Empowering Student’s Metacognitive Skill Through Cirsa Learning

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Abstract. Metacognitive skill is the process of thinking about thinking, process of developing self-awareness, the ability to self-assess and how to learn and solve the problems at hand. An important dimension to the metacognitive process is the knowledge of thinking skills in planning, regulating, and evaluating an academic task. Metacognitive skill can be trained using a learning model, one of which is Cirsa, a learning developed by integrating a CIRC-based scientific approach. This study aims to measure and know the effect of Cirsa learning on students’ metacognitive ability. The research method used is quasi-experiment using pretest-posttest non-equivalent control group design. The study involved 248 students, 8th grade on Biology subject at MTS Al Hidayah Citaringgul Bogor as the research sample. The development of metacognitive instrument referred to MAI (Metacognition Awareness Inventory). The results showed that Cirsa learning model had an effect on the students’ metacognitive ability with the sig value of 0.000. Cirsa learning proved superior to CIRC (Cooperative Integrated Reading and Composition) and conventional learning on human digestive and excretory system topics. Teaching Biological topics with a scientific approach is a demand in the K-13. Therefore, the authors suggest teachers to develop students’ metacognitive skill with Cirsa learning which emphasize on reading and scientific-based activities.

1. Introduction

21st century learners’ ability is related to various skills [1–4]. One of skills should be mastered is reading comprehension [5,6]. Good reading comprehension ability by the learners is to train Students to understand a reading thus it can be used as reading to learn activity [7]. It is believed that it could help the students to understand the advantages and disadvantages of knowledge development process thus students will be able to identify the needs to fulfill the century’s knowledge and skill demand [8].

Based on their knowledge and skills to identify the learning needs, students are able to manage attitude and actions to optimize their learning process and result [3]. The skill known as metacognitive skill, which is a skill referring to activities of controlling, monitoring, and self-regulation occurred
During study time [9]. The metacognitive skill refers to controlling, monitoring, and self-regulation during study and solving a problem that is in accordance [10,11]. The skill is concerned about procedural knowledge related to the real rules and control on one’s cognitive process and learning activities [9-13]. Metacognitive knowledge is related to one’s knowledge on how the cognition is empowered, whereas metacognitive control is related to how one controls his/her cognitive operation [14].

Metacognitive skill empowerment needs to be conducted so that students become independent person [4]. Metacognitive skill is also called as executive skill [9]. The skill consists of various dimensions, among others, task assignment analysis skill, planning, monitoring, checking or evaluation, recapitulating, and re-reflecting as a form of metacognitive skill behavior manifestation when the students do a work method. Learning activity implementation that encourages metacognitive skill is influenced by learning model [15-17]. Sciences learning activity pattern in Indonesia orientes more towards cognitive learning result and less efforts in the empowerment of student’s metacognitive skill. The importance of applying learning that able to improve student’s metacognitive skill [17].

21st century students are in the acceleration of technological era thus in-class learning should no longer a teacher-centered [2]. As well as in sciences learning, design should fulfill students’ curiosity in skill of their self-understanding as learners [9]. Sciences play important role to improve those skills [5,18,19]. Sciences learning pattern in Indonesia is mostly concept-oriented and less metacognitive skill empowerment. The implication is students’ low cognitive ability since they are not trained to understand their own cognitive ability (self-assessment) and less able to empower their cognitive ability (self-regulated). Therefore, the implementation of reading comprehension-pattern learning to improve metacognitive skill needs special attention.

Various researches have been conducted focusing on learning design that could improve reading ability [20-23]. One’s reading ability on science is developed through a learning model emphasizing on reading and writing [19,24,25]. A learning model that has those characteristics is cooperative integrated reading and composition (CIRC). CIRC learning is a cooperative learning focused on the use of group in learning process. The group consists of 4-5 students and it is heterogeneous in nature, which is one group consisted of various cognitive, affective, and psychomotor abilities. In addition, it also varies in gender and other social aspects [5,26]. Cooperative learning trains students to cooperate to maximize learning condition to achieve pre-determined learning goals. Each member is given responsibility and works together thus they could master the subject and achieve the learning goals [6,13,27]. Several research results indicate that CIRC is recommended for sciences learning [23,25,28,29].

CIRC learning application in Indonesia needs to be developed to fit the curriculum. 2013 curriculum (K-13) applies for various educational levels in Indonesia, from elementary school to secondary schools. Through the application, teacher is expected to apply scientific approach learning [30-32]. Scientific approach is believed to have advantages by setting the students to study how the scientists work and improve their scientific attitudes.

CIRC learning model has weaknesses since it has not accommodated all stages in scientific approach. The development of scientific approach-based CIRC learning model (Cirs) is an effort to overcome the problem. The designed Cirs learning accommodates learning aspects that are not only emphasizing on reading and writing processes but also scientific activities of observing, asking, trying, reasoning, and communicating [3].

Syntax of Cirs (Scientific Approach-based CIRC Learning) consist of three stage. First stage of Cirs syntax was group division, in this stage teacher explain the learning model, logistic and its implementation. Present the learning goals and motivate the students and relate the present materials to the previous material through pictures or learning videos. The closing activity at the first stage was guided the students to form heterogeneous group consisted of 4-5 students. Scientific approach that used in this stage is Observe. The second stage was reading, discussion and finding the main concepts of the article. Teacher activities include: guide students to prepare articles/reading materials according to the topic of material being studied, give opportunity to the students to read, discuss and understand the articles, and for the last was to guide the students to find important facts, articles’ main concept and re-
write them on the learner worksheet. Scientific approach that used in this stage is exploration, association and ask. The last stage of Cirsa syntax was group presentation. Teacher activities include: ask some groups to present the assignment given, facilitate the students to have class discussion, and direct the discussion. Scientific approach that used in this stage is communicate [3].

Cirsa learning design is believed to be relevant to 21st century development demand since it gives emphasize on learning that prioritizes group cooperation ad reading, and it is a scientific method-based. Group learning is believed to make learning more effective [33]. Therefore, the result of Cirsa learning model development is expected to not only improve students’ metacognitive skill but also help teacher to prepare the implementation of learning that supports reading comprehension skill improvement in sciences and metacognitive. The research aimed to find out the influence of Cirsa learning on students’ metacognitive skill learned through Cirsa, CIRC and conventional learning.

2. Method
The research was quasy experiment research. Pretest-posttest non-equivalent control group design was used as the research design. Independent variables in the research consisted of three models: CIRC learning model and Cirsa learning models as experimental classes and conventional learning model as control class, whereas the dependent variable was metacognitive skill. Research design can be seen in Table 1.

| Table 1. The Randomized Pretest – Posttest Control Group Experimental Design |
|-------------------------------|-----------------|-----------------|
| Pretest                      | Treatment       | Posttest        |
| T1                           | X0              | T2              |
| T3                           | X1              | T4              |
| T5                           | X2              | T6              |

Note:
T_1,3= Pretest.
T_2,4= Posttest.
X_1 = Cirsa Learning.
X_2 = CIRC Learning.
X_0 = Conventional Learning.

2.1. Research Population and Sample:
The population in the research was the 8th grade students at MTS Al Hidayah, Citaringgul Bogor. Research sample was 248 students. Sampling conducted randomly by considering the equality in students’ abilities based on the average score in sciences grade in the previous semester’s achievement report. Total class used was 6 classes with the following division: 4 classes consisted of 2 classes of experimental groups learned through Cirsa learning and 2 classes of experimental groups learned through CIRC, whereas the remaining 2 classes were control group class learned through conventional learning.

2.2. Research Instruments
Instrument used in the research was student worksheet developed by referring to Cirsa and CIRC learning syntax. Metacognitive instruments in form of description test questions developed by referring to metacognitive awareness Metacognitive Awareness Inventory (MAI). There were 5 (five) metacognitive test questions consisted of excretion system and human respiratory materials. In its implementation process, students were given one set of metacognitive questions to be completed in 50 minutes.

2.3. Data Collection
The research was conducted in the first meeting of excretion system and human respiratory materials. Students had received explanation previously on the learning contract and learning activities to be conducted using Cirsa and CIRC learning models as well as assignments to be completed. The goal of the activities was for students and teachers to have an appropriate understanding on learning activities.
The experimental research was conducted for 2 (two) months. Students were given metacognitive pretest before learning and another test after they completed the learning.

2.4. Data Analysis

Research data was analyzed using descriptive statistics in form of metacognitive average score. Hypothesis testing was conducted using Anacova test. Before the test, assumption precondition tests conducted. The test consisted of data normality test and variance homogeneity test. Normality test used One-Sample Kolmogorov-Smirnov, whereas homogeneity test used Levene’s Test of Equality of Error Variances. The tests were done using statistical analysis program of SPSS 22.0 for Windows with significance value of 0.5%.

3. Results

Research result summary using descriptive test and Anacova test on the influence of learning model on metacognitive skill is presented in Table 2 and 3.

Table 2. Descriptive Test Result of Student’s Metacognitive Post-test Scores

| Model    | Mean | N   | Std. Deviation |
|----------|------|-----|----------------|
| Cirsa    | 83.18| 84  | 10.666         |
| CIRC     | 72.45| 82  | 12.173         |
| Conventional Model | 69.46| 82  | 8.021          |
| Total    | 75.10| 24  | 11.960         |

Based on Table 2, it is known that the mean score average order from the highest to the lowest was student groups learned with Cirsa, student groups learned with CIRC, and the lowest was the conventional group.

Table 3. Anacova Test on the Influence of Learning Model on Metacognitive

| Source     | Type III Sum of Squares | Df | Mean Square | F       | Sig.  |
|------------|-------------------------|----|-------------|---------|-------|
| Corrected Model | 17441,343⁴  | 3  | 5813,781    | 79,301  | .000  |
| Intercept  | 36579,996     | 1  | 36579,996   | 498,958 | .000  |
| Pretest    | 1433932,000   | 248| 73313       |         |       |
| Model      | 35329,677     | 247|              |         |       |
| Corrected Total | 1433932,000 | 248| 73313       |         |       |
| Total      | 35329,677     | 247|              |         |       |

Result of Anacova test in Table 3 indicates that there was an influence of learning model on metacognitive skill with significance value of 0.002, which is less than alpha of 0.005 (< 0.005). Therefore, H₀ stated that there is no metacognitive influence difference between Cirsa, CIRC, and conventional learning models is rejected. Research hypothesis stated that there is a metacognitive difference influence between Cirsa, CIRC, and conventional learning models is accepted. It can be concluded that there was an influence of learning model on metacognitive skill. Ad hoc test was conducted using LSD test and the result is presented in Table 4.

Table 4. LSD Test Result on the Influence of Learning Model Application on Metacognitive Skill

| (I) Model | (J) Model | P Value |
|-----------|-----------|---------|
| Cirsa     | CIRC      | .000    |
|           | Conventional Learning | .000    |
| CIRC      | Cirsa     | .000    |
Based on Table 5, it can be seen that students learned with Cirsa learning model had a significant difference on metacognitive skill with students learned with CIRC (P value of 0.000) and conventional learning models (P value of 0.000). In addition, there was no significant difference on metacognitive skill between students learned with CIRC and conventional learning (P value of 0.068).

4. Discussion
Students’ metacognitive skill value improvement was influenced by learning model [34]. In addition, there was an influence of learning model on metacognitive skill. Cirsa learning was significantly empowered students’ metacognitive ability. Based on the ad hoc test using LSD, in experiment classes that used Cirsa learning model, students had a corrected average score of 10.73 higher than those in classes with CIRC learning model and 13.72 higher than those in control classes with conventional learning model. The significant difference was due to metacognitive improvement related to Cirsa learning model syntax.

Cirsa learning is a learning emphasizing on scientific approach. It is very suitable for Biology learning that needs scientific thinking ability [3]. Cirsa itself is a learning model emphasizing on stages where students are required to go through reading process. It is great in building student’s way of thinking to fit the order.

In the Cirsa learning model syntax each stage is able to familiarize the students to use their metacognitive skill. Skill used in the first stage of group division with scientific approach was observing skill. The stage requires students to work in a group. Students could learn metacognitive skill better if they work in a cooperative group [34]. Group work evaluation by each group member occurs in cooperative group work conducted through learning process as well as assessment and social interaction improvement, and efforts to improve each group member’s performance.

The second syntax is reading. Discussion and finding the main concept of the article by combining scientific approach occurred from the students is exploring and associating. It is student’s effort to quickly and accurately study a material by getting the main ideas of an article. Procedural knowledge is knowledge on something. Most of the knowledge is represented by able to take the essence of a material, know how material information presented in the book is simplified, and get the main ideas of the material. Strategies that develop metacognitive skill, it will encourage students in new vocabulary development and reading comprehension skill improvement [20,34].

Scientific approach empowerment teaches students to explore and associate and teacher plays role as a facilitator. The teacher guides students to look for, analyze, interpret, and evaluate [35]. Exploring and associating a reading will teach students to ask themselves or self-regulated students. It is a part of metacognitive skill since students will be responsible for their own learning progress and adapt their learning model to achieve assignment demand [36]. Activities involved in learning, such as the use of appropriate skills and models to solve problem and to make performance estimates, are metacognitive skills occurring in students. In the 2nd syntax of Cirsa model, students can be facilitated to do a simple experiment in form of a practicum so students think more logically and systematically [13]. This type of learning is more effective compare to the lecture-type learning [37].

The third syntax of Cirsa model, group presentation and scientific approach combination that appears from students, is communicating. During the presentation, student group will teach each other (giving each other skill, understanding, and experience through the activity principle of responding answer and questions occurred in class discussion). Metacognitive learning needs to pay attention on interaction and relationship between students and students, student motivation, and relationship between students and teacher [38]. The communicating syntax is a cooperative learning representation that is essential in training students to improve their metacognitive skill since the communicating activity with presentation has metacognitive activation aspect. During communication process metacognitive skill activation will occur, which is self-examine process and it raises question on self-correct thinking [39]. Metacognitive...
skill occurs in controlling, monitoring, and self-regulation activities that happen when learning and solving a problem. Several studies indicate that self-regulation in learning has been used to improve academic achievement [40]. Learning model applied is not only to deliver materials but also to train students’ thinking ability so they could use their cognitive structure in a full and directed manner [41]. Cirsa learning model in this research was not only to deliver material but also to train students’ metacognitive skill.

Conventional learning should not be used frequently. Teacher should innovate with various other learning models [42]. Unstructured conventional learning also makes students less active in learning. Passive students will ask no question unless asked by the teacher, whereas questioning process is one of important process in building scientific thinking ability in scientific approach. In addition, conventional learning is minimal in observing process since teacher focuses only on material delivering.

5. Conclusion

Base on this research result, it can be concluded that learning model applied in excretion system and human respiratory materials at MTS Al-Hidayah had influence on students’ metacognitive skill. The metacognitive skill of students learned with Cirsa was significantly different to those students learned with CIRC and conventional learning models. CIRC and conventional learning models were not significantly different.

Cirsa learning is recommended to be applied in sciences learning to empower metacognitive skill. Further research is needed on the influence of Cirsa learning on other variables, such as critical thinking skill, science literation, and science concept mastering.

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