The Innovation Class uses the Proyect Based Learning model to improve the problem solving skills of Jabal Ghafur University students

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Abstract

The purpose of this study was to describe the problem-solving abilities of students majoring in mathematics education at Jabal Ghafur Sigli University, consisting of critical and creative, collaborative and communicative abilities using the Project Based Learning (PJBL) model in completing research methodological tasks. This research use desciptive qualitative approach. The sample subjects in this study were 10 semester 7 students. Sampling using purposive sampling technique. Data collection using assignment techniques, evaluation, presentation and interviews and documentation. Data analysis techniques include data reduction, data presentation and conclusions. The results showed that students had all the indicators of problem-solving abilities including critical thinking, creative, communicative and collaborative thinking skills, although they were not optimal.

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1.Introduction

The latest educational challange is every educational institution must be able to produce graduates who have 21 st century competence. 21 st century competence is expected to be able to work together (Collaborative), able to think critically, creative thinking, and skilled in communication (communication and problem solving). These competencies are known as 21 century skills (Trilling & Hood, 1999). In line with this opinion Widana (2017) stated that there are 3 competency groups needed in the 21st century skills, namely: a) having good character (faith and piety, curiosity, never giving up, social and cultural sensitivity) , able to adapt, and have high competitiveness); b) have a number of competencies (critical and creative thinking, problem solving, collaboration, and communication); and c) mastering literacy including thinking skills using sources of knowledge in the form of print, visual, digital, and audit.

Thinking skill are divided into basic level thinking skill which include remembering (C1), understanding (C2), and applying (C3). Then high level thinking skills which include analyzing (C4), evaluating (C5) and creating skills (C6) (Anderson & Krathwohl, 2001). Beside that the students not only having basic level thinking skills (LOT), but students must also have order thinking skills (HOTS). Conklin (2011b) states that there are two characteristics of high-order thinking skills, namely critical and creative thinking. Critical thinking is the ability to analyze and evaluate information (Desoete et al., 2006). This means that critical thinking is the ability to analyze and evaluate information. Furthermore, Bassham et al., (2007) stated that "critical thinking is the art of thinking about thinking while thinking to make thinking better". The meaning of critical thinking is the art of thinking about how to think to make up the best minds. Therefore, experts agree that critical thinking contains two thought processes, namely analytical thinking or reasoning and decision making. Reasoning is a thinking activity such as clarity, accuracy, validity or precision, relevance, depth and reliability of information and other evidence that supports the argument, to produce a conclusion (Ruland, 2003). So, critical thinking is a process of reasoning about a problem to the complex stage of the "why" and "how" of the solving process so as to produce a decision.

Creative thinking contains aspects of cognitive, affective and metacognitive skills. Cognitive skills include the ability (1) flexibility, (2) fluency, (3) originality, (4) elaboration (Coleman & Hammen in Yudha, 2004; Musbikin, 2006). Affective skills include sensing problems and opportunities, being tolerant of uncertainty, understanding the environment and creativity of others, being open, taking risks, building self-confidence, self-control, curiosity, expressing and responding to feelings and emotions, and anticipating things. unknown (Sukmadinata, 2004). Metacognitive abilities include designing strategies, setting goals and decisions, predicting from incomplete data, understanding creativity and what others do not understand, diagnosing incomplete information, making multiple considerations, regulating emotions, and advancing elaboration of problem solutions and plans. (Puccio and Murdock in Costa, ed., 2001).

2.Literature Review

The Innovation Class and Project Based Learning

There are weaknesses in the development of student soft skills and hard skiils as mentioned above. This weakness occurs when the lecturer does not apply learning methods that involve students actively. The results of the research revealed that in general, lecturers were very weak, which led to the creativity of students as learners. The position of a lecturer tends to appear as a one man show, while students tend to be subordinated in the learning process (Santosa, 2014). In the table below, it is revealed that Chang (2012) in an innovation class stated that student activities in problem solving and discussion were still weak.

	Type of activity	Persentage
1	Investigation	3
2	Practical work	10
3	Discussion	15
4	Problem Solving	20
5	Exposition	12
6	Self-study presentation	10
7	Collaboration with Peers	10
8	Analysis and Conclusion Drawing	10
9	Reflection on self-study	10

Source: Chang (2012)

Table 1. An overview of the distribution of activities in the Innovative Class

Based on the table above, innovative learning should stand out in the number of sessions for problem solving and discussion and exposure, followed by elements of other learning activities. This indicates that in general, lecturers in delivering lectures are theoretical, so that the lack of student inspiration in work, especially those based on research results in the field, ultimately makes students more passive and has weak creativity. The dominance of lecturers in learning in several countries can be seen more clearly from the information listed in the table below.

No	Country	the perpetrator	Number of Words from Lecturer	Number of Words from
1	Indonesia	Lecturer / Student	2633	1
2	Netherland	Lecturer / Student	5148	7
3	Switzerland	Lecturer / Student	5360	1016
4	Chech Republic	Lecturer / Student	5452	8
5	Australia	Lecturer / Student	5136	8
6	Hongkong	Lecturer / Student	5798	6
7	United States	Lecturer / Student	5902	1018

Source: Chang (2012).

Table 2. Number of Words Said by Lecturers and Students in Each Subject.

The information we get from the table above shows that students listen more, listen and only watch the lecturers deliver the material predominantly. Whereas according to Santosa (2014), students should ideally be positioned as the center of the learning process, not as objects anymore. For example, the involvement of students in Indonesia in the learning process is only 6.9%, the rest of the lecturers dominate more than 90%.

Higher education institutions are required to be able to design and implement innovative learning processes so that students can achieve optimal learning outcomes in the affective (character), cognitive (knowledge) and skills (skills) aspects. One of the learning methods that can involve students actively and innovatively is Project Based Learning (PjBL). PjBL is a process-centered, relatively time-focused, problem-focused learning model, meaningful learning units by combining concepts from a number of components, be it knowledge, disciplines or field experience. The learning model takes place collaboratively in hierogeneous groups. Given the collaborative nature of project work, the development of learning skills takes place among students. In general, project-based learning takes three stages:

No	Fase	Discreption
1.	Project planning	a. Identify real problems and find the root of the problem, b. Finding alternative problem solving strategies, c. Doing planning.
2.	Project implementation	a. Student guidance in completing assignments, b. Examination of task completion, c. Discussion between teams in groups.
3.	Project Evaluation	a. Progress in solving the problem, b. Teamwork and individuals, c. Diary book, d. Performance evaluation and presentation, e. Project report in written form.

Source : Lestari & Yudhanegara (2015)

Table 3: Stages of Project-based Learning

Problem Solving Ability

Problem solving is a process to achieve goals when the achievement of these goals are not clear (Ryan et al., 2016). One of the important components of 21st century education is problem solving ability (Wismath et al., 2014). Furthermore Griffi (2012), emphasizing the abilities that students must have in the 21st century, namely:

Critical thinking and Problem solving skiil

a. Communication and collaboration skiil

b. Creativity and Innovation skiil

c. Information and communication technology literacy

The problem solving indicators used in this study are modified from Polya, those are understanding the problem, making plans, implementing plans and looking back. Based on the above, the purpose of this study was to explore and describe the variations in students' thinking skill in solving lower activity in the class problems, based on the problems as follows "How do students manage their thinking skill process to solve problems in the class room activity?"

3.Method

Research Design

The type of research is a qualitatif descriptive, Sources and data collection methods include documentation, observations and interviews. Data analysis, namely data reduction, presenting of data and conclusions.

The Procedure of Data Collection

The research started by administering the examine document to the selected subjects. The subjects of this study were 10 students, 7 th semester, mathematics education departement at Jabal Ghafur University Sigli Indonesia. They were divided into two group namely high group (five students) and middle group (five students). They were asked to solve the problems at the school, which is looking for the causes of low student mathematics learning achievement (Project). The lecturer designs a systematic task (project) so that students learn knowledge and thinking skills through a structured and complex search / exploration process. While students work on assignments in the form of projects that have been systematically designed, then in some time later show their performance and are accountable for their work in the discussion forum. The ability to be observed is the ability to think critically and creatively, collaboratively and communicate. The indicators of this ability are as follows:

No	Aspect	Indicators
1.	Problem Solving	- able to identify problems and root causes, - Able to carry out the right strategy and re-selection
2.	Creativity	- Arranging all the strategy on the problem solving systematically. - Creating patterns and ideas as well as linking and applying them to solve problems.
3.	Critically	- Understand the problem and conduct an assessment to select a solution to the problem. - Implement decisions and conclusions.
4.	Communication	- able to communicate effectively to audiences both orally and in writing,

	- Submit supporting arguments that are strong and can be	
	accepted logically	
5. Collaborative	- Able to work in teams.	

Sourch: Conklin (2011b); Cai & Jacabcsin (1998)

Table 4. Thinking Skiil Indicators

No		Thinking skill	Good	Poor
1.	Problem Solving	able to identify problems and root causes,	4 or 3	2 or 1
		able to carry out the right strategy and re-selection,	4 or 3	2 or 1
2.	Creativity	arranging all the strategy on the problem solving systematically.	4 or 3	2 or 1
		creating patterns and ideas as well as linking and applying them to solve problems.	4 or 3	2 or 1
3.	Critical	Understand the problem and conduct an assessment to select a solution to the problem.	4 or 3	2 or 1
		Implement decisions and there are conclusions.	4 or 3	2 or 1
4.	Communication	able to communicate effectively to the audience	4 or 3	2 or 1
		proposing a strong supporting argument that can be accepted logically.	4 or 3	2 or 1
5.	Collaborative	able to work in teams.	4 or 3	2 or 1
		be actively involved in group discussions	4 or 3	2 or 1

Table 5. Thinking Skiil and scoring rubrics of the study

4.Results

Variations in students' interviews

The interview conducted for the students after the presentation class was analyzed. The purpose was to describe students' thinking skill. To illustrate some of the it conditions, further interviewers are conducted against the ten students are:

Students Category		Good	Poor
High	GT	10	-
	AZ	8	-
	GM	7	3
	TC	8	2
	BT	8	2
Percentage		41 (82%)	9 (18%)
Middle	HM	6	4
	AS	5	5
	HT	5	5
	AM	7	3
	TM	6	4
Percentage		29 (58%)	21 (42%)

Table 6. Determining of students' Thinking skill

5.Discussion

The interview showed students with high group, including GT, AZ, GM, TC and BT and AM, from the middle group, always do the collaborative with the others and motivation to succeed, because school is a place to forge students in developing thinking skills, interacting to communicate, collaborating and a place to obtain accurate information to shape students' thinking skills (Bacanli et al., 2011). But there were four students from the middle group who were less involved in teamwork, namely HM, AS, HT and TM. The full interview results showed the students' thinking skill were categorized as good with 82%, and 58% for the high, and middle groups, respectively.This further indicates that the collaborative with the others were key succeed in communication skill and critical thinking. These thinking skills are necessary to exist in the 21st century. 21st century skills are various types of skills needed by humans in facing challenges and increasingly complex lives (Redhana, 2019). The rapid development of technology and widespread globalization

in the 21st century have raised the concerns of many practitioners, educators and international organizations in the world about what skills students should have for the future (Levy & Murmane; Noe et al, 2014; Wagner, 2008; National Research Council, 2010). Then Masingila & Wisniowska (1996), the students said that I can do it, but I can't explain it." Doing is important, but studens' understanding and communicating what they are doing is more important.

6.Conclusion

The full interview results showed the students' thinking skill were categorized as good with 82%, and 58% for the high, and middle groups, respectively. Qualitatively, the interviews showed thinking skill was categorized as good based on ten indicators, and the smart or high group was found to have more than the others by using collaborative team, to achieve thinking skill. The interview showed students with high group, including GT, AZ, GM, TC and BT and AM, from the middle group, always do the collaborative with the others and motivation to succeed, because campus is a place to forge students in developing thinking skills, interacting to communicate, collaborating and a place to obtain accurate information to shape students' thinking skills. However there were four students from the middle group who were less involved in teamwork. The lecturer must always involve students in the learning process, especially in solving problems to improve critical thinking skill, and creative thinking skill.

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