ACADEMICIA: An International Multidisciplinary Research Journal
ISSN: 2249-7137 Vol. 12, Issue 12, December 2022 SJIF 2022 = 8.252
A peer reviewed journal

ENHANCING STUDENTS' ENGAGEMENT IN SCIENCE VIA METACOGNITIVE LEARNING STRATEGY

Cristy E. Cabresos*; Ehlrich Ray J. Magday**

* Secondary School Teacher,
Malinao High School, Malinao,
Banisilan, Cotabato, Philippines
Email id: cabresoscristy@gmail.com

** Faculty, Science Education Department,
College of Education, Central Mindanao University,
University Town, Musuan, Bukidnon, Philippines
Email id: ehlrichray@gmail.com

DOI: 10.5958/2249-7137.2022.00886.2

ABSTRACT

The study investigated the effects of Metacognitive Learning Strategy (MLS) onstudents' engagement in science of MalinaoHigh School, Malinao, Banisilan, Cotabato, Philippines. A quasi-experimental research design involving two intact groups of Grade 7 students exposed to MLS and non- MLS was utilized. An adopted questionnaire was used to determine students' engagement. Independent t-test was used todetermine significant difference of students' learning engagement between groups. Findings of the study revealed that cognitive and affective engagement of bothgroups manifested students are very much engaged in learning science, however, engagement of students in MLS was significantly higher than thosein the non-MLS class. Metacognitive Learning Strategies may be employed to enhance students' engagement in science classes.

KEYWORDS: *Affective Engagement, Cognitive Engagement Metacognitive Learning Strategy, Science Class, Students' Engagement.*

INTRODUCTION

Over the years, the approach to education has undergone significant changes due to innovative frameworks introduced to the Philippine educational system to meet the demands of the ASEAN and as well as global standards. However, the quality of science education has been a long shot concern in the Philippines as reflected on the results of international examinations participated by high school students wherein the performance still ranked in the bottom specifically in Science, Mathematics and Reading. It is a known fact that science is an important subject at all grade levels and understanding its basic concepts leads to an increase in the content knowledge. However, teachers are facing the difficulties of letting students understand scientific principles and still continuously strive to improve their instructional practices to enhance students' conceptual understanding.Engaging students in meaningful applications of their knowledge is a key aspect of both addressing the standards and providing greater access which possibly affect performance. Not only do the standards emphasize the importance of meaningful engagement in real-world tasks, but evidence shows that engagement is strongly related to student performance

on assessment tasks, especially for students who have been typically less advantaged in school settings.

Metacognitive learning strategy is an inquiry-based instruction in which metacognitive activities or metacognitive prompts are incorporated within the phases of 7E learning cycle. Embedding to MLS promotes understanding of scientific ideas through providing lessons that consist of realistic context and sensible application to new situation. Student's' progress is measured according to their needs, and it should occur in rich classroom discourse. Learners often show an increase in self-confidence when they build metacognitive skills which may lead to successful learning.With the new approaches to the secondary education program, the metacognitive learning strategy may help promote students' learning engagement in science.

REVIEW OF RELATED LITERATURE

Metacognitive Learning Strategy

Metacognitive strategies refer to methods used to help students understand the way they learn; in other words, it means processes designed for students to 'think' about their 'thinking'. (Stetson & Associates, 2015). Mitsea & Drigas (2019) emphasized that metacognitive strategies refer to conscious monitoring, sequential processes to control learning, higher order executive skills, decisions learners make before, during and after the learning. It has been proven that the implementation of metacognitive strategies results to higher-order cognitive abilities, attentional and memory control, self-confidence and leads to independent and meaningful learning. Metacognitive skills play an important role in most problem-solving activities faced by students in daily classes (Boyle et al., 2016). Haidar et al., and Kistner et al., as cited by Ellis et al., (2014) highlighted that most significant gains in student achievement result when students are taught the use of metacognitive strategies in explicit ways. Characteristics of explicit teaching include direct instruction, modelling, explaining the benefits of using the strategy, and providing repeated opportunities for using the strategy in guided and independent practice formats. Additionally, Sun (2013) stated that it is recognized students tend to perform better on exams and complete work more efficiently if they possess a wide range of metacognitive skills.

Accordingly, metacognition play a pivotal role in enhancing motivation and performance of students is the crux of all of those studies, which have been conducted so far. Researchers have done painstaking efforts to explore the advantages of using metacognition in an organized way. In educational domains, motivation is measured by observing students' approach and attitude towards their studies. (Iftikhar, 2015).Tanner (2017), stated that while using specific individual assignments to teach students metacognitive strategies is one explicit approach, there are more subtle ways that metacognition can be integrated into the fabric of any course and become part of the everyday language of both teacher and students. This is particularly useful in helping students to become aware of when it is appropriate to apply their own metacognitive strategies—for example, identifying confusions—that they may have learned through previous assignments. when to apply these strategies is hypothetically the point at which they have matured into lifelong learners within their disciplines. Metacognitive skills also have a role in critical thinking and problem solving. If you know what you know and do not know, your metacognitive skills help drive you to obtain the missing information, which we refer to as self-directed or self-regulated learning (Medina & Castleberry, 2017).

Affective Engagement in Science

Affective engagement connotes emotional reactions linked to task investment. The greater the student's interest level, positive affect, positive attitude, positive value held, curiosity, and task absorption (and the less the anxiety, sadness, stress, and boredom), the greater the affective engagement. Based on current research and understanding, we don't know how the three types of engagement interact, and we are not certain which antecedents are linked to which types (Ladd & Dinella, 2009) as cited by Boykin & Noguera, 2011. Additionally, Nadeem, et al., (2014), states that affective engagement provides self-report related to feelings of frustration, boredom, interest, anger, satisfaction; student-teacher relations; work orientation. The affective engagement is characterized by student feelings, attitudes, and perceptions towards the institution. Moreover, affective engagement emphasizes interest and enjoyment, behavioral engagement typically refers to observable time on task (Parsons et al., (2012).Students who lack the competence to perform at a requisite level may end up lower levels of affective engagement. This in turn may lower their level of motivation to continue their work within a music rehearsal setting, which may then lower their overall level of behavioral and/or cognitive engagement. The more disengaged students are, the less likely they are to learn and acquire skills necessary to succeed, which leads to under-achievement and the cycle continues (Pagan, 2018). Learning activities that provide learner choices, develop sociality, are perceived as important to the student and are seen as relevant or related to existing student knowledge are all associated with higher levels of both cognitive and emotional engagement (Manwaring, 2017).

Cognitive Engagement in Science

Cognitive engagement connotes investment aimed at comprehending complex concepts and issues and acquiring difficult skills. It conveys deep (rather than surface-level) processing of information whereby students gain critical or higher-order understanding of the subject matter and solve challenging problems (Boykin & Noguera, 2011). Additionally, Chapman as cited by Nadeem, et al., (2014) stated that cognitive engagement is defined as the extent to which students are taking interest, paying attention and spending mental effort in learning tasks by using cognitive strategy and knowledge to complete a task. Moreover, Rotgans & Schmidt (2011), defined cognitive engagement as the extent to which students' are willing and able to take on the learning task at hand and point out that cognitive engagement in the classroom can be characterized as a psychological state in which students put in a lot of effort to truly understand a topic and in which students persist studying over a long period of time. Furthermore, cognitive engagement is the extent to which students are able to take on the learning task. This includes the amount of effort students are willing to invest in working on the task (Sesmiyanti, 2018).

Cognitive engagement is really important to influencing a learner's active use of purposeful in classroom learning and by using this engagement the students can be motivated, interested and interactive to follow studying in the classroom. Thus, students' engagement is really significant in learning process because they want to get feedback from instruction who give from their teacher, and known student's efforts to learn and also to motivate students work in classroom activity (Sesmiyanti, 2018). Students who exhibit behaviors that allow them to master academic work are seen to have deep cognitive engagement, while students who exhibit behaviors such as rote memorization and rituals, they perceive will help them to do well without developing mastery of the material are demonstrating shallow engagement. Fredricks et al., as cited by Davis (2010), indicated that inclusion of cognitive engagement makes an important distinction

between students' efforts to simply do the work and effort that is focused on understanding and mastery students who are cognitively and behaviorally engaged will attend to the task at hand and simultaneously manage their learning.

SIGNIFICANCE OF THE STUDY

This study is an endeavor to provide essential data on the effectiveness of Metacognitive Learning Strategies on Students' Engagement in Science that is of value to students and teachers. The study would give students the opportunity to construct knowledge by themselves through metacognitive learning activities and gives them the opportunity to practice active participation in their thinking process as it elevates experience and may lead to higher conceptual understanding. Empowering students to have control over how they process, retain and make use of the information they learn in the classroom can be translated to real life applications of the scientific concepts and principles. This work also serves as basis for teachers to come up with innovative features in embedding metacognitive learning activities in teaching science content that will cater to the needs of students. They may design pedagogical activities that incorporates metacognition as an integral aspect of teaching to achieve better conceptual understanding.

OBJECTIVES AND HYPOTHESIS

The study aimed to 1) determine the level of students' engagement in Science as exposed to metacognitive learning strategy and non-metacognitive learning strategy in terms of theira. affective and b) cognitive domain; 2) find out if there is a significant difference in students' affective and cognitive level of engagement in Science as exposed to metacognitive learning strategy and non-metacognitive learning strategy. The null hypothesis is stated as "There is no significant difference on students' affective and cognitive engagement when exposed to metacognitive learning strategy and non-metacognitive learning strategy."

RESEARCH METHODOLOGY

This study utilized the quasi-experimental research design involving two heterogeneous intact groups, namely: the experimental group exposed to metacognitive learning strategy and the control group exposed to non-metacognitive learning strategy. Two (2) intact Grade 7 sections with forty (40) students each in Malinao High School, Malinao, Banisilan, Cotabato served as the participants of the study. A survey questionnaire developed by Appleton et al., (2005) on assessing students' engagement toward science learning was adopted for the purpose of this study.

The five (5) point Likert scale was used to analyze the students' engagement in learning Grade 7 Science. The following scale was used during the interpretation of data:

The student's engagement toward Science was	Range	Qualitative Description	Qualitative Interpretation
	4.20 – 5.00	Strongly Agree	Highly Engaged
	3.40 – 4.19	Agree	Very Much Engaged
	2.60 – 3.39	Undecided	Moderately Engaged
	1.80 – 2.59	Disagree	Less Engaged
	1.00 – 1.79	Strongly Disagree	Not Engaged at all

administered to the students after the actual activities of Grade 7 science class utilizing 7E learning model for evaluating the engagement manifested by students during the metacognitive learning strategy.Descriptive statistics such as mean, percentages and standard deviation were employed to determine the students' engagement as exposed to metacognitive learning strategy and non-metacognitive learning strategy. T-test for independent samples was utilized to determine any significant difference between students' engagement under study.

RESULTS AND DISCUSSION

On Affective Engagement

Table 1 presents the level of affective engagement in science, mean scores and qualitative interpretation of students exposed to metacognitive learning strategy and non-metacognitive learning strategy.

As shown, students exposed to MLS group obtained an over-all mean score of 3.90 while those students exposed to non-MLS group has an over-all mean of 3.75 both indicated "very much engaged".

TABLE 1. STUDENTS' AFFECTIVE ENGAGEMENT IN SCIENCE

		GROUP			
Affective Engagement Towards Science		MLS n=40		non-MLS n=40	
Indicator		Mean	QI	Mean	QI
1.	Overall, my science teacher is open and honest with me.	3.98	Very Much Engaged	3.60	Very Much Engaged
2.	My science teacher is there for me when I need him.	4.23	Highly Engaged	4.00	Very Much Engaged
3.	The class rules are fair.	3.90	Very Much Engaged	3.65	Very Much Engaged
4.	My science teacher is open to any questions when we are in doubt	3.98	Very Much Engaged	3.78	Very Much Engaged
5.	When something good happens at school, my family/guardian(s) want to know about it.	3.88	Very Much Engaged	3.68	Very Much Engaged
6.	My classmate care about me.	3.78	Very Much Engaged	3.63	Very Much Engaged
7.	My family/guardian(s) are there for me when I need them.	4.13	Very Much Engaged	3.95	Very Much Engaged
8.	I have some friends in our class.	4.15	Very Much Engaged	4.10	Very Much Engaged
9.	My classmates are there for me when I need them.	3.90	Very Much Engaged	3.38	Moderately Engaged
10.	My classmate like me the way I am.	3.45	Very Much Engaged	3.45	Very Much Engaged
11.	Overall, my science teacher at my school treat students fairly.	4.13	Very Much Engaged	3.73	Very Much Engaged

12.	My classmate respect what I have to say.	3.33	Moderately Engaged	3.15	Moderately Engaged
13.	I enjoy talking to my science teacher.	3.80	Very Much Engaged	3.75	Very Much Engaged
14.	I feel safe at school.	4.00	Very Much Engaged	4.25	Highly Engaged
15.	In our class, my science teacher care about the students.	4.03	Very Much Engaged	3.98	Very Much Engaged
16.	My family/guardian(s) want me to keep trying when things are tough at school.	3.33	Moderately Engaged	3.38	Moderately Engaged
17.	When I have a problem at school, my family/guardian(s) are willing to help me.	3.78	Very Much Engaged	3.30	Moderately Engaged
18.	I enjoy talking to my classmate.	4.25	Highly Engaged	4.38	Highly Engaged
19.	My science teacher at my school is interested in me as a person, not just a student.	4.30	Highly Engaged	4.13	Very Much Engaged
	OVER-ALL MEAN	**3.90**	**Very Much Engaged**	**3.75**	**Very Much Engaged**

Based on the result, students displayed positive affective engagement in science when they feel that the learning environment is safe and the people they interact with genuinely values and helps them.Fredricks et al., as cited by Capella et al., (2013) noted that students are committed to or involved in school, and represents daily interactions between students and their learning contexts. Similarly, Abdullah et al., (2012) stated that classroom environment will stimulate learning and makes both the instructor and students feel satisfied, which eventually leads to effective learning process. This result may be attributed to students thinking that their classmates will think they are stupid or that they are slow learners. They think other students will make fun of them as no one else has doubts about the concept and only they cannot understand the simple topic (Khan, 2018). In addition, (Center, 2019) found out that in some instances, students act rudely to test the instructor, to flex their own intellectual muscle, or to show off to classmates.

On Cognitive Engagement

As shown in Table 2, students exposed to MLS group obtained an over-all mean score of 4.08 while those students exposed to non-MLS group has an over-all mean of 3.81 both indicated "very much engaged".

TABLE 2. STUDENTS' COGNITIVE ENGAGEMENT IN SCIENCE

	GROUP			
COGNITIVE ENGAGEMENT TOWARDS SCIENCE	MLS n=40		non-MLS n=40	
Indicator	Mean	QI	Mean	QI

1.	When I do well in our science class it's because I work hard.	3.80	Very Much Engaged	3.68	Very Much Engaged
2.	Going to school after high school is important.	4.40	Highly Engaged	3.88	Very Much Engaged
3.	I'll learn, but only if my family/guardian(s) gives me a reward. *	3.88	Very Much Engaged	3.70	Very Much Engaged
4.	I'll learn, but only if the science teacher gives me a reward. *	3.95	Very Much Engaged	3.73	Very Much Engaged
5.	The grades of my science class do a good job of measuring what I'm able to do.	4.08	Very Much Engaged	3.73	Very Much Engaged
6.	I plan to continue my education following high school.	4.53	Highly Engaged	4.00	Very Much Engaged
7.	Learning science is fun because I get better at something.	4.45	Highly Engaged	3.90	Very Much Engaged
8.	What I'm learning in my science class will be important in my future.	4.25	Highly Engaged	4.08	Very Much Engaged
9.	The science tests in my class do a good job of measuring what I'm able to do.	4.05	Very Much Engaged	3.93	Very Much Engaged
10.	Science is important for achieving my future goals.	4.30	Highly Engaged	4.03	Very Much Engaged
11.	Learning science will create many future opportunities for me.	4.15	Very Much Engaged	4.00	Very Much Engaged
12.	Most to what is important to know about science you learn in class.	4.08	Very Much Engaged	3.93	Very Much Engaged
13.	When I do science activities, I check to see whether I understand what I'm doing.	3.83	Very Much Engaged	3.75	Very Much Engaged
14.	After finishing my science activities, I check it over to see if it's correct.	3.85	Very Much Engaged	3.48	Very Much Engaged
15.	I feel like I have to say about what happens to me in our science class.	3.78	Very Much Engaged	3.60	Very Much Engaged

16.	I am hopeful about my science class.	3.93	Very Much Engaged	3.58	Very Much Engaged
	OVER-ALL MEAN	**4.08**	**Very Much Engaged**	**3.81**	**Very Much Engaged**

As displayed in Table 2, students in the MLS group rated "strongly agree" on five (5) items and "agree" on the eleven (11) items, while students in the non-MLS group rated "agree" on all items.Based on the results, students' view the need for science as integral component of their education. In the new K to 12 curriculum where science is arranged in a spiral progression, it is imperative that students continue to be engaged cognitively as they learn the different science concepts in every grade level.*Data findings of Pezaro (2016) supports the present result that teachers are* best placed to make decisions about learning *goals* for *their students*, and how best to *achieve* them, drawing on *their* professional and expert knowledge of individual *students*, classroom dynamics, and learning environments, as well as a range of evidence about learning and practice. Moreover, school students are naturally curious, which makes science an ideal subject for them to learn. Science allows students to explore their world and discover new things. It is also an active subject, containing activities such as hands-on labs and experiments. This makes science well-suited to active younger children. Science is an important part of the foundation for education for all children (Das et al., 2014).

Table 3 presents students' affective engagement between groups. MLS exhibited a mean score of 3.90 while 3.74 in non-MLS with a t-value of 2.613 (p=000). These datafindings indicate highly significant results which means groups differ significantly with each other.

TABLE 3. COMPARISON OF STUDENTS' AFFECTIVE ENGAGEMENT IN SCIENCE

GROUP	MEAN	SD	t-Value	Probability
MLS	3.9079	.32548	2.613	.000**
Non-MLS	3.7487	.20626		

***significant at 0.01 level*

Thus, the null hypothesis stating that there is no significant difference in the students' affective engagement level when exposed to metacognitive learning strategy and non-metacognitive learning strategy is rejected.This conforms to the study Zepeda et al., (2015) that highlights the importance of metacognitive skills as they demonstrate that direct instruction and practice of multiple metacognitive skills can improve metacognitive monitoring, learning, transfer, and motivational outcomes. Similarly, Soesilawaty et al., (2019) concluded that there is a positive relationship between metacognitive skills and cognitive learning outcomes of students. Moreover, Milis (2016) concluded that metacognition is a complex but valuable skill that can nurture students' learning and their self-awareness of the learning process.

Table 4 shows that there is a significant difference in the students' level of cognitive engagement towards Science when expose to MLS and non-MLS (p=0.00). MLS mean (4.0797) and non-

MLS mean (3.8094) with a t-value of 3.695. Thus, the null hypothesis stating that there is no significant difference in students' cognitive engagement after the exposure to metacognitive learning strategy and non-metacognitive learning strategy is rejected.

TABLE 4. COMPARISON OF STUDENTS' COGNITIVE ENGAGEMENT IN SCIENCE

GROUP		MEAN	SD	t-VALUE	Probability
MLS					
	Posttest	4.0797	.30124	3.695	.000**
NON-MLS					
	Posttest	3.8094	.35127		

***significant at 0.01 level*

Metacognition is an important aspect of learning because it is related to conceptual change, enables longer retention, and broader material applications, and is a significant predictor of academic success (Gabrijela & Velki, 2012). Additionally, metacognitive has also become an important element in the efforts of students to gain a deep understanding of the concepts in science and skill in problem solving (Cook et al., 2013).

CONCLUSIONS AND RECOMMENDATIONS

After the implementation of Metacognitive Learning Strategies, students' in both groups were very much engaged in learning science and showed similar level of engagement in both affective and cognitive domains. Thus, engagement is an important element to be considered by teachers in the process of learning. However, there is significant difference on students' engagement in Science between MLS and non-MLS groups in affective and cognitive domains in favor of the MLS group. Science educators may apply a variety of metacognitive learning strategies in classroom instruction to develop students' affective and cognitive engagement. Furthermore, teachers are encouraged to prepare meaningful activities that can promote interaction among students, giving them the opportunity work in groups and manage their own learning.Science educators may apply a variety of metacognitive learning strategies in classroom instruction to develop students' affective and cognitive engagement. Furthermore, teachers are encouraged to prepare meaningful activities that can promote interaction among students, giving them the opportunity work in groups and manage their own learning.

REFERENCES

1. Abdullah, M.Y., Bakar, N. & Mahbob, M.H. (2012). Student's participation in classroom: What motivates them to speak up? *Procedia – Social and Behavioral Sciences*, 51(2012) 516 – 552.

2. Appleton, J., Christenson, S., Kim, D. & Reschly, A. (2005). Measuring cognitive and psychological engagement: *Validation of the Student Engagement Instrument. Proquest LLC.* 438-439.

3. Boykin, W. & Noguera, P. (2011). Chapter 3. Engagement. *Creating Opportunity to Learn*. Retrieved from http://www.ascd.org/publications/books/107016/chapters/Engagement.aspx

4. Boyle, J., Rosen, S., & Forchelli, G. (2016).Exploring metacognitive strategy use during note-taking for students with learning disabilities. *Education 3–13*, Vol. 44, No. 2, 161–180. Retrieved from http://dx.doi.org/10.1080/03004279.2014.929722

5. Cappella, E., Kim, H.Y., Neal, J., & Jackson, D. (2013). Classroom peer relationships and behavioral engagement in elementary school: The role of social network equity. *Am J Community Psychol*. 2013 Dec; 52(0): 367–379. doi: 10.1007/s10464-013-9603-5

6. Center, E. (2019). Students are intentionally challenging the instructor's authority. *Carnegie Mellon Univerisity*. Retrieved from https://www.cmu.edu/teaching/solveproblem/stratbehaverudely/index.html

7. Das, N., Amrita. & Singh, A. (2014). Importance of science in school curriculum. *We School Knowledge Builder - The National Journal*. Volume -2 | 2014 | ISBN 1-63102-454-X

8. Davis, H. (2010). What does it mean for student to be engaged? Retrieved from https://www.corwin.com/sites/default/files/upmbinaries/50258_Davis___An_Interpersonal_Approach_to_Classroom_Management_CH1.pdf

9. Ellis, A., Denton, D., Bond, J. (2017). An analysis of research on metacognition teaching strategies. *Procedia-Social and Behavioral Science*. 116 (2014) 4015 – 4024. 5th World Conference on Educational Science – WCES 2013.

10. Firdaus, F., Priatna, N., & Suhendra S. (2017). An implementation of 7E learning cycle model to improve student self-esteem. *Journal of Physics:* Conf Series 895 (2017) 012084.

11. Khan, A. (2018). Why students do not ask their doubts from teachers? Retrieved from *www.jagranjosh.com*

12. Manwaring, K. (2017). Emotional and Cognitive Engagement in Higher Education Classrooms. *Proquest LLC.* p. 82-83.

13. Mitsea, E. & Drigas, A., (2019). A journey into the metacognitive learning strategies. ***International Journal of Online and Biomedical Engineering (iJOE)*** –eISSN: 2626-8493. Vol 15, No 14. https://www.researchgate.net/publication/336833456

14. Medina, M.S., Castleberry. A.N. & Persky A.M. (2017). Strategies for improving learner metacognition in health profession education. Am J Pharm Educ. 2017 May;81(4):78.

15. Nadeem, H.A., Mehmood, D. E., & Haider, I., (2014). Cognitive and affective engagement in a comparative perspective: an evidence of formal and non-formal post graduate students. *School Education Department, Punjab.*

16. Pagán, J. (2018). Behavioral, Affective, and Cognitive Engagement of High School Music Students: *Relation to Academic Achievement and Ensemble Performance Ratings.* Proquest LLC. p. 48.

17. Parsons, S., Parson, A.W., Burrowbridge, S.C., & Malloy, J., (2012). Students' affective engagement in literacy tasks: Observations of and interviews with sixth-grade students. *ResearchGate*. https://www.researchgate.net/publication/267099237

18. Pezaro, C. (2016). The role of a teacher and the purpose of education. *Science of Learning.*https://npjscilearncommunity.nature.com/users/19567-charlotte-pezaro/posts/13089- the-role-of-a-teacher-and-the-purpose-of-education

19. Rotgans, J., & Schmidt, H., (2011). Cognitive engagement in the problem-based learning classroom. Advances in Health Sciences Education. *Adv Health Sci Educ Theory Pract*. 2011 Oct; 16(4): 465–479

20. Sesmiyanti, S. (2018). Student's cognitive engagement in learning process. *Pendidikan Bahasa Inggris, STKIP PGRISumatera Barat.* 2500. Indonesia. E-ISSN : 2252 – 4792 Volume 5 –No.2 2016

21. Stetson & Associates. (2015). Metacognitive strategies. *Inclusive Schools Network. 14343-G Torry Chase Blvd. Houston, Texas 77014.* https://inclusiveschools.org/metacognitive-strategies/

22. Sun, L. (2013). The effect of metacognitive learning strategies on English learning. *Theory and Practice in Language Studies*, Vol.3, No. 11, pp.2004-2009

23. Susantini, E., Isnawati, I., & Indana, S. (2018). Using metacognitive strategy to teach learning strategies: A study of Indonesian pre-service biology teachers. *The New Educational Review* 52(2):258-268

24. Tanner, K. (2017). Promoting student metacognition. *CBE-Life Science Education.* Vol. 11. No. 2. https://doi.org/10.1187/cbe.12-03-0033