Gerpak Tuyul as the context in learning addition integer using LSLC system

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Abstract. The researcher aims to produce a learning trajectory that can help students understand the operation of adding integers using the game gerpak tuyul. The sample of this study was students of class VIII of SMP Negeri 1 Palembang. The research method used is design research (design research). this study was designed through integer material learning using the context of the game of gerpak tuyul. Data collection is done through video recordings, photos and interviews. The stages of this study consisted of experimental preparation, design experiments and retrospective analysis. This research was only conducted in stage 1, namely preliminary preparation. The results of this study indicate that the resulting learning trajectory can help students more easily understand the concept of integer addition operations.

1. Introduction

According to Walle the principles and standards of content of the NCTM are numbers and operations, algebra, geometry, and measurement analysis [1]. Then Utami also said that integer material is a material fundamental and continuous because one concept with concept is another interconnected [2]. The introduction of numbers starts with the introduction of natural numbers, chopped numbers, and then integers [3]. Integer is a material that is very important for students to study because it is based on Graduates' Competency Standards (SKL) that must be achieved by students for mathematics subjects based on Permendikbud No. 20 namely understanding the concept of integers, fractions, counting operations and their properties, and using them in solving everyday life problems [4]. Guided by Permendikbud No. 24 Regarding core competencies and competencies basic that must be achieved by students, especially in integer material, that is adding up and subtracting integers [5]. Then based on the national standard school exam questionnaire, which is to understand integer operations [6].

Based on the facts in the field, it shows that many students consider integer operation learning material to be material difficult. Vlasis saying that students have difficulty understanding the changing role of the minus sign they assume that two minus signs in the problem are plus (for example, \(-1 + -5 = 6\)) then to answer problems such as \(6 + -2\) students add 2 and then subtract 2 [7]. Then previous research said that students had difficulties in material related to numbers. Because students tend to be less enthusiastic. Especially for integer operating material which is considered quite difficult. One of them is in KD 5.2 Adding integers. The most basic problem that is often faced by students is that there still many students who do not understand or cannot distinguish the sign (\(-\)) or (\(+\)) as a count operation with a sign (\(-\)) or (\(+\)) as a type of mathematical number [8]. Even teachers experience difficulties in designing interesting and meaningful integer learning [9].

Lesson Study is one of ways to overcome the problems where Lesson Study is a model of guidance for teachers or lecturers [10], collective and requires cooperative team collaboration [14]. Lesson
Study for Learning Community (LSLC) is a system of teacher professional development through collaborative learning and based on the principles of collegiality and mutual learning to build learning communities and improve the quality of learning which ultimately creates dynamic interactions between teachers so that creativity and motivation are built continuously [10].

Then based on the 2013 curriculum is expected to be implemented 21st century learning. This is to address the demands of an increasingly competitive era. The 21st century learning reflects four things, namely: (critical thinking skills), creativity (creativity), communication (communication), and collaboration (collaboration) [12]. According to Sato in collaborative learning activities involving students' diverse understanding abilities, the teacher designs lessons using two types of topics, namely shared topics (jumping task) [12]. In LSLC activities a group of teachers collaboratively and continuously implementing, observing, and reporting learning outcomes [13].

Shared topics (sharing task) are individual tasks through small group collaborative material containing basic level textbooks and must be understood by all students, and the topic of jumping (jumping task) is a problem that is given to improve the ability of students to be higher. Problems with jumping tasks contain basic material that has been developed (exceeding the level of the textbook), namely the application material from the basic concept. The advantage of "jumping task" is that it can create learning activities among students such as dialogue, interaction and effective collaboration [14].

One approach to mathematics learning that is in accordance with learning and in line with the 2013 curriculum is Indonesian Realistic Mathematics Education [15]. In teaching the concept of learning mathematics, the PMRI (Indonesian Realistic Mathematics Education) approach emphasizes the use of context as a starting point in learning mathematics such as traditional games, folktales, legends, and formal forms of mathematics can be used as contexts or realistic problems [16]. Realistic mathematics education emphasizes teaching mathematics starting from things close to students [17]. The context needed is the context that must be explored in various situations or variations, the context needed by students includes the cognitive aspects of students [11]. The learning context can also be presented in the form of games so that children become active and enjoy learning mathematics. Some of the games used by the research for integer operations are Muslimin with the title "Design of Learning to Reduce Numbers Through Traditional Games Congklak Based on Indonesian Realistic Mathematics Education in Class IV Elementary School" [16] and Sustainable with the title "Use of Model Sets and Game Remi Bilbul in the Learning of Summing Numbers in Elementary Class IV [15].

PMRI is one of the learning approaches that will lead students to understand mathematical concepts by constructing themselves through prior knowledge related to their daily lives, discovering the concepts themselves so that learning becomes meaningful [18]. PMRI has five characteristics: (1) using real-life contexts as a starting point for learning; (2) using the model as a bridge between abstract and real, which helps students learn mathematics at various levels of abstraction; (3) using students' products or strategies as a result of doing mathematics; (4) interaction is very important for learning mathematics between teachers and students, students and students; and (5) the relationship between strands, with other disciplines, and problems that matter in the real world [19].

Where in this study, one of the games used by researchers was the game of gerpak tuyul. Based on the description above, the researcher intends to design and conduct research with the title "The Game of the Tuyul Gerpak As a Context in Learning Material of the Summation Summation Operation Using the System Lesson Study for Learning Community (LSLC)" The researcher aims to produce a learning trajectory that can help students understand the operation of adding integers using the game gerpak tuyul.

2. Method
The research methodology used in this study is design research. The design research method used is type validation studies. This study consists of three stages that can be done repeatedly until the discovery of a new theory which is the result of a revision of the tried learning theory. Stages consist of a series of student activities that are guesses about students' strategies and thoughts that can change and develop during the learning process. The research subjects were students of the VIII SMP Negeri
1 class VIII 2018/2019. This study consists of 3 stages, namely (1) Design Preliminary. At this stage the researcher designed integer material learning using the context of the game of gerpaktyuyl. At this stage the researcher conducts a study of the literature relating to the material that will be the content in the design of learning and the context that will be used in this study, namely the game "GerpakTuyuyl", (2) The Design Experiment have different abilities, namely students who have high, medium and low abilities. This trial was conducted on a small group of 8 people and then divided into 2 groups, group distribution was also based on the level of students' ability evenly (3) Retrospective Analysis is data obtained from the trial phase analyzed to see the ability of students to complete the sheet work of students. This research was only conducted in stage 1, namely preliminary preparation

3. Result and Discussion
The learning approach in this study is the PMRI approach, Indonesian Realistic Mathematics Education (PMRI) is an adaptation of the Realistic Mathematics Education approach developed in the Netherlands in the 1970s by Hans Freudenthal [2]. This study uses a lesson study system, lesson study activities that are activities carried out collectively and require cooperation with a cooperative team. The stages in implementing LSLC are the Plan (Scheduling & Planning), the Do (Teaching & Observating) and the See (Reflecting) Phase. This research uses the Design Research method in which there is a cyclic process (loop cycle) of the design and testing of learning activities [1]. There are three stages in Design Research, namely: (1) Preparation for research, functions to implement the initial ideas of the literature review before designing learning activities. (2) Teaching Experiment, aims to collect data to answer research questions consisting of a series of activities that are designed, tried and revised, and (3) Retrospective Analysis, analysis of the results of the data from the previous stage to then be evaluated to develop further designs so that research objectives are achieved [20]. This research was only carried out in phase 1, namely the initial preparation or preliminary research.

3.1. Preparation and Planning
Preparation and planning are things that need to be prepared before the research. There are three stages: (1) preliminary, functions to implement the initial ideas from the literature review before designing learning activities. (2) Teaching Experiment, aims to collect data to answer research questions consisting of a series of activities that are designed, tried and revised, and (3) Retrospective Analysis, analysis of results data from the previous stage to be evaluated to develop further designs to achieve research objectives [21]. This research was only carried out in stage 1, namely preliminary preparation or preliminary research. As for the implementation agenda table can be seen in the table below:

| Date               | Activities                                                                 |
|--------------------|-----------------------------------------------------------------------------|
| February           | The researcher prepares student worksheets, plans for implementing learning, instructs the teacher to add negative integers with positive integers. |
| Thursday, 21 March 2019 | Validation and prediction of answer to worksheet learners the problem of adding negative integers with positive integers with peers. |
| Friday, 29 March 2019 | Validation and prediction of answer to worksheet learners the problem of adding negative integers with positive integers with math teacher. |
| Tuesday, 2 April 2019 | Test the worksheet of the students the sum of negative integers with positive integers into small group. |
3.2. The implementation

The research was conducted at SMP Negeri 1 Palembang. Observation do in class VIII.5. The series of activities carried out by the researcher are validation of peer, validating student worksheet and predicting answers with teachers, and small group.

3.2.1 Validation of Peer.

Validation with peers (Andini PPS Unsri Student Mathematics Education Study Program) was conducted to obtain information on whether the student worksheet is in terms of constructs, content and language. Then after being validated by colleagues, the researcher revised the student worksheet.

![Figure 1. Student worksheet Cover before and after validation with colleagues](image1)

The discussion between colleagues and researcher:
Andini : Ariska, your cover should be add the submatter, like sum of integers.
Researcher : Okay. I will add that on my cover.

![Figure 2. Student worksheet before and after validation with colleagues](image2)
Colleagues recommend:
Andini: Please, change the problem in jumping task number one because it's too easy.

Figure 3. Student worksheet before and after validation with colleagues

Colleagues recommend:
Andini: Enlarge the table in the number two jumping task.

3.2.2 Validating Student Worksheet and Predicting Answers with Teachers.
After the student worksheet is validated with colleagues, the researcher then validates the student worksheet and predicts the students' answers together with the teacher to get information on whether the student worksheet is appropriate and able to be understood by students in terms of constructs, content, and language. After being validated, the researcher revised the student worksheet. Validation and prediction of answers were done with a Mathematics teacher (Ms. Nurjanah, M.Pd.). When the researcher validates the student worksheet to the teacher there is no improvement, but when predicting student answers there are several differences in student answer predictions, namely:

Figure 4. Results of student answer predictions

There is a difference in the prediction of the answers between the teacher and the researcher on the number one jumping task.
Teacher:
High ability students: \(-5+8+10=13\)
Medium ability students : 13
Low ability students : 5+8+10=23
Researcher:
High ability students : 13
Medium ability students : -5+8+10=13
Low ability students : 5+8+10=23

3.2.3 Small Group.
After the student worksheet was tested on 8 students then the student worksheet was tried in a small group consisting of at least 8 people and then divided into 2 groups, group distribution was also based on the level of students' ability evenly. Here the researcher becomes the teacher and conducts the learning process in accordance with HLT which has been designed and tested the validated student worksheet, the system used is Lesson Study. The model teacher observes the small group process so that later it can perform a similar learning process during the field test with the research subject students.

The results of the answers in this small group were then analyzed by researchers. At this stage researchers conduct learning using the lesson study system. The expression of students at the learning process using the lesson study system can be below:

**Figure 5.** Apperception activities

Based on the picture above, the researcher opened the learning by saying greetings, then conveying the students' initial knowledge about the gerpak tuyul game. After that, the researcher asks students to work on the problems found on the student worksheet. When working on the problem, M. Iqbal just stood still and moved his fingers. This shows that he is experiencing difficulties.

**Figure 6.** Sharing task and jumping task.

The picture above shows that the researcher replayed the video game of the gerpak tuyul and informed the students, when having difficulty in completing the worksheets, ask for help from your group of friends by saying the word "please teach me". After a few minutes M. Iqbal asked Abias to help solve the problem. After that, M. Iqbal expressed his thanks and smiled at Abias.
From the picture above, M. Iqbal presented the results of the work in front of the class. In the learning process the researcher opens the learning by saying greetings asking students' initial knowledge about the "tuyul gerpak game", conveying the learning objectives and providing motivation to students. Then the researchers asked students to work on the students' worksheets, while working on the worksheets of M. Iqbal students had difficulty being seen from their facial expressions. The researcher asked students who had difficulty asking for help from their friends by saying "please teach me" then M. Iqbal asked Abias for help. So that at the end of learning M. Iqbal looks smiling and can solve the problems contained in the student worksheets.

4. Conclusion

Based on the results and discussion that has been described, it can be concluded that students can understand the concept of summing integers based on learning trajectories that are designed using the tuyul cart game. On the worksheet the students participated in 4 activities. In the first and second activities on average, 85% of students answered correctly, in the third activity on average, 80% of students could answer correctly, in the fourth activity on average, 35% of students could answer correctly after giving directions.

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