Assessment of Contextual Learning in Mathematics

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**Abstract**. Mathematics is a very important lesson to be taught. Mathematics learning is a learning that cannot be separated from the real world. Many methods and approaches to learning are used to better interpret mathematical concepts. One of the lessons that can connect mathematics material with reality is contextual learning. Contextual learning is considered to be effective in use because of its principles that lead students to construct and find their understanding of a mathematical concept. Of course, a good lesson is followed by an appropriate assessment. *Authentic Assessment* is an assessment related to contextual learning because it is a part of contextual learning. The assessment is carried out for students to assess students' abilities during the learning process. The purpose of this study is to describe (1) contextual learning, (2) its application to mathematics as well (3) assessments used in contextual learning in mathematics. The description of the assessment is described in the following literature review article.

1. Introduction The

Quality of education can be seen from the quality of its implementation not only from its planning and development [1]. In the 2013 curriculum that is currently used, the development of character values ​​is also considered in learning, in addition to facilitating students in aspects of higher-order thinking skills [2]. One of the most important lessons for all levels of school is mathematics [3]. mathematics has an important role in the development of science and technology [4].

To support the implementation of mathematics learning that can develop mathematics as well as character values ​​in students, of course, requires an approach and learning model that can be appropriate by the teacher. Learning should be something meaningful that actively involves both teachers and students. One solution that can be used to make this happen is with a learning design that can provide space for students to be actively involved, innovative, affective, creative, also fun [3]. Teachers have demands to be more creative so that the teaching and learning process can be carried out properly [5]. The learning process is expected to involve students actively which includes active questions, discussions, and others. So that students can construct their mathematical ideas and understanding [4]. Learning that can be used to help students construct their understanding is contextual learning. This is because contextual learning exposes students to the material as well as following the material they are learning [6].

One important aspect of learning is the assessment process which should be able to measure students' abilities [7]. Appropriate assessments can enhance the usefulness of these assessments such as providing grades to students, improving teaching and learning, or providing individual feedback to students and students' parents or guardians [8].

1. Methods

This research uses a literature review to describe the assessment of mathematics learning using contextual learning. The literature studied is related to contextual learning, assessment in learning, and *authentic assessment* in contextual learning.

1. Literature Review
	1. **What is contextual learning?**

The contextual approach to learning is a process in education that aims to help students interpret the material being studied and apply it in daily life both in personal, social, and cultural life [9]. According to Berns and Ericson, the contextual learning approach is a teaching-learning concept that can help teachers to link learning and situations in the real world which are also useful as motivation for students to determine the relationship between knowledge and its application in the lives of students as students, members of society, and also as family members so that it can motivate them to work hard to apply learning outcomes [10].

In line with that, Kalchik and Oertle also stated that a contextual learning approach is an approach to learning designed to connect the material with real situations in certain contexts that can attract students' interest [11]. According to Jhonson there are 8 aspects related to contextual learning, namely: (1) Making meaningful relationships; (2) Make meaningful work; (3) Creating self-regulated lessons; (4) Cooperate or be cooperative; (5) creative and critical thinking; (6) Make individuals grow and develop; (7) Achievement of high standards; and (8) Using *authentic assessment* [9].

"Sutawijaya and Afgani D [12] describe the components of contextual learning as follows:

1. Constructivism (constructivism); explaining one's knowledge is constructed by the individual gradually, where the results will be expanded to a limited extent. One has to build up his knowledge and give meaning to the real experiences he experiences. Based on this, learning must be packaged into a process of 'constructing' not 'receiving' knowledge. On this basis, it can be stated that the task of the teacher as a facilitator in the learning process is by (1) making knowledge that has meaning and is by the real world to students; (2) allowing students to discover and apply their understanding; and (3) facilitating students to apply their own chosen strategies in learning.

2. *Inquiry* (find); The core part of contextual learning activities is the meaning of Finding. The knowledge and skills obtained from students are expected not to remember facts, but the results of discovering them themselves. Students always have to plan activities that lead to finding activities. The stages of finding are making observations (observing), asking questions, proposing hypotheses, collecting data, and concluding.

3. *Questioning* (asking); Asking questions is an important part of a learning activity, as well as a contextual approach. Asking questions on the learning process is seen as an activity for educators to encourage, guide, and assess students' thinking abilities. For students, asking questions is an important thing in learning activities with the inquiry, which is digging up information to confirm what they already know and paying more attention to what they don't know.

4. *Learning Community* (learning community); The concept of a learning community directs the results of learning activities to be obtained based on the results of cooperation. Learning outcomes are obtained from the results of sharing information among students, groups, and also between students who already understand or who do not understand the learning material.

5. *Modeling* (modeling); Is a part of contextual learning that is aimed at developing skills and knowledge, accompanied by certain examples and models. The model can be a step in implementing ways to solve the problem. Models can also be made by involving them directly or indirectly.

6. Reflection (reflection); Is a way of thinking looking at the past for new things that are learned. Reflection activities can be in the form of direct statements about new things that are learned, make lesson notes, provide *feedback*, and discuss also produce product results.

7. *Authentic Assessment* (the actual assessment); is the process of collecting data that can describe the development of student learning. Because the actual assessment emphasizes the learning process, the assessment can be carried out during the learning process."

3.2 How is the application of CTL in mathematics?

In mathematics, contextual learning can be done using teaching aids that are by the existing material [13]. The application of contextual learning in mathematics itself is intended to improve mathematical abilities and attitudes that support these abilities. Sulastri in her research found that the application of contextual learning can improve students' conceptual understanding skills [14]. The inquiry component, constructivism, is a standout that supports the increased ability of students to understand concepts. Assessment techniques used are observation sheets, tests during the learning process, and documentation during learning activities [15]. Contextual learning is combined with the use of worksheets to help students work on related questions.

"The choice of contextual learning in mathematics learning is also intended because it wants to provide many opportunities for students to construct their knowledge from the real world, train students to find relationships / connect concepts that will and have already been mastered and find relationships between mathematical concepts and other subjects, to gain the ability. The mathematical connection that can support the achievement of SK / KD students [16]".. Contextual learning can be done by forming groups then students are guided to find mathematical concepts and an understanding of the mathematical concepts they have.

**3.3 *How to Assess Contextual Learning?***

In addition to the application of a contextual approach, proper assessment also needs to be applied to fit the established learning objectives. This can lead to the teacher's mathematics experience becoming students' mathematics experience, the phenomenon of teaching to test, and learning for exams to become access to learning [17]. According to Lee, assessment is an integration component in learning [18].

Assessment should be able to provide an overview of information to the teacher so that it can improve learning outcomes and students can develop their abilities optimally [19]. Wiggins revealed that the assessment can be said to be authentic if we measure it with the appropriate task [20].

In CTL, there is a component *Authentic Assessment*, which can be done formatively or summatively. Mueller and Stiggins define *authentic assessment* as follows:

*"A form of assessment in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills" (Mueller, 2007)* [21]

*"Performance assessments call upon the examinee to demonstrate specific skills and competencies, that is, to apply the skills and knowledge they have mastered." (Stiggins, 1987, p. 34).*[22]

*An authentic assessment* is closely related to contextual learning. This can be seen from the *Authentic Assessment* which is part of the implementation of contextual learning. The authentic assessment aims to assess various types of abilities within the existing context and then the assessment is also to appreciate the results, processes, and ideas of workmanship [23]. Furthermore, to make an *Authentic Assessment*, the following steps are needed [21]: (1) identify the standards that will be used, (2) choose the form of the aspect to be assessed, (3) identify the criteria for that aspect, (4) make a rubric. Aspects that are assessed can be in the form of cognitive aspects as well as affective aspects. For the cognitive aspects, the instrument used was a test. The types of tests used also vary, both in the form of multiple choices, descriptions, and short answers. Meanwhile, for the affective aspect, a questionnaire or questionnaire can be used.

Through contextual learning, it is hoped that there will be a link and a relationship between the material taught and real life. So that what students learn can be assessed authentically by the teacher. to prove that the learning being taught is under the contextual. As a part of learning, the authentic assessment must be done [9] [24] [25].

"Puspawati (2014) through her research integrated authentic assessment in contextual learning [26]. Through the learning process that is carried out, the teacher does not convey the concept directly but gives problems to students. An authentic assessment that is integrated into the learning makes student-centered learning and the teacher acts as a learning facilitator."The

implementation of an authentic assessment in contextual learning uses an assessment format that facilitates students in solving a problem contextually, unlike the format in multiple-choice or true-to-wrong assessments. Komalasari explained that there are three formats for authentic assessment in contextual learning, namely. (1) Tests that present real-world conditions that match the material to students, (2) Tasks given are in the form of skills, simple investigations, or integrated investigations. (3) Records of student learning activities or learning processes are made in the format of portfolios, presentation reports, interview sheets, checklists, and others [27].

These formats are applied to aspects of assessment, both attitude assessment, cognitive or knowledge assessment, and skills assessment. Johnson also argues that there are four types of authentic assessment in contextual learning, namely project appraisal, written answers, and individual work. [9]." . In contextual learning, the teacher may be able to use assessment in the form of a portfolio because the tools and materials from student portfolios can be drawn from the phases in the contextual learning model.

In learning mathematics assessment in the cognitive realm can be in the form of an assessment of the ability to understand and remember, the ability to apply knowledge to solve problems, the ability to analyze problems, the ability to understand concepts, the ability to think creatively, the reasoning abilities and other mathematical abilities. Meanwhile, affective assessment can be done on attitudes, interests, motivation, self-confidence, and others.

"Fauziah et al (2017) researched the assessment of statistical learning. Statistics is one of the appropriate branches of mathematics to use authentic assessment. The authentic mathematics assessment of statistical learning referred to in this study is devoted to the use of project appraisal". It was found that during learning, students and teachers actively participated. "Group and individual performance can be observed during the learning process [28]."

1. Result & Discussion

Based on the literature review above, the results of the study are presented in the following table:

|  |  |
| --- | --- |
| No  | Studies |
|  | Researcher Research | Tittle | Assessment Instrument Used | Results |
| 1 | Tatagno, Sa’dijah, Akbar [15] | Assessment of Skills in Contextual Building Broad Concept Learning | Project work reports and written tests | Student understanding |
| 2 | Sari, Rahayu dan Widyaningrum [13] | Learning Mathematics Using Models Contextual Teaching and Learning (CTL) on Cube Material with Tofu Context in Class VIII | Test and Group worksheets | Achievement |
| 3 | Puspawati dkk [26] | The Influence of an Authentic Assessment Assisted Contextual Approach on Mathematics Learning Outcomes in terms of Numeric Ability in Students | Worksheets | Activity and achievement |
| 4 | Maryati, I & Priatna .N [29] | Integration of Mathematical Character Values ​​through Contextual Learning | Records of learning activities (observation sheet) | Attitude (curiosity, confidence, creative and thorough) |
| 5 | Sulastri, Ai [14] | Application of a Contextual Approach in Mathematics Learning to Improve Students 'Understanding of Mathematical Concepts | Observation Sheet, Test of | Understanding of Mathematical Concepts |
| 6 | Tatagno, Sa’dijah, Akbar[28] | Application of Authentic Assessment in Contextual Learning on the MaterialFractions | of Group Worksheet | Students' active attitudes |

Based on the table above, it can be seen that the assessment instruments used can be in the form of recorded activities learning, portfolios, or tests. And assessment in contextual learning can be used to assess both affective and cognitive forms. For example, project work reports and written tests are used to assess students' conceptual understanding skills. This is because the project work report and test instruments used have been prepared based on indicators of problem-solving abilities.

Worksheets can also be used to see student activity during learning. This can also be supported by observation sheets so that the assessment will be better. From the table, it can also be seen that authentic assessment which is one of the elements of contextual learning can be integrated into mathematics learning with appropriate material. Appropriate material is defined as material that has a real-world context. So that learning and assessment of contextual learning can be carried out.

1. Conclusion

Contextual learning is one of the lessons that can be done in mathematics. Of course, this learning includes self-assessment as well. Moreover, one of the elements in contextual learning is *authentic assessment.* In instrument learning, assessment can be done in the form of learning recordings, portfolios, or tests. Assessment in contextual learning can be done to assess students' cognitive and affective abilities. So that the existence of a proper assessment can also be an evaluation of learning for the better.

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