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Improving Critical Thinking Skills and Student Responsibilities Through Collaborative Based Science Learning (CBSL) Model

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***Abstract*—Research has been conducted on the feasibility of Collaborative Based Science Learning (CBSL) learning models to train critical thinking skills and student responsibility of Junior High School State 6 Banjarmasin. The syntax of the CBSL model is 1) Motivation and Problem Orientation; 2) Collaborative Critical Thinking Activities; 3) Communicate Results; 4) Advanced Training; 5) Reflection. This development research aims to determine the practicality and effectiveness of CBSL prototype models. The subjects of this study were as many as 125 students in grade 8 of SMP 6 Banjarmasin. The research instruments used were instruments of Facione's critical thinking skills and Escarti's instrument of responsibility. The results showed that the feasibility of the CBSL model showed a very good (85.38%), the activity of students in learning showed a very active (86.63%), there was an increase in critical thinking skills (mean N-gain = 0.87 / high) and student responsibility (Very Good). Thus the CBSL model has met the requirements of practicality and effectiveness as a prototype of a model.**

Keywords—critical thinking skills, responsibilities, CBSL model

I. INTRODUCTION

The 21st-century competency framework is the foundation of the 2013 curriculum development to prepare students to have 21st-century competencies [1]. The 2045 demographic bonus of the Indonesian nation needs to be maximized by equipping students with 21st-century competencies with a variety of 21st-century skills. These skills include learning and innovation skills such as mastery of information technology, critical thinking skills, collaboration, life skills, and career.

Curriculum 2013 is designed to equip students to be able to overcome various problems of life that are more complex and can survive in facing everyday life. The theme of the 2013 Curriculum development is to produce productive, creative, innovative, and affective Indonesian people through strengthening integrated attitudes, skills, and knowledge. Therefore we need learning that supports creativity that prioritizes personal experiences through observing, asking, reasoning, trying (observation based learning), solving problems and working in groups through collaborative learning. This is in line with the Framework for 21st Century Learning where students must be creative, critical, able to collaborate and communicate well [2]. With the curriculum 2013, graduates are expected to possess the knowledge, various skills, and attitudes that can anticipate life in the 21st century. Permendikbud No. 20/2016 concerning the structure of the SMP / MTs curriculum states that the competencies that SMP / MTs students must achieve in science learning include thinking skills and student responsibility.

Preliminary studies related to students 'critical thinking skills and responsibilities in SMPN 6 Banjarmasin are still low, this is due to the lack of science learning activities that train students' thinking skills, students are given more clarification-only exercises, not much involved in solving problems collaboratively. As a result, student responsibility is also low. This fact is corroborated by the results of the international study of PISA (Program for International Students Assessment) which places Indonesian students at the bottom of the rankings. Based on the results of the PISA study for science materials in 2009, Indonesia was in 60th position out of 65 countries with a score of 383, then ranked 64th out of 65 countries with a score of 382 in 2012, and experiencing an increase in 2015 which was in position 62 of 70 countries with a score of 403 [3], [4], [5], [6], [7], [8]. The results obtained are still below the international average score of 500. The composition of the PISA questions tested is dominated by high-level thinking questions including reasoning which is part of critical thinking; this is the weak point of Indonesian students. The results of the PISA study show that Indonesian students are still in the category of having limited scientific knowledge, have not been able to associate material with other material, and do not yet

have the skills to arrange explanations based on evidence and arguments using critical analysis indexed on aspects of reasoning.

Therefore, learning needs to be able to overcome the problem above. One of them is the Collaborative Based Science Learning (CBSL) learning model. The CBSL model is collaborative based learning used in learning to train critical thinking skills and student responsibility. This CBSL model was developed from the Problem Based Learning (PBL) model, Process-Oriented-Guide-Inquiry-Learning (POGIL) and the Inquiry model, as a form of innovation perfecting the shortcomings of these models in the framework of critical training skills and student responsibilities. The syntax of the CBSL model is as follows: 1) Motivation and Problem Orientation; 2) Collaborative Based Critical Thinking Activities; 3) Communicate Results; 4) Advanced Training, and 5) Reflection.

This research was conducted to fulfill the practicality and effectiveness aspects of the CBSL learning model so that it was focused on how the implementation of CBSL learning models, student activities in learning activities, the results of students' critical thinking skills and student responsibility. This is done in line with the product criteria (mode) of a learning model that must meet the requirements for validity, practicality, and effectiveness [9].

II. METHOD

This research used development research design to produce a product and test the effectiveness of a product produced, namely the CBSL learning model to train critical thinking skills and student responsibility [10], [9]. The development research design uses McKenney models with three stages, namely: 1) the preliminary study phase includes needs analysis, literature study, and field surveys, 2) the design phase of the model prototype, validation, revision, and testing, 3) the model testing stage.

In this paper, researchers report the results of a broad model test phase, namely the practicality and effectiveness aspects of the CBSL learning model by observing and evaluating the learning activities of the CBSL model (model trials) related to the implementation of the Learning Implementation Plan and student activities in learning critical thinking skills and student responsibilities. The research subjects were 8-grade students of SMP Negeri 6 Banjarmasin in 2017/2018 as many as 125 students who took science lessons. Learning activities take place in 4 times face facing (@ 3 x 40 minutes), namely the material of the Human Motion System.

Observations and assessments were carried out by three observers using learning implementation instruments to obtain data on the ability of model teachers to implement CBSL model learning. The practicality of the CBSL learning model is described based on the percentage of CBSL model syntax, student activity in learning, the results of students' thinking skills and student responsibility. This CBSL learning model is said to be practical if the percentage of CBSL learning model syntax is not less than 75% with the criteria for the teacher's ability to implement the learning model at least Good (above 70%) and student activities in CBSL model learning activities at least Active categories (above 70%). The effectiveness of the CBSL learning model is described based on the achievement of the results of students' critical thinking skills with a minimum value of critical thinking skills = 3.0 and N-Gain values> 0.3 (medium criteria) and responsibilities with a minimum average value> 2.0 (Good criteria) [11].

III. RESULTS AND DISCUSSION

A. The practicality of the CBSL Model

CBSL Learning Model is a learning model specifically developed from PBL, POGIL models and Inquiry models to train critical thinking skills and student responsibility. The syntax of the CBSL learning model developed is 1) Motivation and Problem Orientation; 2) Collaborative Based Critical Thinking Activities; 3) Communicate Results; 4) Advanced Training. This CBSL learning model refers to the John Dewey problem-solving process flow [12].

Phase 1) Motivation and Orientation Problems, supported by the ARCS theory to arouse curiosity and interest in students towards learning, Dewey's perspective (1916) where schools should be a laboratory for solving real-life problems, and the theory of primacy effects [13], [14]. Also supported by several research results such as [15], [4], [16], which state that motivation can have an effect on success in individuals and critical thinking, giving questions with real-world applications is an effective strategy for teaching science as a process.

Phase 2) Collaborative-Based Critical Thinking Activities, supported by social constructivist theory Vygotsky [14], [12], which states that students need information relevant to learning, actively involved in the information process and constructing their knowledge, involved interaction with people more mature adults and peers, students learn the best concepts in the zone of proximal development (ZPD). This supports the results of [17], [18], [19], which states that the content of inquiry activities improves critical thinking skills and students' scientific skills, the 2013 curriculum implementation emphasizes collaborative learning in achieving desired competencies at the junior/MTs level [1], [20], [21], [22], responsibility is a part of life skills and a 21st century career [23], [2], collaborative-based learning builds students' mutual understanding in solving academic problems or other complex problems [24], [25].

Phase 3) Communicating Results, supported by dual coding theory [14], cognitive constructivist theory [14], social constructivist theory Vygotsky [14], which states that good information when presented varies, stimulates social interaction with others the development of new ideas and enriching the intellectual development of students, as well as the stimulation of information will be obtained if processed seriously and deeply will be able to obtain knowledge, skills and good attitudes. This is supported by the results of research by [23], which states that students who are serious in processing information will have better memories, group discussions support student participation in communication, students are responsible if they can utilize knowledge to solve problems in real life situations, understand the meaning of learning, adopt their own attitudes and points of view.

Phase 4) Advanced training, supported by Piaget's cognitive constructivist theory, cognitive apprenticeship theory, scaffolding [12], [13], [14], where positive transfer of past knowledge is useful in facilitating learning or solving new things, students need actively involved in the process of obtaining information and constructing their knowledge, students need to be trained gradually to be able to interact with experts or peers who are more knowledgeable, students need to be trained with complex, difficult, and realistic tasks and then given sufficient assistance to solve tasks that are. This is supported by the results of research by [26], [27], [28], [25], which states that models and methods need to be varied, more systematic activities in learning activities so that it will train and improve students 'critical thinking skills, need to emphasize responsibility to students in the teaching and learning process, and the need for collaboration in completing tasks as a productive way to improve students' cognitive.

Phase 5) Reflection, supported by theories related to self-evaluation, recency effects, contingent praise, and metacognition [12], [14], where evaluation is useful to assess what has been done as a reflection for further improvement and motivated to be better again. According to [13] the evaluation of teachers from the inquiry process carried out by students is a peer component in the framework of the process of critical thinking.

The practicality of CBSL learning models can be obtained from the learning implementation data provided by the observer on the teacher's ability to carry out student learning and activities during learning.

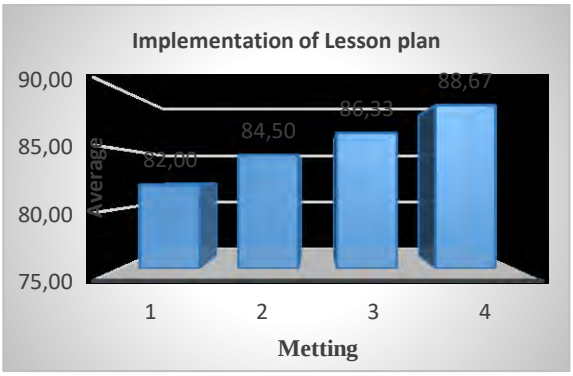

Fig. 1. Implementation of the CBSL Model

Figure 1 shows that the implementation of the lesson plan in the four meetings for the Human Motion System material with the phases of the CBSL learning model syntax can be carried out entirely by the teacher, meeting 1 = 82.00% (Very Good), meeting 2 = 84.50% (Very Good) , meeting 3 = 86.33% (Very Good) and meeting 4 = 88.67 (Very Good). The average assessment given by the observer on the ability of the model teacher during 4 meetings showed a positive result, which was 85.38% (Very Good). The quality of teaching model teachers is increasing from meeting 1 to meeting 4; this is because teachers increasingly master the phases of the CBSL model learning model well. Improving the ability of teacher models in applying the CBSL model in learning Human Body Motion along with input and suggestions given by observers during learning activities, so that the model teacher can improve the learning process well.

The phases of the CBSL model syntax implemented by the teacher model can be seen in Graph 2 below.

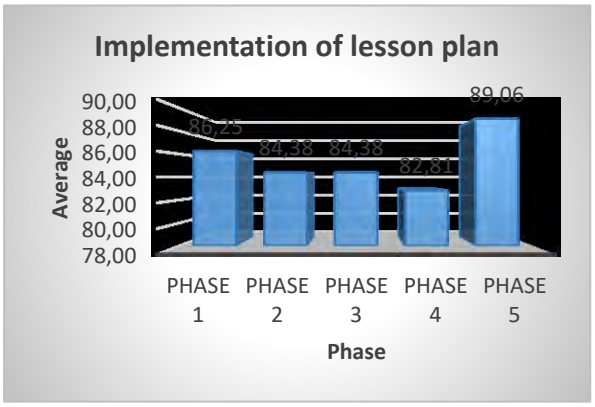

Fig. 2. Implementation of CBSL Model Syntax

Figure 2 shows the learning phases of the CBSL model have been carried out entirely by the model teacher well. Quality of Phase 1 implementation of Problem Motivation and Orientation 86.25% (Very Good), Phase 2 Collaborative Based Critical Thinking Activities 84.38% (Very Good), Phase 3 Communicating Results 84.38% (Very Good), Phase 4 Advanced Training 82.81% (Very Good), and Phase 5 Reflection 89.06 %% (Very Good). All learning phases of the CBSL model have been carried out by the model teacher (above 75%) with the quality of the teacher model in the teaching of the Very Good category (85.38%). Thus the practicality of the CBSL model has met the criteria of a prototype learning model.

Student activity in learning with the CBSL model is shown in Figure 3 below.

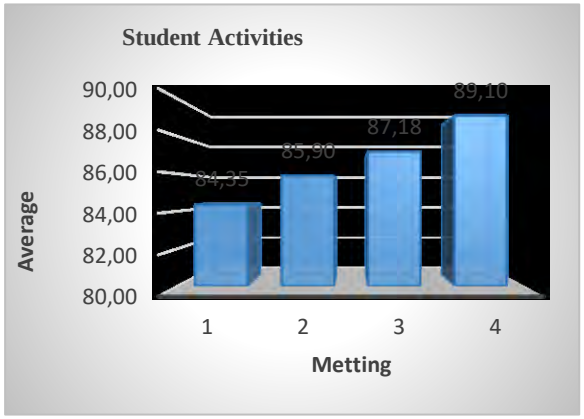

Fig. 3. Student Activities

Figure 3 shows that student activities in learning activities with CBSL models include very active categories. Each learning phase shows positive student activity. The percentage of student activities in learning activities in meeting 1 was 84.35% (Very Active), meeting 2 was 85.90% (Very Active),

Meeting 3 was 87.18% (Very Active), and Phase 4 was 89.10% (Very active). The average student activity in the CBSL model learning process was 86.63% (Very Active).

Thus, the feasibility of the CBSL learning model, the ability of the model teacher in carrying out the phases of the CBSL model and student activities in CBSL model learning activities showed that the CBSL learning model fulfilled the requirements of a learning model in terms of practicality.

B. The effectiveness of the CBSL Model

The effectiveness of the CBSL model is described based on the completeness of students' critical thinking skills and student responsibility. At the time of the pretest, all students were not complete in solving the questions of critical thinking skills. The achievement of critical thinking indicators is still below 3.0. Achievement of analysis indicators = 1.38, evaluation indicators = 1.36, interpretation indicators = 1.24, and inference indicators = 1.38. After learning with the CBSL model, then the posttest was done to increase students' critical thinking skills, where the indicator of analysis = 3.32, evaluation indicators = 3.29, indicators of interpretation = 3.24 and inference indicators = 3.35. Thus all students complete in solving the questions of critical thinking skills given.

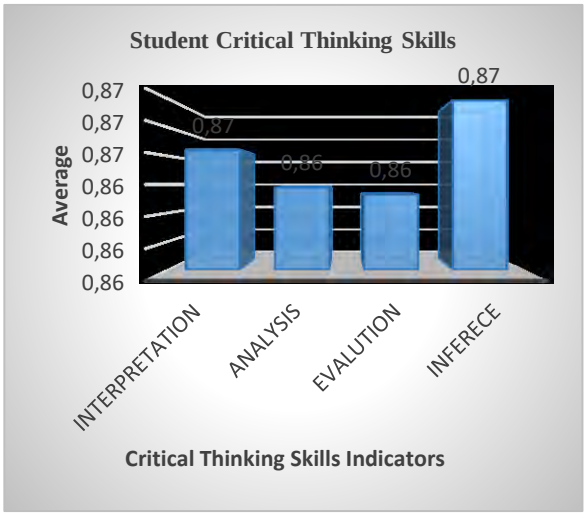

Fig. 4. Student Critical Thinking Skills

Figure 4 shows that students' critical thinking skills during learning with CBSL models show positive results with N-Gain values for all critical thinking indicators above 0.3. Value of ¬N-Gain indicator analysis = 0.86 (High), evaluation indicator = 0.86 (High), interpretation indicator = 0.78 (High) and Inference indicator = 0.87 (high). These results indicate that students' critical thinking skills in learning Human Body Motion material using the CBSL learning model have been completed. Increasing students' critical thinking skills in completing test questions is caused by students having been trained in critical thinking skills in the learning phases of the CBSL model, especially in the collaborative phase of critical thinking activities, the phase of communicating the results and the advanced training phase.

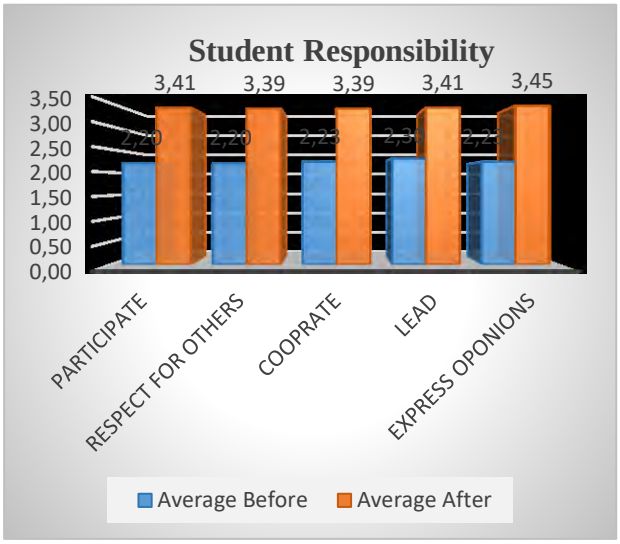

Fig. 5. Student Responsibility

Figure 5 shows the responsibilities of students during their learning with CBSL models. Before student responsibility learning activities were still classified as Good and after the implementation of learning with the CBSL model there was an increase in student responsibility, the average participating indicator rose from 2.20 (Good) to 3.41 (Very Good), the average indicator of respect for others rose from 2 , 20 (Good) to 3.39 (Very Good), the average indicator of cooperation rose from 2.23 (Good) to 3.39 (Very Good) the average lead indicator rose from 2.30 (Good) to 3.41 (Very Good) and the average indicator of expressing opinion also rose from 2.23 (Good) to 3.45 (Very Good). The increase in student responsibility is inseparable from the design of each phase of the CBSL learning model that always trains 5 indicators of responsibility in learning activities so that students have a responsibility in completing the tasks given by the model teacher during the learning process.

Thus, in terms of completeness of critical thinking skills and student responsibility, the CBSL learning model can be said to be effective.

IV. CONCLUSION

Can be concluded that: 1) implementation of CBSL learning model in learning Human Body Motion can improve critical thinking skills and responsibilities of students of SMPN 6 Banjarmasin, 2) the syntax of the CBSL model developed is: 1) Motivation and Problem Orientation; 2) Collaborative Based Critical Thinking Activities; 3) Communicate Results; 4) Advanced Training, and 5) Reflection, and 3) the CBSL model can be implemented in other science materials to improve critical thinking skills and student responsibility.

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