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Profile of Prospective Biology Teacher's Critical Thinking Skills as an Effort to Prepare 21st Century Generations

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Abstract The purpose of this study was to assess the degree of critical thinking skills for prospective biology instructors in the Plant Biosystematics course as starting knowledge in order to better educate the twenty-first century generation. This study was carried out as part of the Plant Biosystematics course at UIN KHAS Jember. The descriptive research method with a quantitative approach was adopted. Random sampling was utilized as the sample strategy. A multiple-choice test is used to acquire the critical thinking assessment instrument, which relates to six critical thinking skills. The results revealed that the critical thinking abilities of biology teacher candidates recorded 54 and 68.1 on the Good scales, but needed to be developed further. Whereas the skills to analyze and explain have a score of 63 and 40.9 with sufficient criteria, respectively, they still require a lot of improvement in order for the criteria to become higher, while self-regulation skills have a score of 63 with very sufficient criteria, but these self-regulation skills should be more than enough because self-regulation is very important for individuals. This demonstrates that Biology students at UIN

KHAS Jember must develop their critical thinking abilities, which will be required in the twenty-first century.

Keywords: Critical thinking skills, 21st century generation, Prospective teachers, Learning biology

INTRODUCTION

The 21st century is marked as the century of openness or the century of globalization. The 21st century is a century marked by massive changes from a society of aggression to an industrial society and a knowledge society (Afandi, et al, 2016). At this time, there were lots of new demands that asked for breakthroughs in thinking, drafting concepts, and actions. These demands also occur in education in Indonesia. In an effort to deal with all these demands, a new paradigm is needed to face the challenges of the 21st century. The new paradigm applied in education in Indonesia is the 21st century paradigm. This 21st century paradigm aims to shape the younger generation so that they are ready to face all the demands and challenges faced in the 21st century.

The skills needed to face the globalization era are usually abbreviated as 4C, namely critical thinking and problem solving skills, collaboration skills, communications skills, creativity and innovation skills. One of the skills that is needed in facing this globalization era is the skill or ability to think critically. This is also reinforced by Budi Cahyono's opinion which states that (Cahyono, 2017), critical thinking skills are skills that have been recognized as very important skills for successful study, work, and life in the 21st century.

Critical thinking skills are one of the skills that need to be mastered. Critical thinking skills are important skills that students must have in order to be ready to face the 21st century (Nasution et al., 2023). Critical thinking skills are skills and tendencies to make and conduct assessments of evidence-based conclusions (Eggen & Kauchak, 2012). Critical thinking skills are closely related to learning biology or science. Even critical thinking skills are often considered the same as scientific thinking skills in science (Gun, et al., 2007; Ergazaki, 2000). Therefore, critical thinking skills need to be trained through various learning models, learning methods, or other efforts.

Facione (2013), which explains that critical thinking skills consist of 6, namely: interpretation, analysis, conclusion, evaluation, explanation, and self-regulation. Each of these critical thinking skills also has sub-skills and questions that will lead individuals to have critical thinking skills. Six critical thinking skills can be measured using instruments that are developed through sub-skills and questions that refer to critical thinking skills. Based on this statement, we can see that the ability to think critically is very important for every biology student to have. As a provision to become prospective educators and create a better 21st century generation. Teachers would play a crucial part in the process of teaching and learning (Harahap & Nasution, 2022).

Teachers are agents of learning innovation, thus they must be able to generate new ideas for teaching and learning (Afriza & Nasution, 2022). Efforts to empower critical thinking skills can be formed and honed through well-organized and well-directed lecture processes. Basically every Tadris Biology course requires critical thinking skills, including the Plant Biosystematics course. Plant Biosystematics is one of the compulsory courses that must be taken by students of Tadris Biology. After taking this course, students of Tadris Biology are expected to be able to understand and master taxonomy, nomenclature, variation, species, phylogeny and how to construct phylogenic trees, etc.

Based on the problems above, it is necessary to conduct research that aims to determine the level of critical thinking skills of prospective biology teacher students in plant biosystematics courses as initial knowledge in an effort to prepare the 21st century generation.

METHOD

This research is a type of descriptive research with a quantitative approach. This study aims to determine the level of critical thinking skills of biology teacher candidates in the Plant Biosystematics course as initial knowledge in an effort to prepare the 21st century generation. The research population was students of Biology at UIN KHAS Jember who were at a high level starting from the 2019 and 2020 classes, the course in Plant Biosystematics at UIN KHAS Jember.

The sampling technique used was random sampling, with a sample of 22 students. The critical thinking assessment instrument was obtained from giving multiple choice tests. The test contains 6 multiple choice questions based on 6 critical thinking skills related to the Plant Biosystematics course which include: Interpretation, Analysis, Conclusion, Evaluation, Explanation, and Self-Regulation.

Assessment is carried out based on student answers with specified value criteria. Achievement scores are on a scale of 0-90 with criteria ranging from very poor to very good, with the standard being the total achievement score divided by the maximum score that can be achieved, multiplied by 10 or 100. In this way a student score or grade will be obtained based on each answer.

Table 1. Value range criteria

Code	Criteria	Value range
A	Very good	76-90
B	Good	61-75
C	Adequate	46-60
D	Poor	31-45
E	Very Poor	0-30

FINDINGS AND DISCUSSION

Based on the results of the analysis and calculations that have been done, obtained 22 students with an average value of students' critical thinking in the form of ratio data in the form of a percentage. Ratio data in this study are represented by numbers to show the true value of the object being measured, including 6 critical thinking skills (interpretation, analysis, conclusion, evaluation, explanation and self-regulation). The following (Table 2) are the evaluation results or average scores, the results of the number of students who have answered the test correctly on the Google form in the Plant Biosystematics course based on 6 critical thinking skills.

Table 2. Average score based on 6 critical thinking skills

Critical Thinking Type	Average score	Description
Interpretation	54	Adequate
Analysis	63	Good
Conclusion	45	Poor
Evaluation	68,1	Good
Explanation	40,9	Poor
Self-regulation	63	Good

According to the data obtained, the average total score of all students is 55.3, and the proportion of students answering correctly differs depending on the six critical thinking abilities. First, the Interpretation data type has an average value of 54, indicating that 12 students have interpretation abilities and meet the adequate criteria. Second, analysis which has an average of 63 which shows 14 students have analysis skills and are included in the Good criteria. Third, is the type of conclusion data which has an average of 45 which shows 10 students have conclusion skills and are included in the poor criteria. Fourth, is the type of Evaluation data which has the highest average value, namely 68.1, which shows that 15 students have evaluation skills and are included in the good category. Fifth, the Explanation data type has the lowest average value, namely 40.9 which shows 9 students have explanation skills and show the poor criteria. Lastly is the type of self-regulation data which has an average value of 63 which indicates 14 students have self-regulation skills and are in the good category.

The critical thinking ability of biology teacher candidates in terms of interpretation is in the Enough category. Zhou et al., (2013) explain that interpretation is the ability to categorize problems, define characteristics and clarify meaning properly. With good interpretation skills, the better one's ability to categorize problems, explain characteristics, and clarify a definition well.

The critical thinking skills of biology students from the analytical dimension have good criteria, meaning that students are able to test various theories, understand existing opinions and statements (Nuraini, 2017). Critical thinking skills of biology students in the Conclusion dimension have less criteria. This is due to the lack of students' ability to read effectively and look for the main points and their relationships from a reading.

The critical thinking skill with the highest average is in the evaluation dimension. The evaluation skills of biology students have good criteria, so that a student is able to assess the credibility of a statement either inductively or deductively (Maslakhatunni'mah, Safitri, and Agnafia, 2019). Critical thinking skills of biology students in the explanatory dimension are still not good. This is due to the lack of ability to explain a theory or reading that is still fixated on books and written statements, so that students are unable to make effective statements on their own in a reading and tend to forget the knowledge they have read.

In self-regulation critical thinking skills, biology students have good criteria with a good average score. with good self-regulation, students are able to monitor one's cognitive activity, analyze, and evaluate one's inferential judgments based on the direction of the question, confirming, validating, or correcting one's thoughts (Facione, 2015).

These skills can be trained and acquired by the 21st century generation through a good educational process as well. This was also revealed by Wibowo (2012), that future generations as human resources need serious attention to produce quality generations who are ready to be competitive. A quality generation will be obtained through a quality education process and educators who have good skills. For this reason, it is very important for prospective teachers to have quality abilities or skills to prepare quality 21st century generations.

In the 21st century, AI is growing, previous research has stated that AI can be used for education, such as to create questions (Nasution, 2023). Teachers as educators must have good critical thinking skills, in order to be able to utilize AI in learning, instead of being fooled by AI-made assignments by students.

The ability to think critically is very important for prospective biology teacher students to have, because critical thinking skills will greatly help prospective teachers prepare the 21st century generation who are able to solve problems ranging from the simple to the most complex (Synder & Synder, 2008). For this reason, prospective biology teacher students must also be able to prepare themselves to become prospective teachers with good skills, one of which is critical thinking. This was also revealed by Surya (2016) that being a teacher in the 21st century must be able to guide students in developing critical thinking skills apply new knowledge, analyze information, be communicative and collaborative, be able to solve problems and use technology in a variety of information access.

CONCLUSION

Based on the findings of the research, it is possible to infer that the critical thinking skills of prospective biology teacher students enrolled in the Plant Biosystematics course at UIN KHAS have various scores and criteria for each competence. Critical

thinking skills in terms of interpretation, conclusion, and evaluation have a score of 54 and 68.1 with Good/Good criteria, respectively, but need to be enhanced further. Whereas the Skills to analyze (analyze) and explain (explain) have a score of 63 and 40.9 with sufficient criteria, respectively, they still require a lot of progress in order for the requirements to grow higher. While self-regulation abilities have a score of 63 with highly sufficient standards, these skills should be more than enough because self-regulation is critical for individuals.

Biology students at UIN KHAS Jember must develop their critical thinking abilities, which will be required in the twenty-first century. Preparing the next generation to think critically will enable Biology students at UIN KHAS Jember to become more professional teacher candidates.

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