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Research Article

## Empowering students' metacognitive skills on sscs learning model integrated with metacognitive strategy

*Yusnaeni*<sup>[1][2]</sup>, *Aloysius Duran Corebima*<sup>[3]</sup>

<sup>[1]</sup>Postgraduate students, State University of Malang, (INDONESIA)

<sup>[2]</sup>Study Program of Biology Education, Faculty of Teacher Training and Science Education, State University of Nusa Cendana Kupang, (INDONESIA)

<sup>[3]</sup>Biology Department, Faculty of Mathematics and Science, State University of Malang, (INDONESIA)

Corresponding author: durancorebima@gmail.com

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**ABSTRACT:** This research was conducted to investigate the effect of Search Solve Create and Share learning model integrated with metacognitive strategy (SSCS + MS) on student's metacognitive skills. The quasi experimental research design was used to compare the effect of traditional learning, as well as the learning models of SSCS, and SSCS+MS on metacognitive skills of class X Senior High School students in Kupang, Indonesia. Data were analyzed by using one-way ANCOVA continued with post hoc analysis of Least Significant Different test. The results of research show that SSCS + MS learning model increases the students' metacognitive skills, with an increase of 25.58% higher than that of the SSCS learning model and 67.33% higher than that of the traditional learning. These research findings indicate that the SSCS + MS learning model has the biggest potential in empowering students' metacognitive skills compared to the two other learnings. Based on these findings, teachers need to implement SSCS + MS learning model to empower student's metacognitive skills.

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**Key words:** metacognitive skills, metacognitive strategy, Senior High School, SSCS learning model.

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### INTRODUCTION

Students' thinking skills, especially high order thinking skills, are crucial in solving the problems and challenges of learning in the 21st century. According to Tan (2004), in the 21st century, students needed to have metacognition as a key to enhance their thinking capacity. Greenstein (2012) also explained that in the 21st century, metacognitive thinking ability was one of the skills needed to be developed. Therefore, the learning in the 21st century should be carried out by focusing on high order thinking skills, particularly the empowerment of metacognitive skills.

Metacognition is the process of thinking how to think using a particular strategy in an attempt to resolve the problem. Awareness is needed to improve learning. Thinking can help someone to solve problems and to make decisions. According to O'Neil and Brown (1997), metacognition is the process of thinking about their own thinking in order to develop strategies to solve problems. Correspondingly, Blakey and Spence (1990) also added that metacognition was the process of thinking about thinking and learning how to learn.

Learning by empowering metacognitive thinking skills is one of the efforts to empower students' thinking skills. According to Efklides (2006), metacognition is an important part of learning. Sperling et al. (2004) also added that metacognition skills were believed to help students gave information about their learning activities and learning progress. Similarly, Pennequin et al. (2010) expressed that metacognitive skills enabled students to choose and to create a strategy explicitly

by thinking about and assessing their understanding.

According to Al-Khayat (2012) and Jausovec (1994), metacognitive skills are needed to help individuals in order to solve problems. Brown (1980) also revealed that metacognitive skills as self-awareness of progressive cognitive activity and orders how someone directed, planed and monitored his cognitive activity. This illustrates that an important component of metacognitive skills is the students' ability to reflect on their own learning.

Empowering metacognitive skills in learning is very necessary because metacognitive skill plays an important role in solving students' learning problems. According to Eggen and Kauchak (1996), the empowerment of students' metacognitive skills in learning can help students become self-regulated learner. Self-regulated learners are responsible for their own learning progress. Furthermore, Corebima (2009) also revealed that the self-regulated learners can be empowered or trained through a particular strategy or effort.

Students having a good metacognition in their learning process can be independent learners. Livingston (1997) revealed that the increase of students metacognitive skills depended on students' ability to learn independently. The more skillful the students learn independently, the easier their metacognition to develop. Weiner and Kluwe, (1987) also added that metacognition referred to special mental operations in order to examine, plan, organize, monitor, predict and

evaluate their own thinking processes.

Metacognition has a lot of important roles in learning. Meacognition is the key of making students to learn with greater understanding and as a key component of a student's academic success (Aleven & Koedinger, 2002), as predictor of academic success for learning disabilities students (Ruban, 2000; Tranin & Swanson, 2005), has an important role in developing the critical thinking skills (Ku & Ho, 2010), stimulates creative thinking (Pesut, 1990), as well as it is a key factor in the process of problem solving (Jacobse et al., 2012).

Nowadays, research on the empowerment of students' metacognitive skills through the implementation of some learning strategies has begun to be conducted. Students' metacognitive skills can be improved by using appropriate learning strategies, as reported by Suratno (2010), Listiana et al. (2016), Bahri and Corebima (2015), and Palennari (2016). The results of those researches have open a big opportunity to conduct other studies related to the implementation of new learning strategies, and one of which is the empowerment of metacognitive skills through Search Solve Create and Share (SSCS) learning model integrated with metacognitive strategy (MS).

SSCS learning model is one of cooperative learning models based on problem solving. SSCS learning model can be promoted to increase students' metacognitive skills. Several researches related to SSCS learning model have been conducted, as reported by Baroto (2009), that the SSCS learning model could develop students' critical thinking skills. Suciati (2013) added that the SSCS was effective in the process of problem solving. Similarly, Utami (2011) reported that SSCS was also effective in improving students' creativity. Problem solving skill, critical thinking skill and creative thinking skill are high order thinking skills interlinked with metacognitive skill. Carin (1993) revealed that metacognition was aimed to increase learning awareness, problem solving skill, creative thinking skill, and the application ability in real situations.

On the other hand, the use of metacognitive strategies has been attributed to learning success (Carr et al., 1989). Furthermore it has been reported too that metacognitive strategy promotes metacognitive skills of students having learning disabilities (Montaque, 1992), and metacognitive strategy increases students' efforts in problem solving ( Mocos & Kafoussi, 2013). The results of research linking metacognitive strategies and thinking skills have been reported by Miranda (2010), Nindiasari (2011) and Afandi, et al (2012). In general, the results of their research show that the use of metacognitive strategies in learning can enhance students' thinking skills.

Based on the advantages of SSCS learning model and the use of metacognitive strategies, it is necessary to conduct a research investigating the potential of SSCS learning model integrated with metacognitive strategies (SSCS + MS). SSCS + MS is an alternative learning model in an effort to empower

students' metacognitive skills.

**METHOD**

**A. Research design**

The design of this research was a quasi-experimental research to compare the effects of conventional learning model, SSCS, and SSCS + MS on metacognitive skills of the students of class X Senior High School in Kupang, Indonesia. The research design (Table 1) was *pretest-posttest Nonequivalent control group design* (Borg & Gall, 1983).

**Table 1. Experimental Research Design of Pretest-Posttest nonequivalent Control Group Design**

<i>Pretest</i>	<i>Group</i>	<i>Posttest</i>
T <sub>1</sub>	X <sub>1</sub>	T <sub>2</sub>
T <sub>3</sub>	X <sub>2</sub>	T <sub>4</sub>
T <sub>5</sub>	X <sub>3</sub>	T <sub>6</sub>

(adapted from Borg & Gall, 1983)

Note: T<sub>1</sub>, T<sub>3</sub> and T<sub>5</sub>: Pretest                      T<sub>2</sub>, T<sub>4</sub>, and T<sub>6</sub>: posttest

X<sub>1</sub>: Conventional Learning      X<sub>2</sub>:SSCS learning model

X<sub>3</sub>: SSCS + MS learning model

**B. Research samples**

This research was conducted in three schools, State Senior High School 3 Kupang, State Senior High School 4 Kupang, and Catholik Giovanni Senior High School Kupang. The sampling technique used was total sampling based on the consideration that only those schools which were possible in Kupang. Three natural science classes in class X at the first semester were used as the samples of this research. The research samples consisted of students assumed to be homogeneous based on the average score of the results of placement tests.

**C. Research Instruments**

Metacognitive skill was measured using an essay test integrated with cognitive tests. The test consisted of 10 numbers. The measurement of metacognitive skill referred to Corebima (2009). The essay test was given at the beginning (pretest) and at the end (post-test) of the research. The instruments were validated before used. Validation included expert validation and empirical validation. Expert validation included content and construct validity of the instrument, which was estimated in accordance with the curriculum. Construct validity was related with the construction or concept of science tested. Empirical validation was carried out to 105 senior high school students in Kupang, Indonesia. The reliability of the essay test was also tested. Reliability refers to the degree of test scores which are free of measurement error or an index that indicates the extent of a measuring instrument can be reliable. Reliability of the instrument was 0.71, with a discriminating power of 0.41 to 0.61 and the difficulty level of 24.44% - 60.56%.

**D. Experiment Process**

For one semester, three classes from each school were taught by using different learnings, namely traditional learning, SSCS learning model and SSCS + MS learning model. The learning materials included biodiversity, viruses, protists, and Monera. The traditional learning was done by the teacher without the intervention of the researcher. SSCS learning model used the syntax of the learning-based on Separdson and Pizzini (1992). SSCS + MS learning model also used the same syntax as the SSCS) conducted by adding the intervention from the researcher in the form of *underlining* technique during the phase of *Search* and *self-assessing* and at the end of phase *Share*.

**E. Data analysis**

The research data were analyzed by using one-way ANCOVA and followed with post hoc test of Least Significant Difference (LSD) test.

**RESEARCH RESULT**

The results of the prerequisite test show that the normality test One Sample Kolmogorov-Smirnov Test for the pretest was 0.000 ( $p < 0.01$ ) and for the posttest was 0.000 ( $p < 0.01$ ). On the other hand, the result of Lavene homogeneity test for the pretest was 0.793 ( $p > 0.05$ ) and for the posttest was 0.000 ( $p < 0.01$ ).

The ANCOVA results of the students' metacognitive skills are presented in Table 2. The result of LSD test related is presented in Table 3.

**Table 2. Results of ANCOVA of Students' metacognitive Skills**

Source	db	Mean Square	F	Sig.
Metacognitive skills	1	5525.517	85.208	.000
Model	2	7922.908	61.089	.000
Error	311	20167.654		
Total	315			

Table 2 shows that the learning models give different effects on students' metacognitive skills ( $p < 0.05$ ). Based on the LSD test result at the Table 3, it seems the highest metacognitive skills is offered by the SSCS + MS learning model. The increased score of metacognitive skills on SSCS + MS learning model is 25.58% higher than that of SSCS learning model and 67.33% higher than that of traditional learning model.

**Table 3. The Result of LSD Test of Students' metacognitive Skills**

Learning	Pretest Metacognitive Skills	Posttest Metacognitive Skills	Difference	Metacognitive SkillsCor	Increase (%)	LSD Notation
SSCS+SM	26.8832	44.5434	17.6602	43.885	65.892	a
SSCS	26.3660	39.5084	13.1424	39.258	49.846	b
Traditional	24.8967	30.6660	5.7693	31.575	23.173	c

**DISCUSSION**

As what has been revealed, the prerequisite test shows that the results do not meet the requirements for ANCOVA test related to the fact that the ANCOVA test remained to be done, the effort is made to obtain an initial picture which would be confirmed again in the further researches, which is expected that the prerequisite test was met.

The results of ANCOVA test followed by LSD test show that the potential of SSCS + MS learning model in empowering the student's metacognitive skills is the highest one compared to that of SSCS learning model as well as traditional learning; each learning has different potential among each other in empowering the student's metacognitive skills. The results of this research are in line with the results of the previous researches (Suratno, 2010 and Bahri, 2016). Their research results generally reveal that the use of different learning strategies show different effects on metacognitive skills.

Related to these research results indicating that the SSCS + MS learning model has the highest potential in empowering students' metacognitive skills, this condition might happen because SSCS learning model is a learning model based on problem solving. In SSCS, students are directly involved during the process of problem formulation and problem resolution. According to Blakey & Spence (1990) problem solving makes students to think more actively. Problem solving activity generally makes students as self-conscious thinkers and independent learners.

Problem solving skill is associated with metacognitive skills. The problem solving based learning, involves the application of the process of planning, supervising, monitoring and reflecting. The process of planning, monitoring and reflection is included in metacognition (Safari & Maskini, 2016). A complex problem requires more metacognitive controls (Havenga et al., 2013). Anandaraj and Ramesh (2014) reported that there was a significant correlation between metacognition and problem solving skills.

When the SSCS learning model is combined with metacognitive strategies (SSCS + MS), students will be able to identify more suitable ways to learn in their condition. At that moment the student is doing metacognition. Shannon and College (2008) revealed that metacognition was defined as an understanding of what one knew, accompanied by understanding and applying the learning task in a certain situation to do something effectively and efficiently. Ibe (2009) also added that metacognitive strategy in learning was a teaching strategy that could motivate students and provided an opportunity for students to learn, to understand and to organize the information received.

Metacognitive strategy applied to the students can make them become *self-regulated learner*, where by metacognitive strategy they can monitor and control their own learning. According to Corebima (2009) *self-regulated learner* can be empowered or trained through a particular strategy or effort. Livingston (1997) also noted that the increase in students'

metacognitive ability depended largely on the students' ability to learn on their own, and the more capable of self-learning ability they were, the more easily they could develop their metacognition.

Metacognitive strategy which is highlighted in the SSCS + MS model is the *underlining* strategy and *self-assessing*. Underlining texts given indirectly, makes the students monitor their reading comprehension, as revealed by Weinstein and Mayer (1986) that in underlining students select important ideas in the passage. Selecting the important ideas in the text can monitor students' comprehension during reading.

The activities of underlining the ideas in the text provide an opportunity for students to experience *self-directed learning*. Underlining the reading material indirectly trains students to learn independently, filter information and be responsible for their learning. Students who use the above mentioned strategies in their learning activities will also show a better metacognitive skills. Eggen and Kauchak (1996) explained that metacognitive skills helped students becoming *self-regulated learners* who were responsible for their own learning progress and adapted their learning strategies to accomplish the task.

In addition to underlining, the activity of self-assessing is also one of metacognitive strategies given to students as an effort to monitor and evaluate their learning activities before, during and after their learning. The activity of self-assessing makes students learn better. Schraw and Dennison (1994) revealed that students who were skilled in assessing themselves and aware of their capabilities would act more strategically. Peters (2000) also added that the learning emphasizing on self-reflection and knowledge construction might contribute to the metacognitive skills.

SSCS + MS learning model is very useful to be implemented in class as one alternative of learning models which empowers students' metacognitive skills. By implementing SSCS + MS learning model in the classroom, it is expected that the students' high order thinking skills are more empowered. In this case, the ability to solve problems and metacognitive skills is also empowered. Furthermore students' critical and creative thinking skills are empowered too because metacognitive skills are directly related to students' critical and creative thinking skills. Thus, finally, the challenge of learning in the 21st century can be resolved.

## CONCLUSIONS AND RECOMMENDATIONS

### A. Conclusions

The conclusions presented should be viewed in terms of the unfulfilled prerequisite test related to ANCOVA. The results of ANCOVA test show that SSCS + MS learning model has the highest potential to empower students' metacognitive skills compared to the two other learnings. The increase of students' metacognitive skills in the SSCS + MS learning model is 25.58% higher than that of the SSCS learning model and 67.33% higher than that of traditional learning.

### B. Recommendations

The main suggestions in this research are that it is necessary to conduct further research investigating the results of this research, especially related to the unfulfilled prerequisite tests. By the results of this study, the researcher also suggests that teachers use SSCS + MS learning model in the classroom. The SSCS + MS learning model is effective to increase students' metacognitive skills. If the students' metacognitive skills are empowered to be higher, the other thinking skills, such as problem solving, critical and creative thinking skills will also increase, which in turn, it can improve students' learning results.

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