Research Design prototype of Teacher Book and Student Book based on Contextual Teaching and Learning (CTL) to Practice Critical Thinking Skills of Grade VII

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Abstract- This study aims to produce a prototype of a Teacher's Book and a Student Book based on Contextual Teaching Learning (CTL), describes validity, practicality, and the effectiveness of the prototype. This type of research is developmental research that refers to educational design research by Tjeerard Plomp & Nieveen using the 4D model by Thiagarajan, comprising the phases of define, design, develop and disseminate. Teacher's books and student books were tested on 33 students. The trial results were analyzed descriptively qualitatively. The results are as follows: 1) The validity of Teacher's Books, Student Books and critical thinking assessment tests with the "valid" category. 2) Practicality of Teacher's Books and Student Books is very practical in terms of the mode of implementation of learning, readability of student books in the "easy" category. 3) The effectiveness of learning is very effective and has seen improvements in the test of critical thinking skills. Student responses gave positive responses. Based on these results it can be concluded that the prototype of the teacher's book and the student's book are very feasible to be applied in the learning process because it enhances critical thinking skills.

Index Terms- Prototype Research Design, Teacher's Book, Student's Book, CTL, Critical thinking

I. INTRODUCTION

The 21st Century skills (Partnership for 21st Century Skills 2013) needed include critical thinking and problem solving where people who think critically are able to use their abilities to try to solve the problems they face independently, also have the ability to compile and express, analyze, and solve problems. One of life skills or competencies that must be possessed by students is critical thinking skills. With critical thinking skills students will be more skilled in making decisions, strategic planning, scientific processes and problem solving that can be utilized in everyday life. Contextual teaching and learning (CTL) is a learning concept that helps teachers link subject content with real-world situations and motivates students to make knowledge relationships and their application in life. CTL has 7 pillars (Nurhadi 2002) namely 1) constructivist, 2) find 3) Ask, 4) Learning Society, 5) Modeling, 6) Reflection and 7) real assessment. Whereas CTL According to CORD (Center for Occupational Research and Development) there are five educator strategies in the context of implementing contextual learning, namely: 1) Relating, 2) Experiencing, 3) Applying, 4) Cooperating 5) Transferring.CTL was chosen because it has several advantages, among other things students can organize themselves and be active so that they can develop individual interests, build knowledge relations and in everyday life, use higher-order thinking or critical thinking. Alam Insan Mulia Middle School as one of the schools in East Surabaya, if referring to the results of daily tests with HOTS (High Order Thinking Skill) questions, it is still low at C3 level, which is Applying. As for the stages in C4, the analyzing stage is still below the KKM. This is due to the lack of relevant learning tools to support learning and are not integrated either in teacher books, student books and worksheets that still contain more factual knowledge. Referring to these results it is necessary to practice critical thinking skills by using Teacher's Books and Student Books as steps that can be used by teachers and students to complete tasks both in theory and practice so that students are able to solve HOTS questions, students also have skills think critically, and in learning students become more motivated and focused. It is hoped that in the Teacher's and Student's Books there are new features including CTL pillars, metacognition in the realm of knowledge, cognitive and psychomotor learning outcomes, student-centered learning to collaborate and train students' critical thinking skills.

II. THEORYTICAL REVIUW

The level of thinking in reasoning includes the basis of basic thinking, critical thinking, and creative thinking (Krulik & Rudnick (1995). The level of thinking is basic thinking, critical thinking and creative thinking. Thinking is an activity of reason to process the knowledge we receive through the five senses, and intended to achieve a truth Logic thinking can be interpreted as reasoning, where reasoning itself is part of thinking that is beyond the level of remembering. This level of thinking is important (Andreson (2001). A person must master one level of thinking before he can go to the next level. The reason is we cannot ask someone to be creative if he does not know it, does not understand it, cannot apply it, cannot analyze it, and cannot analyze it, and can't evaluate Critical thinking is a disciplined way of thinking used by someone to evaluate the validity of something (ideas, questions, arguments, research, etc.) (Beyer in Filsaime 2008). Screven and Paul (2008) view critical thinking as an intelligent disciplined process of conceptualism, application, analysis, synthesis, and evaluation of the active skills collected from conceptualization, application, analysis, synthesis, and active evaluation resulting from observation, reflection, reasoning, or communication. Critical thinking enables students to study a problem systematically, face millions of challenges in an organized way, formulate innovative questions and design solutions. Another theory about critical thinking revealed by Ennis (1996) identifies five systematic behaviors in critical thinking. The behavior can be described as critical thinking stages as follows:

1. Analytical skills

Analysis skills aim to understand a global concept by breaking it down into more detail. Analysis questions require that students identify logical steps used in the thought process to the conclusion. Operational words that identify analytical thinking skills include: describe, explain, make diagrams, identify, describe, connect, detail and so on.

2. Synthesis skills

Synthesis skills are skills that are the opposite of analytical skills. Synthesis skills are skills that combine parts into a new formation or arrangement. The synthesis question requires the reader to integrate all information obtained from the reading material, so as to create new ideas that are not explicitly stated in the reading. This synthesis question provides an opportunity for controlled free thinking.

3. Knowledge and problem solving skills

This skill is a concept applied skill to some new understanding, which requires the reader to comprehend the reading critically so that after the reading activity is finished the student is able to grasp some of the main reading thoughts and be able to pattern a concept. The purpose of these skills is for students to be able to understand and apply concepts to new problems or scope.

4. Concluding skills

This concluding skill is an activity of the human mind based on its understanding / knowledge (truth), which can move towards reaching another new understanding / knowledge (truth). This skill requires students to be able to describe and understand various aspects gradually to get to the next stage, which is a conclusion. So the conclusion is a thought process that empowers its knowledge in such a way as to produce a new thought or knowledge.

5. Judging and evaluating skills

This skill requires careful thought in determining the value of something with various existing criteria. Valuation skills require the reader to provide an assessment of the value measured using certain standards

The critical thinking skills trained in this study are, analytical skills, problem solving skills, inference skills and inference skills.

Contextual teaching and learning (CTL) is a learning concept that helps teachers link material taught with real-world situations and encourage students to make connections between the knowledge they have and their application in daily life (Wasis, 2006). Johnson (2010) states that, CTL is a comprehensive system. So CTL consists of parts that are interconnected between theory and practice, so that it can help students to better understand the material and learning to be more meaningful. This learning assumes that the mind naturally seeks contextual meaning in accordance with the real situation of one's environment, and that can occur through the search for relationships that are reasonable and beneficial. Integrating learning material with students' daily contexts in contextual learning will produce a deep knowledge base, where students are rich in understanding problems and how to solve them. Students are able to independently (freely) use their knowledge to solve new problems and have never been faced, and have more responsibility towards their learning as their experiences and knowledge improve.

According to Nurhadi (2002) a class is said to use a contextual approach, if it applies the seven main components of contextual teaching learning, namely: 1. Constructivism (constructivism), develops the idea that students will learn more meaningfully by working alone, discovering themselves, and constructing their own new knowledge and skills. 2. Finding (inquiry), carry out as far as possible inquiry activities for all topics. The inquiry itself can be interpreted as the process of asking and finding out answers to scientific questions that are answered. 3. Questioning develops the student's curiosity by asking questions. Namely asking for information, explanations to be told about something that students want to know either through question and answer discussion or through interviews.4. Learning community (learning community), creating learning communities by forming learning groups. Can be grouped heterogeneously. 5. Modeling (Modeling), presents the model as an example of learning from something that will be made or produced. Modeling can be in the form of products or procedures for carrying out certain procedures. 6. Reflection (Reflection) that is doing reflection at the end of learning, can be done by reviewing, giving awards or answering questions about learning that has been carried out. 7. Authentic assessment conducts appraisal correctly and various methods or techniques of assessment. Both verbally non-verbal tests, tests or non-tests, projects, practicum and others.

According to the Center for Occupational Research and Development (CORD) there are 5 strategies for educators in the context of implementing contextual learning, abbreviated as REACT, namely: 1) Relating, learning is associated with the context of real life experiences. Learning in the context of

experience must draw students' attention to everyday events and conditions. 2) Experiencing, learning is determined by excavation (exploration), discovery (discovery), and creation (invention). Can do research that actively engages students. 3) Applying, learning when knowledge is represented in the context of its use. Students are introduced to the benefits of learning for their future. Can be done with direct learning experience. Or experimental activities. 4) Cooperating, learning through the context of interpersonal communication, shared use. Done by forming study groups to be able to work together. 5) Transferring, learning through the use of knowledge in new situations or contexts. Namely by connecting the initial knowledge that students already have with the new knowledge they have.

For the purpose of effective learning in the contextual learning process, all of these strategies must be used together, although in practice it is not necessary to require drastic changes from all teachers. The continuous use and reflection of contextual learning leads to the expansion and deepening of teacher knowledge.

CTL learning and 2013 curriculum have similarities, namely in learning activities that are equally inviting students to be able to construct their own knowledge or called constructivists, in addition there are also inquiries, questions, learning communities and authentic assessment. Therefore CTL is suitable to be applied to the 2013 curriculum.

III. EDUCATION DEVELOPMENT METHOD

The research procedure used by researchers refers to Educational design research by Tjeerard Plomp & Nieveen (2010), which describes the validity, effectiveness and practicality of Teacher Books and Student Books using the 4D model by Thiagarajan, et al. (1974). The 4D model itself in the development process consists of four stages, viz

a. define which includes 1) analysis of needs where in the 2013 curriculum students are expected to be able to think critically and be able to solve problems that arise in everyday life. 2) student analysis The subjects in this study were junior high school students grade VII. According to Jean Piaget, human development through four stages of cognitive development from birth to adulthood. Each stage is marked by the emergence of new intellectual abilities where humans begin to understand the increasingly complex world. 3) task analysis which includes the tasks contained in the student book that matches the demands of the curriculum and material about energy in living systems. Analysis of that concept by making a concept map of energy material in living systems. Finally, the analysis of the objectives of this analysis is carried out to determine the achievement of the learning process. Through learning objectives the teacher can find out what he wants to be taught.

b. design, This design phase is carried out to design teacher's books and student books, worksheets and LPs to be developed

c. develop, at this stage aims to produce learning tools in the form of teacher books, student books, as well as the width of the assessment that has been validated by the experts and testing the results of the device using one group pretest-posttest design.

d. disseminate. At this stage of dissemination it is limited to the schools that are carried out research

IV. RESEARCH INSTRUMENT

Validity is a measure that shows the level of validity or validity of an instrument. This validity sheet is used to obtain the validity of the Teacher's Book (instrument 1: Teacher's Book), Student's Book (instrument 2: Student's book), and the critical thinking assessment sheet (instrument 3: Critical thinking assessment sheet). This validation sheet is filled in by experts who assess and study Teacher Books, Student Books, and Assessment Sheets for critical thinking skills. Indicators of validity of teacher's books were developed from: (1) Preliminary Section, (2) Syllabus (3) RPP, (4) Student textbooks, (5) Specification Tables and (6) Inter-component Literacy. Indicators of validity of student books are assessed from: (1) Format, (2) Material, (3) Language, (4) Teaching Model Assessment in Supporting innovation and improving the quality of teaching and learning activities. Whereas the critical thinking assessment sheet was developed by looking at content validity and construct validity.

Instrument Teacher books, student books and grading sheets are said to be reliable if the calculations using the Borich (1994) formula yield reliability $\geq$ 75% ((Borich, 1994)) with the following conditions:

$$Percentage\ of\ agreement = \left(1 - \frac{A-B}{A+B}\right) x\ 100\%$$

Information:

A: The frequency of the aspect observed by the observer giving a high frequency.

B: Frequency of the aspect observed by the observer giving a high frequency.

Practicality of Prototype Teacher's Books and Student Books which include:

a. Learning Implementation Observation Sheet

The learning performance observation sheet was obtained by using the learning implementation observation sheet conducted by two observers who could observe it during the learning activities. The instrument of learning accomplishment is said to be reliable if the calculation using the Borich (1994) formula results in its reliability $\geq$ 75% Readability sheet of the Student Book Prototype by students. This readability sheet instrument is used to determine the level of student understanding when reading student books through student questionnaire responses to Student Books. conducted by taking a sample of 33 students by using a student's readability questionnaire by students.

b. Learning constraints

During the learning process, two observers noted and provided a solution to overcome these obstacles in the form of small notes.

Effectiveness Instruments Prototype Teacher's Books and Student Books, which is:

a. Instruments of critical thinking skills

The instrument of students 'critical thinking skills is used to determine the students' critical thinking skills in the form of

problem descriptions and is done at the beginning and at the end of the meeting.

a) Knowledge test analysis is used to determine the difference between the pretest and posttest scores of critical thinking tests, inferential statistical analysis is done through the N-gain score analysis with the formula:

The N-gain formula was developed by Hake (1999) as follows:

$$g = \frac{Spost - Spre}{100\% - Spre}$$

information:

g (gain) = Increased mastery of knowledge

S_{pre} = Average pre-test or initial ability (%)

S_{post} = Average pre-test or final ability (%)

b) The sensitivity of the items, calculated to determine the effect of a learning. Essay questions on critical thinking skills tests are calculated by equations (Gronlund 1985):

Learning sensitivity index can be done by using the formula

$$S = \frac{\Sigma ses - \Sigma seb}{T(skor\ max - skor\ min)}$$

Information:

S: The sensitivity of success sought

Σses: The total score of the questions after the process

Ebseb: Total score of the questions before the process

Max score: The maximum score obtained

Min score: The minimum score obtained

Q: Number of students taking the test

b. Instrument of student activity

This student activity instrument is used to determine student activities during the learning activities take place. Observed by two observers.

Student Response Instruments

This student response instrument is used to determine student responses after learning using prototype teacher's books and student books to practice critical thinking skills. This instrument was in the form of a questionnaire filled out by students after all meetings had ended.

V. DISCUSSION

A. Validity of Research Results

The results of the validation of the prototype research design of Teacher Books and Student Books based on contextual teaching and learning (CTL) developed were declared valid for use in science learning to train students' critical thinking skills. The following graph is the mode of validity of Teacher's Books, Student's Books and Assessment Sheets.

Teacher Book assessment results provided by the validator as shown in data table 4.1 that the validation results have an average score of 3.7 with a percentage of 94.5%. The validity mode of Teacher's Book is 4 with 100% reliability. This shows that the developed teacher's book is suitable for use in teaching and learning activities. The teacher's book itself contains a syllabus, lesson plans, student books, worksheets and also an assessment sheet along with the key. The learning model used uses the cooperative learning model and in its approach is associated with real life and adjusted to the level of child development. The lesson plans developed in this study are used to achieve core competencies

In learning activities as seen in the appendix, students are taught to think critically, starting from formulating problems, making hypotheses, analyzing data and concluding the results of experiments) in addition to that students are also taught to build their own knowledge by conducting group discussions, observations and experiments. Resources, tools and materials used in learning are easily available to students, inexpensive and can be found in the surrounding environment.

The developed Teacher's Book refers to the Contextual Teaching Learning (CTL) approach, which is a learning concept that helps teachers link material taught with real-world situations of students and encourages students to make connections between the knowledge they have and their application in their daily lives. CTL has pillars: constructivists, inquiry, asking questions, learning communities, reflection modeling and authentic assessment (Johnson, 2010). These CTL pillars are in line with Nurhadi (2002), a class is said to use a contextual approach if it applies the seven main components of contextual teaching and learning. The CTL pillars have been included in the learning activities as shown in the appendix. Likewise with the CTL pillars by CORD namely; relating, experiencing, applying, cooperating and transferring.

The teacher book developed aims to practice critical thinking skills. Critical thinking is practiced as stated by Ennis (1996), namely: 1) analyzing, 2) synthesizing 3), hypothesizing and solving problems, 3) concluding what is stated in learning activities and 4) evaluating. Thus the student book developed was based on CTL to practice critical thinking skills.

The results of the validation of student books conducted by the validator as shown in table 4.2 shows that the student book developed has an average score of 3.6 with a percentage of 92.2%, the validity mode of the Student Book is 4 with 100% reliability, this means student books are very suitable for use in learning. The results of the development of student books because they are adjusted to the syllabus and have been analyzed material based on contextual teaching and learning (CTL). The student book developed in it contained energy material reading materials in the living system, and worksheets and assessment sheets. Based on the CTL character, the activities that exist in student books also require students to be able to capture the relationship between learning experiences received and real life and encourage them to be able to apply them. In accordance with the statement of Sanjaya (2008), that by being able to connect between the material received and real life, the material received will be embedded tightly in students' memories, so it will not be easy to forget. This student book can also be used to support student activities. The results of validation tests of critical thinking assessment conducted by the validator show that the developed test has an average score of content validity assessment, amounting to 3.3 with an assessment percentage of 89.8%, a validation mode of 3 with 100% reliability. This shows that the developed test is worth testing..

B. Practicality of Learning

1. Readability of Student Books

At this stage the researcher conducted an analysis of the readability of student books by Grade VII A students who said that 80% of students said that students' books were easier

to understand and understood than other books that contained the same material. Whereas in class VII B it was 88%.

2. Implementation of Learning

At this stage the researchers conducted a trial lesson plan that had been developed. The researcher acted as a science teacher who was observed by two observers, namely the teacher at the Alam Insan Mulia Middle School. The observer has the duty to assess the implementation of the RPP by using the RPP observation sheet. The results of the implementation of the lesson plan have an average learning outcomes at meeting 1 of 3.5 or 95%. At meeting II was 3.5 or 94%, at meeting III it was 3.8 or 95%. And at the IV meeting amounted to 3.8 with a reliability of 94%. With mode 4 and 100% reliability.

C. Effectiveness of Learning
1. Critical Thinking Assessment Test

Critical thinking is trained, as stated by Ennis (1996), namely: 1) analyzing, 2) synthesizing 3) hypothesizing and solving problems, 4) concluding 5) evaluating. From the data obtained it can be seen that the average value of students' critical thinking in one class before the activity with the developed CTL device is far below the KKM value of 38 whereas after conducting learning activities using the teacher's book and the CTL student book developed, the value of the results The students' critical thinking assessment test increased by 82. The sensitivity of the learning test items ranged from 0.5 to 0.7. According to Aiken, items that were able to measure the learning effect were items that had a sensitivity of> 0.3. This means that the items in this study can be used as indicators of achievement of student competency indicators. while the N gain score obtained was 0.7. With the sensitivity obtained in the second trial, it means that students have successfully followed the learning process well.

The average value of students before learning is very low. This is because students have not been able to work on critical thinking problems. On average students have not been able to work on questions numbers 3,4 and 5 about presenting the results of experimental analysis and synthesizing. But after learning the average value of students increased dramatically. Students can already formulate problems, determine hypotheses, analyze, and conclude and evaluate.

The reliability of student activity instruments is 92%, which means the instruments are said to be good and can be used to observe student activities. based on table data 4.6, it can be seen that the most prominent student activity is conducting an experiment that is equal to 83% then followed by reading 87% of the book. Student activities were observed by two observers using instrument 4. Students have implemented all indicators of student activity. Student activities show effective for all meetings, because indicators of active student activity both at the first, second and third meetings that have been conducted by students. From the student response questionnaire data obtained, it is known that the percentage of positive responses was 83% while the percentage of negative responses by 17% can be seen in table 4.7. Most of the students gave positive responses to the learning activities that had been carried out using CTL approach students. From some students who gave positive responses to the students' books and the learning activities carried out stated that they were very happy to be able to conduct experiments.

The main obstacle is when conducting experiments that are formulating problems, formulating hypotheses, determining variables, and designing experiments it turns out to require longer time than planned, so to anticipate this, it is necessary to also practice skills outside the learning hours before being taught in class.

Teacher books and student books that are developed are suitable to be applied to the 2013 Curriculum. This is because CTL learning and the 2013 curriculum have in common, namely in learning activities, which are equally inviting students to construct their own knowledge or are called constructivists, besides that there is also inquiry, ask, authentic learning and assessment communities. Therefore, CTL is suitable to be applied in the 2013 curriculum. So, this research has succeeded in producing valid, practical and effective Teacher and Student Books to practice critical thinking skills. So that it can facilitate teachers to teach, facilitate students to learn, in accordance with the demands of the 2013 curriculum

VI. CONCLUSION

Prototype Teacher's book and Science Student Book based on contextual teaching and learning (CTL) to train critical thinking skills of VII grade junior high school students on Energy material in living systems that have been developed are very feasible to use and apply in learning because it can train critical thinking skills and have fulfilled 3 criteria, namely validity, practicality and effectiveness

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