motivation towards Science Learning

The data presented in Table 3 shows the mean SMTSL results of the students. Reflected on the table are the scores on the six (6) motivation factors. From the table, it is revealed that there is an increase in the total mean motivation score. This suggests that SRL method increased students' motivation to learn Science, which in this case, Biological Science. Students who are exposed to the SRL method became more engaged in the different motivation factors; thus, they became more motivated towards learning Biological Science as they went through the learning process in the entire duration of the study.

Table 3
Mean STMSL Scores of Students

Factors	Pretest Score		Posttest Score	
	Mean	S.D.	Mean	S.D.
Motivation Score	24.44	1.66	25.02	1.68
	4.07	0.28	4.17	0.28
Self-Efficacy	3.9	0.6	4.06	0.52
Active Learning Strategy	4.3	0.41	4.3	0.53
Science Learning Value	4.42	0.44	4.51	0.45
Performance Goal	3.24	0.64	3.38	0.82
Achievement Goal	4.36	0.66	4.46	0.51
Learning Environment Stimulation	4.22	0.48	4.31	0.49

Examining the six (6) motivation factors, only Active Learning Strategy has an equal total mean score of 4.3 for both pretest and posttest. The other five (5) factors have increased their posttest mean scores. This result may suggest that as students, who were exposed to SRL method, went through the learning process, and they became more confident in their ability to perform specific Science learning tasks given to them. They also have increased their use of a variety of strategies to construct new knowledge based on what they have previously learned. As they underwent the process of accomplishing the

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learning tasks, the students saw higher values of the activities they participated in. Also, as they performed different activities, it seemed that they became more motivated to give their best output among the other groups and even seemed to be more satisfied with the outcomes. The students in the SRL method were exposed to a learning environment that allowed them to think and make use of various learning strategies. The challenge involved in thinking as to what appropriate strategy to use to achieve the learning goals may have increased their engagement in the different motivation factors which, in turn, directed the students to be more motivated in learning Biological Science.

It is further shown that Science Leaning Value was the most significant motivating factor and Performance Goal was the least motivating factor for the students exposed to the SRL method. This may indicate that the students exposed to SRL were strongly motivated by their increased perception of the value of what they were learning as they went through the learning process and were least motivated by competing with other students in the classroom.

The increase in self-efficacy corroborates the findings of Brophy (1998) and Pintrich and Schunk (1996) that self-efficacy is one of those factors that dominate students' motivation towards learning Science. This result is also in agreement with Tuan et al. (2005) who pointed out that students' self-efficacy and learning strategy are two of the essential domains in student Science learning motivation.

It is further shown from the table that standard deviation values were 1.66 in the pretest and 1.68 in the posttest. The standard deviation values in the posttest may indicate that the motivation scores in the pretest were more homogeneous than those in the posttest. In addition, it can be gleaned from the table that values ranged from 4.07 and 4.17 in the pretest and posttest, respectively. These reported mean values were nearer the highest scale value 5, which corresponds to "strongly agree."

Table 4 shows the t-test results of the motivation scores of the students. From the table, the p-value of 0.006 indicates that there was a significant difference between the mean pretest and posttest motivation scores. This result suggests that SRL method increased students' motivation towards Science learning.

Table 4. *Paired-sample t-test on the Mean SMTSL Scores of Students*

Factors	t-value (df=38)	p-value
Motivation Score	2.943*	0.006
Self-Efficacy	1.855	0.071
Active Learning Strategy	0.043	0.966
Science Learning Value	1.132	0.265
Performance Goal	1.375	0.177
Achievement Goal	1.066	0.293
Learning Environment Stimulation	1.129	0.266

*Significance at $p < 0.05$

However, all motivation factors showed p-values greater than 0.05. This means that there were no significant differences in the mean scores among all motivation factors before and after being exposed to the SRL method. Although there were noted increases in the mean posttest scores of the five (5) motivation factors, results still showed that there were no significant differences in students' engagement in each of the motivation factors.

The increase in mean posttest score in Biological Science test and the increase in students' mean posttest motivation score suggest that students' motivation was an important factor in students' achievement. This is similar to what Reynolds and Walberg (1992) and Singh et al. (2002) previously reported that students' attitude and motivation are two of the most critical factors that determine Science achievement. This is also in agreement to other researches (e.g., Garcia &

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Pintrich, 1994; Deci & Ryan, 1985; Pintrich & Schunk, 1996) cited by Cobb (2003) who found that motivation plays a vital role in a students' academic performance.

Correlations between SMTSL Scores and Achievement Scores of Students

Table 5 shows the relationship between students' motivation score and achievement score in Biological Science.

Table 5. *Pearson's Correlations between SMTSL Scores and Achievement Scores of Students*

Scale	Achievement Scores	
	r	Sig (2-tailed)
Motivation Score	0.08	0.62
Self-Efficacy	-0.03	0.86
Active Learning Strategy	-0.03	0.88
Science Learning Value	-0.05	0.75
Performance Goal	0.07	0.68
Achievement Goal	0.19	0.26
Learning Environment Stimulation	0.08	0.62

Results reveal that student's motivation towards Science learning and students' achievement scores gained positive correlation. However, the significant value was 0.62. This indicates that despite the significant increases in the mean achievement and mean motivation scores, students' performance in Biological Science was not significantly related to students' motivation toward Science. In addition, all motivation factors had significant values higher than 0.05; thus, all motivation factors had no significant relationship with students' achievement in Biological Science. These present findings are in contrast to what was reported in the study of Tuan et al. (2005) using SMTSL questionnaire, which revealed that students' motivation has a moderate and significant correlation with students' Science attitude and Science achievement.

The result of the present study that there is no significant relationship between students' motivation and students' achievement, however, may not indicate that the students were not motivated. As shown in Table 3, mean posttest motivation scores increased, suggesting that students were motivated towards Science before and after being exposed to the SRL method.

Conclusion

Self-regulated learning method increased both students' achievement in Biological Science and motivation towards Science learning. There were significant differences in the mean achievement score and mean motivation score. However, students' achievement in Biological Science and their motivation towards Science learning were not significantly correlated.

The significant increase in students' achievement scores and motivation towards Science learning scores implies that SRL method is effective in improving students' achievement and motivation towards learning Science. Therefore, this active method is one of the effective teaching strategies to be used to facilitate college students to have high academic performance.

References

Adib-Hajbaghery, M.(2011). Traditional lectures, Socratic method, and student lectures: Which one do the students prefer?. *WebmedCentral*. 1-9. Retrieved from WebCentral.com

Bandura, A.(1986). Social foundations of thought and action (pp. 5-107). Prentice Hall.: Englewood Cliffs, NJ. Retrieved September 18, 2012, from http://goo.gl/MLAFaj.

Brophy, J. (1998). Motivating students to learn. Madison, WI: McGraw Hill.

Charlton B.G.(2006). Lectures are an effective teaching method because they exploit human evolved 'human nature' to

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improve learning. Editorial. *Medical Hypotheses*. *67*, 1261-1265.

Chen, C.S.(2002).Self-regulated learning strategies and achievement in an introduction to Information systems course. *Information Technology, Learning, & performance Journal*,*20*(1). 11-23.

Cobb, R. Jr. (2003). *The relationship between self-regulated learning behaviors and academic performance in web-based courses*. (Doctoral Dissertation) Virginia Polytechnic Institute and State University.

Coral, R. H. (2003). *Metacognitive learning cycle model: Effects on students' learning in Genetics.* (Doctoral Dissertation) University of the Philippines-Los Banos, Laguna.

Coutinho, S. A. (2006). The relationship between the need for cognition, metacognition, and intellectual task performance. *Educational Research & Reviews, 1*(5), 162-164.

Dinsmore, D.L., Alex&er, P.A., & Loughlin, S.M.(2008). Focusing the conceptual lens on metacognition, self-regulation, & self-regulated Learning. *Educational Psychology Review*, *20*, 391–409.doi:10.1007/s10648-008-9083-6.

Garner, J. K. (2009). Conceptualizing the relations between executive functions and self-regulated learning. *The Journal of Psychology*, *143* (4), 405–426.

Griffin, R. W., & Cashin, W. E. (1989). The lecture & discussion method for management education: Pros & cons. *Journal of Management Development, 8*, 25–32.

Lajoie, S. P.(2008).Metacognition, self-regulation, and self-regulated learning: A rose by any other name? *Educational Psychology Review*. *20*,469–475. doi: 10.1007/ s10648-008-9088-1.

Kriewaldt, J. (2001).*A thinking geography curriculum*.29(4). Retrieved from http://www.gtav.asn.au/interaction/issues/v29n4_dec01/metacognition.htm.

Mcwhaw, K. & Abrami, P.C. (2001). Student goal orientation and interest: Effects on students' use of self-regulated learning strategies. *Contemporary Educational Psychology, 26*, 311–329. doi:10.1006/ceps.2000.1054.

Montalvo, F.T, & Torres, M.C.G.(2004).Self-regulated learning: Current and future directions. *Electronic Journal of Research in Educational Psychology, 2*(1), 1-34.

Paris, S.G., & Paris, A.H. (2001). Classroom Applications of Research on Self-Regulated Learning. *Educational Psychologist, 36*(2), 89–101.

Perry, N. E. & Winne, P. H. Learning from learning kits: gStudy traces of students' self-regulated engagements with computerized content. *Educational Psychology Review, 18*(3), 11-228.

Pintrich, P.R., & Schunk, D.H. (1996). *Motivation in education: Theory, research, and applications* (2nd ed.). Englewood Cliffs, NJ: Merrill Company.

Puustinen, M., & Pulkinnen, L. (2001). Models of self-regulated learning: A review. *Scandinavian Journal of Educational Research, 45*(3), 270-286.

Reynolds, A.J., & Walberg, H.J. (1992). A structural model of science achievement and attitude: An extension to high school. *Journal of Educational Psychology*, 84(3), 371–382.

Schunk, D. (1989). Social cognitive theory and self-regulated learning. In B. Zimmerman & D. Schunk (Eds.), Self-regulated learning and academic achievement: Theory, research, and practice (pp. 83-110). New York: Springer-Verlag.

Tuan, H.L., Chin, C.C. & S, S. H. (2005).The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education, 27*(6), 639-654.

Wang, V., & Farmer, L. (2008). Adult teaching methods in China and Bloom's Taxonomy. *International Journal for the Scholarship of Teaching & Learning*, *2*(2).

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Journal of Education and Society

Wolters, C. A.(1999). The relationship between high school students' motivational regulation and their use of learning strategies, effort, and classroom performance. *Learning and Individual Differences*, 3 (3), 281-299.

Young, S.H., & Konstantinos, V.(2002). Elementary in-service teachers' self-regulated learning strategies related to their academic achievements — *Journal of Instructional Psychology*, *29*(3), 147.

Zafar, I., (2008). *Item Analysis Assumption. Measure of exam internal consistency*(reliability) Kuder Richardson 20 (KR20). Retrieved from http://www.google.com.ph/url?sa=t&rct=j&q=FACT%20SHEET%2024B%20%20Title%3A%20Item%20Analysis%20Assumptions%20%20Measure%20of%20exam%20internal%20consistency%20(reliability)%20Kuder-Richardson

Zhenhui, R. (2001). Matching teaching styles with learning styles in east Asian contexts. *The Internet TESL Journal*, *7*(7). Retrieved from http://iteslj.org/Techniques/Zhenhui-TeachingStyles.html.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*. *81*(3), 329-339.

Zimmerman, B. & Martinez-Pons, M. (1992). Perceptions of efficacy and strategy use in self-regulated learning. In D.H. Schunk & J. Meece (Eds.), Student perceptions in the classroom: Causes and consequences (pp. 185-207). Hillsdale, NJ: Erlbaum.

Zimmerman, B. J. (1995). Self-regulation involves more than metacognition; A social cognitive perspective. *Educational Psychologist*, *30*(34), 217-221.

Zimmerman, B. J. (2000). Attaining self-regulation: A social-cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13–41). San Diego, CA: Academic Press.

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