TÜRK FEN EĞİTİMİ DERGİSİ
Yıl 15, Sayı 2, Haziran 2018

Journal of
TURKISH SCIENCE EDUCATION
Volume 15, Issue 2, June 2018

http://www.tused.org

# Improving Students' Metacognitive Skills through Science Learning by Integrating PQ4R and TPS Strategies at A Senior High School in Parepare, Indonesia

Henny SETIAWATI[2], Aloysius Duran COREBIMA[2]

[1] Biology Department, Faculty of Teacher Training and Educational, University of Muhammadiyah Parepare, INDONESİA
[2] Biology Department, Faculty of Mathematics and Natural Science. State University of Malang, Malang, INDONESİA

**Received:** 03.11.2016 **Revised:** 06.06.2017 **Accepted:** 16.10.2017

The original language of article is English (v.15, n.2, June 2018, pp.95-106, doi: 10.12973/tused.10233a)

## ABSTRACT

Metacognitive skills can be developed through the implementation of appropriate learning strategy. This research of pretest-posttest nonequivalent control group design was designed to compare the effects of PQ4R, TPS, PQ4R-TPS, and conventional learning on the metacognitive skills of senior high school students class X in the first semester of 2013 in Parepare, Indonesia. The research samples consisted of 240 students, selected using random sampling technique. The metacognitive skills were measured by an essay test developed by the researchers, validated by experts, and empirically validated before the instrument was used, by trying out the instruments at 40 students of class XI. The research findings show that PQ4R-TPS learning strategy is significantly more potential in empowering students' metacognitive skills compared to the other learning. PQ4R-TPS learning strategy needs to be implemented, accustomed to, and continuously trained to the students in order to improve their metacognitive skills.

**Keywords:** metacognitive skills, PQ4R learning, sains learning, TPS learning.

## INTRODUCTION

Metacognitive skill is one of the high-level thinking skills that students require to face the challenges ahead. Corebima (2009) stated that the empowerment of thinking and metacognitive skills is needed in order that the students became independent learners. Independent learners organize themselves to be more actively trying to develop themselves and to determine the learning objectives, to motivate themselves and to find purpose with the strategy that has been planned (Jahiddin, 2009). In addition, Thamraksa (2005) stated that students having good metacognition could monitor and directed their own learning process, had the ability to control the information, and implemented learning strategies to solve various problems.

Metacognition generally gives an emphasis on the awareness of one's thinking about his own thinking process (Fisher, 1998). According to Flavell (1976), metacognition refers to

Corresponding author e-mail: durancorebima@gmail.com

metacognitive knowledge and metacognitive experiences. Metacognitive knowledge refers to the knowledge or belief about the factors controlling one's cognitive processes. Flavell (1976) classified metacognitive knowledge into 3 variables i.e., individual variable, task variable, and strategy variable. The individual variable refers to the knowledge of oneself as a thinker, meaning that all our behavior is the results of the way we think. The task variable refers to the knowledge or all information about the nature of the tasks proposed, guiding the individual in managing tasks. The strategy variable refers to the knowledge of how to do something or to overcome the existing difficulties.

According to Garner (1987), Schraw and Dennison (1994), and Peirce (2003), metacognitive knowledge plays a role in learning and problem solving. Furthermore, metacognitive knowledge consists of 3 components, i.e., declarative knowledge, procedural knowledge, and conditional knowledge.

Declarative knowledge is the knowledge about oneself, and about the strategies, skills, and learning resources needed to learn (Garner 1987), and it is a factual information known by someone (Peirce, 2003). Declarative knowledge refers to the student's ability to accurately evaluate their saved knowledge in the form of facts, rules, or other knowledge that can efficiently be used to communicate their ideas (Stuever, 2007). To understand a learning material, students need to associate their knowledge related to "about," "what," and "that" related to something.

Procedural knowledge refers to the use of anything known in declarative knowledge and its application in learning activities. Procedural knowledge is the knowledge of how to do something and how to do the stages of a particular process. In other words, procedural knowledge refers to "how" to do something.

Conditional knowledge is the knowledge related to when to use a procedure, a skill or a strategy and when those things should not be used, why a procedure takes place and under what conditions the procedure takes place, as well as why the procedure is better than the other procedures. Conditional knowledge refers to the "why" and "when" the cognitive aspects used (Garner, 1987; Peirce, 2003; Stuever, 2007).

In addition to cognitive knowledge, metacognition also refers to metacognitive experience. Metacognitive experience is the monitoring that guides the achievement of cognitive objectives. This process helps to organize and to manage the learning which consists of planning, monitoring, and evaluating cognitive activities (Livingston, 1997). Similarly, Stuever (2007) stated that metacognitive experience helped students relating new information with their prior knowledge to determine their level of understanding, then the students effectively selected and organized strategies facilitating the task. Metacognitive experience helps to organize and monitor the learning which consists of planning and monitoring cognitive activities, and evaluating the results of these activities.

Similarly, Flavell, Hammond, et al. (2000) also stated that there were two aspects of metacognition: 1) reflection of thinking about what we knew, and 2) self-control in managing how we learned. The ability to develop metacognition can make us become reflective learners, as well as the learners who acquire specific learning strategies.

In addition to metacognitive knowledge, one of the metacognition components is metacognitive skills (Desoete, 2001). These skills are required for active learning, critical thinking, reflective assessment, problem solving, and decision making (Dawson, 2008). According to Lee and Baylor (2006), metacognitive skills consist of four keys, namely planning, monitoring, evaluation, and revising.

Planning is an activity that is carefully carried out in order to organize the whole learning process. The planning activities include determining the learning objectives, learning steps, learning strategies, and learning expectations. Monitoring is an activity that regulates and monitors learning activities and learning progress. Evaluation is the activity to evaluate

self-learning process that includes assessing the progress of learning activities. Revision is the activity to revise the self-learning process that includes modifying the plan of previous objectives, strategies, and other learning approaches.

Students' metacognitive skills refer to the prediction skills, planning skills, monitoring skills, and evaluation skills (Veenman, 2006). Similarly, Hammond et al. (2000), stated that metacognitive skills had an important role in many types of cognitive activities including comprehension, communication, attention, retention, and problem solving. Thus, the metacognitive skills possessed by students can help to direct their own learning. Metacognitive skill plays an important role in determining the success of learning, so teachers need to teach metacognitive strategies to students (Djuanda, 2016). The research findings by Bahri and Corebima (2015) showed that metacognitive skills had a contribution on students' cognitive learning results.

*The Role of Metacognitive skill in Learning*

Empowering metacognition in the classroom encourages students to develop their metacognitive awareness, for example, starting with making their learning objectives and clear performance objectives. According to Chikmiyah (2012), metacognition was an ability that significantly increased the effect of learning, which could be considered to be empowered in learning.

The empowerment of metacognition is very important for students. AAAS (American Association for the Advancement of Science) in 2011 expressed that metacognition in biology learning in the 21st century required learning how to integrate the concepts at all levels of organization and complexity, as well as synthesized information related to conceptual domain. The empowerment of students' metacognitive skills aims at enabling the students to understand how they think about biology, like how biologists think (Tanner 2012). Metacognitive skills are required when customary responses are not successful. Guidance in recognizing and practice in applying the metacognitive strategies will help students successfully solve problems throughout their lives.

Metacognition helps students to become independent learners who can manage and plan their learning process. Livingston (1997) stated that metacognition had a very important role for successful learning. Similarly, Schraw & Dennison (1994), stated that students who skillfully made an assessment of themselves were aware of their ability, performed more strategically, and were better than those who were not skillful.

According to Hammond, et al. (2000), as an educator, it is important for us to help encourage the development of students' metacognitive skills that will help them learn how to learn. The facts show that the students are not skilled, or they fail at using metacognitive skills. If one of the school purposes is to prepare students to become lifelong learners, it is important to help them use their metacognitive skills.

According to Anderson and Krathwohl (2001), metacognition is advantageous for students to: (1) be more aware of and responsible for their own knowledge and ideas; (2) be able to think and solve problems; (3) identify the various types of metacognitive in planning, monitoring and regulating their cognition; (4) determine learning strategies that can be used to search for the meaning of texts and understand the subject matter in the classroom or from books; and (5) prepare themselves for tests. Similarly, according to Keiichi (2000), metacognition plays an important role in solving problems and makes students more skillful at problem solving through their cognitive knowledge.

Teachers can empower students' metacognitive skills in the learning process. According to Lin et al. (2005), future teachers should empower students' metacognitive skills in learning at all costs. Similarly, Corebima (2010) stated that the empowerment of students'

metacognitive skills could be done during the learning process, either through the habituation of metacognitive learning strategies or through the implementation of appropriate learning strategies. Metacognitive skill training can increase the students' awareness to learn, make a learning plan, control the learning process, evaluate their effectiveness, strengths and weaknesses as a student. Djuanda (2016) stated that teachers were obliged to activate the learning engaging students to reflect on their learning activities. Students should be encouraged to plan and determine the learning objectives clearly, choose the appropriate learning strategies with their learning styles, monitor and evaluate his performance accomplished.

In this regard, some of the previous research results showed that metacognitive skills could be improved by using the appropriate learning strategies. Corebima and Idrus (2006) reported that Thinking Empowerment by Questioning (TEQ) and Think Pair Share (TPS) learning strategies could improve students' thinking skills at the junior high school level. Danial (2010) also stated that there was a correlation between metacognitive skills and the concept mastery. Sepe (2010) found that Team Assisted Individualization (TAI) cooperative learning strategy improved metacognitive skills. Chikmiah (2012) stated that learning strategy significantly improved metacognitive skill and might be considered for its' empowerment in the learning activities. In addition, the research by Suratno (2009) and Muhiddin (2012) stated that Jigsaw learning strategy had an effect on students' metacognitive skills. The research results by Paidi (2008), Bahri (2010), Corebima (2010), and Tumbel (2011) also found that learning strategies had an effect on metacognitive skills.

The learning strategies that can be used to improve students' metacognitive skills include PQ4R (preview, questions, read, reflect, recite, review) and TPS strategies. These learning strategies can be integrated by considering the appropriateness of the learning syntax.

PQ4R learning strategy is considered as one of the learning strategies that has an effect on the empowerment of students' metacognitive skills. The results of the related research, like those reported by Wahyuningsih (2012), Ramdiah and Corebima (2014), Bibi and Manzoor (2011), stated that PQ4R strategy improved students' metacognitive skills.

PQ4R Learning strategy centers on the students, so that students can build their own knowledge. The research by Maesah et al. (2012) reported that the implementation of the PQ4R learning process improved students' learning results, indicated by various indicators of achievement such as achievement test. Related to the use of PQ4R the similar findings were also reported by Wahyuningsih (2012) stating that the good and correct activity of reading makes the students able to take the main points of what they read. The more main points they can understand from the reading material read, the more knowledge they gain, and it will greatly help students to establish a comprehensive understanding. Ramdiah and Corebima (2014) also reported that PQ4R strategy integrated with concept maps appeared to have higher potential in improving students' metacognitive skills.

TPS learning strategy is also potential in improving the students' metacognitive skills. The results of the previous research related to this strategy reported that TPS learning strategy helped in empowering metacognitive skill (Stuever, 2006; Miranda, 2010), and provided an opportunity for students to train their thinking skill and finally gave meaningful knowledge that could improve students' learning results Widodo (2011). Similarly, Ngozi ibe (2009) stated that TPS strategy involved the students to think independently through the procedures taking place in it.

PQ4R strategy is easy to be applied at all levels of education, and it is able to assist students improve their questioning skills and communicate their knowledge. Similarly, the TPS strategy, one of the cooperative learning strategy, can optimize students' participation and empower students' metacognitive skills. Huda (2012) stated that TPS strategy was simple, but very useful. TPS learning strategy follows the steps of thinking, discussing in

pairs, and sharing the results of the discussion to all students in the classroom. The results of the discussion are a concept constructed by students.

Based on the potential of PQ4R and TPS strategy mentioned above, the integration between PQ4R and TPS, referred to PQ4RTPS, can be implemented in learning activities. Both of these strategies are potential to improve students' metacognitive skills as they both play a role in empowering effective problem solving skills. In addition, students gain an understanding of the learning material presented, ask questions, read, connect information, create a new understanding by themselves, carry out evaluation, and make conclusions.

The empowerment of metacognitive skills in senior high schools in Parepare has not been generally carried out yet. It can be seen from the results of the survey conducted by researchers showing that the empowerment of students' metacognitive skills is still lacking, even the teacher's knowledge related to the empowerment of thinking skills in biology learning is still limited. Djuanda (2016) reported similar findings that there were a lot of teachers who did not understand the metacognitive strategies, so that they had not taught and conducted any activities promoting the activation of students' metacognitive strategies consciously and deliberately.

Based on the elaboration above, this research aims at determining the potential of PQ4RTPS strategy in empowering students' metacognitive skills. This information is very valuable for teachers to select appropriate learning strategies that focus not only on the cognitive learning but also on the empowerment of students' thinking skills..

## METHODS

This is a quasi-experimental study designed to compare the effect of metacognitive skill of students in the first semester of Class X of senior high school in Parepare, Indonesia in 2013. The research design was pretest-posttest control group design (Fraenkel & Wallen, 2009). Four classes used in this research were treated with different learning, namely the PQ4R, TPS, PQ4RTPS, and the conventional learning. The class samples were selected by random sampling. The samples of this research consisted of 240 students of class X Senior High School in Parepare, Indonesia, having homogeneous academic ability based on the grouping test. The students' metacognitive skills were measured by *essay* tests developed by researchers and validated by experts and empirically validated before the tests were used. The empirical validation was done by trying out the instruments at 40 students of class XI. The try out was carried out to determine the validity and reliability of the instruments. The rubric of metacognitive skills used referred to Metacognitive Achievement Description rubric consisting of 7 scales (0-7) (Corebima, 2009). The four classes were taught by using different learning strategies for one semester, and then they were given a final test. Furthermore, the data were analyzed by Ancova with a significance level of 5%, supported by the program of SPSS 20 for Windows. If the results of ancova were significant, it would be analyzed further with the post hoc LSD test. The treatment procedures based on the research design is shown in Table 1.

**Table 1.** *Design of quasi-experimental Research*

| Pretest | Group | Posttest |
|---|---|---|
| $T_1$ | $X_1$ | $T_2$ |
| $T_3$ | $X_2$ | $T_4$ |
| $T_5$ | $X_3$ | $T_6$ |
| $T_7$ | $X_4$ | $T_8$ |

$T_1$, $T_3$, $T_5$, and $T_7$: Pretest
$T_2$, $T_4$, $T_6$, and $T_8$: Posttest
$X_1$: PQ4R strategy, $X_2$: TPS strategy , $X_3$: PQ4R-TPS strategy, $X_4$: Conventional learning

## FINDINGS

The results of Ancova test related to students' metacognitive skills are shown in Table 2, and the results of post hoc test are shown in Table 3.

**Table 2.** *The Results of Ancova Test on the Students' metacognitive Skills*

| Source | Type III Sum of Squares | df | Mean Squares | F | Sig. |
|---|---|---|---|---|---|
| corrected Model | 50642.678 [a] | 4 | 12660.669 | 1.188E3 | 0.000 |
| intercept | 373.681 | 1 | 373.681 | 35.059 | 0.000 |
| XMetacog | 16087.206 | 1 | 16087.206 | 1.509E3 | 0.000 |
| Strategy | 851 925 | 3 | 283.975 | 26.643 | 0.000 |
| Error | 1609.454 | 151 | 10.659 | | |
| Total | 601237.377 | 156 | | | |
| corrected Total | 52252.132 | 155 | | | |

**Table 3.** *The Results of post hoc Test of the Effect of Learning on Students' metacognitive Skills*

| Learning | Posttest Mean Scores | Posttest Mean Scores | Gain | Corrected Mean Score | LSD Notation |
|---|---|---|---|---|---|
| PQ4RTPS | 62.356 | 75.914 | 13.558 | 66.293[a] | a |
| PQ4R | 52.129 | 63.785 | 11.657 | 61.760[a] | b |
| TPS | 51.904 | 63.167 | 11.263 | 61.308[a] | b |
| CONV | 32 | 35.476 | 3.476 | 48.400[a] | c |

The results of Ancova related to the students' metacognitive skills show that learning strategies have an effect on students' metacognitive skills ($p < 0.05$). The results of LSD test show that the corrected mean score of the metacognitive skills of the students taught by using the integration of PQ4R-TPS is significantly higher than those taught by using PQ4R, TPS, and conventional learning; the corrected mean score of the PQ4R is not significantly different from the that of TPS learning.

## DISCUSSION and CONCLUSION

The findings of this research reveal that the integration of PQ4R-TPS had the potential to improve students' metacognitive skills than if it is separately implemented. The implementation of the integration of PQ4R-TPS learning strategy can improve students' metacognitive skills because of, for instance, the combination of learning syntax of PQ4R-TPS. The syntax of PQ4R learning consists of six steps, namely Preview, Question, Read, Reflect, Recite, Review which gradually guide each student to use their metacognitive skills. According to Logsdon (2007) and Rodli (2015), each step of PQ4R learning strategy encourages students to use their metacognitive skills. Similarly, the TPS learning, as a type of cooperative learning, can empower students' metacognitive skills. TPS learning consisting of the stages of thinking, paired discussion, and sharing to all students is the factor which increases the potential of PQ4R strategy so as to minimize time, to coordinate through groups, and to activate all students in the classroom.

Furthermore, the implementation of the integration of PQ4R-TPS learning contributes to the improvement of metacognitive skills, which can be seen from the learning syntax. Stage "P" (preview), as the beginning of this activity, is the stage where the students read learning material quickly by identifying titles, subtitles, or parts that are considered important. Through the preview, the students already have an idea of the things they are learning (Bibi

and Manzoor, 2011). At this stage, the students already use their metacognitive skills through planning and prediction skills.

In relation to "Q" (question) stage students formulate questions developed from a simple question to the complex question. The questions include what, who, where, when, why, and how questions. The questions were developed toward the formation of declarative, structural, and procedural knowledge (Bibi and Manzoor, 2011). Moreover, formulating the questions was also done by using the previously owned knowledge (Logsdon, 2007) encouraging students to think at a higher level (Rogers, 2006).

The reading activity on the "R" (read) stage is the act of reading in more detail and comprehensive ways with the purpose of finding the answers to the questions that have been formulated (Logsdon, 2007). At this stage, the students record the important parts that become their prediction of answers to the questions formulated. This reading is the process of thinking (Khattack & Khan, 2002) because in reading we do not only read the text, but also try to understand what we read (Leipzig, 2001).

While reading, students should make a reflection or "R" (reflect). This activity encourages the development of students' horizons because the students try to understand what they are reading by connecting the reading materials with their prior knowledge, connecting sub topics with concepts, and connecting the reading materials with the existing information (Logsdon, 2007).

The next activity is "R" recite or question and answer themselves. This stage involves the students' thinking skills to recap the information that has been understood. They then formulate concepts, explain the relationship between these concepts, and write back with their own editorial (Huber, 2004).

The final stage of PQ4R strategy is a review. Logsdon (2007) stated that at this stage students wrote a summary of the information they understood. This activity encourages students to think by reviewing the learning material.

The integration of PQ4R-TPS learning strategies is believed to be more potential in empowering students' metacognitive skills, because the TPS learning continues the series of thinking activities that have been repeatedly done in the previous PQ4R strategy. The procedures of TPS learning provides the opportunity for the students to think, discuss, and share with other students (Miranda, 2010). According to Kennedy (2007), TPS strategy encourages all students to be active in the classroom through writing, thinking, listening, and speaking skills. Thus, the TPS learning strategy is very helpful in empowering the students' metacognitive skills. Stuever (2006), assumed that the students would get a lot more opportunities in the empowerment of metacognitive skills during the implementation of TPS learning strategy. The students explore their thoughts, write about what they think, and compare their ideas with the other students' ideas. When the students share their conclusions to the class, they will defend their findings and may also review their ideas.

Group activities and collaborative work are parts of the steps in TPS learning strategy. These activities have great potential to empower students' metacognitive skills. The students discuss and answer the questions together in groups, which allows students to learn and help one another address their weaknesses. Similarly, the sharing activities, both in groups and in the classroom, can improve students' metacognitive skills. Each student listens to the other students' opinions and answers, and they will have a discussion in order to find out the answers of questions, and can ultimately make a summary of their study result. According to Ofudu (2012), one of the reasons that TPS strategy can improve the learning results is that all group members have the opportunity to interact in pairs and help each other understand the reading material.

The integration of PQ4R-TPS strategy is a strategy that both trains group learning (cooperative) and reduces the individuality of the students. Students can learn more fun and

can obtain good learning results. The process of thinking and cooperation activities that occur in the implementation of the integration of PQ4R-TPS strategy can improve students' metacognitive skills.

According to Hammond, et al. (2000), the ability to develop metacognition can make us become reflective learners, as well as the learners who acquire specific learning strategies. Similarly, Dawson (2008) stated that these skills are required for active learning, critical thinking, reflective assessment, problem solving, and decision making. Metacognition makes students become independent learners who can manage and plan their learning process. Livingston (1997) stated that metacognition had a very important role for successful learning.

Based on the discussion above, the integration of PQ4R-TPS learning strategy has an effect on students 'metacognitive skills. The integration of PQ4R-TPS learning strategy holds significantly more potential to improve students' metacognitive skills than the other learning strategies.

**Suggestions**

The integration of PQ4R-TPS learning strategy has the potential to increase the students' metacognitive skills. The empowerment of the integration of PQ4R-TPS learning strategy needs to be implemented, habituated, and continued to be trained to students in order to improve their metacognitive skills. Therefore, it is recommended that teachers implement this learning strategy to assist students in becoming independent learners.

.

**REFERENCES**

Anderson, O.W. & Kratwohl, D.R. (2001). *A Taxonomy for Learning, Teaching, and Assesing (A Revision of Bloom's Taxonomy of Educational Objectives*). New York: Addision Wesley Longman, Inc.

Bahri, A. & Corebima, A.D. (2015). The Contribution Of Learning Motivation And Metacognitive Skill on Cognitive Learning Outcome of Students Within Different Learning Strategies. *Journal of Baltic Science Education*, *14*(4), 487-500.

Bahri, A. (2010). *Pengaruh Strategi Pembelajaran RQA pada Perkuliahan Fisiologi Hewan terhadap Kesadaran Metakognitif, Keterampilan Metakognitif dan Hasil Belajar Kognitif Mahasiswa Jurusan Biologi FMIPA UNM [The effect of RQA Learning Strategy in Animal Physiology lecture on Metacognitive Awareness, Metacognitive Skills and Cognitive Learning results of the students of the Department of Biological Science of Math and Science faculty, UNM]*. Unpublished master's thesis, State University of Malang, Indonesia.

Bibi, R & Manzoor H. A. (2011). Effect of *PQ4R* Study Strategy in Scholastic Achievment of Secondary School Student in Punjab (Pakistan). *Language in India, 11*, 247-267. Retrieved from http://www.language india.com

Chikmiyah, C. & Bambang, S. (2012). Hubungan antara Pengetahuan Metakognitif Belajar *Siswa* melalui Hasil Jenis Model Pembelajaran Kooperatif Think Pair Share on Buffer Sulusi Masalah (The correlation between Students' Metacognitive Learning Knowledge through Cooperative Learning Model Results of Think Pair Share on Buffer problem solution). *Unesa Journal of Chemical Education, 1*(1), 55-61. Retrieved from http://www.ejournal.unesa.ac.id/article/201/36/article.pdf

Corebima, A.D. & Idrus, A.A. (2006, February). *Pemberdayaan dan Pengukuran Kemampuan Berpikir pada Pembelajaran Biolog (Empowerment and Measurement of thinking skill in Biology learning).* Paper presented at the International Conference and Measurement and Evaluation in Education, School of Educational Studies Universiti Sains Malaysia Penang, Malaysia.

Corebima, A.D. (2009). *Metacognitive skill measurement integrated in achievement test.* Paper presented at COSMED, RECSAM, Penang, Malaysia.

Corebima, A.D. (2010). *Berdayakan Keterampilan Berpikir Selama Pembelajaran Sains Demi Masa Depan Kita (Empowering Thinking Skills in the science learning for Our Future).* Papers Presented at the National Seminar on Science at the State University of Surabaya, Indonesia.

Danial, M. (2010). *Pengaruh Strategi Pembelajaran PBL dan GI terhadap Metakognisi dan Penguasaan Konsep Kimia Dasar Mahasiswa Jurusan Biologi FMIPA UNM (The effect of PBL and GI learning strategies on Metacognition and Concept gaining of Basic Chemistry of the Students of Department of Biological Science at UNM).* Doctoral dissertation. State University of Malang, Indonesia.

Dawson, T.L. (2008). *Metacognition and Learning in Adulthood. Prepared in Response to Tasking from ODNI/CHCO/IC Leadership Development Office. Developmental Testing Service, LLC*, Retrieved April 20, 2014, from http://www.devtestservice.org/PDF/Metacognition.pdf

Desoete, A. (2001). *Off-Line Metacognition in Children with Mathematics Learning Disabilities. Faculteit Psychologies en Pedagogische Wetenschappen*. Universiteit-Gent. Retrieved October 25, 2010, from https:/archive.ugent.be/retrieve/917/801001505476.pdf

Djuanda, M. (2016). *Urgensi Metakognitif dalam Meningkatkan Mutu Pembelajaran di Madrasah* (Urgency of Metacognition in Improving the Quality of Learning in Madrasah). Retrieved January 28, 2016, from Office of Religious Training Center in Jakarta. The Ministry of Religious Affairs. Web site: http://bdkjakarta.kemenag.go.id/index.php?a=artikel&id=884

Fisher, R. (1998). Thinking about thinking: Developing metacognition in children. *Early Child Development and Care, 141*(1), 1-15.

Flavell, J.H. (1999). Cognitive Development: Children's Knowledge about the Mind. *Annual Review Psychology*, *50*(1), 21-45. Retrieved from http://web.mac.com/jopfer/courses/846-Concepts_files/Flavell20% 281999%29% 20TOM.pdf

Fraenkel, J. R. & Wallen, N.E. (2009). *How to design and evaluate research in education. Seventh edition*. New York: McGraw Hill Companies.

Garner, R. (1987). *Metacognition and reading comprehension*. Norwood, NJ: Ablex.

Hammond, L.D. Kim, A., Melissa, C. & Daisy, M. (2000). *Thinking About Thinking: Metacognition*. The Learning Classroom: Theory Into Practice: Stanford University School of education (pp. 157-172). Retrieved from https://www.learner.org/resources/series172.html

Huber, J.A. (2004). A closer lock at SQ3R. *Reading Improvement*, *41*, 108-112. Retrieved from http://www. eric.ed.gov/?id=EJ705142

Huda, M. (2012). *Cooperative Learning. Methods, techniques, structure, and Model Application.* Moulds II. Yogyakarta: Student Library.

Jahiddin. (2009). *Pengaruh Pembelajaran Kooperatif STAD dan CIRC pada* Siswa *Akademik Tinggi dan Rendah terhadap Metakognisi dan Penguasaan Konsep Biologi SMA Negeri Kota Bau-Bau (The Effect* of *STAD and CIRC Cooperative Learning on students' metacognition of those of High and Low Academic* Ability as well as *on their Biological Concepts Mastery at Senior High School, Bau-Bau).* Doctoral dissertation. State University of Malang, Indonesia.

Keiichi, S. (2000). *Metacognition in Mathematics Education. Mathematics Education in* Japan. Japan: JSME.

Kennedy, R. (2007). In Class Debates: Fertile Ground for Active Learning and the Cultivation of Critical Thinking and Oral Communication Skills. *International Journal of Teaching and Learning in Higher Education. 19*(2), *183-190*. http://www.isetl.org/ijtlhe/pdf/IJTLHE.pdf

Khattack, I. & Khan, D. (2002). Teaching Reading Skills. A Two Component Approach. *Journal of Education and Research*. IER, University of Peshawar, *5*(1), 29-34.

Lee, M. & Baylor, A.L. (2006). Designing Metacognitif Maps for Web-Based Learning. *Educational technology & Society*, *9*(1), 344-348. Retrieved from http://www.ifets.info/journals/9_1/28.pdf

Leipzig, D.H. (2001). *What is Reading?*. From Learning Letters to Reading Aloud: Strategies for Reading Fun. 2010 SPAC Conference. Retrieved from http://www.readingrockets.org/article/what-reading

Lin, X., Schwartz. D.L., & Hatano, G. (2005). Toward Teacher Adaptive Metacognition. *Educational Psychologyst. 40*(4). 245-255.

Livingston, J.A. (1997). *Metacognition: An Overview*. Retrieved April 5, 2014, from http://www.gse.buffalo.edu/fas/shuell/cep564/metacog.html

Logsdon, A. (2007). *Improve Reading Comprehension With the PQ4R Strategy*. Retrieved March 4, 2016, from http://www.learningdisabilities.about.com/od/ instructionalmaterials/a/*PQ4R*strategy.html

Maesah, I., Odig Sunardi, Rita Retnowati. (2012). *Penerapan Pembelajaran IPA dengan Menggunakan Strategi PQ4R (Preview, Question, Read, Reflect, Recite, and Review) dan Talking Stick untuk Meningkatkan Hasil Belajar Siswa Kelas VII SMP IT AL-Muttaqien Bogor* [The implementation of PQ4R (Preview, Question, Read, Reflect, Recite, and Review) and Talking Stick in science learning to Improve Learning Outcomes of Grade VII Junior high school IT AL-Muttaqien, Bogor]. Bogor: Biology Education Study Program Pakuan Bogor university. *E-Journal Universitas Pakuan*. *2012*:1-13. Retrieved from http://e-journal.unpak.ac.id/detail.php?detail=mahasiswa& id=580**,** December 12, 2012.

Miranda, Y. (2010). Dampak Pembelajaran Metakognitif dengan Strategi Kooperatif terhadap Kemajuan Metakognitif Siswa dalam Mata Pelajaran Biologi di SMA Negeri Palangka Raya (Effects of Cooperative Learning Strategy on the Students' metacognitive Progress in Biology Subject in Senior High School, in Palangkaraya). *Journal of Education Research FKIP University of Palangkaraya. 20*(2), 187-201.

Muhiddin, P. (2012). *Pengaruh Integrasi Problem Based Learning dengan Pembelajaran Kooperatif Jigsaw dan Kemampuan Akademik terhadap Metakognisi, Berpikir Kritis, Pemahaman Konsep, dan Retensi Mahasiswa pada Perkuliahan Biologi Dasar [The Effects of the Integration between Problem Based Learning and Jigsaw Cooperative Learning, and academic Ability on Metacognition, Critical Thinking, Concept Gaining, and Retention of Students in basic Biology Lecture]*. Doctoral dissertation. State University of Malang, Indonesia.

Ngozi ibe, H. (2009). Metacognitive Strategies on Classroom Partisipation and Student Achievment in Senior Secondary School Science Classrooms. *Science Educational International*. *20* (1), 25-31. Retrieved from http://www.icaseonline.net/sei/files/p2.pdf

Ofodu, G.O. (2009). *Comparative Effects of Two Cooperative Instructional Methods on Reading Performance of Secondary School Students in Ekiti State, Nigeria*. (Doctoral dissertation, University of Ilorin, Ilorin, 2009). Retrieved from http://krepublishers.com/02-Journals/IJES/IJES-03-0-000-11-Web/IJES-03-2-000-11-ABST-PDF/IJES-03-2-103-11-124-Ofodu-G-O/IJES-03-2-103-11-124-Ofodu-G-O-Tt.pdf

Paidi. (2008). *Pengembangan Perangkat Pembelajaran Biologi yang Mengimplementasikan PBL dan Strategi Metakognisi, serta Efektifitasnya terhadap Kemampuan Metakognitif, Pemecahan Masalah, dan Penguasaan Konsep Biologi Siswa SMA di Sleman Yogyakarta (Developing Biology Learning Media implementing PBL and Metacognition Strategy and its Effect on metacognitive Skill, Problem Solving, and Biology Concept Mastery of Senior High School Students in Sleman, Yogyakarta.* Doctoral dissertation. State University of Malang, Indonesia.

Peirce. (2003). *Metacognition: Study Strategies, Monitoring, and Motivation. A Greatly Exanded Text Version of a Workshop*. Retrieved March 15, 2013, from http://academic.pgcc.edu/~wpierce/MCCCTR/metacognition.html

Ramdiah, S. & Corebima, A.D. (2014). Learning Strategy Equalizing Students' Achievement, Metacognitive, and Critical Thinking Skills. *American Journal of Educational Research*. *2*(8), 577-584. Advance online publication. Retrieved June 2015. DOI:10.12691/education-2-8-3.

Rodli, M. (2015). Applying *PQ4R* Strategy for Teaching Reading. *Indonesian EFL Journal*. *1*(1), 31-41.

Rogers, B. (2006). *Classroom Behaviour, A Practical Guide to Effective Teaching, Behavior Management and College Support*. (2nd ed.). London: Paul Chapman Publishing.

Schraw, G & Dennison, R.S. (1994). Assessing Metacognitive Awareness. *Contemporary Educational Psychology*, *19*(4), 460-475.

Sepe, F.Y. (2010). *Pembelajaran Metakognitif pada Strategi Pembelajaran Biologi Kooperatif TAI dan Pengaruhnya terhadap Metakognitif, Kemampuan Berpikir Kritis dan Hasil Belajar Kognitif Sains pada Siswa SMP Swasta di Kota Kupang (Metacognitive Learning in Biology Learning using cooperative Strategy of TAI and its Effect on metacognitive Skill, critical Thinking Skills and Science cognitive Learning Results of Private Junior High School Students in Kupang).* Unpublished master's thesis. State University of Malang, Indonesia.

Stuever, D.M. (2006). *The Effect of Metacognitive Strategies on Subsequent Participation in Middle School Science Classroom.* Master's Thesis, Wichita State University, 2006). Retrieved from https://soar.wichita.edu/bitstream/handle/10057/276/t06027.pdf?sequence=4&isAllowed=y

Suratno. (2009). *Pengaruh Strategi Kooperatif Jigsaw dan Resiprocal Teaching terhadap Keterampilan Metakognisi dan Hasil Belajar Biologi Siswa SMA Berkemampuan Atas dan Bawah di Jember (The Effect* of *cooperative Learning Strategy Jigsaw and Resiprocal Teaching on metacognitive Skill and Biology Learning results of Senior High school students having high academic Ability and low academic Ability in Jember).* Doctoral dissertation. State University of Malang, Indonesia.

Tanner, K.D. (2009). Talking to Learn Why Biology Students Should Be Talking in Classroom and How to Make it Happen Feature. Approaches to Biology Teaching and Learning. *CBE-Life Science Education*, 8, 89-94. doi:10.1187/cbe.09–03–0021

Thamraksa, C. 2005. *Metacognition: A Key to Success for EFL Learners*. Retrieved February 20, 2016, from http://www.bu.ac.th/knowledgecenter/epaper/jan_june2005/chutima.pdf

Tumbel, F.M. (2011). *Pengaruh Strategi Pembelajaran Cooperatif Script Dipadu Problem Posing dan Kemampuan Akademik Siswa terhadap Keterampilan Metakognitif, Kemampuan Berpikir, dan Pemahaman Konsep Biologi pada SMA di Kota Bitung Sulawesi Utara (The Effect of cooperative Script Learning integrated with Problem Posing Learning strategy and Students' academic Ability on metacognitive Skills, Thinking Skills, and Biology Concept Gaining of Senior High School in Bitung North Sulawesi).* Doctoral dissertation. State University of Malang, Indonesia.

Veenman, M.V.J., Wolters, B.H.A.M. Van Hout., & Afflerbach, P. (2006).*Metacognition and learning: conceptual and methodological considerations.1*, 3-14, Retrieved from http://*www.denken-horen-bouwen.com*, Recieved: 08 December 2005/Accepted: 08 December 2005/Published. DOI 10.1007/s11409-006-6893-0

Wahyuningsih, A.N. (2012). Pengembangan Media Komik Bergambar Materi Sistem Saraf untuk Pembelajaran yang menggunakan Strategi *PQ4R* (The Development of illustrated Comics for nervous System Learning Material for the Learning Activity implementing *PQ4R* Strategy). *Journal of Innovative Science Education. JISE. 1*(1), 19-27. Retrieved from http://www.journal.unnes.ac.id/nju/index.php/jpppasca/article/viewFile/1533/1709.

Widodo, S. (2011). *Perbandingan Hasil Belajar Biologi dengan Menggunakan Metode Pembelajaran Cooperative Learning Tipe Group Investigation (GI) dan Think Pair Share (TPS). [Comparative Biology Learning Outcomes Using Learning Method Cooperative Learning type Group Investigation (GI) and Think Pair Share (TPS)]*. (Thesis, Universitas Islam Negeri Syarif Hidayatullah Jakarta, 2011). Retrieved from http://repository.uinjkt.ac.id/dspace/bitstream/123456789/2584/1/SIGIT%20WIBOWO-FITK.pdf.