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ANALYSIS OF CRITICAL THINKING SKILLS FOR BIOLOGY TEACHER PROSPECTIVE AT UNIVERSITY OF PAPUA

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Abstract

This research is a type of descriptive research with the aim of knowing the critical thinking ability profile of prospective biology teachers at the University of Papua. The population in this study were all prospective biology teacher students at the University of Papua. The sampling technique is purposive sampling, namely sampling based on a specific purpose. The number of respondents was 42 prospective biology teachers. The instrument is in the form of essay questions. Based on research data analysis, the average proportion of critical thinking skills for biology teacher candidates is 55.03. Furthermore, the proportions based on critical thinking criteria are 10% uncritical, 53.33% less critical, 36.67% critical and 2.38% very critical. This in general it can be interpreted that the critical thinking skills of prospective biology teachers at the University of Papua are in the less critical category, this is very important to be empowered as a provision to face competition in the era of the industrial revolution 4.0.

Keywords: *Analysis, Critical Thinking Skills, Prospective Biology Teachers*

Abstrak

Penelitian ini merupakan jenis penelitian deskriptif dengan tujuan untuk mengetahui profil kemampuan berpikir kritis calon guru biologi di Universitas Papua. Populasi dalam penelitian ini adalah seluruh mahasiswa calon guru biologi di Universitas Papua. Teknik pengambilan sampel dengan cara Purposive Sampling yakni pengambilan sampel berdasarkan tujuan tertentu. Jumlah responden sebanyak 42 calon guru biologi. Instrumen berupa soal essay. Berdasarkan analisis data hasil penelitian rata-rata persentase keterampilan berpikir kritis calon guru biologi yaitu 55,03. Selanjutnya persentase berdasarkan kriteria berpikir kritis yaitu kategori tidak kritis 10%, kurang kritis 53,33%, kritis 36,67 % dan sangat kritis 2,38%. Dengan demikian secara umum dapat disimpulkan bahwa keterampilan berpikir kritis calon guru biologi Universitas Papua berada pada kategori kurang kritis, hal ini kiranya sangat penting untuk diberdayakan sebagai bekal untuk menghadapi persaingan di era revolusi industry 4.0.

Kata Kunci: Analisis, Keterampilan Berpikir Kritis, Calon Guru Biologi

INTRODUCTION

One of the 21st century life skills needed in the education process in higher education is thinking skills. A person's ability to be successful in life can be determined, among other things, by his thinking skills, especially in solving the life problems he faces. One of the skills that is very essential for life and functions effectively in all aspects of life is critical thinking skills. Critical thinking skills are skills that



focus on making decisions that are logical, reasonable, reflective, responsible, skilled and focused in deciding what to believe or do so that they are successful in solving a problem at hand (Walker, 2003; Ennis, 1993; Ennis, 1996; Schafersman, 1991; Facione, 2016; Nold, 2017) Furthermore, Beyer (1995) defines that critical thinking skills are the skills of making reasonable judgments so that they can assess the quality of something, starting from the simplest activities such as daily activities to concluding statements, ideas, arguments, research, and others.

The importance of critical thinking as an educational goal illustrates that critical thinking is one of the main unresolved pedagogical problems (Kuhn & Jr, 2004). Developing students' critical thinking is the main goal of education in societies around the world so that they can design teaching to develop students' critical thinking (Larsson, 2017). Critical thinking skills are a very important intellectual capital for everyone and are a fundamental part of human maturity, so it is important to teach them at every level of education .

Several studies that have been conducted regarding students' critical thinking skills, including those conducted by Prayogi & Asy'ari,(2013), (2013) state that critical thinking can have a positive impact on student achievement. Furthermore, Bezanilla et al., (2019) stated that critical thinking skills can develop student competence, high school students' critical thinking skills have increased in Papua (Iwan, Istisaroh, Sirait, & Damopolii, 2020), and critical thinking dispositions can also encourage students to train critical thinking skills (Nieto & Saiz, 2011).

Students' critical thinking skills are important to be empowered (Khoiriyah, Roberts, Jorm, & Van der Vleuten, 2015; Ismail, Harun, Zakaria, & Salleh, 2018; Eldy & Sulaiman 2013; Pu, Ni, Song, Zhang, Wu, W, & Wang, 2019, Masek & Yamin , 2012;. This is in line with Schell & Kaufman (2009) stating that it is very important for students' critical thinking skills to be empowered so that students are always ready for the challenges they face. The same thing was conveyed by Thompson (2019) that students need to be encouraged to always think critically so that students can develop their critical thinking skills. Furthermore, several research reports state that it is important to develop students' critical thinking skills in schools as a provision for facing various challenges in their lives (Bashith & Amin, 2017); Iwan, Istisaroh, Sirait & Damopolii, 2020; Orozco & Yangco, 2016; Prayogi & Asy'ari ; Yazar, 2015).

Although a lot of empowerment of critical thinking skills has been carried out, several other research results show that critical thinking skills are still under-empowered, including research conducted by Unger, (2018) which states that students' critical thinking skills have not had a real effect. critical thinking and how to empower it is still very limited (Brunt, 2005) and the critical thinking skills of prospective biology teachers still need to be developed (Fitriani, Asy'ari, Zubaidah, & Mahanal, 2018).



Based on data from researchers' observations of FKIP UNIPA biology education students, it shows that the average value of students' thinking skills of 42 people is 60.07 (medium category), this shows that critical thinking skills are still in the moderate category. Thus it can be said that the critical thinking skills of biology education students are still classified as less critical. Based on this study, critical thinking skills are very important to train. However, at this time, very few actually teach students to think critically. Even the critical thinking skills possessed by graduates from elementary to tertiary education are still low. The low critical thinking skills of students because this aspect of thinking skills has not been handled properly. For this reason, it is necessary to conduct preliminary research related to the profile of critical thinking skills of FKIP biology teacher candidates. The purpose of this study was to analyze the critical thinking skills of biology teacher candidates at the University of Papua as a provision for facing the challenges of 21st Century biology learning.

METHOD

The research method used in this research is descriptive quantitative with a survey to analyze the critical thinking skills of prospective biology teacher students. The population in this study were prospective biology teacher students at the University of Papua, totaling 42 prospective teacher students. The sampling technique is a purposive sampling technique which selects a representative sample according to needs. The samples obtained amounted to 42 respondents. Data was collected using essay test questions totaling 7 questions assisted by Google Classroom. The use of the Google form in data collection was carried out considering the conditions of the Covid-19 pandemic that hit the world. Essay test item items were developed referring to Zubaidah, Corebima, Mistianah (2015) modified from Finken and Ennis (1993) with the formula:

$$\text{Value} = \frac{\text{Total score obtained}}{\text{Maximum score}} \times \text{rating scale}$$

Maximum score

Data were analyzed by descriptive quantitative to determine the percentage of each aspect. Furthermore, the percentage of each aspect is averaged and matched with the criteria to determine the level of critical thinking criteria for prospective biology teacher students.

Table 1. Category of critical thinking skill

Range	Category
$81,25 \leq x \leq 100$	Very high
$62,50 \leq x \leq 81,25$	High
$43,75 \leq x \leq 62,50$	Currently
$25,00 \leq x \leq 43,75$	Low

$00,00 \leq x \leq 25$ Very low

Zubaidah, Corebima, Mistianah (2015) modified from Finken dan Ennis (1993)

RESULT AND DISCUSSION

Based on the results of research that has been done using Essay test questions via Google form with a total of 42 students as prospective biology teachers, the average percentage of critical thinking skills of prospective biology teachers at the University of Papua is obtained. The percentage of critical thinking skills for biology teacher candidates is presented in the following table;

Table 2. Percentage of students' critical thinking skills

Score	Category	Frequency	Percentage (%)	average
$81,25 \leq x \leq 100$	Very high	1	2,38	
$62,50 \leq x \leq 81,25$	High	9	21,43	
$43,75 \leq x \leq 62,50$	Currently	24	57,14	55,03
$25,00 \leq x \leq 43,75$	Low	8	19,05	
$00,00 \leq x \leq 25,00$	Very low	0	0	
Total		42	100	

Based on Table 2 it can be seen that students' critical thinking skills are in the very high category ($81.25 \leq x \leq 100$) 1 person is 2.38%, then students' critical thinking skills are in the high category ($62.50 \leq x \leq 81.25$) as many as 9 people at 21.43%, while the most critical thinking skills are in the medium category ($43.75 \leq x \leq 62.50$) as many as 24 people out of 42 students that is equal to 57.14%. Then in the low category ($25.00 \leq x \leq 43.75$) there were 3 people at 19.05%. Furthermore, the very low category does not exist or 0%. The average value of students' critical thinking skills is 55.03. This indicates that prospective biology teacher students have critical thinking skills in the medium category. The results of students' critical thinking skills tests can be presented in the following graph;

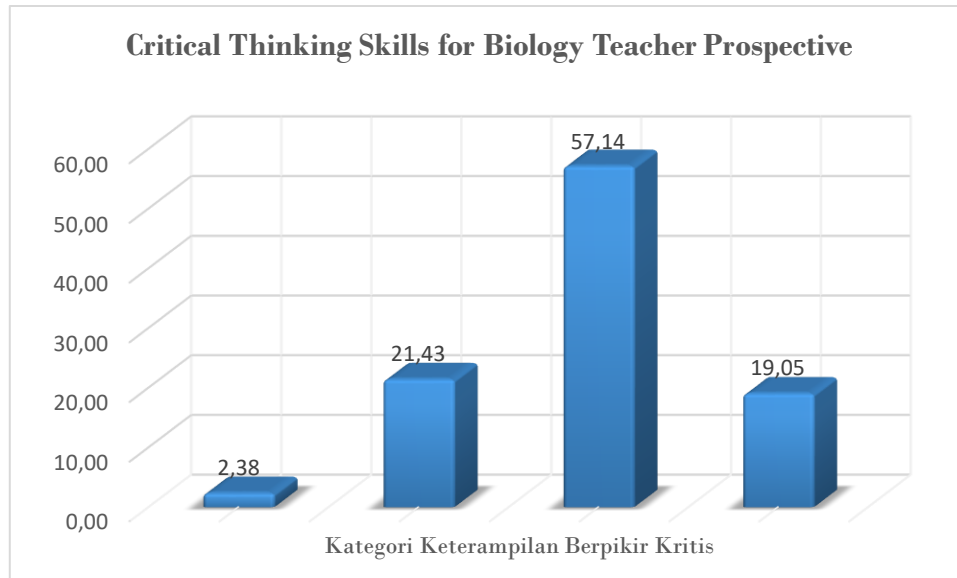


Figure 1. Graph Critical thinking skills of biology teacher prospective

Based on the distribution of the average percentage of students' critical thinking skills, biology teacher candidates are in the medium category, namely 57.14% or an average grade per class of 55.03. This figure is interpreted to mean that the average prospective biology teacher at the University of Papua has a pattern of thinking that is still not critical. This can be caused because lecturers still rarely empower students' critical thinking skills in the learning process. This is in line with what was found by Urger (2018) that students' critical thinking skills have not shown a real effect. critical thinking and how to empower it is still very limited (Brunt, 2005) and the critical thinking skills of biology teacher candidates still need to be developed (Fitriani, Asy'ari, Zubaidah, & Mahanal, 2018). Critical thinking skills of prospective teacher students are still low (Amin, Duran Corebima, Zubaidah, & Mahanal, 2017). Biology teacher candidates' critical thinking skills are still in the medium category (Arsih, Zubaidah, Suwono, & Gofur, 2020).

The findings in this study serve as an initial analysis so that in the future it can always empower students' critical thinking skills in learning. Therefore having the critical thinking skills of prospective biology teacher students is very important to be able to prepare themselves to face the era of the industrial revolution 4.0 and to make it easier for prospective biology teachers when they enter the world of work . Therefore, in the future, critical thinking skills should always be trained in the learning process. This is what is expected in education today, namely to produce graduates who can think critically to build a better nation. Because in the world of work, only students who have a critical mindset will be able to compete and survive the challenges of the 21st century. This is in line with Zabit (2010) stating that empowering students' critical thinking skills is important so that students can solve problems and provide solutions to problems. Furthermore, several research reports state that it is important to develop critical



thinking skills as a provision to face various challenges in life hidupnya (Bashith & Amin, 2017; Iwan, Istisaroh, Sirait & Damopolii, 2020; Orozco & Yangco, 2016; Prayogi & Asy'ari, 2013; Yazar, 2015).

Based on the results of this study, it shows that the average value of students' thinking skills of 42 people is 55.03 (low) with a very critical percentage of 2.38% (1 person), critical 21.43% (9 people), less critical 57.14% (24 people) and very less critical at 19.05% (8 people). Thus it can be said that the critical thinking skills of biology education students are still relatively low/less critical. This is in line with what was conveyed by Asyari, Muhdhar, & Susilo, (2016) that students need to be encouraged to think critically where students can plan, debate, state questions and problems, and analyze and provide solutions to a problem they face. Thus it can be said that critical thinking skills are very important for biology teacher candidates at the University of Papua to face the challenges of 21st Century learning.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the critical thinking skills of biology teacher candidates at the University of Papua are in the medium category, therefore the findings of this investigation serve as the result of an initial analysis of the problems encountered in learning biology. This research can also be a reference for future researchers who wish to continue investigating students' critical thinking skills. In addition, it can also serve as a basis for further discussion and research in the context of other higher order thinking skills such as creative thinking, problem solving, and communication and collaboration. These efforts can be in the form of implementing models, strategies, or active and innovative learning. It is hoped that students' critical thinking skills can be empowered in every lesson, especially for prospective biology teachers at the University of Papua. Some of the students' obstacles in filling out the questionnaire through the Google form coincided with the COVID-19 pandemic, so there was a possibility of impurity in thinking when filling out the student questionnaire. In addition, the completion of the questionnaire through the Google form is difficult for researchers to control.

REFERENCES

- Amin, A. M., Duran Corebima, A., Zubaidah, S., & Mahanal, S. (2017). *The Critical Thinking Skills Profile of Preservice Biology Teachers in Animal Physiology*. (November). <https://doi.org/10.2991/icet-17.2017.30>
- Arsih, F., Zubaidah, S., Suwono, H., & Gofur, A. (2020). Critical thinking skills of prospective biology teachers: A preliminary analysis. *AIP Conference Proceedings*, 2215(April). <https://doi.org/10.1063/5.0000538>



- Asyari, M., Al Muhdhar, M. H. I., Susilo, H., & . I. (2016). Improving critical thinking skills through the integration of problem based learning and group investigation. *International Journal for Lesson and Learning Studies*, 5(1), 36–44. <https://doi.org/10.1108/IJLLS-10-2014-0042>
- Bashith, A., & Amin, S. (2017). The Effect of Problem Based Learning on EFL Students' Critical Thinking Skill and Learning Outcome. *Al-Ta Lim Journal*, 24(2), 93. <https://doi.org/10.15548/jt.v0i0.271>
- Beyer, BK. 1995. *Critical Thinking*. Bloomington: Phi Delta Kappa Educational Foundation
- Bezanilla, M. J., Fernández-Nogueira, D., Poblete, M., & Galindo-Domínguez, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher's view. *Thinking Skills and Creativity*, 33, 100584. <https://doi.org/10.1016/j.tsc.2019.100584>
- Eldy, E. F., & Sulaiman, F. (n.d.). *Integrated PBL Approach: Preliminary Findings towards Physics Students' Critical Thinking and Creative-Critical Thinking*. 8.
- Ennis, R. H. (1993). Critical thinking assessment. *Theory Into Practice*, 32(3), 179–186. <https://doi.org/10.1080/00405849309543594>
- Fitriani, H., Asy'ari, M., Zubaidah, S., & Mahanal, S. (2018). Critical Thinking Disposition of Prospective Science Teachers at IKIP Mataram, Indonesia. *Journal of Physics: Conference Series*, 1108, 012091. <https://doi.org/10.1088/1742-6596/1108/1/012091>
- Fitriani, H., Asy'ari, M., Zubaidah, S., & Mahanal, S. (2019). Exploring the prospective teachers' critical thinking and critical analysis skills. *Jurnal Pendidikan IPA Indonesia*, 8(3), 379–390. <https://doi.org/10.15294/jpii.v8i3.19434>
- Ismail, N. S., Harun, J., Zakaria, M. A. Z. M., & Salleh, S. Md. (2018). The effect of Mobile problem-based learning application DicScience PBL on students' critical thinking. *Thinking Skills and Creativity*, 28, 177–195. <https://doi.org/10.1016/j.tsc.2018.04.002>
- Iwan, I., Istisaroh, I., Sirait, S. H. K., & Damopolii, I. (2020). *The development of teaching materials oriented problem-based learning integrating Tifa to train student's critical thinking skills*. 030006. <https://doi.org/10.1063/5.0000587>
- Khoiriyah, U., Roberts, C., Jorm, C., & Van der Vleuten, C. P. M. (2015). Enhancing students' learning in problem based learning: Validation of a self-assessment scale for active learning and critical thinking. *BMC Medical Education*, 15(1), 140. <https://doi.org/10.1186/s12909-015-0422-2>
- Kuhn, D., & Jr, D. D. (2004). Metacognition: A Bridge Between Cognitive Psychology and Educational Practice. *Theory Into Practice*, 7
- Larsson, K. (2017). Understanding and teaching critical thinking—A new approach. *International Journal of Educational Research*, 84, 32–42. <https://doi.org/10.1016/j.ijer.2017.05.004>



- Masek, A., & Yamin, S. (2012). The Impact of Instructional Methods on Critical Thinking: A Comparison of Problem-Based Learning and Conventional Approach in Engineering Education. *ISRN Education*, 2012, 1–6. <https://doi.org/10.5402/2012/759241>
- Nieto, A. M., & Saiz, C. (2011). Skills and dispositions of critical thinking: Are they sufficient? *Anales de Psicología*, 27, 9.
- Orozco, J. A., & Yangco, R. T. (2016). *Problem-Based Learning: Effects on Critical and Creative Thinking Skills in Biology*. 9, 9.
- Paul, R., & Elder, L. (n.d.). *Critical Thinking Competency Standards*. 66.
- Pu, D., Ni, J., Song, D., Zhang, W., Wang, Y., Wu, L., Wang, X., & Wang, Y. (2019). Influence of critical thinking disposition on the learning efficiency of problem-based learning in undergraduate medical students. *BMC Medical Education*, 19(1), 1. <https://doi.org/10.1186/s12909-018-1418-5>
- Prayogi, S., & Asy'ari, M. (2013). IMPLEMENTASI MODEL PBL (PROBLEM Based Learning) Untuk Meningkatkan Hasil Belajar Dan Kemampuan Berpikir Kritis Siswa. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, 1(1), 80. <https://doi.org/10.33394/j-ps.v1i1.521>
- Samsudin, A. 2009. Berpikir Kritis. <http://pendidikansains.blogspot.com/2009/12/berpikir-kritis.html>. Diakses 11 Maret 2020
- Schell, R., & Kaufman, D. (2009). Critical Thinking in a Collaborative Online PBL Tutorial. *Journal of Educational Computing Research*, 41(2), 155–170. <https://doi.org/10.2190/EC.41.2.b>
- Thompson, C. C. (2019). Advancing Critical Thinking Through Learning Issues in Problem-Based Learning. *Medical Science Educator*, 29(1), 149–156. <https://doi.org/10.1007/s40670-018-00649-2>
- Ulger, K. (2018). The Effect of Problem-Based Learning on the Creative Thinking and Critical Thinking Disposition of Students in Visual Arts Education. *Interdisciplinary Journal of Problem-Based Learning*, 12(1). <https://doi.org/10.7771/1541-5015.1649>
- Walker, S. E. (n.d.). *Active Learning Strategies to Promote Critical Thinking*. 6.
- Yazar Soyadı, B. B. (2015). Creative and Critical Thinking Skills in Problem-based Learning Environments. *Journal of Gifted Education and Creativity*, 2(2), 71–71. <https://doi.org/10.18200/JGEDC.2015214253>
- Zabit, M. N. M. (2010). Problem-Based Learning On Students Critical Thinking Skills In Teaching Business Education In Malaysia: A Literature Review. *American Journal of Business Education (AJBE)*, 3(6). <https://doi.org/10.19030/ajbe.v3i6.436>



Zubaidah, S. (2010.). *Berpikir Kritis: Kemampuan Berpikir Tingkat Tinggi yang Dapat Dikembangkan melalui Pembelajaran Sains*. Makalah Disampaikan pada Seminar Nasional Sains 2010 dengan Tema “Optimalisasi Sains untuk Memberdayakan Manusia” di Pascasarjana Universitas Negeri Surabaya.

Zubaidah, S., Corebima, A.D., & Mistianah (2015). *Asesmen Berpikir Kritis Terintegrasi Tes Essay*. Prosiding Seminar Nasional Symbion Pendidikan Biologi Universitas Ahmad Dahlan. 4 April 2015.