



## CHARACTERIZED PROJECT BASED LEARNING TO IMPROVE CRITICAL THINKING SKILL

Aceng Saripudin<sup>1</sup>, Sri Haryani, Sri Wardani

<sup>1</sup>Post-graduate Programs State University of Semarang, Semarang, Indonesia  
(email: aceng.saripudin@yahoo.com, HP: 085323421982)

<sup>2</sup>Department of Chemistry Semarang State University, Indonesia

### ABSTRACT

Project-based learning (PjBL) has been support to be effective to increase student's critical thinking skill. This study aims to improve the students critical thinking skills through the development of characterized project-based learning that are valid, project based which are effective. This is a research and development type of study that consist of define, design and develop steps. One group pretest-posttest design applied to know the effectiveness of characterized project-based learning model. The subjects of this research were the student in 7th grade SMP Negeri 14 Tasikmalaya. Hence, the data was processed descriptively and statistically. Critical thinking skills improvement was calculated with N-Gain.

The results showed that (1) the learning instrument is valid with validity score 3.7, categorized as excellent. The maximum score for this validity is 4. (2) The package can be considered as an effective as a learning device as it helps more than 25 students (predetermined criteria). 30 students have totally mastered the test of critical thinking skills. The N-Gain of 0.2 which indicaties middle improvement. The highest N-Gain performance for critical thinking skills component is 0.038 (low) for strategies and 0.008 (low) for judgement (3) the score for characters were 87.9% 'Good'.

Key Word: characterized project-based learning, critical thinking skill

### INTRODUCTION

The learning model is an overview of the management of learning by teachers to achieve a certain competence. In the learning model includes designs on what to teach, how to teach and how to how to assess is performed. Quality learning model can be seen from the quality of learning as stated in the syllabus, lesson plan and assessment techniques, illustrating the steps of learning to achieve a certain competence. What the teacher planned a very influential on the quality of managed learning.

In fact as long as there is a tendency that the teachers do not have time to develop a learning device that is capable of integrating the issues in real life by planting a character that can improve critical thinking skills of student in defining the problem, take action to get the findings, take decisions and evaluate (Duran & Sendag, 2012). Issues in real life is also a sensitive issue and it contains a moral dilemma, which is supposed to be a valuable learning resource for the character development of students in school.

Permendikbud No. 58 in 2014 suggested the use of project-based learning model to the dimensions of the

concrete procedural knowledge and skills, thus encouraging higher-order thinking skills of student to produce a work contextual. Project-based learning model has become one of the main learning model as a response of school to the challenges of the 21st century (Filippatou & Kaldi, 2010; Cakici & Turkmen, 2013).

Project-based learning is a learning model that organizes learning about the project (panasan & Nuangchalerm, 2010) in which students conduct in-depth investigation of a topic real (Altun et al., 2009), to integrate the knowledge and present the results they learned (Kubiatko & Vaculova, 2011). Besides being able to develop ideas of students to create original solutions, find the available resources, presents the results of information search and evaluate the findings of its own (Kubiatko & Vaculova, 2011), project-based learning also supports the principles of constructivist (Kwan and Wong, 2012), in collaboration with others, independent and active involvement of student (Cakici and Turkmen, 2013).

The fact the process of learning science contrary to it. Teachers rarely develop comprehension and critical thinking habits by providing authentic experiences and

projects which encourage problem solving skills. On the other hand, the analysis of the syllabus and lesson plans that use science teachers indicate that very few indicators of critical thinking skills that appear in indicators of learning outcomes. This is commensurate with the results of a field study conducted by researchers at SMP 14 Tasikmalaya.

Teachers have made several attempts to develop an understanding and habits of critical thinking by providing authentic experiences and projects which encourage problem solving skills such as conducting assessments of cognitive, affective and psychomotor, and provide bonuses for each learning activity undertaken student. But the results are not satisfactory, as evidenced by the low initial test results of exploration ability of student (EAS) class VII for several indicators of critical thinking in the field study conducted by researchers such as in Figure 1.

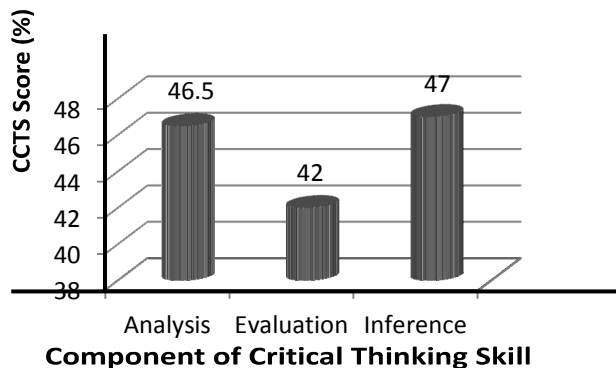


Figure 1. Test Result EAS

Low EAS test results of students of class VII SMP 14 Tasikmalaya, implying that the critical thinking skills possessed student still low. EAS tests carried out on 6 November 2014 was designed from the critical thinking skills indicators proposed by Philips et al. (2004). Based on the test results, poor critical thinking skills of students, especially in terms of the ability of analysis, evaluation and concluded capability (inference).

Critical thinking was one of the higher order thinking skills and problem solving in everyday life because it involves logical thinking, interpret, analyze and evaluate information for use in decision making reliable (Chukwuyenum, 2013). There are five components of critical thinking skills in mastering the learning material (Clulow & Brace-Govan, 2001), namely: (1) elementary clarification, (2) in-depth clarification, (3) judgement, (4) inference, and (5) strategies.

Research on project-based learning with the intention of improving the skills of critical thinking has been done, but in general the learning models often do not appear syntax learning that infuses the character of

the students and is not equipped with a software package that is characterized by learning critical thinking skills.

Researchers interested in developing a project-based model of science learning with the planting of character, with the hope of improving the critical thinking skills of student. Characters that allegedly can improve critical thinking skills of students who are integrated in the syntax of project-based learning model is the character of hard work, creativity, curiosity, respect and reading achievement. The development of this model includes a series of learning process that is a manifestation of the implementation of learning tools, particularly syllabi, lesson plans, teaching materials, media and assessment as set out in Permendikbud NO. 58 Year 2014, Permendikbud No. 103 of 2014 and Permendikbud No. 104 Year 2014. In addition, related to the integration of the values of characters are characters that can improve critical thinking skills in learning, this development will also support the Indonesia's Education Act No. 20 of 2003 Article 3.

## METHODS

This research can be classified into types of research and development. This is because according to the research objectives that have been raised by developing a project-based learning model to enhance the critical thinking skills of student. The development of this model includes a series of learning process that is a manifestation of the implementation of learning tools, particularly syllabi, lesson plans, teaching materials, worksheets student and test critical thinking skills.

Development model Thiagarajhan instructional systems, and Semmel Semmel (the 4-D models) were simplified (Trianto, 2013). Model 4-D consists of Define (definition), Design (design), Develop (development) and Disseminate (spread). The define stage consists of (a.) preliminary analysis of the end; (b) analysis of student; (c) analysis of the material; (d) the analysis of the task; (e) the formulation of learning objectives; (f) selecting media learning support; (g) determining support services. The design phase consists of selecting the format and design of the learning device. The development phase consists of expert validation and field trials covering limited testing and large-scale trials using pre-experimental design types One-group pretest-Posttest Design.

Subjects were students of class VII SMP Negeri 14 Tasikmalaya. Data collection techniques in this study using two kinds of instruments as a means of collecting data that the instrument test and non-test instrument. Test instruments in the form of test critical thinking skills of student. Non-test instrument validation learning device in the form of sheets, observation sheets (observation) character and critical thinking skills of student and student response. Data analysis critical thinking skills test results using the N-Gain. The validity of the data

analyzed by descriptive study on average, while the affective aspects (character), psychomotor, and response student using frequency distribution percentages.

## RESULT AND EXPLANATION

The purpose of this study is to establish the characteristics of the resulting product development and effectiveness of project-based learning model character.

### Model Characteristics Product Development Learning Tool

Based on the assessment of the general validator states that each device has a good product and got a recommendation to be tested. However, there are still some improvement suggestions for the improvement of the learning device. Description of the assessment of learning outcomes obtained by the learning device that was developed to meet the criteria defined as "valid". Achievement of the validity of the learning device is caused when the process of developing into account the characteristics of student, competency to be achieved in their entirety related to the domain of cognitive, affective, and psychomotor as well as the complexity of the learning objectives and availability of resources relevant to the achievement of competencies (Rusman, 2012; Majid, 2012).

In general, the validator expressed syllabus very well and can be used with little revision. Development being done in this syllabus is as follows:

- 1) Load indicators are designed to follow the stages of Bloom's Taxonomy for higher-level thinking (higher order thinking) and contains learning activities directly lead to real activity measured in critical thinking.
- 2) The real activity of designing a product / project along tracks based projects designed in groups.
- 3) The existence of a type of bill / products / projects and forms of life instrument in proficiency assessment covering basic life skills assessment and instrumental. Assessment can be done individually or in groups.

This is in line with the opinion of Anderson (2001), that the critical thinking skills to have the same meaning as the rate higher level thinking, especially in the aspect of "evaluation". Critical thinking pedagogy always refers to the theory, which gives students practice in some of the lower levels of critical thinking skills before directing them to tasks more difficult than the process of critical thinking. Real activity in accordance with the project design of learning materials, either individually or in groups, according to research results Altun et al. (2009), makes the student are highly motivated, feel actively involved in their own learning, and generate solutions (work or products) and an appropriate quality in the learning topics.

Implementation of the learning activities in this study used time allocation of 2 x 40 minutes and 3 x 40 minutes for each activity in-person or practicum. Lesson

plan developed include 2 part, ie 1: environmental pollution materials that are designed for the 3rd meeting, 2: global warming materials are designed for 2 meeting. Lesson plan development is based Guideline Subjects Natural science in Permendikbud No.58 Year 2014, Permendikbud No. 103 and 104 Year 2014.

Development is done for lesson plan is the requirement for students to implement project-based learning activities by integrating character that leads to an increase in critical thinking skills. The integrated character that is the character of hard work, creativity, curiosity, respect and love reading achievement.

Student in conducting discussion groups, observation and practical presentations related to the theme of environmental management. Teachers act as facilitators that guide, direct, and always supervise the activities carried student. In this case the implementation of the observations made by the two teachers as an observer, and each observer observed two groups of 5-6 students. The activities carried out student who deliberately designed in the lesson plan is critical thinking activities in accordance with each step in the syntax of project-based learning model.

Teaching materials in the form of a module entitled "Environmental Management" which is the central theme of learning materials in the study. Teaching materials is integrated with characters that leads to an increase in critical thinking skills in the essential concepts of each theme chosen. Teaching materials developed in this study is used as a learning resource materials and guidance for student during the learning process as well as in self-learning activities.

Teaching materials produced contains subject matter that requires student to use / link the concepts that have been discovered during the learning process with everyday life. The module is equipped with concept maps, animations, illustrated stories, sentences injection of motivation and other interesting features, can lead student to solve problems.

Contextually materials development is consistent with research Kubiato & Vaculova (2011) further motivate student to learn, because what they learn can help they make decisions, take action and make the solution in tackling environmental pollution and global warming. In addition, the use of animation in teaching materials developed based on that with the use of this animation can attract and increase the involvement of student, particularly their teens in learning science. This is consistent with the study of Spiegel et al. (2013) that the teenager would be more engaged in learning science by using comics and picture books.

Work-sheet students containing the problem, topic, objectives, tools and materials are required, operational measures, and the matter to be discussed. Work-sheet students special characteristics generated in this study are:

- 1) The existence of discussions to identify issues in the environment of student in everyday life ..

- 2) Provide a big responsibility to the students to carry out their own learning and collaboration / groups.
- 3) The activities to create a project management model of pollution, according to the observation of the problems student.
- 4) Demand that student are able to analyze the results and present observations or express an opinion or observations to others.

Worksheet Students development, according to the submitted Rahma (2012), that learning requires student optimally involved in the process of learning can enhance students' critical thinking skills. The same statement also expressed by Curto and Bayer (2005) which states that critical thinking can be developed to enrich the experience of student meaningful. Practical activities which require observation of the phenomena will challenge students' critical thinking skills (Broadbear, 2003).

Overall, the characteristics of project-based learning model generated character has its own characteristics, namely:

- 1) The integration of character values that lead to an increase in critical thinking skills in the learning device used in learning.
- 2) Provide a big responsibility to the students to carry out their own learning and collaborating or groups.
- 3) Demand that the learner is able to analyze the observations and compiled a scientific report.
- 4) The process of learning is done there is a project to design activities along with his step independently in groups, collect product or result that the project has been designed and presented the results of the project.

**Effectiveness Characterized Project-Based Learning Model**

Project-based learning model developed character is said to be effective if (1) the attitude of student that lead to critical thinking skills meet minimal mode predicate Good value (B) equal to the greater of 0.75 (75%), (2) meet completely individual learning and classical with a score greater success equal to 75%, ie with classical completeness reach 25 student from number 33 student, and (3) increased critical thinking skills with a score greater success equal to 75%.

The results showed that the use of project-based learning model effectively characterized by the fulfillment of the attitude value (character) of 87.9% as much as 29 student from 33 predicated "Good". Based on the data obtained in this study, the average student learning outcomes has increased the thoroughness of the final value posttest. Mastery was achieved, namely student achieve minimum completeness criteria (78) for completeness of individuals and 90.91% reaching criteria for classical completeness.

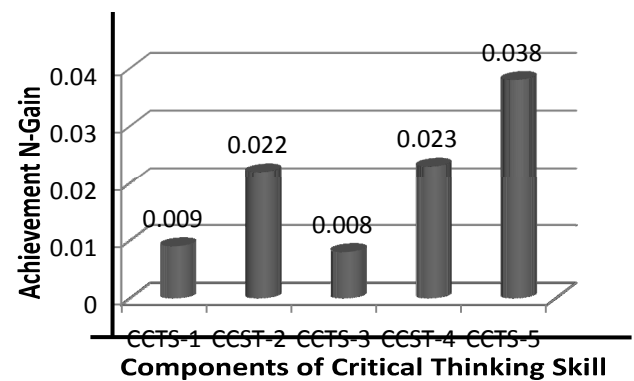
The study of students who meet the minimum completeness criteria and achievement in the classical mastery learning has proven that learning to use project-based learning device characterized by a positive

influence that can improve student learning outcomes and critical thinking skills of student. Results of this research is supported by research conducted by (Filippatou & Kaldi, 2010) that get results, project-based learning benefits for students, including those who have difficulty learning.

Results of the pretest and posttest student to use critical thinking skills test questions are designed in accordance component of critical thinking skills, according Clulow & Brace-Govan (2001), gained an average of 74.61 pretest and posttest average of 83.21. Further calculations using the formula N-Gain, obtained an average increase of 0.34 which are in moderate criteria, showed an increase in students' critical thinking skills.

The results are consistent with the results of the study Altun (2009) and the results Celiker & Balim (2012), which shows that the project-based learning may be the rise in academic achievement of students. Steps in project-based learning can develop the thinking of student to create original solutions, finding the resources available, presenting search results and evaluating the findings of its own information (Kubaitko & Vaculova, 2011). The development of thought of students in the process of constructing a concept or knowledge which causes students to have meaningful experiences, related to the concept and the learning outcomes they get.

Another reason that led to the increase in critical thinking skills of students is the presentation of the results of the activities of student. Presentation of activities begins with observation, discussion, analyze and synthesize concepts, topics or problems in learning. This is in line with the scientific approach, and supported by research Kubiato & Vaculova that project-based learning can develop the thinking of student to create original solutions, presents the search results and evaluating the findings of its own information.



Keterangan: CCTS-1 : Elemenary clarification  
 CCTS-2 : In-dept clarification  
 CCTS-3 : Judgement  
 CCTS-4 : Inference  
 CCTS-5 : Strategies

Figure 2. Profile Achievement N-Gain in Each aspect of Critical Thinking Skills

Based on the analysis of every aspect, it is known that of the five aspects of critical thinking skills after learning studied, in general critical thinking skills of students has increased. N-Gain achievements of student to think critically low in this study is the aspect of decision-making skills/judge, while the highest achievements of the N-Gain is the aspect of skill in determining the strategic steps (strategy) as shown in Figure 2.

The low increase in critical thinking skills aspects of the 3rd namely decision-making skills/judge compared to other aspects due to the increase of student unfamiliar with constructivist approach and lab managed by the students themselves. Aspects of decision-making skills/judge in research on the theme of environmental management is highly related to practical activities.

Although work-sheet students developed already require student to be able to design an experiment itself, but the scarcity of teachers to integrate issues in real life with cultivation of character in the learning and practice of teachers not to give creative freedom in doing a practicum for student to be one reason for the increase thinking skills the most critical aspect is low (Duran & Sendag, 2012; Goleman, 2004).

## CONCLUSION

Model of project-based learning in character on the theme of environmental management that was developed in this study has the characteristics (1) there are the activities of designing a project as well as step works, collect the product or the results of the project and present, (2) the cultivation of character values that lead to increased skills critical thinking in learning device that is the character of hard work, creativity, curiosity, respect and love reading achievement. The results showed that the character of project-based learning model that was developed to obtain a valid criteria to be used in the study, with an average score of all the learning device is the highest score of 3.7 out of 4.

Once the project-based learning model effectively characterized by results (1) the critical thinking skills of students increased from an average score of 74.61 into 83.21 earlier, with an average gain of 0.34 N were in middle category (2 ) attitude of student that lead to an increase in critical thinking skills with minimal mode predicate Good value (B) reached 87.9% (3) student achieve minimum completeness criteria = 78 for completeness of individuals and 90.91% reaching criteria for classical completeness.

Project-based learning model character on the theme of environmental management that was developed in this study is proven to improve students' critical thinking skills. In addition, the skills that accompany the learning process of students also successfully developed through this research, although it has not obtained the data which supports the improvement of these skills.

Researchers suggest the need for further research on project-based learning model of character to enhance the science process skills of student.

## BIBLIOGRAPHY

- Altun Y.S. Turgut, U. & Büyükkasap, E. 2009. The Effect Of Project Based Learning on Science Undergraduates' Learning of Electricity, Attitude Towards Physics And Scientific Process Skills. *International Online Journal Of Educational Sciences*, 1(1): 81-105.
- Anderson, W.L & Krathwohl, R.D. 2001. *A Taxonomy for Learning Teaching and Assessing A Revision of Bloom's Taxonomy of Educational Objectives*. USA: Addison Wesley Longman.
- Broadbear J T. 2003. Essential elements of lessons designed to promote critical thinking. *The Journal of Scholarship of Teaching and Learning (JoSoTL)*3 (3): 1-8.
- Çakici, Y. & Türkmen, N. 2013. An Investigation of The Effect of Project-Based Learning Approach on Children's Achievement And Attitude In Science. *The Online Journal of Science and Technology*, 3(2): 9-17.
- Celiker, H.D. & Balim, A.G. 2012. Effects of Project Based Learning of The "Solar System And Beyond: Space Puzzle" Unit on Student Achievement. *Journal of Theoretical Educational Science*, 5(3): 254-277.
- Chukwuyenum. 2013. Impact of Critical thinking on Performance in Mathematics among Senior Secondary School Students in Lagos State. *IOSR Journal of Research & Method in Education*. 3(5): 18-25.
- Clulow, V. & Brace-Govan, J. 2001. *Learning through bulletin board discussion: A preliminary case analysis of the cognitive dimension*. Paper presented in the Moving Online Conference II, September 2-4, 2001, Gold Coast, Australia
- Curto, K. & Bayer, T. 2005. An Intersection of Critical Thinking and Communication Skills. *Journal of Biological Science* 31(4):11-19.
- Duran, M. & Sendag, S. 2012. "A Preliminary Investigation into Critical Thinking Skill of Urban High School Student: Role of an IT/STEM Program". *Scientific Research Creative Education*. 3(2): 241-250.

- Filippatou, D. & Kaldi, S. 2010. The Effectiveness Of Project-Based Learning On Pupils With Learning Difficulties Regarding Academic Performance, Group Work And Motivation. *International Journal Of Special Education*. 25(1): 17-26.
- Goleman, D. 2004. *Emotional Intelligence*. Translated by T. Hermaya. 2008. Jakarta: PT. Gramedia Pustaka Utama.
- Kubiatko, M. & Vaculová, I. 2011. Project-Based Learning: Characteristic And The Experiences With Application In The Science Subjects. *Energy Education Science and Technology Part B: Social and Educational Studies*. 3(1): 65-74.
- Majid, A. 2012. *Perencanaan Pembelajaran*. Bandung: PT. Remaja Rosdakarya.
- Panasan, M. & Nuangchalerm, P. 2010. Learning Outcomes of Project-Based and Inquiry-Based Learning Activities. *Journal of Social Sciences*, 6(2): 252-255.
- Permendikbud No.58 Tahun 2013 tentang Kurikulum 2013 Sekolah Menengah Pertama/ MadrasahTsanawiyah. Jakarta : Kemendikbud
- Permendikbud No.103 Tahun 2013 tentang Pembelajaran Pada Pendidikan Dasar dan Pendidikan Menengah. Jakarta : Kemendikbud
- Permendikbud No.104 Tahun 2013 tentang Penilaian Hasil Belajar oleh Pendidik Pada Pendidikan Dasar dan Pendidikan Menengah. Jakarta : Kemendikbud
- Philips, C., Chesnut, R.J., & Rospond, R.M. 2004. "The California Critical Thinking Instrumen for Benchmarking, Program Assessment, and Directing Curricular Change". *American Journal of Pharmaceutical Education*, 36(4) Article 101.
- Puskur. 2010. *Pengembangan Pendidikan Budaya dan Karakter Bangsa*. Jakarta: Puskur Balitbang Kementerian Pendidikan Nasional.
- Rahma, A.N. 2012. Pengembangan Perangkat Pembelajaran Model InkuiriBerpendedkatan SETS Materi Kelarutan dan Hasil kali Kelarutan untuk Menumbuhkan Keterampilan Berpikir Kritis dan Empati Siswa Terhadap Lingkungan. *Journal of Educational Research and Evaluation* 1 (2): 133-138.
- Rusman, 2012. *Model-Model Pembelajaran*. Jakarta: PT. Rajagrafindo Persada.
- Spiegel, A.N., McQuilan, J., Halpin, P., Matuk, C., & Diamond, J. 2013. Engaging Teenagers with Science Through Comics. *Research Science and Education Springer*. 43(6): 2309-2326.
- Trianto. 2013. Model Pembelajaran Terpadu. Konsep, Strategi dan Implementasinya dalam Kurikulum Tingkat Satuan Pendidikan (KTSP). Jakarta : Bumi Aksara.