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# The Potential of Asking and Critical Thinking of Students in the Course of Development of Teaching Materials Through Problem-Based Learning Models

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***Abstract***

*The purpose of this research is to describe the potential of students to ask questions and think critically in the subject of developing teaching materials using the problem-based learning model. Research using descriptive methods; data collection using observation sheets of asking activities, and tests of critical thinking skills in the form of essays. Data analysis was carried out descriptively. The results showed that the average percentage of student questions was dominated by the low-level thinking category (LOTS) by 80%; the question category of higher-order thinking (HOTS) by 20%. The percentage of student questions in the HOTS category is 69.2% lower than in the LOST category. In the aspect of critical thinking skills, the mean value of the interpretation indicator is 82.80; analysis 84.05; inference 79.6; evaluation 81.0; explanation 75.3; and indicators of self-regulation worth 70.5. Based on the results of the study, it can be concluded that the problem-based learning model can facilitate students to increase their potential to ask questions and think critically in learning the development of teaching materials.*

***Keywords:*** *Potential to ask questions, critical thinking, problem-based learning, and development of teaching materials.*

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## INTRODUCTION

Learning is the most important part of the educational process that must be carried out to achieve its goals. The learning process that is carried out in a planned and serious manner will be able to facilitate students in developing their various potentials, including the potential to ask questions and think critically. These two potentials are important aspects to be owned and mastered by every student, including college students. Therefore, the learning process is expected to be able to facilitate students to train and empower these two potentials through the learning process.

Asking is a very basic part of literal human behavior. Questions asked by students can activate their initial knowledge or concepts, and help students to describe this knowledge (Schmidt, 1993). Asking activities can provide clues that these students have a tendency to think critically. According to Chin and Osborne, 2008), asking is a thought process related to critical thinking, creative thinking, and problem solving. Asking questions is a key activity in implementing active and meaningful learning. Questions are an indicator of students' thinking abilities which are known through quantity and quality (Chin and Osborne, 2008).

Critical thinking skills are skills that can be learned. Thus these skills can be taught. Critical thinking skills will not develop properly without conscious effort to develop them during learning (Zohar, Weinberger, and Tamir; 1994). Critical thinking skills require continuous and deliberate learning and practice in order to develop to their potential. Questioning skills and critical thinking are two things that are interrelated, and become potentials that are needed by students in the learning process. Both of these potentials become an indispensable part of a person's maturity process, and become part of important life skills for students to master, including university students. Therefore, matters relating to students' questioning and critical thinking skills need to be trained and empowered through the learning process or lectures.

The development of teaching materials is one of the elective courses that students can program in the biology education study program at FMIPA UNG. The teaching material development course combines theoretical studies and practice in developing a teaching material product through lectures. This is intended so that students not only know and master knowledge theoretically, but are also able to apply knowledge practically. The hope is that lectures on the development of teaching materials can make a positive contribution to developing students' self-potential, especially in the aspects of asking questions and critical thinking.The importance of the potential for asking questions and critical thinking for the intellectual development of students needs to be addressed with thoughts and concrete steps. One of them is through a learning-based study or research process, by applying a learning model that can train and empower students to ask questions and think critically.

The application of the Problem Based Learning (PBL) model or problem-based learning in teaching material development learning, to develop the potential to ask questions and think critically is an appropriate step. The basic thing to consider is that the Problem Based Learning model has a learning syntax that has the potential to empower students' questioning and critical thinking skills. The hope is that by applying the Problem Based Learning model in teaching material development learning it is expected that students' potential in asking questions and critical thinking can increase. Thus, the results of his research will become the basis for establishing Problem Based Learning as a learning model that has the potential to facilitate students in increasing their potential to ask questions and think critically.

## METHODS

This type of research is descriptive quantitative, carried out in the odd semester of the 2021-2022 Academic Year, in the Biology Education Study Program, the Biology Department, FMIPA UNG. Using a problem-based learning model (Problem Based Learning). The population is all students who take teaching material development courses. The sample is all students who make up a population of 24 people.

Research data includes data on the quantity and quality of questions obtained through observation during lectures. Student questions were identified based on the Revised Bloom's Taxonomy according to Krathwohl (2010). Question quality and quantity data were analyzed descriptively, and grouped based on cognitive level.

Critical thinking data, obtained from the results of critical thinking essay tests according to Facione (2010). Data on critical thinking skills were analyzed descriptively based on the components of critical thinking according to Facione (2010), namely interpretation, analysis, inference, evaluation, explanation, and self-regulation.

**RESULTS & DISCUSSION**

1. Description of the Potential of Asking Students

The potential of students in asking questions orally and in writing in teaching material development lectures, with a problem-based learning model (Problem Based Learning) can be identified based on cognitive level in the Revised Bloom's Taxonomy. The results of the identification and analysis of the potential to ask questions from biology education students based on their cognitive level can be seen in the following table.

**Table 1**. The Number and Quality of Student Questions in the Teaching Material Development Lecture Based on the Subject.

| PB | Number of Students | Number of Questions | % | Questions Cognitive Levels | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | C1 | C2 | C3 | C4 | C5 | C6 |
| PB1 | 24 | 6 | 24 | 2 | 2 | 1 | 1 | 0 | 0 |
| PB2 | 25 | 8 | 32 | 3 | 2 | 2 | 1 | 0 | 0 |
| PB3 | 25 | 11 | 44 | 3 | 3 | 2 | 2 | 1 | 0 |
| Amount | | 25 | 100 | 8 | 7 | 5 | 4 | 1 | 0 |
| Percentation (%) | | | | 32 | 28 | 20 | 16 | 4 | 0 |
| Cognitive Levels | | | | 80 (LOTS) | | | 20 (HOTS) | | |

Informations:
PB.1= Main Points of Teaching Materials Posters and Leaflets
PB.2= Main Points of Teaching Materials Handouts and Modules
PB.3= Main Discussion Student worksheets
C1= Remembering, C2= Understanding, C3= Applying, C4= Analyzing, C5=Evaluating, C6=Creating, Mhs = Students

The results of data analysis in table 1 show that the number of student questions in the teaching material development course during three meetings was 25 questions. The number of questions at each meeting varies based on the subject matter and cognitive level of the questions. On the subject matter of poster and leaflet teaching materials, there are 6 questions or as much as 24%, and are dominated by low-level cognitive questions as much as 83.3%. On the subject matter of handouts and modules, there were 8 questions or 32%, and dominated by low cognitive levels of 87.5%. On the subject matter of student worksheets there are 11 questions or 44%. Questions were dominated by low-level cognitive levels of 72.7%.

Overall data on the quality of student questions is dominated by the C1 cognitive level of 32%. Furthermore, C2 28%, C3 20%, C4 16%, and C5 4%. In this study, questions in the category of creating (C6) did not appear until the end of

the meeting. The fact of this research is an indication that students' ability to ask questions in the cognitive aspect of C6 (creation or creation) still needs to be trained and empowered continuously through HOTS-based learning, including the problem-based learning model (PBL).

In the results of this study, there was a tendency that the activity or process of asking students in learning increased from the first meeting to the third meeting. This increase is closely related to the potential of the applied PBL model. The potential of this learning model is in the form of syntax or stages that can facilitate students in carrying out reading activities, understanding concepts and thinking about them, and questioning these concepts through class discussion activities. A learning that applies the PBL model is considered to be able to facilitate students solving or solving a problem through learning. The PBL learning model can train, motivate, and facilitate students to ask questions, so that it effectively increases the quantity of student questions. Chin & Chia (2004) argued that problem-based learning includes discussion activities to determine and solve problems, develop an investigation plan so that it can accommodate students' high-level questions.

The results of data analysis on the quality of student questions show that of the 25 questions asked by students, 80% are classified as Lower Order Thinking Skills (LOTS), and 20% are Higher Order Thinking Skills (HOTS). The results of this study can be interpreted that the interest of students to ask questions is still relatively low, even if there are questions asked, most of them are still classified in the LOTS category. According to Rosyida et. al. (2016), the quality of questions that are classified as LOTS shows the low way of thinking of students. On the other hand, a quality or quality question put forward by students can show that students have carried out thinking and reasoning processes (Hasruddin, 2009). According to Ramli's statement (2015), the ability to think at a high level is built by first strengthening the basics of thinking which are grouped by Bloom as lower order thinking skills (Lower Order Thinking Skills).

### **3.2** Description of Students' Critical Thinking Skills

The results of research on teaching material development lectures about students' potential in critical thinking skills, through problem-based learning models or problem-based learning can be presented in Table 2, below.

**Table 2.** Average Value of Students' Critical Thinking Skills

| Subjects | Value of Students' Critical Thinking Skills Based on Indicators | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| PB.1 | 79.63 | 81.46 | 74.69 | 80.16 | 71.84 | 70.00 |
| PB.2 | 83.49 | 85.76 | 81.7 | 80.23 | 75.87 | 68.47 |
| PB.3 | 85.27 | 84.93 | 82.54 | 82.72 | 78.24 | 73.05 |
| Average Value | 82.80 | 84.05 | 79.6 | 81.0 | 75.3 | 70.5 |

Informations:
PB.1= Main Points of Teaching Materials Posters and Leaflets
PB.2= Main Points of Teaching Materials Handouts and Modules

PB.3= Main Discussion Student worksheets
A= Interpretation, B= Analyzing, C= Inference, D= Evaluation, E= Explanation, F=Self Regulation

The data in Table 2 shows that the average value of critical thinking skills from students who study through the Problem Based Learning model varies based on the subject matter and the indicators. On the first subject, the highest value of critical thinking skills is found on the analysis indicator worth 81.46, and the lowest is on the self-regulation indicator worth 70.00. In the second subject, the highest value of critical thinking skills is found in the analysis indicator, which is 85.76, and the lowest is in the self-regulation indicator, which is 68.47. In the third subject, the highest value of critical thinking skills is on the interpretation indicator with a value of 85.27, and the lowest is on the self-regulation indicator with a value of 73.05.

Based on the data in table 2 above, it shows the average value of the self-regulation indicator is 70.5, lower than the other indicators. This needs to be improved with the consideration that the indicator of self-regulation is the ability of students to think, control themselves, direct feelings and behavior towards the learning environment, and evaluate and monitor their learning activities. Self-regulation will help students to learn in a disciplined manner and improve students' critical thinking skills and learning outcomes (Budiwiguna, Winartib, and Harnantyawati, 2022).

Problem Based Learning encourages students not only to think in terms of concrete things but more than that to think about abstract and complex ideas (Trianto, 2009). Problem Based Learning improves critical thinking skills significantly, when compared to traditional learning (Dehkordi, 2008). According to Yuan, et al. (2008), Problem Based Learning has a significant effect on critical thinking skills. The application of Problem Based Learning learning can help students develop critical thinking skills (Fakhriyah, 2014).

Critical thinking skills are skills that can be learned. Thus these skills can be taught. Critical thinking skills will not develop properly without conscious effort to develop them during learning (Zohar, Weinberger, and Tamir; 1994). Critical thinking skills require continuous and deliberate learning and practice in order to develop to their potential. Therefore, students must be challenged in order to develop critical thinking skills during learning.

## CONCLUSION

The results of research on the potential for asking and critical thinking of students in the teaching material development course are summarized as follows; (1) Student questions are dominated by the low level thinking category (LOTS) by 80%; and 20% higher order thinking category (HOTS). The percentage value of student questions in the HOTS category is 69.2% lower than questions in the LOST category; (2) Students' critical thinking skills are dominated by analysis indicators worth 84.05, and the lowest indicator, selfregulation worth 70.5; (3) The problem based learning model, through its syntax, has the potential to facilitate students to increase their potential in asking questions and thinking critically through the learning process.

Based on the conclusions above, it can be suggested that Problem Based Learning can be used as a learning model that can be applied to empower students' potential to ask and think critically in biology learning in general, and in teaching material development courses in particular. Besides that, conducting studies or research on other subjects, with the same learning model.

**REFERENCES**

Budiwiguna, B. S., Winarti, E. R., & Harnantyawati, R. (2022, February). Analisis Kemampuan Berpikir Kritis Peserta Didik SMP Negeri 19 Semarang Kelas VIII Ditinjau dari Self-Regulation. In *PRISMA, Prosiding Seminar Nasional Matematika* (Vol. 5, pp. 311-319).

Chin, C., & Chia, L. G. (2004). Problem-based learning: Using students' questions to drive knowledge construction. *Science education*, *88*(5), 707-727.

Chin, C., & Osborne, J. (2008). Students' questions: a potential resource for teaching and learning science. *Studies in science education*, *44*(1), 1-39.

Dehkordi, A. H., & Heydarnejad, M. S. (2008). The effects of problem-based learning and lecturing on the development of Iranian nursing students' critical thinking. *Pak J Med Sci*, *24*(5), 740-743.

Facione. (2010). *Critical Thinking: What It Is And Why It Counts*, Diakses Tanggal 17 April 2022. Dari http://www.insightassessment.com.pdf.

Fakhriyah, F. (2014). Penerapan problem based learning dalam upaya mengembangkan kemampuan berpikir kritis mahasiswa. *Jurnal Pendidikan IPA Indonesia*, *3*(1).

Hasruddin. (2009). Memaksimalkan Kemampuan Berpikir Kritis Melalui Pendekatan Kontekstual. *Jurnal Taburasa* PPS UNIMED. Vol. 6 (1).

Ramli, M. (2015). Implementasi riset dalam pengembangan higher order thinking skills pada pendidikan sains. In *Prosiding SNPS (Seminar Nasional Pendidikan Sains)* (Vol. 2, pp. 6-17).

Sholihah, M. A., Zubaidah, S., & Mahanal, S. (2015). Keterampilan Metakognitif Siswa SMA Negeri Batu Pada Mata Pelajaran Biologi. *Jurnal Pendidikan Biologi*, 1669-1679.

Trianto, M. P. (2009). Mendesain model pembelajaran inovatif-progresif. *Jakarta: Kencana*.

Yuan, H., Kunaviktikul, W., Klunklin, A., & Williams, B. A. (2008). Promoting critical thinking skills through problem-based learning. *CMU. Journal of Soc. Sci. and Human*, *2*(2), 85-99.

Zohar, A., Weinberger, Y., & Tamir, P. (1994). The effect of the biology critical thinking project on the development of critical thinking. *Journal of Research in Science Teaching*, *31*(2), 183-196.