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Supporting First Grade Students Learning Number Facts Up To 10 Using A Parrot Game

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Abstract

Knowing number facts up to 10 become crucial if we want students to solve addition and subtraction problems using more abbreviated strategies. Otherwise, students will keep counting one-by-one until they get an answer. One of important number facts is number pairs that make ten because it is an important 'benchmark' that students will refer to constantly. Considering the important of number facts up to 10, we designed a parrot game activity to supports students learning process. We designed an instructional activity based on Realistic Mathematics Education (RME) approach. We tried this instructional activity with twenty seven first grade students in SDN 179 Palembang. As a result, we found that many first grade students were able to know number facts up to 10, but they still need models to support their thinking.

Keywords: number facts up to 10, number pairs that make 10, and parrot game.

Abstrak

Pemahaman akan hubungan bilangan sampai 10 menjadi sesuatu hal yang sangat penting bagi siswa untuk menyelesaikan permasalahan penjumlahan dan pengurangan dengan strategi yang lebih cepat. Dilain pihak siswa yang tidak memiliki pemahaman akan hubungan bilangan akan selalu menggunakan strategi yang sangat tradisional yaitu menghitung satu-satu sampai mereka menemukan jawaban yang diinginkan. Satu hal yang paling penting bagi siswa adalah memahami pasangan bilangan 10 karena ini merupakan landasan bagi siswa dalam melakukan perhitungan penjumlahan dan pengurangan. Menyadari pentingnya pasangan bilangan 10 maka dirancang sebuah kegiatan pembelajaran yang dikenal dengan permainan burung Beo. Pembelajaran ini didasarkan atas pendekatan Pendidikan Matematika Realistik Indonesia (PMRI) dan diuji cobakan dengan 27 siswa SDN 179 Palembang. Hal yang menarik yang ditemukan dalam penelitian ini yaitu pada umumnya siswa dapat menentukan pasangan bilangan 10 tetapi mereka masih membutuhkan model guna mendukung pengetahuan mereka.

Kata Kunci: pasangan bilangan sampai 10, pasangan bilangan 10, dan permainan burung Beo.

Introduction

It takes time for first grade students to develop number understandings, and they come to first grade with wide widely varying number experiences (Confer, 2005). Some

first grade students have few, others have many. For students who have many number experiences, they will not get difficulties to understand number facts up to 10 mentally. However, other students who do not have enough numbers experiences, they will need more time to know number facts up to 10. They often keep counting one-by-one using fingers to find a number fact.

Actually, some number facts will be particularly important in forming the basic upon which further arithmetic is built (Anghileri, 2006). Rapid recall of number pairs that make ten will be crucial for later calculations and becomes important 'benchmarks' that students will refer to constantly. These number facts will be more important than any formal recording because these are very useful when we want students perform more abbreviated strategies.

Considering the important benchmarks of number facts especially up to 10, we designed an instructional activity to support first grade students learning number facts up to 10. We used a parrot game a base of mathematical activity based on Realistic Mathematics Education (RME) approach. Using this activity, students were challenged to find number facts mentally. Consequently, we formulated the central issue of this research into a research question: "How can a parrot game activity support first grade students learning known facts up to 10?" The answer of this research question will be a conclusion of the whole research as well.

Realistic Mathematics Education

The central issue of Realistic Mathematics Education (RME) is that mathematics should be meaningful for students (Freudenthal, 1991). The term 'realistic' means that a problem situation must be experientially real for students. This does not indicate that the problem situations are always encountered in their daily life. An abstract mathematical problem can be a real for students when that problem is meaningful for them. Moreover, they are able to experience mathematics when they solve meaningful problems because mathematics is a human activity (Freudenthal, 1991).

In Realistic Mathematics Education students get many opportunities to construct their own understanding. They are challenged to develop strategies in solving problems and discuss with other students. Therefore, the instructional activity on finding number facts up to 10 is based on the tenets of Realistic Mathematics Education (RME).

Treffers (1987) described five tenets of realistic mathematics education (RME) which are: (1) the use of contexts, (2) the emergence of models, (3) students' own constructions and productions, (4) interactive instruction, and (5) the intertwining of learning strands. In this research, we just apply three tenets of realistic mathematics education (RME). Based on first tenet, we use a parrot game as a contextual situation in which the parrot can know number facts up to 10. We also used the third tenet that is students' own constructions and productions. The students are challenged to think mentally about number facts up to 10. The last tenet that we used is interactivity. The classroom discussion provokes students' interaction among them by guiding of a teacher.

Method

The research methodology that we use in this study is a design research. There are three phases of conducting a design research. (Gravemeijer & Cobb, 2006): preliminary design, teaching experiment, and retrospective analysis. In the preliminary design, we formulate a hypothetical learning trajectory consisting three components: learning goals for students, mathematical activities, and hypothesis about the process of the students' learning (Simon, 1995; Simon & Tzur, 2004). In the teaching experiment, we test the instructional activities and improve the conjectured learning trajectory. During this phase, we collect data such as classroom observations, students' interview, and field note. Those data are analyzed in the retrospective analysis phase.

To get the data, we conducted the research in SDN 179 Palembang, Indonesia. Twenty-seven first grade students aged 6-8 years old were involved in the teaching experiment on a day in April, 2011. We used video recording and observation reports to collect data of the classroom learning as well. We also interviewed some students to get deeper information of their thinking process.

Hypothetical Learning Trajectory

The purpose of this research is to develop an instructional activity that supports first grade students learning known facts up to 10. We design a Hypothetical Learning Trajectory (HLT) that consists of the goal for students' learning, the mathematical activities that are used to promote students' learning, and hypotheses about a process

of students' learning (Simon, 1995; Simon & Tzur; 2004). We describe the hypothetical learning trajectory as follows:

Goal

The goal of this activity is that students develop understanding about number facts up to 10.

Description of Activity

A Parrot game (*Figure 1*) is adopted from *waku-waku* that is developed in the Netherlands (Menne, 2001; Treffers, 2001). In this game, students are challenged for reproductive practices because they have to think about number facts up to 10. The teacher can start the activity by showing a colorful parrot puppet on her hand and telling to the students that:

This is a Parrot and he can say for instance 10. What a number pairs can give the answer 10?

Figure 1. A parrot game picture

Conjecture of students' thinking

Students will come up with many own productions. They are challenged to think mentally what number facts they know. Some students probably use their fingers to represent that number. Other students will use counting on by keeping a number on their heads, and then they count on by fingers for the next number. When a student gives wrong number facts, the teacher takes it into a discussion. The teacher can ask other students to fix it.

Result and Analysis

The parrot game is an activity that was designed to support students to learn known facts up to 10. Before the students played the parrot game, the students have been

learnt calculations up to 10, so we assumed that the students have known that a number representing a quantity of objects. In this mini lesson, the students did not work with concrete objects instead of mental calculations.

The learning process on the parrot game was started by giving a story to the students. The story is about a Parrot that was able to know number facts up to 10. By showing the Parrot puppet, the students were really enthusiastic to engage on this activity. We observed that the students raised their hands to get the opportunity to tell known facts up to 10. We described the learning process to find one of important know facts that was number pairs that make ten.

Teacher : Please raise your hand if you know number pairs that make 10!

The students raised their hand

Figure 2

Teacher : Rafi.

Rafi : 8 plus 2.

Teacher : yes, 8 and 2. True, true, and true (Parrot said)

Teacher : Who is next? (The students raised their hands) Fabella!

Fabella : 7 plus 3.

Teacher : Do not say addition, but number pairs!

Students : 7 and 3.

Fabella : 7 and 3.

Teacher : True, true, and true (as a Parrot)

Teacher : Please raise your hand if you know! Agung! (The students raised their hands)

Agung : 6 and 4 (Agung said weakly)

Teacher : True, true, and true (as a Parrot)

Teacher : Please raise your hand if you can say number pairs! (The students raised their hands) Firza!

Firza : 5 and 5

Teacher : True, true, and true (as a Parrot)

The phrase '*8 plus 2*' and '7 *plus 3*' showed that Rafi and Fabella thought number pairs that make 10 as addition two numbers that equal ten. Both students used the word '*plus'* to reason number pairs that make ten, but the phrase '*do not say addition, but number pairs*' said by the teacher influenced students to change '*plus'* became *'and'*. When we saw the phrase *'8 plus 2'*, *'7 plus 3'*, *6 and 4*, and *'5 amd 5'* that were said by four students respectively, it seemed that the next student said a number pairs was inspired by the previous student, for instance: Agung said *'6 and 4'*, then Firza said *'5 and 5'*. Those students develop a big idea of compensation that was moving 1 from 6 to 4 to make 5 and 5.

Teacher : Ok, Please talk directly if you know number pairs that make 10!
Firza : 9 and 1
Agung : 4 and 5
Teacher : Ah!
Chantika : 5 and 5
Teacher : Mmmm (as a Parrot)
Rista : 5 and 5
Tata : 4 and 6
Teacher : Is it correct 4 and 5?
Students : Incorrect
Teacher : So, what is the correct one?
Students : 5 and 5
Teacher : What is a pair of 4?
Students : 6

The other number pairs that make ten the students said was 9 and 1, but a student, Agung, said an incorrect number pairs that was showed by the phrase *'4 and 5'*. The other students directly corrected it such as Chantika and Rista corrected it to be 5 and 5. It seemed that they added 1 to 4 became 5. Otherwise, the phrase *'4 and 6'* showed that Tata had a different idea with her friends. It seemed that she added 1 to 5 became 6.

The teacher challenged students to find other number facts up to 10. One of the number facts was number pairs that make 7. Actually, this number was chosen randomly, so there was no role that we designed on this teaching experiment.

The teacher asked students to raise their hands if they wanted to talk.

Figure 3

Teacher : Ok. Please tell number pairs that make 7! Ok Agung.

Agung : 5 plus 2.

Teacher : 5 and 2, true, true, and true. (Shaking the Parrot head). Who can tell more?

Some students raised their hands.

Rafi : 4 and 3.

Teacher : 4 and 3, true, true, and true. (Shacking the Parrot head).Ok, who is next?

Fabella raised her hand.

Teacher : yes, Fabella.

Fabella : 3 and 4.

Teacher : 3 and 4, true, true, and true. (Shaking the Parrot head). Who is next?

Maudy raised her hand.

Teacher : Maudy!

Maudy : 5 and 6. (Saying weakly)

Teacher : The Parrot cannot hear.

A student : 2 and 5.

Maudy : 5 and 6.

Teacher : 5 and 6, Mmmm…(The parrot said). What does it mean?

Chantika : It was incorrect.

Teacher : What is the correct one?

Chantika : 1 and 6.

Teacher : Yes, Harnita!

Harnita : 2 and 5.

The phrase '*5 plus 2*' showed that Agung was able to find a number pairs that makes 7. Based on our observation, he used his fingers and represented 5 using left hand and 2 using right one. Rafi, the student sat next to Agung, said a number pairs that was 4 and 3. It seemed that he had a big idea that was compensation by knowing facts.

Meanwhile, the phrase '*3 and 4*' showed that Fabella came to the idea of commutativity. A student, Maudy, gave an incorrect number pairs that makes 7. Chantika corrected it by changing 5 became 1, so she got a number pairs that was '*1 and 6*'. Meanwhile, Harnita had different idea from Chantika. It seemed that she changed 6 became 2, so she got a number pairs that was 2 and 5. It seemed that the students show relations among numbers.

Conclusion

The conclusion was drawn based on our finding in the teaching experiment in order to answer the research question. From the result of the teaching experiment, we found that the parrot game activity really engaged the students to be active in communicating their ideas of number facts up to 10. It was showed by many students raised their hands to say their answers on number pairs that make 10 and 7. This activity gave an opportunity for students to think mentally because they were not asked to write the answers on a paper.

Throughout the parrot game activity, the students were able to discuss their answer. In such case, when a student gave a wrong number pairs, the other students tried to fix it by looking the relations of numbers. It seemed that the students showed a network of numbers. As an example, when Agung said 4 and 5 make 10, Chantika fixed it by adding 1 to 4 making 5, so 5 and 5 make 10.

This activity also emerged the idea of addition because some students thought number pairs as an addition of two numbers. It seemed there was a conflict between students and teacher's language. However, there was not a big problem for students to find number facts up to 10. The last conclusion is that about a mathematical idea. We found that during a parrot game, the students build some mathematical ideas that were compensation and commutativity.

Based on our finding on the teaching experiment, we give some suggestions for future research about number facts. We suggest that the students have not only learnt known facts up to 10 but also up to 20 because those know facts are really needed for students to solve addition problems up to 100 using more abbreviated strategies. We also suggest that the students probably need a model to support their thinking when they make a wrong number fact. For instance, we can use an arithmetic rack to represent students' answer.

References

Anghileri, J. (2006). *Teaching Number sense.* London: Continuum International Publishing group.

Confer, C. (2009). *Teaching Number Sense Grade 1.* The United State of America: Math Solutions Publications.

Freudenthal, H. (1991). *Revisiting Mathematics Education: China Lectures.* Dordecht, the Netherlads: Kluwer Academics Publisher.

Gravemeijer, K.P.E. & Cobb, P. (2006). Design Research from a Learning Design Perspective. In: van Den Akker, J., Gravemeijer, K. P. E. McKenney, S. & Nieveen, N (Eds.). *Educational Design Research.* New York: Routledge.

Menne, J. (2001). Jumping ahead in Classroom-based Research in Mathematics Education. The Netherlands, Amersfoort: Wilco.

Simon, M. A. (1995). Reconstructing Mathematics Pedagogy from a Constructuvist Perspective. *Journal for Research in Mathematics Education 26, 114 – 145.*

Simon, M. A. & Tzur, R. (2004). Explicating the Role of Mathematical Tasks in Conceptual Learning: An Elaboration of the Hypothetical Learning Trajctiry.*Mathematical Thinking and Learning.* 6(2), 91 – 104.

Treffers, A. (1987). *Three Dimensions. A Model of Goal and Theory Description in Mathematics Instruction – The Wiskobas Project.* Dordecht, the Netherlands: Reidel Publishing Company.

Treffers, A. (2001). Grade 1 (and 2): Calculation up to 20. In: van den Heuvel-Panhuizen, M (Ed). *Children Learn Mathematics: A Learning-Teaching Trajectory with Intermediate Attainment Targets for Calculation with Whole Numbers in Primary School.* The Netherlads: Freudenthal Institute, Utrecht University.

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