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Promoting students' critical thinking skills through project-based learning in Indonesian higher education

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Critical thinking skill is the most needed skill in higher education. However, many students are unable to develop their ability to think critically. Therefore, this research is focused on promoting higher education students' critical thinking skills by applying project-based learning in the learning activity. Project-based learning is the media for students to develop their critical thinking skills through communication, negotiation, and problem-solving in group discussions. Those activities require critical thinking to achieve the learning objectives. Thus, this study aims at (1) examining the idea of critical thinking, (2) discussing ways of improving critical thinking learners, and (3) measuring learners' capacity of critical thinking using project-based learning approaches. The study is non-empirical by employing a qualitative approach to students' critical thinking and project-based learning perspectives. The subjects of this study were 30 higher education students. The data of this study were collected through questionnaires and interviews. The findings reveal that students can improve innovation and exercise criticism in completing project-based learning in the classroom. It is suggested that ELT practitioners apply project-based learning in their classrooms.

Keywords: 1945-constitution, critical thinking, higher education, project-based learning.

INTRODUCTION

Critical thinking has been identified as a main and basic skill for success in higher education (Roohr & Burkander, 2020). The sustainability of students' learning development may be aided by their critical thinking abilities. The progress of students' improvement on critical thinking might take a period since it isn't obtained by when human was born, yet critical thinking is obtained by training. Many other factors could support students' improvement in critical thinking. The common factors are reading books and group discussions. In addition, it also can be taught by teachers based on the curriculum that supports students' critical thinking improvement. Due to its importance in education system, critical thinking integration in classroom is written in the ministry of education and culture (MoEC) of Indonesia's policy No. 3, 2020. It is also supported by some studies that critical thinking abilities of high-level learners need to be improved (Zhang, 2020; Butler et al., 2017; Anwar et al., 2021).

On the other hand, PISA 2015 results published that critical thinking of Indonesian students is under the average of other countries (OECD, 2015). It means that education system in Indonesia needs some adjustment, especially on the process of learning. Teachers must integrate or use learning techniques that promote critical thinking. One of them is project-based learning.

Indonesian government also recommends the use of project-based learning methods because these methods have been proven effective in increasing the capacity of learners. This has been proven by some researchers like Rochmawati et al. (2019), Wajdi (2017) and Anazifa & Djukri (2017). The first two research were conducted to elementary and secondary school students, and the last was in science subjects. Less have been done in higher education. To shed light on the application of project-based learning application in higher education, this research aims to know the benefits and aims of project-based learning in promoting students' critical thinking skills. In addition, the students' perception of project-based learning applications is also investigated.

Literature Review

We all know life is inseparable from the process, and of course, the process we face needs to be bridged with critical thinking. Moreover, the amount of information in this technological era is as massive as a dynamite explosion that will continue into the future. If the generation born at this time only receives information with one blink of an eye and receives it clearly, then critical thinking has an important role in the formation of values and the right decision-makers. This was approved by Filho et al. (2020) which revealed that critical thinking is one of the main competencies in Education for Sustainable Development (ESD). ESD is an education that encourages learners to make decisions with the right information and be able to take responsibility for what they have decided. ESD itself can be defined as "education to achieve sustainable development" or education that aims to achieve sustainable development.

Today the world is discovering Education for Sustainable Development (ESD) which is defined as holistic and transformative education that discusses the essence and outcomes of learning in a pedagogical environment (Rieckmann, 2017). ESD not only integrates issues of weather change, poverty, sustainable consumption but also creates interactive teaching and learning context centered on learners. What ESD needs now is the evolution of teaching and learning. In addition, the use of new approaches in education makes it possible to develop critical thinking. Project-Based Learning then helps students apply their knowledge to real social problems. Project-based learning helps students develop soft skills such as teamwork & collaboration, communication, critical thinking, and creativity (Vogler et al. 2018). This is believed to be true because some previous researchers have proven the application of this project-based learning in their research. Some of them revealed the real success seen from the percentage of research as well as the results of surveys conducted in these researches. This is our strongest reason to continue research on project-based learning in improving students' critical thinking. After discovering a lot of literature on aligned research, we gained more knowledge to continue this research until the final stages.

Critical Thinking Skills

What comes to mind when you hear the word 'critical thinking' is to think with great and deep intentions about a subject. Thus, several definitions of critical thinking have been collected according to the experts who are the basis of the theory in this research. Pryor & Kang (2013) defined critical thinking as an individual's process of suspending his or her personal judgment, keeping the mind open to all information, and skeptically solving the problems before. There is another definition that mentions critical thinking is an ability possessed by individuals in channeling the competence of higher-order thinking and rational thinking (Filho et al. 2020,238). What is meant by rational thinking here are: (1) research/analysis, (2) alloy/synthesis, and (3) introduction and solving problems.

Generally, critical thinking is naturally done by most of the population in this world when it comes to finding real visible inequality. It causes the brain to work to find out more in that event, then the brain easily deduces the solution it should have done. It turns out that this was approved by Johnson (2000) as quoted by Pryor & Kang (2013) suggesting to start critical thinking at a time when learners are facing their problems. The reason is none other than to test learners in bringing up ideas that judge or perhaps protect them. The idea will come up by itself which comes from the experience of the learner itself. Johnson also stated that thinking about the problem is a major process for solving the problem.

Many things can be done to improve our critical thinking abilities. One of them is by reading a lot of works of literature. In a book, there are thousands of words neatly arranged. This makes the brain produce positive phrases and clauses. Then this positive production will have a positive impact on yourself when it gets into trouble in life. The solutions found will have a positive impact afterward and so on. Another thing that can be done to improve the ability to think critically is by watching a television show that makes us want to participate in delivering statements. Television shows currently recommended by researchers are Mata Najwa and Hitam Putih. The reason is that in the two television programs, students can see the real problems that occur in this country when watching Mata Najwa. While Hitam Putih proves that Indonesia has a lot of inspiring people who make many people motivated to be even more advanced.

Project-Based Learning Approach

Learning in the form of a team sounds very fun according to most people because it makes it easier to work on the assigned project. That is why the 2013 curriculum adopts project-based learning in improving the quality of education in Indonesia. This is stated in the 1945 Constitution Article 31 paragraph (3) about the government's efforts in organizing a national education system such as one of which is project-based learning. Project-based learning is an innovative approach in the learning strategy of all disciplines.

This approach is implemented to succeed the learning strategy in the 21st century to improve the ability of learners (Bell, 2010). By definition, as Pryor and Kang (2013,2) quoting Jonassen (1997) describe project-based learning as an approach with an instruction that focuses on real but unstructured problems.

The center of this orientation is an experience based on students who are asked to solve problems. Stehling and Munzert (2018) said this project-based learning method was developed and applied with the aim of improving the competence of educators in carrying out fun learning. Many countries have succeeded in applying project-based learning methods. This proves that this method has a huge impact on education. Therefore, learning through this method is considered promising because it displays the ability of learners in critical thinking (Tatnall 2020,347).

In a variety of ways project-based learning may be brought into classrooms: Teachers and schools can employ external project-based learning curriculum, design their own project-based learning techniques, or project-based learning can be included in a whole-school reform initiative. It is generally difficult to implement project-based learning. It demands that instructors change their roles (from directors to learning facilitators) and not only accept uncertainty, but also increase classroom noise and activity. Teachers need to develop new abilities in teaching management and understand, using technology, how best to help students in learning. Teachers must be convinced that students are completely able to learn from this method. Given these obstacles, the effective implementation of project-based learning is likely to depend upon the growth of the profession, whether initial training or continued support. There are 3 main principles of project-based learning according to Tatnall (2020):

1) Learners are directly involved in the application of their skills and knowledge,

2) Learners apply the knowledge gained to solve a problem, and

3) Curricular results can be identified, but the results of the learner's learning process cannot be fully predicted.

The basic design concepts of many project-based learning models aim to help students shift from newcomers to experts and to build their ability to transfer information (Pellegrino and Hilton, 2012). Consequently, schools and other organizations committed to deeper learning typically refer to project-based learning as a key education method (Huberman et al., 2014; Pellegrino and Hilton, 2012). In the following paragraphs, we offer a brief summary of the study into these distinguishing qualities of further education and methods in which project-based learning may promote their growth.

In several project-based learning study schools, positive impacts on students' involvement, motivation, and belief in their own effectiveness have been identified, while there were different variations in the specific project-based learning model and the degree of its implementation in these schools. By promoting students' critical thinking skills through project-based learning, it is expected that students get the benefits of what has been mentioned before. It can help students to direct themselves to be more independent.

RESEARCH QUESTIONS

Regarding the generally acknowledged relevance of critical thinking abilities, research on critical thinking as a learning goal at higher education is relatively scarce. More study is needed to determine if colleges prepare students to be critical thinkers and what factors are connected with greater levels of critical thinking. Having a thorough understanding linked with greater levels of critical thinking may assist higher education in focusing on measures to promote students' critical thinking abilities. On the other hand, this research assists a significant role in measuring the improvement of students' critical thinking skill by the implementation of project-based learning as a result of new research science in the field of education.

Therefore, further issue discussions will be evaluated by the following research questions:

Research Question 1: What is the most significant effect of promoting critical thinking skills through the implementation of project-based learning in the classroom?

Research Question 2: How could project-based learning stimulate students' critical thinking?

Research Question 3: What are other factors that bring the most impactful criteria for improving students' critical thinking skills?

Research Question 4: How are students' perceptions on critical thinking performance in higher education?

METHOD

This research does not attempt to measure the critical thinking capacity of learners by using standardized tests, but rather proves the truth about improving students' critical thinking skills through project-based learning. As it is known that this research relates to how students fit into project-based learning methods. Therefore, this type of research is non-empirical research by adopting a qualitative approach to explore the perspectives of learners on critical thinking and project-based learning. A qualitative approach is an investigation in which researchers collect data and interact directly with predetermined respondents (McMillan & Schumacher, 2006). This definition defines qualitative research as an appropriate approach for researchers who want to explore the problems of learners in learning and conveying their critical thinking in an educational environment. The advantage of this method is being able to analyze data that is not numerically arranged. The process of data analysis is as follows: First, the data obtained from the results of surveys and interviews are analyzed and described through the process of coding into several themes that are adapted to the theory of Project-Based Learning and Critical Thinking. Second, summarize some of the findings and make the rest as evaluation material. Finally, conclude the results of the research.

TABLE 1 | 5 Points of Students' perspective on critical thinking and project-based learning

NO	COMPACTION	Number	Percentage
1	Knowing the impacts of having critical thinking skills	6	22%
2	Being motivated to think critically	5	19%
3	Reading literature to empower their level of thinking	6	22%
4	Getting a good impact on project-based learning to their thinking	7	26%
5	Having a group discussion	3	11%
	answer coding total	27	100%

In this research procedure, there are stages of research implementation from the beginning until the research ends. Here's our research procedure: First of all, what researchers do is literature studies. Second, observation in class in English Debate and Critical Thinking courses. The results of these observations are then analyzed to bring up problem formulations and research objectives. Furthermore, planning consists of determining research methods, collecting definitions of required literature reviews, and creating questionnaires & questions for interviews. The next stage of the researchers analyzed the survey data and interview answers that had been conducted. Then the results of the data analysis will be concluded and will be the basis for advising parties related to this research.

The data was obtained through interviews and questionnaires by including 30 participants. Participants in this research are students who understand critical thinking and have participated in debates or even debate classes. They were: 1 woman (Islamic Religious Education students), 1 woman (Islamic Broadcasting Communication student), 1 woman (Early Childhood Education student), 22 women (English Education students), 1 man (Islamic Broadcasting Communication), 1 man (Informatics Engineering student) and 3 men (English Education students). The research has 30 participants who were in semesters 1 and 3 for questionnaires, and the rest of 10 participants joined the interview. Interviews are data collection tools that make researchers interviewers and respondents/participants as subjects interviewed (Johnson & Christensen, 2004). The interview was conducted using a semi-structured interview that begins with 5 questions and will be developed to customize the answers to the research. Interviews were conducted through online meetings from 20th — 21st February 2020. 10 statements of questionnaires were given to the participants to collect their perspectives on critical thinking and project-based learning with the answer choices are 'strongly agree - agree - disagree - strongly disagree'. The questionnaires were done in a week started from 20th — 28th February 2020 via Google Forms.

RESULTS AND DISCUSSION

The interview consists of 5 questions where there are 2 specific questions to measure the critical thinking of the respondents. Meanwhile, the questionnaires consist of 10 statements with 5 mains. Points inside. The data collected revealed most students are actually motivated to think critically from many aspects of life such as academic, job, environment, and soon, as it is illustrated in Table 1

Table 1 revealed that actually higher education students' have a big motivation to increase their ability in critical thinking. It's because critical thinking has become a basic ability among college students to explore their creativity in solving environmental problems. As students get a higher level of education, their level of thinking must be improved. It is also researched by Dimmitt (2017) who stated developing critical thinking skills in order to explore and assess some knowledge is a key skill for university students in the first year (supported by the research from Connor-Greene & Greene, 2002; Ellis, 2009). While discussing the best form of learning for generations and using best-practice approaches, teachers will provide their students with strategies for resolving challenges, making the best choices, and finding answers to their learning environment.

As we can see point 5 has a low percentage compared to others. This illustrates that in fact not every student intentionally builds a discussion group to improve the quality of their thinking. Instead, students use their time to read literature a lot, as seen in point 3, which relates to their background of the study.

Critical Thinking Promoted Through Project-Based Learning

Suspending Personal Judgment

Suspension of judgment is a situation when someone is rationally able to suspend their judgment in taking a conclusion of something. The suspension of judgments on subjects, objects, ideas, or whatever you wish to study is one of the most critical tasks. When you approach anything with an open mind, critical thinking produces the greatest results. If we try to suspend our judgments of this information at least, we are more likely to have the potential for new discoveries during the study process, or we are able to do so in certain ways.

It is also necessary to suspend the judgment when analyzing it so that we do not indirectly tell people that our views on the topic or subject matter have already been established. This sort of rigidity implies to people that our work does not really endeavor to uncover or clarify anything, whether in the tone or single thinking of our approach. As though we do not need to put any effort to convince people, it might lead to a cocky document and presentation.

This can be quite removable and probably will not lead to a satisfactory analysis. Suspending personal judgment is promoted through Project-Based Learning as it is stated by some respondents when they face a discussion group;

"I rarely speak up when discussing because I assure that other friends have the best solution. I don't interfere too much so there's no debate." (Excerpt 1)

The statement from the excerpt above shows that he can keep his judge to the group. He always lets others lead the discussion so that there will not be a fight/debate. Whereas, a debate in a discussion is normal. There must be many thoughts to be conveyed from one another. But the point here is not that he does not contribute to the project. He is still active in a group when it comes to running the project. This means that he puts himself to run the assigned project and that already discussed in the group, he does not put himself in the opinion to get a diamond idea for his group. Critically, he's been able to suspend his judgment. He can put himself well in a group project.

"…we cannot show up alone, with groups we are taught to work together in order to increase care and also fight the sense of ego ourselves." (Excerpt 2)

The statement from the excerpt above reveals that it is good to suspend the judgment because in a group discussion people are working together. He pointed that people should not work alone, especially if they selfishly ask for a group project to use their own ideas without getting any other opinion. This should not happen in discussion groups. It will only cause quarrels and the result in the projects will not be maximal. That's why there's a need for good communication within the group. The excerpt above responded well that people should put their egos aside in a discussion because everyone should work together with good communication.

The results of the interview showed that only a handful of students had the ability to suspend their judgment. Basically, everyone does have a reluctance to express their opinions, but the reason they just do not want to contribute is not reasoned in order to create a good discussion among others. This causes not many people to feel the increasing quality of their critical thinking in the discussion room. Many of them throw responsibilities at each other when they work on a project. But someone who suspends their personal judgment, they have critically filtered the direction and also an input for the success of their project. Although actually, a good discussion is a discussion that arises from 2 directions, they have thought carefully that it is actually the opinion of their friends better than their own opinion.

In a discussion group, there are many who convey ideas that are brilliant, but not infrequently also encountered members who always receive the final result of the idea they will work on in a project. An idea will continue to exist and create new ideas. Others will propose suggestions that would be rejected by their judgment. Those who get such thoughts can be highly beneficial. The thoughts of others can be welcomed rather than rejected for their stimulating impact. As critical thinkers who master suspension judgment

skills, they will not necessarily conclude a thing but rather by considering many opinions until they get an opinion that corroborates a fact.

In situations like this, we can see that they are suspending their personal judgment of the group. Unwittingly, many of them are mastering this skill but not too much is seen because their position in the discussion group is not very prominent. Nevertheless, they are included as a critical thinker. Keeping the mind open to all information

Open-mindedness is a virtue of intellectual nature with characteristic goals, including increasing or improving the cognitive interaction with reality. It involves specialized cognitive skills, including those involved in making information comprehensible to themselves and auxiliary habits, so that cognitive skills are truly engaged if necessary. It's an open subject and a continuing difficulty for virtue theorists to decide whether or not to have the virtue guarantees the success to increase or improve their cognitive contact with reality. Open-mindedness is often related to many other excellent attributes such as curiosity, justice, and consideration. An open-minded individual doesn't leap to conclusions but thoroughly examines possibilities. An open-minded individual would like to learn something new and would like to disregard treasured beliefs if there are new and better opportunities. An outspoken individual does not discriminate against a viewpoint from whence it originates but assesses it by its value.

However, the issue remains whether this good character is an intellectual virtue. The fact that there is no unanimity on even the most important characteristics of these qualities complicates answers to this topic. However, to remain focused on the subject of openness as an intellectual virtue, we need to leave aside most problems with regard to the concept of "intellectual virtue." I thus believe that openness is a virtue rather than arguing.

Keeping the mind open to all information can be done by reading and discussing. This skill is promoted through Project-Based Learning as it is stated by some respondents;

"…I improve the ability to think usually by reading books, paying attention around, exchanging thoughts with friends…" (Excerpt 3)

"…I increase my ability to think critically by a lot of readings. But I prefer to observe nature and pay attention to every event that happens…" (Excerpt 4)

"…to think critically, increase knowledge by understanding what others think…" (Excerpt 5)

Three excerpts above proved that they are willing to think critically by keeping their mind open to all information. It is because critical thinking will happen if people are willing to open their mindset. Even with people with whom they disagree, critical thinkers are open and ready to all ideas and arguments. Until they analyze the arguments, logic, reasoning, or evidence they utilize, critical thinkers retain judgment on a message.

Critical thinkers are just and realize that a message is not incorrect or defective essentially if it varies from them beliefs. Critical thinkers remain able to change their minds on a question when this is supported by logical arguments. Statements from excerpts above revealed that they actually know how to improve their critical thinking skills, namely by reading books, discussing, and also paying attention to the events around them.

It is common knowledge that the exchange of information or an exchange of views on a topic utilized in learning takes place in discussions activities. There are typically discussions among students in groups. The concept of equality should be noted in the implementation of the debate. Each student here has the freedom to voice his/her viewpoint, and ideas should not be dominated exclusively by a person or group. A thinker who is critical must have a concept. It's because they know a lot about reading books and talking to other people. Therefore, the conversation can broaden your views till you can say that someone is a critical thinker.

Next, the book gives you a better understanding and a broader, open perspective. In addition to contributing knowledge, books are also entertaining, particularly when reading fictional literature like novels. If we don't realize it, it might inspire us to read a book. However, some circles have recently overlooked the actions of reading books because of occupation. Not only can activate a sophisticated brain circuit network by reading a book, but the stronger and more intricate the circuit is also, the more people read it. This also affects other brain processes, such as memory, mobility, and pain sensitivity. As for reading a book can change the way we look at something. That's what makes a critical thinker able to open his mind to all forms of information obtained. With so much information captured, a critical thinker is able to draw conclusions on a problem that occurs. Critical thinkers will feel they have a variety of ways to solve the problem because of the breadth of knowledge they have. That is why the last point mentioned by Pryor and Kang is a critical thinker able to solve their problem as will be explained in the last point.

Solving the problem

During a lifetime, trials or challenges will always arise. Everyone must have difficulties of their own. The difference is that not everyone can confront difficulties with a cool head and resolve them. We frequently cannot think properly when confronted with issues, since it is overwhelmed with explosive feelings, but critical thinkers will probably find a solution because they have an open mind to widen their perspective. Even it's not that easy to do, a critical thinker must have many ways to solve their problems.

This skill is promoted through project-based learning as it is mentioned down below;

"…Motivation to think critically it is for the success of a project that is being worked on…" (Excerpt 6)

A strong motivation is required in the solution of the problem, as the excerpt above answers. Many issues are abandoned without a clear answer because someone is not encouraged to discover a way out. Critical thinkers will motivate themselves to make solving the problem simpler for themselves. The responder confesses this justification.

"…What motivates me to be able to think critically is when I see there is something complicated that can actually be further simplified…" (Excerpt 7)

The understanding of the situation is a crucial approach to solving difficulties. People need to know what difficulties they are confronting in advance. It cannot be seen from just one point of view in order to see an issue that occurs. To be able to see the problem it requires a number of points of view. They can grasp the problem by looking at the situation from several points of view. Not only that, they can also analyze how the problem may be resolved or how to address it in a solution. In response to the dilemma, excerpt above recognized the basis of the problem so that the easiest solution could be found.

Students' personal engagement in the project group activity, as seen by their high degree of dedication and responsibility in completing their project work, revealed that they were driven by social connection accountability. Students considered the project activity as demanding but extremely gratifying, according to evidence from group discussions in a project. This was considered as evidence of high task value by us. Students struggled most with problem solving, communication issues, and restrictions. Students' ability to think quite passionately concerning different injustices seemed to have expanded as each semester progressed, as they took extra significant roles in group discussion of alternative explanations and additional perspectives regarding their group task, as a result of the implementation of project-based learning. With project-based learning, students have a great deal of trouble working on a project provided by their teachers, this capacity is highly sustainable. In fact, it may be argued that critical thinking bridges the students with a project-driven learning when students are able to solve projects.

Project-based learning method has been successful in promoting students' critical thinking especially in higher education. The research shows the significant findings in implementing project-based learning methods in the classroom: 1) Problem Solving, students are able to solve the problems faced, 2) Self-Directed Learning, students have the freedom to take initiative and foster a sense of responsibility for self-learning, 3) Creative Thinking, students are able to create and create new things, 4) Real World Connection, students are able to apply the concept of learning in problem solving faced, 5) Cooperative & Collaborative Learning, students are able to work together and share with others, 6) Reflection, students are able to convey the learning experience they have gained, and 7) Authentic Material, there are real results of the work of learners. In addition, based on the data collected project-based learning have helped students' to be more active and students are also able to think critically and explore more their creativity during

the discussion from the project-based given (Jusmaya & Efyanto, 2018; Dimmitt, 2017; Gandi, Haryani & Setiawan, 2021).

CONCLUSION

The findings result that project-based learning gives a significant impact on most of students' performance. Students firstly are being motivated to think critically because of their environment especially in academic environment that demand them to be critical. Then Students' finally show their solution in every project-based given during learning process. They also reveal that project-based learning increases their critical thinking ability. Although the success percentage has not been perfect, it can be tested by future researchers to give a deeper method in implementing project-based learning to complete the point of "Suspending Personal Judgement".

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