Contextual Learning in the Design of Coastal Areas For Elementary School Students

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Abstract. The use of real objects as a source of learning for elementary students is considered appropriate given the concrete stages of intellectual development of children of elementary school students. In this connection, the contextual management of learning that designs the student's environment and its impact on mathematical understanding is comprehensively interesting to study. The purpose of this study is to comprehensively examine the impact of the application of contextual learning in the design of Coastal Coastal Areas (BKPP) on students' mathematical understanding abilities on the topic of fractions. The subjects of this study were fourth grade elementary school students in the coastal area. Research data were collected by tests and analyzed by descriptive and inferential statistics. The results showed that: (1) students who were taught with BKPP contextual learning had better mathematical understanding skills in every aspect of measurement compared to conventional learning; (2) significantly the mathematical understanding ability of students who take contextual learning is better than conventional learning.

Keywords: Mathematical understanding, Contextual BKPP

1. Introduction

Indonesia is known as a maritime area, which has 13,466 islands and 2342 inhabited, and a coastline of 99,093 km. Riau Province, has 996 elementary schools located in coastal areas spread across 6 districts and 31 districts (Sumber, Dinas Pen. Riau, 2014). Furthermore, in K13 it is stated that learning management applies a scientific approach by utilizing the concrete experiences of students as learning resources. This means that for schools located in the coastal area, objects such as fish, canoes / boats, nets, coconuts and others should be used as learning resources. Paying attention to the intellectual development of children of elementary school age, the use of real context design in learning is seen as more suitable and more meaningful.

Given the geographical location of Riau Province and the number of elementary schools located in the coastal areas, the use of coastal objects as a design in learning is seen as quite potential. This means that with a fairly large number of elementary schools, the management of learning that utilizes coastal objects as a design is seen as one of the learning innovations that enables the improvement of the quality of learning.

The facts show that student books as mandatory books K13 are generally designed (pictures / objects) that are not well known by students in coastal areas. For example the design drawings used in adding numbers are generally apples, cars and others that are seen as less contextual for elementary school students in coastal areas. In managing learning, teachers generally use mandatory textbooks for students K13 as a single learning source, where the object or context used as a design is less well known to students. This causes the presentation of teaching materials by the teacher does not suit the student environment. This has an impact on optimizing the implementation of the scientific approach carried out in K13 so that the results have not been maximized. The design of objects or contexts used in student books should be modified in such a way as to approach the student environment. For example, students in coastal areas should use student designs such as fish, canoes, coconuts, hooks and so on that describe the characteristics of the coastal environment.

Elementary School is a foundation of mathematical knowledge, it should be equipped with strong mathematical understanding abilities so that it can be used as a bridge / vehicle to build higher mathematical abilities. According to Mayer (Dahlan, 2004: 46) understanding is a fundamental aspect of learning, so the learning model must include the main points of understanding. Understanding the scientific approach as the main approach in K13, and the importance of building mathematical understanding abilities, it is necessary to improve learning by taking into account the characteristics of students and the use of their environment as a source of learning. Departing from these assumptions, the researcher is interested in investigating the impact of Coastal Based Contextual learning (KBPP) on the ability of mathematical understanding.

2. Literature Review

1. Mathematical Understanding Ability

Starting to understand the Mathematical Understanding Ability (KPM), then we need to understand the word forming, namely the ability and understanding of mathematics. According to KBBI, ability can be interpreted as ability, skill or strength. Thus it can be interpreted that the ability as ability or ability of a person to do or complete a job.

Furthermore, Sumarmo (1987: 22) translates understanding as understanding. While from several sources such as Ansari (2003) Ruseffendi (2006), and KBBI (Depdiknas, 2002) it can be summarized that the word "understanding" comes from the verb "understand", which means to understand correctly or to know really. Referring to the meaning of understanding and ability, it can be said that the ability of understanding as the ability to complete a job correctly. Paying attention to mathematical objects consisting of facts, concepts, principles and procedures, the ability of mathematical understanding can be interpreted as the ability to solve a mathematical problem related to facts, concepts, principles and mathematical procedures correctly.

Related to understanding Skemp (1976) distinguishes two types of understanding of instrumental understanding and relational understanding. Identical with Skemp, Hiebert (Even & Tirosh, 2002) argues, procedural knowledge is identical to relational understanding, and conceptual knowledge is identical to instrumental understanding. Whereas Bloom (Wikipedia, 2009) states that understanding consists of translation, interpretation and extrapolation. Pollatsek (in Sumarmo, 2000), stated that understanding consists of: (1) computational understanding and (2) functional understanding.

If we pay attention to the essence of the understanding expressed by the experts above, and the content of elementary school mathematics content, it can be stated that in general, mathematics understanding for elementary school level consists of instrumental understanding (facts, concepts and principles) and relational understanding (seeing the relationship between mathematical objects and manipulating). Noting these types of understanding, the mathematical structure of instrumental understanding is more basic than correlational. In this connection, in strengthening mathematical understanding, instrumental understanding must be strong in order to be used as a vehicle to improve correlational understanding.

Related to this level, Polya (Sumarmo, 1987) suggests that there are four levels of mathematical understanding, namely mechanical understanding, inductive understanding, rational understanding, and intuitive understanding. Experts have many opinions about instrumental understanding and relational understanding. In this regard, Reys (1998) revealed that both understandings are equally important in mathematical expertise. Procedural understanding is based on the sequence of steps and rules that must be considered in solving problems. Whereas relational or conceptual understanding is based on connected networks that connect and sort information (Hiebert and Lefevre, in Reys, 1998), where this is also very needed in learning mathematics

From the opinion above, the KPM in general can be divided into two, namely mechanical or instrumental abilities and relational abilities. Instrumental understanding is defined as an understanding of mathematical objects (facts, concepts and principles) that are separate from each other and only memorize formulas and apply them in calculations without knowing the reasons and explanations. Whereas relational understanding consists of schemes or knowledge structures that are complex and related, which are used to solve complex problems.

Based on the type of mathematical understanding expressed, and taking into account the limitations of mathematical objects (facts, concepts and principles) in the elementary curriculum and the stage of intellectual development of fourth grade students who have not been fully able to think relational, then in this study the KPM aspects studied are limited to the ability of instrumental understanding that is consists of abilities: (1). classifying mathematical objects; (2). interpret facts or ideas or concepts; (3). find examples of facts or concepts; (4). give examples and not examples of facts or concepts. Furthermore, considering the subject matter of this study is to recognize fractions, the measured mathematical ability is related to knowing fractions.

In order to equate perceptions about contextual learning in this paper, we first understand the meaning of contextual words. Contextual in the Oxford Dictionary is defined as the basis of situational, social, and / or interpersonal factors in the interpretation of messages or actions. In the use of linguistics, contextual words usually refer to extra linguistic factors (such as the context of a situation). A statement can be said to be contextual if it has meaning that can be derived from just words and their arrangement in a sentence. We can understand the meaning of the sentence itself and the words arranged in it without having to know the sentence before and after it, or other foreign information (Quora, 2016). Other contextual meanings put forward by Gravemeijer & Doorman, (1999), in contextual problems that is a problem can be said contextual if the problem situation can be experimentated by students in real terms.

Based on the opinion above, contextual words can be interpreted as a situational factor in the form of information (messages) or actions (experiences) that can be experimentated by students in real terms. This gives the meaning that situational relates to the conditions experienced (ever experienced) both in the form of information or events experienced (actions). By paying attention to contextual understanding, contextual learning in the design of coastal areas in this study can be interpreted as a learning activity that utilizes or uses real situations (experiences) that are both information or actions experienced by students (can be experimentally manifested by students) in the region coast as design in pointing out or explaining mathematical objects.

In its implementation, the contextual learning activities referred to in this study use the scientific approach recommended in K13. In Permendikbud no. 81 A 2013 annex IV concerning General Guidelines for Learning states that the learning process consists of five main learning experiences, namely: observing, asking questions, gathering information, associating, and communicating.

Taking into account the nature and basic principles of the scientific approach in K13 and the contextual learning referred to, it can be stated that the contextual problems contained within the student environment are used as designs (object images) observed by students in the scientific approach.

3. Methodology

This type of research is quasi-experimental because researchers cannot control all aspects that can affect the impact of the treatment given. The research design used is described below:

Kelompok	**Perlakuan**	**Postes**
Eksperimen	X_1	O
Kontrol	X_2	O

Cottrel dan James (2012)

Note: X1: KBPP Learning
X2: Conventional (Learning with a scientific approach)

The subjects of this study were grade IV elementary school students in Sungai Apit District, Kab. Siak consists of 4 classes which are divided into experimental and control classes. Data collection instrument is a test of the ability to understand mathematical topics about fractions. The data collected was then analyzed with inferential statistics to illustrate the impact of the treatment given and descriptive to describe the students' mathematical understanding abilities for each aspect of measurement.

3. Result and Discussion

Based on the results of data analysis calculations using the average difference test of two samples are briefly contained in the following table:

Tabel 1. Rekapitulasi Deskripsi Data Kemampuan Pemahaman Matematis

Sumber	Control	Exp	Uji Homogen			Uji Rataan		
			F_h	$F_{t(0.01)}$	Kes. H_0	t_h	$t_{t\ (0.05)}$	Kes. H_0
N	53	56	1,76	,000	Terima	137,9	1,97	Ditolak
Rataan	7,717	10,3						
Simp.baku	0.08	0.06						

Cat: Skor ideal = 14

From the facts in Table. 1 obtained information that the difference test results reject Ho. Noting these results and the average KPM of the experimental group students (10.3) is higher than the control class students (7,717), it can be stated that the application of the BKPP contextual learning approach gives a better KPM impact compared to conventional learning. This means that the use of objects that are in the nearest environment of students as a design in presenting mathematical objects has a better impact on student KPM compared to lesser-known objects.

The results of this study reinforce previous findings, Saragih, S (2016) related to the application of students 'environmental design media (marginal elementary school oil palm plantations) contributed to the decrease in students' misconceptions about numbers. Lina Erviana, (2015) states that the application of environment-based learning media can improve students' understanding of concepts. Ahyar Rosyidi, AA.I.N. Marhaeni, I.W. Suastra, (2012) the results of the study indicate that there are differences in science learning between Quantum learning based on environment with conventional methods in terms of learning motivation and learning achievement.

Increased student KPM, shows that the use of objects contained in the student environment as a design in the presentation of mathematical objects needs to be a concern for teachers in managing learning, especially in schools that have unique environmental characteristics. In other words, in managing learning the teacher does not have to be fixated on the object contained in the student book (K13) if it is deemed unfamiliar to the student. The results of this study can also be used as an effort to strengthen the implementation of a scientific approach as a learning innovation.

Furthermore, although the results of data analysis show that the application of the BKPP contextual approach contributes positively to the KPM of students, but if the competency achievement is noted with an average score of 10.3 from an ideal score of 14 or 73,% can be said to be not optimal. This means that the learning impact that has been applied has not yet yielded optimal results.

In this regard, it is necessary to further study the student's KPM based on the measurement aspects in order to obtain a more meaningful picture related to the impact of the action given. The description of KPM students based on aspects of measurement is contained in the following table.

Aspek	**1**	**2**	**3**	**4**
Skor ideal	4	4	2	4
Eksperimen	2,88/72%	2,93/73%	1,40/70%	2,84/71%
Control	2,25/56%	2,25/56%	1,04/52%	2,19/55%

Note: Aspect-1: classifying mathematical objects; (2). interpret facts or ideas or concepts; (3). find examples of facts or concepts; (4). give examples and not examples of facts or concepts.

The facts contained in the table above shows that in general the KPM of the two sample groups is different in every aspect. If you pay attention to the difference in difference, then compared to the ideal score, you will get the fact that in terms of the biggest student KPM the difference lies in aspect-2, which interprets facts or concepts by 17% and aspect-4, which provides examples and not examples of facts or concepts of 14%. This shows that the contribution of BKPP contextual learning is more prominent in both aspects.

However, when seen in general, the achievement of KPM competencies of students who were treated ie 57% showed a mathematical understanding of students related to the introduction of student fractions is still low. This means that students still have difficulty understanding fractions mathematically. In this regard, based on the researcher's search for students' answers, it was found that there were similarities in the difficulties experienced by students of the two sample groups in knowing fractions. In aspect-1, from the answers of the treatment group students can be described that in classifying the object of fraction there are still many students who have wrong perceptions with facts that indicate a fraction. For example, from the facts showing a fraction, 46.4% of students stated that 6/2 was a fraction. Furthermore, based on tracing through interviews it can be concluded that students have the perception that fractions are always expressed in the form a / b, without understanding that the conditions, a <b.

In aspect-2, about interpreting facts or ideas or concepts, shows that 42.4% of students in the experimental group and 57.2% of the control group answered incorrectly. Based on the students' answers obtained a description, that in stating the meaning of the number ¼, the two sample groups better understand the meaning of the number ¼ if the illustration is expressed in the context of "a fish weighing 1 kg cut 4 is the same weight. One piece of the bunch is fried by the mother. How much of the whole, is the fish fried by the mother? "Compare with the context" In a plate there are 4 fish. One fish is fried by the mother. How much of the whole fish is fried by mother? "

The fact that the students 'answers showed that students' perceptions related to the meaning of fractions was still limited to "one (a) piece which was broken into several equal parts. Students have not been fully able to understand the meaning of fractions in the context "as of the whole object" in question. Then from the results of the researchers' interviews with several students, there were still students who saw that the meaning of ¼ was based on the unit value used. Like the example above, because one piece of fried fish weighs ¼ kg, students say that the fried part is ¼.

Mathematical understanding of aspects-3, in general, the experimental group students find examples of a fact or concept well. This can be seen from the average score obtained ie 1.40 from an ideal score of 2 or the level of competency achievement is 70%. As for aspect 4, which provides examples and not examples of facts or concepts the capabilities of the two groups are not much different. The percentage of competency achievement for the experimental group reached 71% and control 54.7%.

In this aspect there are two questions, namely making shading which shows 2/5 and provides examples of 2/5 in everyday life. Conceptually (showing with shading) the achievement competency of the experimental group was 84.2% and the control group was 61.8%. While showing 2/5 in the context of life, the achievement of the experimental group competence was 57.8% and the control group was 47.6%. This fact shows that the ability of students to give examples of a concept of fractions in daily life is not optimal.

Noting that the impact of treatment has not been optimal and seeing the achievement of student competencies in every aspect of measurement, it is necessary to reflect back on the management of learning (treatment given). In the implementation of learning activities everything begins with things that are contextual BKPP, then the concept is exemplified in the form of an illustration formally using a number line or shading a building. To strengthen students' mathematical understanding, then students are asked to give examples in formal form through both the number and shading lines for some fractions.

Noting the stages of learning above, then through reflection obtained weaknesses in building students' mathematical understanding related to introducing fractions. The weakness in question is the strengthening of understanding of the concepts that are built are not in line with the principles of building mathematical knowledge, especially for elementary students, namely Horizontal-Mathematical-Horizontal Mathematical Mathematics.

Departing from this principle, the learning activities that should be carried out are:

Step-1 Hariszontal Mathematics	• Give an example of the concept of a fraction that is BKPP contextual • By using BKPP learning media, students are asked to identify (mention) the fraction values designated in the media • Students are asked to make contextual illustrations of examples of a BKPP fraction
Step-2 Vertical Mathematics	• Give examples of the concept of a fraction through formal illustrations (in line with contextual illustrations) • Give not an example of the concept of a fraction through formal illustration

	• By using learning media (formal illustration), students are asked to identify examples and not examples of fractions • Students are asked to make a formal illustration that is an example and not an example of a fraction in the same design.
Step-3 Horizontal Mathematics	• Students are asked to make contextual illustrations which are examples and not examples of a fraction in the same design

4. Conclusion

Based on data analysis and discussion, it can be concluded that:

1. The application of BKPP contextual learning has a positive impact on KPM on the topic of recognizing fractions.

2. There are variations in students' KPM differences in recognizing fractions between groups of samples in terms of the KPM aspects that are measured.

3. In general students still have difficulty recognizing fractions in their dominant order: (1) classifying mathematical objects; (2) give examples and not examples of facts or concepts; (3) interpreting facts or ideas or concepts, and (4) finding examples of facts or concepts.

5. Suggestions

Based on the discussion of research results, there are a number of suggestions related to this research, namely:

1. In managing learning, it is necessary to arrange the use of object designs so that students can understand the meaning of fractions well.

2. Paying attention to the sequence of students' difficulties in understanding the meaning of fractions based on the measurement aspects used in this study, then it is better to manage the learning needs to be arranged in line with the principle of building mathematical knowledge, especially at the elementary level ie, contextual-formal-contextual.

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