

Biology Assessment Survey of Semarang Senior High As a Description of 21st Century Teacher's Readiness

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Abstract

Critical thinking and problem solving skills, creativity and innovation, collaboration, and communication are types of skills that students must master to face the challenges of the 21st century. The role of the teacher in the learning process becomes an important factor to facilitate students in achieving the various skills needed at this time. The objectives of this study was to describe the readiness of 21st century teachers through the application of 21st century assessments, assessment quality, and alternative assessment models that lead to the needs of 21st century education. This research was conducted by surveys at six different schools, each involving six participant teachers and three participating students, using a quantitative non-experimental descriptive method. The results showed that the type of assessment used were varied, there were three participant teachers who have validated their Biology assessments through teacher discussion forums, and alternative assessment models used by participant teachers have not been used in their entirety, so the objectives of the assessment were not achieved. Thus, based on the Biology assessment used by high school teachers who were active participants in the Semarang MGMP group, it can be concluded that the majority of teacher in Semarang did not show readiness towards 21st century education needs, particularly in the application of assessments that lead to 21st century skills (4C's)

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INTRODUCTION

Critical thinking and problem solving, creativity and innovation, communication, and collaboration are important skills of the 21st century. 21st century education is expected to prepare students to become successful individuals in life. The focus of 21st century education refers to two things namely academic mastery and the development of 21st century skills (Alismail & Guire, 2015).

Various types of teacher efforts to measure these types of skills are the key to knowing the achievement of the learning process. These are the teacher's role as an agent of learning to improve the quality of education. The government has sought various measures to improve the quality of education in Indonesia, one of which is improving the education curriculum. The application of creative and innovative learning with good mastery of technology in developing students' critical thinking skills, solving problems, creating new ideas, working together, and communication are things that must always be improved to obtain quality in education.

The quality of education is strongly influenced by the quality of teachers. Before the learning activities occur, teachers have an obligation to develop learning instruments including assessments. Ghaicha (2016) explains that assessment is part of learning and it is a strong factor for encouraging or exploring students' learning abilities. Therefore, the assessments are reflection of a learning activity carried out by the teacher, so that the teacher must have good skills in developing assessments. This is consistent with statement from Hendri (2010) that professional teacher competency is the ability to develop valid assessments.

Appropriate assessment will have a positive impact in improving student skills including 4C's. Thus, a teacher must have knowledge and skills in carrying out education and also be aware of its function as an educator. This is in line with the goals of 21st century education according to Kivunja (2014), which is to prepare students to be more productive and creative by active learning, critical thinking and problem solving, innovative, and cooperation in groups facilitated by the use of technology. Pheeraphan (2013) explains that the

use of technology can improve communication and collaboration skills. Besides, appropriate assessment can be used to identify weaknesses and strengths, and also the needs of students (Arsad et al., 2011).

Based on the results of observing the learning documents, most types of assessments used in teaching and learning activities still tend to be done in a low cognitive ability. Thus, the 21st century skills that are expected to exist in students cannot be achieved properly. The other results explain that many countries have succeeded in implementing learning that carries the needs of the 21st century.

Based on the description above that there is a gap between the quality of learning today with the needs of the 21st century in terms of the use of Biology assessments, the researchers will conduct a Biology assessment survey as a description of the readiness of 21st century teachers. This survey was aims to identify the types of Biology assessments, describe the quality of Biology assessments compared with 21st century needs, and describe alternative assessment models of 21st Century Biology learning based on the study of data obtained.

METHODS

This research is a type of survey research with a non-experimental quantitative approach. The population in this study were all Biology learning assessments for the X-IPA grade of senior high schools in the 1st semester of the academic year 2017/2018. The assessments owned by Biology teachers participating in the MGMP groups in Semarang which consisted of 30 teachers. The sampling was done randomly and obtained six Biology teachers participating in the MGMP groups in Semarang. The results were in the form of interviews with teachers and student questionnaires. The steps taken in the study include: (1) making a research design, (2) planning data collection and conducting initial surveys, (3) determining population and sample targets, (4) determining respondents and collecting data, (5) conducting analysis data, and (6) presents the report.

RESULTS AND DISCUSSION

The focus of this study reveals the Biology teacher's readiness of 21st century in Semarang through a Biology assessment survey in the first semester of the academic year 2017/2018. The research data were obtained through interviews with teachers and questionnaires by students. The

data includes three things: the types of Biology assessments used by teachers and the frequency of use of assessments, the quality of Biology assessments, and alternative assessment models. Data on the type and availability of Biology assessment in the X-IPA grade of senior high schools in the 1st semester of the academic year 2017/2018 presented in Figure 1.

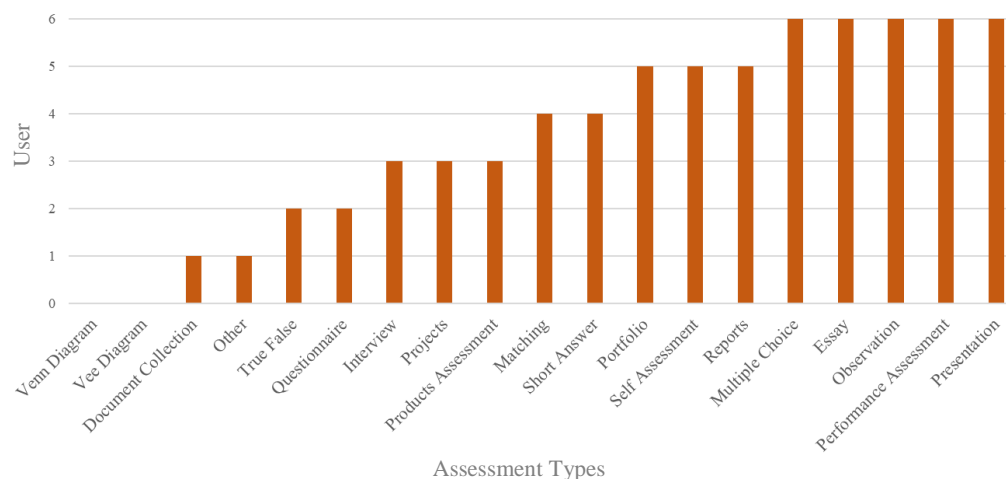


Figure 1. Types and Availability of Biology Assessments

Figure 1 shows that 17 from 19 types of assessments available throughout the study sample. It means that there are 89.5% of assessments used by teachers. There are several types of assessments used by all participant teachers, namely observation, performance assessment, multiple choice, presentation, and description. The rest data in this study shown in Figure 1 are the other types of assessments used by teachers in the learning process that are not listed in the interview guidelines, in the form of peer-to-peer assessments.

The types of assessments not found in all sample schools are Vee and Venn diagrams. This type of assessment was not used by the participant teacher because it was considered unfamiliar, even in the interview results, it was found that a participant teacher did not know the type of assessment. Thus, there is need for assistance in developing variations of the assessment, including Vee and Venn diagrams. So, Biology teachers more familiar with the types of 21st century assessments and not experience difficulties in applying the assessment in the learning process (Prasetyo et al., 2016).

In addition to the type of assessment, we can also observe the frequency of use of the

assessment. This means that the assessment is not only available or owned by the participant teacher, but is used in the learning process. The frequency of use of each assessment is presented in Table 1.

Table 1. Frequency of Use of Biological Assessments

Participant	Frequency of Use				
	Days	Weeks	KD	PTS	PAS
GS1	0	0	5	2	0
GS2	1	0	12	5	5
GS3	2	0	1	1	1
GN1	0	0	4	3	0
GN2	2	0	0	4	0
GN3	2	0	10	4	5
Total	7	0	32	19	11

Note: GS (Private Teacher), GN (State Teacher), KD (Basic Competence), PTS (Mid Semester Assessment), and PAS (Final Semester Assessment)

The numbers in Table 1 show the number of Biology assessments used at specific times, daily, weekly, KD, PTS, and PAS. Through Table 1 it can be seen that the most frequent use of the assessment occurs in basic competence use. This explains that the participant teacher uses the

assessment the most when a basic competency has been completed. Although it was not carried out by all the participating teachers, the assessments were mostly used in which after the basic competence done, which there were 32 times for all participant teachers. Unlike the case in the weekly category that does not indicate the use of assessment. It is suspected that the teacher tends not to finish the material being taught so that there is no use of the assessment in the learning process. While the zero number in the PAS category is interpreted as a difference in the views of the teacher in giving answers, thus the type of

assessment that was not made by the teacher was not mentioned at the interview. In PAS activities, the types of questions used are government development or MGMP forums.

The 21st Century teacher's readiness was identified by the use of assessment that leads to all four skills or 4C's. The types of assessments include essays, performance assessments, portfolio, projects, products assessments, Venn diagram, Vee diagram, reports, and presentation. Data on 21st century skills development in Biology assessment are presented in Figure 2.

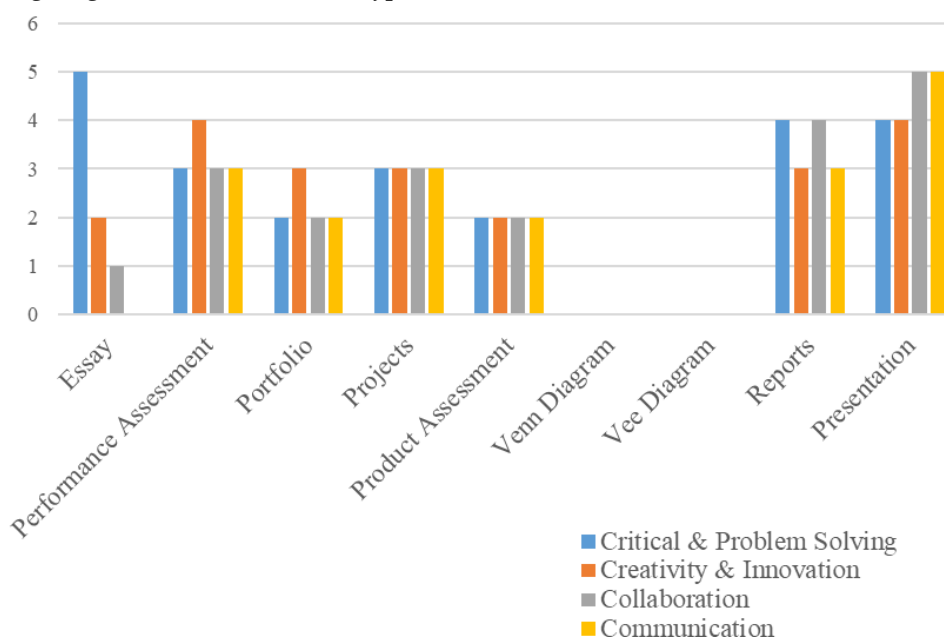


Figure 2. Development of 21st Century Skills in Biology Assessment

Figure 2 shows that there are seven out of nine types of 21st century Biology assessments used by participant teachers. In this case the use of assessments reached 77.8% of all types of 21st century assessments contained in the interview guidelines. The large percentage achieved by the results of interviews about the use of 21st century assessment types confirms that teachers have understood the importance of applying these assessments to measure 21st century skills in students.

The results of the measurement of 4C's in Figure 2 shows that seven assessments used by effective teachers to develop 4C's even though their application still needs a lot of improvement.

It can also be seen that only the description of the description is not able to measure all 21st century skills, namely communication skills. This is because these types of assessments are often used to collect student data individually.

The data in Figure 2 compared with the student questionnaire data. The results obtained indicate that there are some things that are not appropriate, but this did not change the results of the study because most of the data showed the compatibility of the results. In addition to student questionnaire data, the data in Figure 2 was also compared with 21st century needs assessments according to journal studies. The results are presented in Table 2.

Table 2. Comparison of Use of Participant Teacher Assessments with 21st Century Needs Assessment based on Journal Studies

21st Century Needs Assessment based on Journal Studies	Type of Assessment
ICT-based assessment	8, 9
Formative assessment	1, 8, 9
Active learning (<i>Creative problem Solving</i>)	1, 2, 4, 5, 8, 9
Portfolio assessment	3
Alternative assessment in the form of performance assessment (including making reports and presentations)	2, 8, 9
Rubric, performance-based assessment, portfolio, self-assessment, peer-to-peer evaluation, student response systems, concept maps	2, 3, 5 Notes: The assessments are available outside the 21 st century assessment
Cognitive assessment in the form of questions and rubrics	1

Note: 1) Essay, 2) Performance Assessment, 3) Portfolio Assessment, 4) Projects, 5) Product Assessment, 6) Vee Diagram, 7) Venn Diagram, 8) Reports, and 9) Presentation.

Table 2 shows that all types of assessments used are types of assessment that tend to lead students to 4C's. The assessment are known as alternative assessment or authentic assessment. This is in accordance with the demands of the 2013 curriculum that expects authentic assessment in the learning process, but the application of authentic assessments is not yet completely correct and sustainable. Wijayanti (2014) explains that authentic assessments have several characteristics including real experiences, carried out during and after the learning process, self-assessment and reflection, measurement of skills and performance, continuous assessment, there is feedback so that students know the failure and success clearly. Thus, authentic assessment is a holistic measurement of data so that ultimately there is feedback from the assessment process. The fact is, the teacher does not provide feedback on most of the assessments.

Table 2 also shows the types of self-assessment and peer-to-peer assessments. Winaryati et al. (2018) explains that by assessing oneself, students come to understand their strengths and weaknesses. This type of assessment was not included in the interview guidelines on the type and availability of 21st Century Biology assessments on the grounds that the assessments did not measure the 21st century skills referred to in this study, namely 4C's. In addition, Putri et al. (2018) explained that self-assessment and peer-to-peer evaluation showed low active ability. Nevertheless, these two assessments are important in the learning process.

Cognitive assessment is one type of assessment to assess student knowledge. The type of cognitive assessment in Table 2 number 7 in this study is the assessment in the form of multiple choice and description. This assessment is often used as a formative assessment in which every basic competency has been completed. This assessment is the type of assessment most often used by teachers, because it is classified as easy to implement.

In addition to variations in the types of assessments, the development of valid assessments is an important matter before they are applied. A valid assessment relates to the appropriateness of the interpretation of test results or can also be defined as an assessment that can carry out its measuring function correctly. The 21st century Biology needs assessment implemented by participant teachers is the development of the work of independent and MGMP groups. This is in accordance with the work of teachers according to Hendri (2010), which must have the competence of professional teachers, one of the forms is the ability to develop valid assessments.

In the MGMP group, the quality of the assessment has been tested because it has been through an official group with experts in their fields. While the type of assessment is made independently by the participant teacher, the validity process of the assessment can be carried out with colleagues in the same subject area, conducting trials on student groups, as well as direct consultation with experts and participating in educational training activities that refer to the

assessment 21st century. This is in accordance with Yusuf (2017) who explains that the content validity process of an assessment can be carried out in discussion activities that are followed by experts in the field of study concerned as well as experts in measurement and assessment. The validity process of the assessment is in the form of an instrument review with the aim of assessing the accuracy of the measuring instruments compiled.

Based on the results of the study, it is known that from the six participant teachers, there were only three teachers who carried out the validity of the assessment process, either in the form of discussions through the MGMP forum or training by experts when attending training activities or directly appointed as the target teacher for 2013 curriculum training. What can be revealed from the results of the above data is that the validity of the assessment is not carried out on every type of assessment and not all teachers carry out the process of validity of the assessment. Thus the teacher is considered not to prepare a valid assessment because of the limitations of the review or considers the review as less important. Even though the validity of an assessment is an important activity so that its measurement is right when applied to students. The validity process of the assessment does not have to go through large forums such as MGMP or training by experts, but can be done by colleagues in the same field, namely Biology. However, the perceived lack of importance of the review makes this process of validity less necessary for some teachers.

The use of these types of assessments cannot be separated from the availability of school facilities and infrastructures as well as the creativity of each Biology teacher. School facilities and infrastructure greatly affect the implementation of a good learning process, the more complete a school is in providing learning

facilities, the learning activities will be easily implemented. Another factor lies in the level of willingness and creativity of the teacher concerned. Thus, school facilities and the creativity and willingness to continue learning from the teacher are the factors that determine the quality of the learning process. This is consistent with the results of research by Prasetyo et al. (2016) that the application of assessment is highly considered by teachers because of reasons of limited time, limited knowledge, and limited skills to develop various types of creative assessment that are varied and authentic. In addition, an understanding of authentic assessments such as Venn diagrams, Vee diagrams, concept maps, observation sheets, and self-assessments is still low for Biology teachers. Thus there is a need for training for Biology teachers in applying creative and effective assessments in learning activities.

Some teachers also did not show high awareness of the needs of the 21st century education. It was seen from the lack of teacher tendencies towards the educational needs of the 21st century. Although the types of assessments used were varied, teachers still inclined to the aspect of knowledge to face the midterm, final tests, and national examinations. In fact, students should not be demanded from the aspect of knowledge but also in aspects of skills and attitudes. Thus the need for the application of alternative types of assessment that can maximize student skills. Wardani (2012) explains that alternative assessments are able to measure critical thinking skills and problem solving. Gloria (2012) added that alternative assessment was very instrumental in efforts to improve students' scientific thinking and reading skills. The application of this type of assessment in the learning process is presented in Table 3.

Table 3. Alternative Assessment Models of 21st Century Biology Learning Based on Data Studies

Alternative Assessment Model	Partisipant
Essay	GS1, GS2, GS3, GN1, GN2, GN3
Performance assessment	GS1, GS2, GS3, GN1, GN2, GN3
Portfolio assessment	GS1, GS2, GS3, GN1, GN3
Projects	GS1, GS3, GN1, GN3
Product	GS1, GS3, GN3
Venn diagram	-
Vee Diagram	-
Reports	GS1, GS2, GS3, GN1, GN2
Presentation	GS1, GS2, GS3, GN1, GN2, GN3

Note: GS (Private Teacher), GN (State Teacher)

Based on Table 3. it is found that the most used of alternative assessment models are essay, performance assessments, and presentation. Wusqo et al. (2016) explains that performance assessment and presentation are alternative assessments that are effectively used as evaluation material. Thus, alternative assessments can become assessments that can meet the needs of the 21st century on students. In this case schools must contribute to implementing assessments that can measure and develop higher-order thinking skills (Osborn, 2013).

According to the participant teachers, of the three types of alternative assessments that are often used, the assessment descriptions are only good for measuring critical thinking skills and problem solving as well as creativity and innovation. Thus, it is important for teachers to increase the variation of other types of alternative assessments in the learning process. Through this, it is expected that 21st century skills in students can be better developed.

The 2013 curriculum also emphasizes the use of authentic assessments in learning. So this is in accordance with the needs of the 21st century where measurement is not only cognitive, but also attitudes and skills. Based on the above study, the teacher's understanding of authentic assessments already exists, but the application of authentic assessments is not yet fully correct and sustainable. Authentic assessment is a holistic measurement of data so that ultimately there is feedback from the assessment process. Thus teachers who already understand the importance

of 21st century education needs also do not have the opportunity to develop authentic assessments that are consistent with the 2013 curriculum and certainly lead to 4C's.

Low understanding by teachers of the educational needs of the 21st century is influenced by several things. The factors are influenced by teachers' lack of support and not having examples to assessments to measure 4C's. Teachers training does not easily make teachers proficient in developing 21st century assessments. Therefore, there is a need for more trainings, especially to optimize the ability of teachers in developing authentic assessments. This is clearly seen in the results of Prasetyo et al. (2016) which states that teachers' understanding of authentic assessments is still low, some have never applied it, or have never even made authentic assessments. But there are also teachers who already know about authentic assessment but do not apply it in their classrooms for various reasons as obstacles.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the majority of teachers in the Semarang have not shown readiness in the 21st century's educational needs, especially in the application of assessments that lead to 21st century skills (4C's). This is proven through several things, namely the type of assessment used by teachers has varied, but some of the assessments used are cognitive aspects of the assessment, only three teachers found the

process of validating the Biology assessment, and there are seven alternative assessment models of 21st Century Biology learning in participating schools, but in its application it is not fully complete in accordance with the purpose of authentic assessment. Each participating school has a number of different alternative assessment models, this depends on the level of creativity and willingness of the teacher and the learning facilities of the respective schools.

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REFERENCES

- Alismail, H. A. & McGuire, P. (2015). 21st century standards and curriculum: current research and practice. *Journal of Education and Practice*, 6(6), 150-155.
- Arsad, N. M., Osman, K., & Soh, T. N. T. (2011). Instrument development for 21st century skills in biology. *Procedia Social and Behavioral Sciences*, 15, 1470-1474.
- Ghaicha, A. (2016). Theoretical framework for educational assessment: a synoptic review. *Journal of Education and Practice*, 7(24), 212-231.
- Gloria, R. Y. (2012). Pentingnya asesmen alternatif dalam meningkatkan kemampuan berpikir dan membaca ilmiah siswa pada pembelajaran biologi. *Jurnal Scientiae Educatia*, 1(1), 99-106.
- Hendri, E. (2010). Guru berkualitas: profesional dan cerdas emosi. *Jurnal Sang Guru*, 1(2), 1-11.
- Kivunja, C. (2014). Do you want your students to be job-ready with 21th century skills? change pedagogies: a pedagogical paradigm shift from vygotskyian social constructivism to critical thinking, problem solving, and siemens' digital connectivism. *International Journal of Higher Education*, 3(3), 81-91.
- Osborne, J. (2013). The 21st century challenge for science education: assessing scientific reasoning. *Thinking Skills and Creativity*, 10, 265-279.
- Pheeraphan, N. (2013). Enhancement of the 21st century skills for Thai higher education by integration of ict in classroom. *Procedia Social and Behavioral Sciences*, 103, 365-373.
- Prasetyo, A. P. B., Sukaesih, S., & Hadiyanti L. N. (2016). Pendampingan guru biologi kota semarang dalam mengembangkan instrumen penilaian otentik pada kurikulum berbasis kompetensi. *Unnes Science Education Journal*, 5(1), 1182-1190.
- Putri, F. A., Anggraito, Y. U., & Alimah, S. (2018). The effectiveness of guided inquiry strategy on students' collaboratuve skill. *Journal of Biology Education*, 7(2), 144-150.
- Wardani, O. P. (2012). Pengembangan perangkat evaluasi berdasarkan taksonomi the stucture of observed learning outcome (solo) pada mata pelajaran Bahasa Indonesia kompetensi membaca peserta didik kelas X SMA. *Jurnal Pendidikan Bahasa dan Sastra Indonesia (Seloka)*, 1(2), 79-84.
- Wijayanti, A. (2014). Pengembangan autentic assesment berbasis proyek dengan pendekatan saintifik untuk meningkatkan keterampilan berpikir ilmiah mahasiswa. *Jurnal Pendidikan IPA Indonesia*, 3(2), 102-108.
- Winaryati, E. (2018). Penilaian kompetensi siswa abad 21. Dalam: *Seminar Nasional Edusainstek*. Semarang: FMIPA UNIMUS 2018.
- Wusqo, I. U., Taufiq, M., & Handayani, R. (2016). Pengembangan asesmen alternatif praktikum kimia dasar II melalui chemistry fair project (CFP) berbasis konservasi dengan memanfaatkan daily chemical. *Jurnal Penelitian Pendidikan*, 33(2), 145-154.
- Yusuf, M. (2017). *Asesmen dan Evaluasi Pendidikan: Pilar Penyedia Informasi dan Kegiatan Pengendalian Mutu Pendidikan Edisi Pertama*. Jakarta: Kencana.