

Literacy Assessment Ability of Creative Thinking in 21st Century Science Learning

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Keyword: 21st Century literacy assessment.

Abstract: This study aims to determine the student teachers' literacy skill in creative science thinking assessment. The method used in this study is a survey method in the form of documents of creative science thinking assessment literacy questions that have been validated by education experts consisting of creative thinking indicators: *fluency, flexibility, originality, and elaboration*. The subjects in this study were the eighth-semester students of elementary school teacher education program. The results of the study obtained fluency (41%), flexibility (33%), originality (29%), elaboration (46%). Whereas, based on the standard indicators of assessment literacy it was obtained: selecting the assessment method (20%), developing the assessment method (12%), managing the assessment results (14%), using the assessment results when making decisions (16%), developing assessment procedures (15%), communicating the results of the assessment (13%), and recognizing unethical valuation methods (10%). This illustrates that the assessment skills of creative science thinking assessment of the elementary student teacher candidates are still in the low category. The lack of understanding of the creative thinking assessment is due to the lack of reading resources about creative thinking assessment literacy held by students and the basic education study program curricula that have not yet accommodated indicators of creative thinking, especially learning evaluation courses.

1 INTRODUCTION

An assessment needed on 21st century learning is an assessment functioning as learning. By using an assessment as learning system, teachers are able to integrate both in a learning process. A quality teaching can be seen also in the quality of assessment instrument arranged by teachers, and vice versa, the quality of the instrument mentioned can illustrate the quality of learning process conducted (Kemendikbud, 2016).

In the learning process, an assessment is needed to determine the characteristics and provide an assessment to students. Assessment can be used for a variety of purposes, such as determining student classes, national accountability, monitoring systems, allocating resources to an area, placing or monitoring students, determining interventions, improving teaching and learning, or giving individual feedback to students and parents or guardians. Newton (Suurtamm et al, 2016).

Rotherdam & Willingham (Wijaya & Nyoto, 2016) noted that the success of a student depends on 21st century skills, and one of the life skills that must be possessed in the 21st century is the ability to think creatively. Creative thinking skill is the ability or thought process to provide new ideas that can be applied in problem solving (Munandar, 2012). Students must learn to acquire it; therefore, the current learning activities must be adapted to the development of knowledge in the 21st century that integrates literacy skills, knowledge skills, skills and attitudes, and technology mastery. Literacy becomes an important part of a learning process. Students who can perform literacy activities to the maximum will certainly get more learning experiences compared to other students (Kemendikbud, 2013).

Based on the results of interviews with a lecturer who teach elementary learning evaluation courses, it was found that as long as the lecturer taught the subject he had never taught or measured the creative

thinking skills of students (the student teachers), because the lecture process was only referring to the description in the curriculum of the elementary school teacher education program (PGSD). This is supported by documentation on questions of mid-term exam, final exam and course descriptions in the curriculum in PGSD. Specifically, for elementary learning evaluation subject, the material and evaluation of students' creative thinking skills have not yet to appear. As a result, the student teachers passed with an understanding of inadequate key assessment concept (for example, validity, bias, etc) and low self-efficacy to use judgment (Volante & Fazio, 2007). Therefore, elementary school teacher candidates (the students) must be prepared as early as possible in their assessment literacy skills, so that they have good knowledge as a provision to become teachers later. For this reason, the problem in this study is: how is the ability of elementary school students, teachers to understand the creative science thinking assessment in elementary school for 21st century learning?

In this 21st century, the human resources needed are human resources that possess 21st century competencies. These competencies include critical thinking skills, creative thinking skills, communication skills and collaborating skills. Thus the four competencies of the 21st century can be said as a generic goal of the learning process and based on this, the assessment that must be developed has to be an assessment that can be used to support the achievement of these objectives. Learning assessment is data collection executed by adhering to certain principles. Assessment should be carried out by adhering to the six general assessment principles as stated below: (1) The main purpose of the assessment; (2) the assessment criteria; (3) the assessment must be carried out fairly; (4) the assessment must be professionally developed; (5) the assessment must be delivered clearly and continuously; and (6) the assessment must be open, continually reviewed, evaluated, and systematically corrected (Abidin, 2016).

Literacy assessment is present when a person has knowledge and skills related to the assessment needed for competent performance, people's responsibility "(Popham 2009). Literacy assessment requires an understanding and use of appropriate judgments based on basic theoretical and philosophical knowledge of student learning measurements (Volante & Fazio, 2007).

Literacy understanding of creative thinking assessment is important to be developed in higher education, because students' assignments generally

tend to be more directed at solving problems in the real world context. Students are not only introduced to theories / concepts in the scientific field, but are also encouraged to deal with relevant problems around them which require a higher level of thinking. Learning in higher education is essentially a planned and patterned activity to create an atmosphere and provide services so that students learn effectively. For the lecturers, the main task that must be executed is to plan and perform learning and make an assessment of every material that has been taught. The three are inseparable unity systems. Effective and meaningful learning requires an appropriate and comprehensive assessment system. The standard literacy assessment proposed by Sanders & Vogel (1993) are as follows:

1.1 Teachers Must Be Skilled in Choosing an Appropriate Assessment Method for Instructional Decisions

Teachers who meet this standard will have the conceptual skills and applications following it. They will understand how valid assessment data can support instructional activities such as providing appropriate feedback to students, diagnosing group and individual learning needs, planning individual education programs, motivating students, and evaluating learning procedures. Assessment choices vary and include questions and tests submitted by the text and curriculum, standardized criteria and reference tests, oral assessments, spontaneous and structured performance assessments, portfolios, exhibitions, demonstrations, rating scales, examples of paper writing and written tests, school work and homework, peer and self assessments, student records, observations, questionnaires, interviews, projects, products, and opinions of others.

1.2 Teachers Must Be Skilled in Developing Assessment Methods That Are Appropriate for Instructional Decisions

Teachers who meet this standard will have the conceptual skills and applications following it. Teachers will be skilled in planning information collection that facilitates the decisions they will make. They will know and follow the right principles to develop and use assessment methods in their teaching, avoiding common difficulties in student assessment. Such a technique might include

several options listed at the end of the first standard. The teacher will choose a technique that is in accordance with the intent of the teacher's instruction. Teachers who meet this standard will also be skilled in using student data to analyze the quality of each assessment technique they use. Because most teachers do not have access to assessment specialists, they must be prepared to carry out their own analysis.

1.3 Teachers Must Be Skilled in Managing, Publishing, and Interpreting the Results of Assessment Method Produced Externally and Those Produced by Teachers

Teachers must be skilled in managing, publishing, and interpreting the results of various assessment methods. Teachers who meet this standard will have the conceptual skills and applications following it. They will be skilled in interpreting the results of assessments made by informal and formal teachers, including performances of students in class and homework. Teachers will be able to use guidelines for publishing essay questions and projects, stencils for publishing response choice questions, and performance rating scales. They will be able to use this in a way that produces consistent results.

1.4 Teachers Must Be Skilled in using the Results of Assessment in Making Decision on Individual Students, Lesson Plan, Curriculum Development, and School Improvement

Teachers who meet this standard will have the conceptual skills and applications following it. They will be able to use accumulated assessment information to develop good instructional plans to facilitate the development of student education. When using assessment results to plan and/or evaluate instruction and curriculum, the teacher will interpret the results correctly and avoid general misinterpretations, such as based on decisions on scores that do not have curriculum validity. They will be informed of the results of local, regional, state, and national assessments and about appropriate uses for improving student, class, school, district, state and national education.

1.5 Teachers Must Be Skilled in Developing a Valid Student Assessment Procedure That Uses Student Assessment

Teachers who meet this standard will have the conceptual skills and applications following it. They will be able to design, implement, and explain procedures to develop values that consist of various things from various tasks, projects, classification activities, quizzes, tests, and/or other assessments that they may use. The teacher will understand and can articulate why the values they provide are rational and fair, so that they reflect their preferences and judgments. The teacher will be able to recognize and avoid incorrect assessment procedures such as using value as a punishment. They will be able to evaluate and modify their assessment procedures to improve the validity of interpretations made by them about student achievement.

1.6 Teachers Must Be Skilled in Communicating the Results of Assessment to Students, Parents, Other General Audiences, and Other Teachers

Teachers who meet this standard will have the conceptual skills and applications following it. The teacher will understand and be able to provide a precise explanation of how the interpretation of student assessment must be moderated by other socio-economic, cultural, linguistic, and background factors. The teacher will be able to explain that the results of the assessment do not imply that these background factors limit the development of the student's final education. They will be able to communicate with students and their parents or guardians how they can assess the progress of student education.

1.7 Teachers Must Be Skilled in Acknowledging Unethical, Illegal, and Inappropriate Assessment Method and Information

Teachers who meet this standard will have the conceptual skills and applications following it. They will know the laws and case decisions that affect the practice of assessing classes, school districts, and assessing their country. The teacher will realize that various assessment procedures can be misused or used excessively so as to cause harmful

consequences such as humiliating students, violating students' rights to confidentiality, and not using the standard achievement test scores of students to measure teaching effectiveness.

The assessment carried out by the teacher in the implementation of the 2013 curriculum experienced many obstacles including the aspects that must be assessed. The assessment carried out together with the learning process, so that the teaching and learning process became less effective and felt burdened because they had to sum up each student's overall value and then describe the value. This indicates that elementary school teachers experience difficulties in applying 2013 curriculum especially those relating to assessment in 21st century learning.

The issue of 21st century skills is of concern to observers and education practitioners. The North Central Regional Education Laboratory (NCREL) and The Metiri Group (2003) identified the framework for 21st century skills, which are divided into four categories: digital era proficiency, inventive thinking, effective communication, and high productivity. The 21st century competency framework shows that core subject is inadequate; students must be equipped with; 1) creative-critical ability, (2) strong character, (3) support for the ability to utilize information and communication technology (Dadan, 2012)

Partnership for 21st Century Skills (2002) identified six key elements for 21st century that are encouraging learning: (1) emphasizing core subject knowledge; whatever skills developed must be based on knowledge of the contents of the main subject matter and an understanding of the main characteristics; 2) emphasizing learning skills; students need learning skills consisting of three skills, namely skills related to information and communication, thinking and problem solving skills, interpersonal skills and self-regulating skills. A teacher needs to integrate these skills in learning intentionally, strategically and to the greatest extent; (3) using the 21st century tool to develop learning skills; students need to learn how to use tools that are essential for everyday life and to be productive at work. The ability to utilize ICT is very necessary in the 21st century; (4) Teaching and learning in 21st century context; students learn material through examples, applications, and real-world experiences both inside and outside the school; (5) teaching and studying the contents of 21st century; educators need to integrate knowledge and skills in the 21st century. (6) Using the assessment of 21st century that measures 21st century skills; to measure skills in the 21st century, high-quality assessments are needed so

that they can measure student achievement in 21st century elements. For effective instruments to be used, they must be made appropriately.

2 RESEARCH METHOD

The type of research used was descriptive qualitative research. Qualitative descriptive research was used to describe the problem under study. The study was conducted in the Department of Basic Education in the faculty of teaching and education in Khairun Ternate University, with the research subjects of the 2015/2016 elementary school student teachers with total 26 students and the instrument used to obtain data was creative science thinking assessment literacy questions, interviews and documentation.

3 RESULT AND DISCUSSION

3.1 Results of Creative Science Thinking Skill Test

The learning process includes planning, implementation, and assessment. Assessment is one of the instruments used to determine the extent to which achievement of learning objectives has been set previously. One of the skills that must be possessed by student teachers is creative thinking assessment literacy to deal with changes in the 21st century learning. The implementation of the science thinking skill test for 2015-2016 PGSD students based on indicators of creative thinking resulted:

Table 1: Creative Thinking Test Results.

No.	Indicators of creative thinking	Test results
1.	<i>Fluency</i>	41%
2.	<i>Flexibility</i>	33%
3.	<i>Originality</i>	29%
4.	<i>Elaboration</i>	46%

Based on the results of the creative science thinking literacy ability test above, it can be concluded that the ability is still in very low category. This means that the understanding of students as student teachers is still very low, therefore they should be given a good understanding

early on (starting at college), so that they can apply that knowledge to the real world.

There are many aspects used in assessing student learning outcomes, but I emphasize more on the presence, activity, and honesty of students in working on the problem. However, the mastery of theory or knowledge will follow naturally if students achieve those 3 qualities “ (Hidayati, 2016).

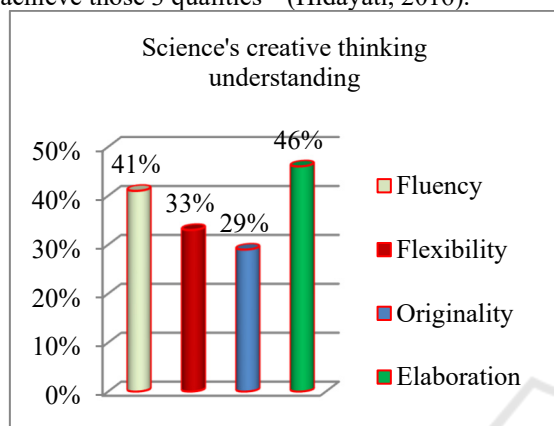


Figure 1: Understanding of Students / Prospective Teachers.

The learning process includes planning, implementation, and assessment. Assessment is one of the instruments to determine the extent to which achievement of learning objectives has been set previously. Course competencies will also be achieved well because students tend to be more disciplined in teaching and learning activities. Nonetheless, authentic assessment actually emphasizes the quality of learning outcomes and does not focus on how high the students' value is.

Assessment of learning outcomes as a process of gathering and processing information to determine the achievement of learning outcomes students need data as information that is relied upon as the basis for decision making (success/failure of students in achieving a competency). To assess this learning outcome, lecturers are not only required to determine what aspects need to be assessed, but also know how to assess these aspects.

In general, student assessment programs were conducted by lecturers in the realm of knowledge, attitude, and skills. Knowledge domain assessment is done by assessing daily assignments, daily examinations, midterms, and final semester examinations. The instrument used in measuring the ability of students in the realm of knowledge was in the form of a description question with regard to the level of Bloom's Taxonomy, so that students have the ability to think higher in answering the questions

given. Observing student attitudes both inside and outside the classroom, such as motivation to learn, responsibility in doing assignments, discipline, politeness, and honesty in doing assignments or examinations was a way to do the assessment in affective domain. In the other hand, the assessment of the psychomotor domain was conducted by assessing the active participation of students in the learning process such as active questions, expressing opinions, and presentation performance, as well as the creative results of students' work.

Learning outcomes assessment provides information to lecturers and students. For lecturers, the information is one of which can be used to determine the extent to which learning goals have achieved based on the predetermined goals. While for students, this information can be used to determine their learning achievements after attending lectures.

Stiggins (1991) noted that educated educators must know "What they value, why they do it, how to best assess achievement of interest, how to produce good performance samples, what can be wrong, and how to prevent problems before they occur". Literacy assessments are very important so that educators can support and measure teaching and learning. In recent years, "given the increasing importance of both large-scale and classroom assessments, developing assessment literacy in the needs of prospective teachers is an explicit component of teacher education programs" (Deluca & Klingler, 2010). Literacy assessment of student teachers is seen as a key link in the relationship between assessment of quality and student achievement (Mertler, 2002) and teachers must have an adequate level of assessment literacy (Popham, 2006).

3.2 Result of Literacy Assessment Skill Test

The implementation of the assessment literacy skill test with an instrument developed based on the description of the indicators of the Literacy Assessment Standards (SLA) for students of the 2015/2016 prospective teacher obtained the following results.

Table 2: Literacy Test Results Assessment Creative Thinking.

No	Assessment Literacy Standard (SLA)	Test results
1.	Choose an assessment method	20%
2.	Develop assessment methods	12%
3.	Manage assessment results	14%
4.	Use assessment results to make decisions	16%
5.	Develop assessment procedures	15%
6.	Communicate the results of the assessment	13%
7.	Recognize unethical valuation methods	10%

From the results obtained above, it can be seen that the ability to choose the valuation method has a higher value, even though it is still in the very low category range, this means that the student teachers already understand the various assessment methods that will be used to develop the assessment instrument. This is in line with the opinion of Popham (2009) and Mardapi (2008) that the selection of a good assessment method will have an impact on the learning process and become a reference for further policy. Likewise in the case of developing assessment instruments, students need to be provided with the development of assessment instruments that can be carried out while attending the evaluation course, so that they have a good understanding of the development of assessment instruments. Sugiyono (2008) & Gable (1986) said that a less developed product is a learning assessment instrument

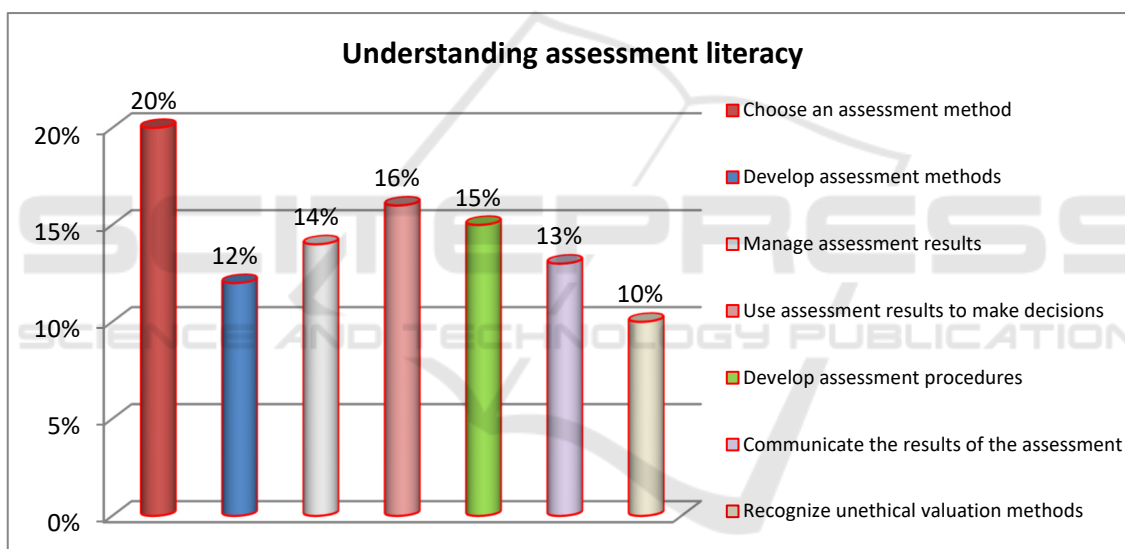


Figure 2. Assessment Literacy Understanding

Teachers are required to be able to choose and use appropriate and useful evaluation tools in providing positive feedback for educators and schools so that, ultimately, learning assessment from schools or institutions, where the learning process takes place, can be a positive value for the quality of the school itself.

In the end the students (students) who carry out the evaluation can better prepare themselves in facing various tests, either pre-test or post-test, summative or formative tests, evaluations conducted by evaluators from outside or inside. Those will not be the worrisome main factor in the learning

assessment for their evaluation results. Stakeholders now expect teachers to be able to provide a notion for the assessment tools they use. Unfortunately, most teachers nowadays know little about assessment because they are traditionally not trained for it (Popham, 2004, 2009a). In fact, "one of the most serious problems in the education profession today is that the level of Literacy assessment of the educators is very low" (Popham, 2010).

These skills help teachers engage in instructional adaptations where they "... use insights from assessment to plan and revise instructions and provide feedback that explicitly helps students see

how to improve ..." (Shepard, Hammerness, Darling-Hammond, & Rust, 2005). Significantly, Wiggins and McTighe (1998) also argued that this skill needs to be explicitly taught inasmuch as it does not appear naturally to every teacher. Clearly, there are many things that can be achieved by improving teachers' literacy assessment. This offers several guarantees that teachers can choose assessment tools that show students making adequate progress towards the country's learning standards (Gardner, 2006; Popham, 2011; Stiggins, 2005).

4 CONCLUSION

1. Elementary school student teachers' ability to understand creative science thinking instruments is in the low category for all indicators of creative science thinking.
2. Elementary school student teachers' literacy assessment ability is in the very low category on all indicators of the Literacy Assessment Standard (SLA).

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