

Enhancing Critical Thinking Skills of Biology Education Students Using Online Formative Assessment

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ABSTRACT

The study of online application of formative assessment in general biology courses aims to improve critical thinking skills of biology education students. This research subject is biology education students in the first semester. This research is preliminary studies that uses e formative assessment as a reflective tool to improve the critical thinking skills of biology education students. The measurement results showed a significant improvement of the critical thinking skills of students of biology education. Formative Assessment as a reflective thinking instruments is needed by students' perceptions of something, this perception will emerge if we direct it and we facilitate it continuously .

Keywords: *Critical thinking skills, Formative assessment, Online system, Reflective*

1. INTRODUCTION

The ability to think critically is part of an important high-level thinking ability that must be mastered by students. Critical thinking is an activity that needs to be developed, because the purpose of critical thinking is to achieve deep understanding, its to be able to overcome problems found in everyday life. Critical thinking skills in the learning process can train students to make decisions from various points of view carefully, thoroughly and logically, therefore the development of critical thinking skills becomes a goal that must be achieved in the learning process. One way to improve students' critical thinking skills is to provide continuous formative assessment. Using online assessment will make it easier for us to apply formative assessment continuously, although it is used frequently, it's Paperless and more efficient because of it's ease of assessment.

Formative assessment based online system as a tool to think reflective, because the main function of online-based formative assessment is to provide students with feedback that can be used to improve their learning experience. The effective informal formative assessment practices may be associated with student learning in scientific inquiry classrooms not only providing value, we can also identify areas that may need improvement and mark their strengths during the learning process. By

providing suggestions and input that build student performance, it will help in making future work plans, so that they can modify their learning behavior and achieve learning goals [1]. Formative assessment is interpreted as all related activities with activities carried out by teachers and students that can provide information where this information can be used as feedback to improve and modifying teaching and learning activities [2].

Based on the findings of research conducted by Anwar et al. [3] that the critical thinking skills of early-level students are still low, one of the reasons is because they are not accustomed to solving critical thinking problems. Therefore, a formative assessment based on critical thinking is needed so that it can provide feedback on each learning topic completed with the aim of improving students' critical thinking skills.

In several aspects, formative assessment is one of the most beneficial assessment strategies, because formative assessment focuses on what must be learned, not what the learner should have mastered. Thus, learners have enough time to improve and obtain the necessary information and skills during the learning process. Therefore, the problem in this study is how to use formative assessment using an online system to improve students' critical thinking skills? which will answer the objectives of this study, namely how to

improve students' critical thinking skills by using online-based formative assessments

2. METHOD

The population of this study were the first semester of biology education student's taking general biology courses. This research is a preliminary studies, pre-test-post-test group design, in this design includes pre-test measurements followed by treatment and post-test for a single group. For more details, see Figure 1.

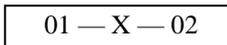


Figure 1. A pre-test-post-test group design [4].

Test results were analyzed based on the Ennis indicator [5], [6] as in the Table 1.

Table 1. The critical thinking skill based on Ennis indicator

Aspect of Critical Thinking	Indicator
Basic Clarification	1) Focus on a question
	2) Analyzing Argument
	3) Asking and answering questions of clarification
Basic Support	4) Judging the credibility of a source
	5) Observing and judging observations reports
Inference	6) Deducing and judging deductions
	7) Inducing and judging inductions
	8) Making and judging value judgments
Advanced clarifications	9) Define terms and judge definitions
	10) Identifying assumptions
Strategy and tactics	11) Deciding on action
	12) Interacting with others

3. RESULT AND DISCUSSION

The Results of pretest showed in the Table 2 that the students' critical thinking skills are still low by the acquisition means is only 46.28. It's means that almost all of the students are still not able to solve the problems of critical thinking.

One of the reasons for the low critical thinking skills of students is because they are not accustomed to facing critical thinking problems. If we provide formative assessments continuously, students' habit of minds will be formed. Some education experts [6], [7], [13], [17]

places habits of mind into three categories, namely self regulation, critical thinking and creative thinking.

Table 2. The pretest and post test result

No.	Indicator of Critical Thinking Skill	Pretest	Post test
1	Basic Clarification	40,2	55,1
2	Basic Suport	53,3	68,3
3	Inference	50,0	59,4
4	Advanced clarification	43,3	57,6
5	Strategy and tactics	44,6	58,3
The average		46,28	59,74

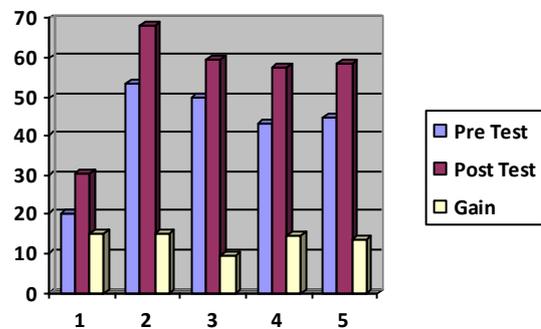


Figure 2. The increasing of critical thinking skill

The results of the significance test using SPSS obtained a sign value of 0.002 (sign < 0.05) so that it can be stated that the formative assessment given continuously has a significant effect for students' critical thinking skills, from figure 1, it can be seen that the gain results show a significant increase between the pretest and post-test results. This indicates that formative assessment which is packaged in the form of feedback and peer assessment based on critical thinking can improve students' critical thinking skills. Agree with that some educators states that feedback will help students to learn, especially pay attention to students about strengths and weaknesses in what he has done. Feedback as things that potentially motivate, help them improve learning and improve their ability to do tasks, helping them to be more reflective (doing self-assessment) and clearly know the achievement and progress of learning [2], [8-11].

One of the causes of this increase is due to familiarizing students with higher-order thinking-based assessments, especially the ability to think critically. Formative assessment as a tool to think reflective will give the feed back for the students. That feed back given continuously will effect to their habits of minds especially their critical thinking skill. One of the factors causing the low critical thinking skills is because

students are not accustomed to facing critical thinking problems, that must be given continuously [3]. Critical thinking is reasonable and reflective thinking that focuses on deciding what to believe or do [5]. So the students habits of mind to think reflective will help students to foster students' thinking skills. Habits of mind means having the character to behave intelligently when faced with problems or answers that are not immediately known [12],[13]

The habits of students' reflective thinking will help students to foster students' critical thinking skills. Reflective thinking is needed by students' perceptions of something, this perception will emerge if we direct it and we facilitate it well. One of them is by using formative assessment based on critical thinking. Assessment based on critical thinking that we apply continuously will build students' perceptions of these critical thinking skills, its impact to their habits of mind.

Similar to results reported nearly two decades ago (Pascarella, 2006), Their multi-institutional findings suggest that student perceptions of organized instruction during college have a small, but statistically significant, positive effect on first-year gains in critical thinking skills [14],[15].

Even though it has increased, the increase is still below the average, namely 59.74 is still in the fair category, not yet in the good category. This means that critical thinking skills are still a problem that must be continuously striven to be better. These are just few of the many studies that point to the fact that although critical thinking has long been an issue, it is a demand that persists to be addressed [16].

Based on this study findings, we can increase the students' critical thinking skills by using formative assessment. The most important point to remember about formative assessment is not about values but about how the learner is progressing.. Learners do not need to show that they have mastered certain material, but they will show improvement as the material progresses. A formative assessment in online system is designed to monitor learner progress and provide feedback that can be used by them to achieve learning goals. Formative assessment as a reflective instrument, that used as feedback on learning progress so that students are will be able to think reflective which will affect to their critical thinking skills improvement. The purpose of providing feedback is to narrow the gap between existing understanding and learning goals [17]

Educators agree that the development of higher order or cognitive intellectual abilities is of utmost importance and that critical thinking "is central to both personal success and national needs" [18]. Students need to "develop and effectively apply critical thinking skills to their academic studies, to the complex problems that they will face, and to the critical choices they will

be forced to make as a result of the information explosion and other rapid technological changes" [19].

4. CONCLUSION

The significance result indicate that there is a significant influence on students' critical thinking skills. The significance value of 0.002 (sig <0.05) so that it can be stated that the formative assessment given continuously has a significant effect for students' critical thinking skills. Formative assessment in this study used as a reflective instrument. That instrument used as feedback on learning progress give an impact to their habits of minds especially their critical thinking skill. It's makes students will be able to think reflective which will affect to their critical thinking skills improvement.

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