



Classroom Management: How Important is Authentic Assessment of 21st Century Skills in Biology Education Students?

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Abstract: To compete in the 21st century, educators need to equip students with various skills called 21st-century skills. The purpose of this research is to identify and describe the perceptions of biology education lecturers and students regarding the authentic assessment of 21st-century skills. The method used in this research is an internet-based survey method. The research participants consisted of 7 lecturers and 80 students majoring in biology education. The instrument used is a result questionnaire consisting of 11 questions for lecturers and ten questions for students. The survey results show that lecturers and students know about the components and urgency of 21st-century skills. In addition, the assessment of these skills is also quite often done. However, there are still some obstacles in authentically assessing 21st-century skills.

Keywords: 21st century skills; Authentic assessment; Biology education

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Introduction

Various challenges arise due to liberalization, the rapid development of knowledge and technology, and the dissemination of information in the 21st century (Sulaiman & Ismail, 2020). One of the main aspects that must adapt to the challenges of the 21st era is education, as the key to producing quality human resources. The education system should implement extensive changes to be able to adapt by highlighting the needs of students by developing relevant 21st-century skills, covering not only cognitive but also non-cognitive aspects, such as collaboration, teamwork and tolerance as the basis for supporting life skills (Chalkiadaki, 2018). 21st-century skills are also known as survival skills in the new economic era (Soule & Warrick, 2015). These skills include several skills and knowledge needed to produce quality individuals (Child & Shaw, 2016).

The aspects of 21st-century skills, according to Griffin (Griffin, et al., 2015; Shidiq & Yamtinah, 2019; Trilling & Fadel, 2009), include creativity,

communication, collaboration, and critical thinking. Meanwhile, according to Binkley, et al. (2012), 21st-century skills are grouped into four categories. The first group is ways of thinking, including creativity and innovation, critical thinking, problem-solving, decision-making, learning to learn, and metacognition. The second group is the way of working, which includes communication; collaboration. The third group is tools for work, including information literacy; ICT literacy. The fourth group is the way of life which includes citizenship, life and career skills, personal and social responsibility (Turiman, et al., 2012; van Laar, et al., 2020). Given the importance of 21st-century skills today, there is a pedagogical impact that requires the application of authentic assessments that allow objectively assessing student abilities. Conventionally, authentic assessment is defined when the tasks are given are related to real-life or have real-life value (Vu & Dall'Alba, 2014). Authentic assessment has the potential to improve learning so that students are ready to dive into the real world. According to Neely & Tucker (2012), authentic assessment is a way to link

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learning and work, creating a correspondence between what is assessed at university and what graduates do in the outside world. Inauthentic assessment activities, students are asked to demonstrate their ability to analyze assignments and synthesize, from the various skills and knowledge they have acquired, that will be required to complete certain outcomes (Ashford-Rowe, et al., 2014). This has an impact on the quality and depth of learning achieved by students and the development of high-level cognitive skills in constructing the meaning of knowledge.

However, tests and exams that focus on knowledge outcomes are still a trend that is widely used internationally (Villarroel, et al., 2019). These assessments tend to measure lower-level thinking. The test is often done by referring to a textbook. Students are made in controlled conditions where supervisors are present to ensure they do not cheat (Hinton & Higson, 2017). Students tend to become passive learners through this process, memorizing content rather than understanding it (Flores et al., 2014). Memorization is not the goal of learning in any course, and memorization cannot prepare students for work and social life. Assessment is critical in the learning process. Assessment strongly influences what and how students learn, framing what they do and encouraging the learning process (Vu & Dall’Alba, 2014). That way, assessment becomes an effective way to improve the quality of student achievement. Improving assessment processes can provide adequate support for 21st-century skills development.

Moreover, the 21st-century skills of students in Indonesia have not been identified and assessed authentically (Hindrasti, et al., 2020). Ana's research results found that essay tests, selected-response tests, and assignment assessments still dominated the assessment activities of biology education students. Students do many lecture assignments without continuous feedback, and students do not know the standard of assessment criteria even though the

implementation of authentic assessment in higher education is a greater chance to do. It is because student assignments tend to be more focused on solving problems in the real-world context. Moreover, the department of biology education includes a group of subjects that have practical's to use performance assessments (Wulan, 2009). However, there are several problems faced by lecturers in the assessment process. The first is the obstacle in conducting a comprehensive and consistent assessment. Second, difficulties in improvising/developing research instruments (Ermawati & Hidayat, 2017).

In order to find out more about the perceptions of lecturers and students regarding the application of authentic assessment of 21st-century skills, especially biology education majors, an analysis of perceptions and what is needed in the field is carried out (Hidayat, et al., 2020; Kartimi, et al., 2021; Shidiq et al., 2020). These analytical activities form the basis for the development of authentic assessments and their application in the classroom. Therefore, this study aims to determine and describe the perceptions of biology education lecturers and students' perceptions of authentic assessment of 21st-century skills.

Method

This study uses an internet-based survey method. The purpose of this research is to identify and describe the perceptions of biology education lecturers and students regarding the authentic assessment of 21st-century skills. The research instrument used is a questionnaire adopted by Hindrasti, et al.(2020). The forms of questions on the questionnaire are multiple-choice and open-ended questions. Questions for lecturers consist of 11 questions and ten questions for students. The questions on the google form questionnaire are presented in Table 1.

Table 1: List of Questions on the Questionnaire

Questionnaire for Lecturers	Questionnaire for Students
- In your opinion, what are the important 21st century skills?	- What do you know about 21st century skills?
- In your opinion, how important is it to develop and assess 21st century skills for biology education students?	- How important is it for Biology Education students to master 21st century skills?
- Please give an explanation regarding your answer in number 2?	- Please provide an explanation regarding your answer in number 2.
- How often do you conduct 21st century skills assessments?	- How often do your lectures evaluate 21st century skills in your courses?
- If you have done a 21st century skills assessment. Explain what skills are being assessed?	- If your 21st century skills have been assessed. What skills are assessed?
- If you have done a 21st century skills assessment. What is the form of the instrument?	- If your 21st century skills have been assessed. What is the form of the measuring instrument (question or questionnaire or rubric or others)?
- If you have already conducted a 21st century skills assessment. Is the assessment you made authentic? Please explain	- If your 21st century skills have been assessed. Is the assessment authentic? Explain!

Questionnaire for Lecturers	Questionnaire for Students
- What are some of the difficulties you experience in assessing 21st century skills? Please explain.	- In your opinion, how important is it to provide examples of relevant skills assessment instruments for Biology Education students?
- In your opinion, how important is it to provide examples of relevant skills assessment instruments for Biology Education students?	- Do you think the 21st century skills of Biology Education students can be assessed in all the courses you take?
- In your opinion, can the skills of 21 Biology Education students be assessed in all the courses taken?	- How do you rate authentic 21st century skills?
- In your opinion, how do you authentically assess 21st century skills?	-

Hindrasti et al. (2020)

Data is collected through google forms which are distributed through WhatsApp's Groups. The data obtained were analyzed quantitatively and qualitatively. Quantitative data are presented based on closed questions, while qualitative data is described in the results of a perception analysis of the authentic assessment of 21st-century skills. Research respondents consisted of 7 lecturers and 80 students. A total of 97.5% of students came from semester 5, and as many as 6. 2.5% of students came from semester 6. The lecturer respondents came from three universities with various types of subjects being taught. Furthermore, the distribution of courses from lecturer respondents is described in Table 2.

Table 2: Profile of Lecturer Respondents

Courses	Percentage (%)
General biology	28.6
Plant Physiology	14.3
Integration of Science and Islam	14.3
Biology Learning Curriculum	14.3
Classroom action research	14.3
Biology Education Project	14.3

Result and Discussion

To prepare 21st-century students to be able to compete in the future, educators around the world are promoting several skills to face the challenges of the 21st-century development (Sari & Trisnawati, 2019). Based on the survey results, according to the lecturers, several 21st-century skills that are important to be taught include critical thinking, creativity, communication, collaboration, problem-solving, and research skills. Ontario Public Service (2016) added that in the 21st century, competencies are needed covering the cognitive, interpersonal, and intrapersonal domains. Cognitive competence includes critical thinking, analytical, and problem-solving, which can be a key indicator of success. However, changes in the economy, technology, and social context in the 21st century make interpersonal and intrapersonal competence more decisive for one's success. Thus, the integration of cognitive, interpersonal, and intrapersonal skills in the learning process effectively becomes very important for educators to do.

In addition to knowing the components of 21st-century skills from educators, it is necessary to know the urgency of these skills from the students' point of view. The perception and importance of 21st-century skills according to the views of biology education students are presented in Table 3.

Table 3: Perception and Urgency of 21st Century Skills According to Students

Student Perception Regarding 21st Century Skills	The Urgency of Mastering 21st Century Skills
- 21st century skills focus on student centers with the aim of providing students with thinking skills including: (1) critical thinking, (2) problem solving, (3) metacognition, (4) communicating, (5) collaborating, (6) innovation and creative, (7) information literacy.	- Because biology students must be able to think critically to solve a problem, biology students must also have creativity and innovation to develop their abilities in the field of science.
- The world and technology are changing very fast. In the 21st century, everyone is required to be able to think critically, be creative, have innovation, be literate in technology and media and be accustomed to collaborating.	- Because 21st-century skills can help us, teacher candidates, to complete assignments and help us in delivering material to friends and students later.
- 21st century skills are skills towards mastering technology for daily activities.	- Because technology is increasingly advanced, humans must be able to master the technology.
- The 21st century is referred to as the age of knowledge, knowledge-based economy, the century of information technology, globalization, the industrial revolution 4.0, and so on. In this century, changes occur very quickly and are difficult to predict in all aspects of life, including economy, transportation, technology, communication, information, and	- Human Resources are required to have 21st-century skills in order to compete in the industrial environment.

others.	
- 21st-century skills include independence, leadership, responsibility, problem-solving, analytical thinking, adaptability, communication, initiative, and self-direction.	- To succeed in facing challenges, problems, and life.

Based on the description in table 3, the students gave various perceptions about the uptake of the 21st century, which still intersect with each other. 21st-century skills emerged as a result of the rapid development of knowledge and technology so that every individual is required to be proficient in thinking, use technology, have creativity, innovate, and collaborate in teams. Moreover, creativity and innovation currently occupy an important position in human development in the face of social and technological change (Robinson, 2011) and are one of the driving aspects of economic success today (Piiro, 2011; Soule & Warrick, 2015). In addition to knowing about 21st-century skills, students also think that these skills are critical to be mastered by them and other students. The importance of mastering 21st-century skills is that it can help individuals skillfully use technology, train creativity and innovation, and equip problem-solving skills. In addition, these skills are essential so that students as future human beings can compete in the global market (Pukelis & Pileičikienė, 2010).

Not only must it be applied in the learning process, but 21st-century skills must also be assessed. Assessment is one component that is directly related to the curriculum (Pantiwati & Nyono, 2020). The assessment will later be useful to assist educators in

evaluating and improving the quality of learning (Charin et al., 2015; Naganuma, 2017; Shidiq et al., 2016). Lecturers have assessed 21st-century skills in the biology education environment. Based on the survey results, as many as 57.1% of respondent lecturers stated that they often conduct assessments on 21st-century skills, and the remaining 42.9% often carry out such assessments. Meanwhile, according to a survey from student respondents, 3.8% of students stated that 21st-century skills assessment had never been conducted. On the other hand, 46.3% of students stated that the assessment was carried out quite often, and 45% of students said that the assessment was often carried out. The remaining 5% of students stated that lecturers very often carry out 21st-century skills assessments.

Assessment activities, especially authentic assessments, are essential for lecturers to carry out every teaching because the assessment has many benefits for students. They can support active learning, increased achievement and more excellent information retention, and provide valuable real-world experiences in a safe and supportive environment (Fox et al., 2017). The following are various types of 21st-century skills that have been assessed and their assessment tools based on the experience of lecturers and students.

Table 4: Types of 21st Century Skills Assessment and Forms of Measuring Instruments Ever Done by Lecturers and Students

Lecture		Students	
- Skill Type	- Instrument shape Measuring Tool	- Skill Type	- Instrument shape Measuring Tool
- Critical thinking	- Cognitive test	- Critical thinking	- test questions
- Analytical Thinking	- Cognitive test	- Information technology and computer skills	- Task
- Creative thinking	- Essay questions and observations	- Language literacy and writing research reports	- Mini research
- Cognitive aspect	- Test	- Multimedia and social media	- Task
- Affective aspect	- Observation	- Attitude of responsibility, love for the environment, and self-direction	- Observation with rubric
- Metacognitive	- Pretest and posttest and questionnaire	- Metacognitive	- Portfolio assignments and tests
- Problem solving	- Essay	- Problem solving	- Tests and questionnaires
- Communication, Collaboration and Cooperation	- Performance assessment	- Communication, Collaboration and Cooperation	- Structured tasks

Based on table 4, lecturers conduct varied assessments, not only fixing on the use of written tests. Various assessment forms such as tests, questionnaire observations, performance assessments,

portfolios, and mini-research are used according to the student's skills to be measured. This is in line with the authentic assessment aspect, where authentic assessment instruments must vary (Hanifah &

Irambona, 2019). Various instruments can be written tests, oral tests, project tests, and performance tests. In addition, authentic assessment instruments must measure learning outcomes holistically based on attitudes, knowledge, and skills competencies. Authentic assessment is essential in science learning, especially biology because authentic assessment: (1) has relevance to the real world; (2) encourages students to develop relationships that are relevant to real-world assignments; (3) provide a continuous task; (4) observing the task of different perspectives; (5) displaying self-reflection; (6) displays teamwork; (7) pursuing meaningful works of art; and (8) produce a

competitive problem-solving paradigm (Ismet & Hariyanto, 2014).

21st-century skills are closely related to authentic assessment because they develop various graduate attributes by providing students with "real world" experiences (Prestidge & Glaser, 2000). These attributes include critical thinking, teamwork, problem-solving, effective communication and reflective practice (Fox, et al., 2017). The following are the perceptions of lecturers and students regarding how to assess authentic 21st-century skills are presented in Table 5.

Table5: Perceptions of Lecturers and Students Regarding How to Assess Authentic 21st Century Skills

Students	Lecture
- Test form assessment	- Use checklists, attitude scales, product rating checklists, and rubrics.
- Objective test	- Practicum assessment with performance rubric, observation, and questionnaire.
- Observation	- Using various instruments (tests and non-tests)
- The active role of the respondent is the key in authentic assessment.	- Make journals with projects in order to assess problem-solving abilities, make work reports, make scientific essays.
- Making reliable instruments	- Develop assessment tools and test questions such as asking questions, arguing, thinking openly, making conclusions, and communicating and collaborating.
- Performance based	- Holistic assessment of attitudes, skills, and knowledge.

Apart from conducting assessments for 21st-century skills, lecturers and students also know how to assess these skills authentically. In carrying out the evaluation, educators can assess student competency skills using various methods, including performance assessment using the observation sheet instrument, project assessment, portfolio assessment, and assessment product using the product assessment sheet instrument (Kunandar, 2014). Practical assessment requires a response in the form of skills to perform an activity or behaviors following the demands of competence.

The importance of authentically assessing 21st-century skills makes the availability of valid and reliable assessment instruments indispensable. Despite its many benefits, some challenges have been identified with regard to authentic assessment. Lecturers face several difficulties in authentically assessing 21st-century skills, including (1) there is no standard instrument; (2) limited time, too many aspects are considered, and there are many respondents, not all respondents responded positively; (3) heterogeneous student needs, interests, abilities and skills are different for each student; (4) must adapt to the rubric used.

Many challenges related to time and cost are experienced because authentic tasks require or are considered to require a more significant investment of time and resources than traditional tasks (Fox, et al., 2017). Another difficulty encountered was that some students found authentic assessment challenging due to the increased emphasis on language and the frequent need for group work (Bohemia & Davison, 2012).

However, emerging challenges can be overcome with careful consultation and planning when designing authentic assessments. Choosing small-scale activities where time and financial support is relatively limited (such as online blogs) and providing detailed tasks with a clear timeline (Litchfield & Dempsey, 2015) can be one solution. In dealing with student attitudes, lecturers can provide practical and challenging real-world assignments on a large group scale. Students are generally willing to commit more time and energy when the assignments they are working on have clear guidelines; rubrics are available so that the objectivity of the assessment can be guaranteed (Hart et al., 2011).

Conclusion

In conclusion, lecturers and students majoring in biology already know the components and urgency of 21st-century skills. They believe that 21st-century skills are essential for equipping individuals to face the era of rapid technological progress. It is also known that the assessment of these skills is quite often done. However, there are still some obstacles experienced by lecturers in carrying out an authentic 21st-century skills assessment. However, the obstacles that arise do not merely prevent authentic assessments of 21st-century skills from being carried out. This research is expected to contribute to educators at the tertiary level, especially biology education majors, in providing an authentic overview of 21st-century skills assessment. It is hoped that further research will develop an authentic

21st-century skills assessment instrument that lecturers can use in universities.

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