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**SEA DR**

CONFERENCE

The Fourth South East Asia Design/Development Research  
International Conference 2016

**PROCEEDING**

**OF SEA DR CONFERENCE 2016**

Presented by:

Graduate Programme, Universitas Negeri Padang

April, 17<sup>th</sup> - 18<sup>th</sup> 2016

Organized by:



# **PROCEEDING**

**ISBN : 978-602-19877-5-9**

**South East Asia Design/Development Research  
International Conference (SEA-DR 2016)**

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Prof. Dr. I Made Arnawa, M.Si**

**GRADUATE PROGRAMME OF MATHEMATICS EDUCATION  
MATHEMATICS AND NATURAL SCIENCES FACULTY  
UNIVERSITAS NEGERI PADANG  
APRIL, 17<sup>th</sup>-18<sup>th</sup> 2016**



## ***Message from the Rector of Universitas Negeri Padang***

Ladies and Gentlemen,

It gives me great happiness to extend my sincere and warm welcome to the all participants of the Forth South East Asian Design/Development Research International Conference 2016 (SEA-DR 2016).

On behalf of Universitas Negeri Padang, let me welcome all of you to the conference in Padang, West Sumatra Province, Indonesia. We believe that from this scientific meeting, all participants will have time to discuss and exchange ideas, findings, creating new networking as well as strengthen the existing collaboration in the respective fields of expertise. In the century in which the information is spreading in a tremendous speed and globalization is a trend.

Universitas Negeri Padang must prepare for the hard competition that lay ahead. One way to succeed is by initiating and developing collaborative work with many partners from all over the world. Through the collaboration in this conference we can improve the quality of our researches as well as teaching and learning process in mathematics, science and technology.

I would like to express my sincere appreciation to Graduate Programme of Mathematics Education, FMIPA UNP and organizing committee who have organized this event. This is a great opportunity for us to be involved in an international community. I would also like to extend my appreciation and gratitude to keynote speakers, parallel keynote and participants of this conference for their contribution to this event.

Finally, I wish all participants get a lot of benefits at the conference. I also wish all participants can enjoy the atmosphere of the city of Padang, West Sumatra.

Thank you very much

Prof. Dr. Phil. Yanuar Kiram  
Rector

**Message *from the* Dean of Faculty of Mathematics and Science  
Universitas Negeri Padang**

Rector of State University of Padang  
Vice-Dean of Faculty, Mathematics and Science  
Head of Graduate Program in Faculty of Mathematics and Science  
Head of Department in Faculty of Mathematics and Science  
Distinguished Keynote Speakers  
Organizers of this conference  
Dear participants  
Ladies and gentlemen

I am delighted and honored to have this opportunity to welcome you to SEA-DR International Conference 2016, which is hosted by Graduate Programme of Mathematics Education Faculty of Mathematics and Science, Universitas Negeri Padang.

As the Dean of Faculty of Mathematics and Science, I wish to extend a warm welcome to colleagues from the various countries and provinces. We are especially honored this year by the presence of the eminent speaker, who has graciously accepted our invitation to be here as the Keynote Speaker. To all speakers and participants, I am greatly honored and pleased to welcome you to Padang. We are indeed honored to have you here with us.

The SEA-DR 2016 organization committee has done a great work preparing this international conference and I would like to thank them for their energy, competence and professionalism during the organization process. For sure, the success I anticipate to this conference will certainly be the result of the effective collaboration between all those committees involved.

This conference is certainly a special occasion for those who work in education, mathematics, science, technology, and other related fields. It will be an occasion to meet, to listen, to discuss, to share information and to plan for the future. Indeed, a conference is an opportunity to provide an international platform for researchers, academicians as well as industrial professionals from all over the world to present their research results. This conference also provides opportunities for the delegates to exchange new ideas and application experiences, to establish research relations and to find partners for future collaboration. Hopefully, this conference will contribute for Human and Natural Resources.

I would like to take this opportunity to express my gratitude to all delegates for their contribution to the SEA-DR 2016.

Thank you,

Faculty of Mathematics and Science  
Prof. Dr. Lufri, M.S.

## ***Message from the Chairman of Organizing Committee***

First, I would like to say welcome to Padang Indonesia. It is an honor for us to host this conference. We are very happy and proud because the participants of this conference come from many countries and many provinces in Indonesia.

Ladies and gentlemen, this conference facilitates researchers to present ideas and latest research findings that allows for discussion among fellow researchers. Events like this are very important for open collaborative research and create a wider network in conducting research.

In this conference, there are about 118 papers that will be discussed from various design/development researches and about 215 participants will join this conference.

For all of us here, I would like to convey my sincere appreciation and gratitude for your participation in this conference.

Thank you very much

Dr. Irwan, M.Si  
Chairman



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GRADUTE PROGRAMME OF MATHEMATICS EDUCATION  
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## Table of Content

	<b>Page</b>
<b>Messages from Rector of State University of Padang</b>	<b>i</b>
<b>Messages from Dean of Faculty of Mathematics and Science</b>	<b>ii</b>
<b>Messages from Chairman of Organizing Committee</b>	<b>iii</b>
<b>The Committee of SEA-DR 2016</b>	<b>iv</b>
<b>Table of Content</b>	<b>vi</b>
No	
1. <b>Hafni Hasanah</b> Development of Mathematical Problem-Type of PISA using Cultural Context North Sumatra for Junior High School	<b>1</b>
2. <b>Novianti Mulyana,M.Pd</b> Realistic Mathematics Education (RME) As An Instructional Design Approach for MAN 4 Jakarta Eleventh Grader Students Majoring in Scientific Studies to Build The Relational Understanding of Integral	<b>9</b>
3. <b>Karmila Suryani</b> Application of Computer Network Systems Module at the Study Program of Computer and Information Technology Education of Bung Hatta University	<b>25</b>
4. <b>Yelia Aktiva</b> The Development of the Learning Devices Based on Problem Based Learning (PBL) atClass x of Senior High School	<b>43</b>
5. <b>Adri Nofrianto</b> Developing Critical Thinking in Mathematics Elementary Education Through Problem Solving	<b>47</b>
6. <b>Ahmad Nizar Rangkuti</b> Design Research in Mathematics Education:A Learning Trajectory on Fraction Topics at Elementary School	<b>54</b>
7. <b>Maria Luthfiana</b> Instructional Design Using Lego in Learning Equivalent Fractions at Elementary School	<b>59</b>
8. <b>Fadli</b> Instructional Design of Square and Rectangle Materials by Using Traditional Game Media “engklek”	<b>64</b>
9. <b>Rizky Natassia</b> Econometric Textbook Development Based Guided Discovery (Teory and Aplication By SPSS and Eviews)	<b>76</b>



10. **Dewi Rahimah, S.Pd., M.Ed.** **83**  
Problems and Lesson Learned in the Implementation of Lesson Study for Learning Community (LSLC) in the Learning Process of Integral Calculus Course at the Study Program of Mathematics Education the Department of Mathematics and Science Education the Faculty of Teacher Training and Pedagogy the University of Bengkulu
11. **Ali Asmar** **94**  
Development Constructivism Learning Materials Use Problem Based Learning Model At Fifth Class Of Elementary School
12. **Yuli Ariani** **104**  
The Development of Cabri 3D Module for Teaching Plane and Space at Junior High School Student
13. **Fatni Mufit** **113**  
A Study about Understanding the Concept of Force and Attitude towards Learning Physics on First-Year Students in the Course of General Physics; as Preliminary Investigation in Development Research
14. **Fauziah Fakhrunisa** **122**  
The Analysis of Problem Solving Ability by Implement Problem Solving Strategy in Mathematics Learning At Class Viii Smp Al-Azhar Syifa Budi Pekanbaru
15. **Ratna Natalia Mendrofa** **129**  
Development of Guided Discovery-Based Mathematics Learning Material for Grade XI-IPA of Senior High School
16. **As Elly S** **137**  
Learning Design Multiplication Use Stick In Elementary School
17. **Hanifah** **142**  
Development of math worksheets based on APOS model (a case study of Integral Calculus)
18. **Rahmi Putri** **157**  
Improvement Mathematics Learning by Using Realistics Mathematics Education (RME) in the Fifth Class At Elementary School No. 001/XI Sungai Penuh
19. **Cut Morina Zubainur** **167**  
Teacher Ability in Teaching of Finding  $\pi$  Value at Primary School
20. **Fitri Arsih** **174**  
The Development of Biology Learning Module Nuance Emotional Spiritual Quotient (ESQ) Integrated on Cell Topicfor Senior High School Students

21.	<b>Fridgo Tasman</b> Introducing Distributive Property of Multiplication by Using Structured Object for Grade Two Elementary Students	<b>187</b>
22.	<b>Husna</b> The Effect of Problem Solving Strategy on Mathematics Learning to Junior High Student's Mathematical Problem Solving Ability	<b>201</b>
23.	<b>Nur Azizah</b> Developing Learning Model Base On Realistic Mathematics Education (Rme) Approach At Senior High School	<b>207</b>
24.	<b>Mokhammad Ridwan Yudhanegara</b> Carefully to analyze the data type of ordinal scale, why?	<b>215</b>
25.	<b>Karunia Eka Lestari</b> Methodology in Undergraduate Mathematics Education Research Culture: The Common Mistakes in Experimental Design	<b>222</b>
26.	<b>Aklimawati</b> The Development Of Hypothetical Learning Trajectory (HLT) for Teaching Circle with Realistic Mathematics Approach	<b>226</b>
27.	<b>Fitriyani</b> Learning The Rule Of Enumeration At Marketing Class Xii By Using Barcodes With The PMRI Approach	<b>236</b>
28.	<b>Nora Susanti</b> Needs Analysis for Cost Accounting Module Practice at Economic Educations Department of STKIP PGRI Sumbar	<b>246</b>
29.	<b>Siti Maysarah</b> The Development Of Teaching Materials Based On Project Assisted By Ms.Excel To Increase Mathematical Communication Ability Of High School Students In Medan	<b>250</b>
30.	<b>Selvia Erita</b> The Development of Mathematics Subject Equipment on Main Material of Cube and Beams Based on Student Centered Learning Activities at Grade VIII of Islamic Junior High School	<b>257</b>
31.	<b>Nur Rusliah</b> Designing "Volume Cube And Beams" Material Learning Using Realistic Mathematics Education Approach In Class V Elementary School 015 / XI Sungai Penuh Academic Year 2015/2016	<b>268</b>

32.	<b>Anggun Pratiwi</b> Learning The Concepts of Intersection & Union Set Using Cultural Context Palembang	<b>276</b>
33.	<b>Nurlaili</b> The Development of Learning Tools Based on Model Eliciting Activities (Meas) Approach To Improve The Problem Solving Ability in Mathematics for Junior High School Grade VIII	<b>285</b>
34.	<b>Yesi Elfira</b> The Development of Mathematics Learning Equipments Based On Problem Based learning for Class VII Student at Junior High School	<b>288</b>
35.	<b>Indah Widyaningrum</b> Learning Greatest Common Factor (GCF) With Jigsaw Puzzles In Class IV	<b>291</b>
36.	<b>Artika Mareta</b> Developing Level 4,5,6 of PISA like-problem to Determine Student's Mathematical Communication Skill of Grade Ten	<b>300</b>
37.	<b>Yusri Wahyuni</b> Define Phase Development of Teaching Materials Based Realisrtic Mathematics Education on The Material Permutations and Combinations	<b>310</b>
38.	<b>Fauziah</b> Implementation Cooperative Pair Check the Enhancement Activities Learning Mathematics in Class XII of Automotive Engineering Vehicle Light ( TOKR ) SMK Citra Utama Padang	<b>313</b>
39.	<b>Hongki Julie</b> Developing Student Learning Materials On The Multiplication Fractions For Grade Five With Realistic Mathematics Education	<b>322</b>
40.	<b>Muhyiatul Fadilah</b> Developing Biology Module On Evolution Topic Using Metacognitive Base For Senior High School Students Class XII	<b>333</b>
41.	<b>Nur Aliyyah Irsal</b> The Self-Regulation of Junior High School Students in Mathematics Classroom Using Metacognitive Guidance	<b>340</b>
42.	<b>Nurfazlin Nova</b> Development of Mathematics Learning Equipments Used Cycle-5 E-Learning Model to Improve Students' Mathematical Communication Skills Class X Student of Senior High School	<b>348</b>



43.	<b>Yeni Amriza Wahyu</b> Development Of Mathematical Learning Equipments Based On Apos Mental Construction To Improve Student's Mathematical Communication Ability For Junior High School Grade VII	<b>353</b>
44.	<b>Fadly Afrisani</b> Preliminary Stage Of The Development Of Math Problems Which Refer To Pisa	<b>357</b>
45.	<b>Veni Indra Yeni</b> Preliminary Research On Developing Mathematical Material With Rme Approach For Improving Mathematical Literacy Ability Of Junior High School Students On Grade VIII	<b>362</b>
46.	<b>Hafizah</b> Development Tool Learning Contextual Based Communication Mathematical Ability to Increase in Class VII SMP	<b>366</b>
47.	<b>Nila Gusnita</b> Preliminary Research On Developing Material Using Van Hiele Theory On Plane Geometry for Students Grade VIII	<b>372</b>
48.	<b>Rani Refianti</b> Learning Design Divisions of Fractions Use Fractions Board	<b>375</b>
49.	<b>Ratna Natalia Mendrofa</b> Development Of Guided Discovery-Based Mathematics Learning Material For Grade XI-IPA of Senior High School	<b>380</b>
50.	<b>Risda Amini</b> The Development of Learning Materials of Integrated Science Used 7E Learning Cycle to Improve Student Learning Outcomes in SMPN 11 Padang	<b>387</b>
51.	<b>Rusyda Masyhudi</b> The Development Of Study Design Of Pythagorean Theorem Topic Using Realistic Mathematics Education (RME) Approach For Class VIII SMP / MTS	<b>394</b>
52.	<b>Sablis Salam</b> The Analysis Of Student's Error On Completing Teacher Competency Test For Prospective High School Mathematics Teacher	<b>404</b>
53.	<b>Liza Efriyanti, S.Si., M.Kom</b> Learning Media Development at Mobile-based Calculus Course in Higher Education	<b>409</b>

54. **Riani** 418  
Learning Mean Basic Concepts Used In Grade V Psb
55. **Eril Syahmaidi** 430  
Development of Interactive Media Based Learning Subjects Animation  
Techniques 2 Dimensional Valid in Vocational High School (SMK)
56. **Halimatus Sa'diyah Pulungan** 438  
The Development Of Mathematics Learning Instruments Based On Guided  
Discovery For Grade VIII Students At Islamic Junior High School In  
Panyabungan
57. **Orin Asdarina** 444  
The Development of Critical and Creative Thinking Instrument for  
Decimal Topic at the Fifth Grade of Primary School Students
58. **Idul Adha** 453  
Development Material With Scientific Approach Of Tangent to A Circle
59. **Yaspin Yolanda** 462  
Development Of Test For Measuring Instruments Science Process Skills  
Students Of Physical Education Stkip Pgri Lubuklinggau In Basic  
Electronics The Lesson's
60. **Usmeldi** 472  
The Development of Authenic Assessment for Supporting the Research-  
based Physics Learning in SMAN 3 Bukittinggi
61. **Yusmarni** 479  
A Model Development of Mathematics Learning Think Create and Apply  
Based Constructivisme at Madrasah Aliyah
62. **Zubaidah Amir MZ** 490  
The Development of Math Module on Metacognitive Approach Basis for  
Facilitating The Students' Mathematical Creative Thinking Ability
63. **Mulia Suryani** 499  
The Analysis Description Of Requirement Based On Website Materials  
Development In Analytic Geometry Class
64. **Atma Murni** 506  
The Development of Learning Device on The Social Arithmetic Topic  
Through Soft Skills-Based Metacognitive Learning
65. **Cecilia Noviani** 513  
Design Research Using PMRI Approach and Inquiry Model On The  
Subject Of Circle At Class VIII in SMP St. Kristoforusi Jakarta

66. **Alfian Jamrah** **523**  
Character Education Development Model Based Values Tau Jo Nan  
Ampek High School Level in The City Batusangkar
67. **Syofianis Ismail** **527**  
The Effect Using Facebook as a Medium for Discussion to Improve  
Students' Writing of Recount Text of the First Year Students at SMAN 5  
Pekanbaru, Riau, Indonesia
68. **Slamet Rianto** **543**  
Model Development Of Social Capital Community Disaster Response To  
Flood Prone Disaster Areas In Padang
69. **Nefilinda** **552**  
Clean Living In Model Management Lubuak Mangindo, Jorong III  
Sangkir, Lubuk Basung District, District Agam
70. **Yuniarti Munaf** **561**  
Community Development Model Through Lane Craftsmen Nonformal  
Education Embroidery in Pesisir Selatan District



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**DEVELOPING STUDENT LEARNING MATERIALS ON THE MULTIPLICATION FRACTIONS FOR GRADE FIVE WITH REALISTIC MATHEMATICS EDUCATION****Hongki Julie**

Sanata Dharma University

[hongkijulie@yahoo.co.id](mailto:hongkijulie@yahoo.co.id)**Abstract**

*Lortie-Forgues, Tian and Siegel (2015) suggests that students' understanding of the fractions was very important in the study of mathematics further and was also used in many professions, but according to Lortie-Forgues, Tian and Siegle (2015) and MA (1999), many students had great difficulty in understanding it. Furthermore, according to Ma (1999), the difficulty was not only the difficulties experienced by students in learning fractions, but also the difficulties experienced teachers to teach the concept of fraction. It was felt by teacher at one of the private elementary school in Yogyakarta, especially in teaching multiplication on fraction. The goals of this study were (1) to build a context that can be used to introduce the meaning of multiplication of two fractions and establish procedures multiply two fractions, (2) to describe the learning path by using the context, and (3) to describe the development of learning outcomes achieved by students. There were two contexts used by the researchers in this study that were buying the ribbon and giving oranges. Lesson plans created by the researcher were for students of grade five. This type of research used by the researcher in this study was the design research developed by Gravemeijer and Cobb. According Gravemeijer and Cobb (in Akker, Gravemeijer, McKeney, and Nieveen, 2006) there were three phases in the research development, namely (1) the preparation of the design, (2) testing the design, and (3) the retrospective analysis.*

**Key Words:** *the multiplication of fractions, realistic mathematics education (RME), and design research.*

**INTRODUCTION**

In 2013 and 2014, the researcher developed some context and sequence of learning that could be used to teach the fractional multiplication in grade five of the elementary school. From the experience of two years, the researcher wanted to develop other contexts that would be used to teach the multiplication of the fraction in grade five of the elementary school. In this year, the researcher had the opportunity to develop and provide contexts about buying the ribbon, and giving oranges. The researcher also got the opportunity to pilot the lesson plan in one class on grade five in a private elementary school in Yogyakarta.

Lortie-Forgues, Tian and Siegel (2015) suggests that students' understanding of the fractions was very important in the study of mathematics further and was also used in many professions, but according to Lortie-Forgues, Tian and Siegle (2015) and MA (1999), many students had great difficulty in understanding it. Furthermore, according to Ma (1999), the difficulty was not only the difficulties experienced by students in learning fractions, but also the difficulties experienced teachers to teach the concept of fraction. There were several studies that have been done related to fractions which explains why fractions into one material that is difficult to understand by students, namely:

1. According to Lamon (2001, in Ayunika, 2012), the development of understanding of the meaning of fractions in the teaching-learning process was a complex process because the concept of fraction had a number of interpretations, namely (1) fraction as a part of the

- whole, (2) fraction as the result of a measurement, (3) fraction as an operator, (4) fraction as a quotient, and (5) fraction as a ratio.
2. According to Ross and Case (1999 in Shanty, 2011), on the process of learning fractions, teachers often emphasize on how to do the operation procedure than on the meaning of the operation.
  3. StafylidoudanVosniadou (2004 in in Shanty, 2011) states that one of the reasons why the idea of mathematical fractions were systematically misinterpreted by students was an inconsistency with the principles of arithmetic used in operations involving natural numbers. For example in the operation of multiplication of natural numbers, if the two natural numbers multiplied, then the multiplicative result was a natural number greater than or equal to two natural numbers are multiplied. It was not always the case if the two fractions multiplied.
  4. According Streefland (1991), in many textbooks the instruction of fractions were characterized by:
    - a. Towards the concept of fraction.
    - b. There were not meaningful contexts both as sources and domains for the application of fractions.
    - c. The isolated use of models and patterns, which never extends to serve the process of algorithmization or mathematization.
    - d. There were not connections with mathematically domains, such as decimal fractions, ratios, scale, and percentages (Vergnaud, 1981).
    - e. Towards the algorithms.

There were three questions that will answer in this paper, namely (1) what the contexts that could be used to introduce the meaning of the multiplication of two fractions?, (2) how to use these contexts to construct the student's understanding about the meaning of the multiplication two fractions, and (3) how the development of learning outcomes achieved by students?

## THEORETICAL FRAMEWORK

The philosophy of RME was mathematics as a human activity, which means that the learning process of mathematics first of all should not be connected with mathematics as a deductive system that was well organized and formal, but it should be connected with mathematics as a human activity (Freudenthal, 1971, 1973, in Gravemeijer, 1994). If the mathematics which was learned by the student was connected with a formal deductive system, then the student would view that mathematics was resulted by the human thinking; it was an abstract and was not related to real-life. So, they will think that they could not find mathematics and using mathematics in their life. Learning mathematics should be able to make the students thought that there was mathematics in human activities, and it was be used by them in real life.

There were four main principles in the RME (Gravemeijer, 1991 and 1994, Treffers, 1991, and Julie, 2014), namely:

1. Guided reinvention;
2. The progressive mathematizing;
3. Didactical phenomenology;
4. Self-developed models.

## RESEARCH METHODOLOGY

The approach used to develop the students' learning materials and the teacher guide in this research activity was RME. This type of research that was used by the researcher in this study

was the design research with three cycles. Things that were presented in this paper what was done by the researcher and what comes out of the third cycle. The data analysis was conducted by video data and the student's work. The steps undertaken by the researcher followed the phases in the development research were developed by Gravemeijer and Cobb.

**RESULTS**

The research results presented in this paper were limited by the researcher on the third cycle. The aims of the design that was made by the researcher were that students could know about the meaning of multiplication of two fractions and the fractional multiplication procedure. Before students experienced learning process designed by the researcher, students have learned about fractions in grade four, namely (1) the meaning of fractions, (2) the ordering of fractions, (3) the simplifying of fractions, and (4) the adding and subtracting of fractions. The problems were given to students inspired by the problems that exist in the book that written by Fosnot, and Dolk (2002) and the teacher's idea who taught the students in grade five.

Here was presented problems that were given to students, a possible answer to such problems, learning path, and the student's answers:

**1. The problem was given to students:**

Kiki needed 3 pieces of ribbon for the gift decoration.

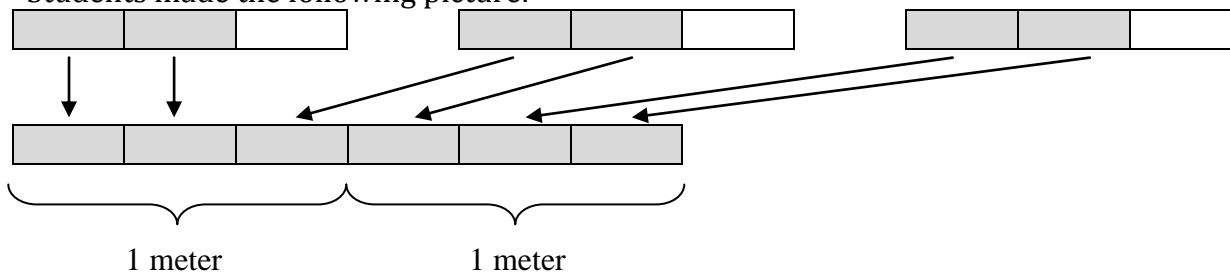
The length of each ribbon was needed Kiki is  $\frac{2}{3}$  meter.

To fulfill the needs of a ribbon, Kiki would purchase the ribbon.

How many meters of ribbon were to be purchased by Kiki?

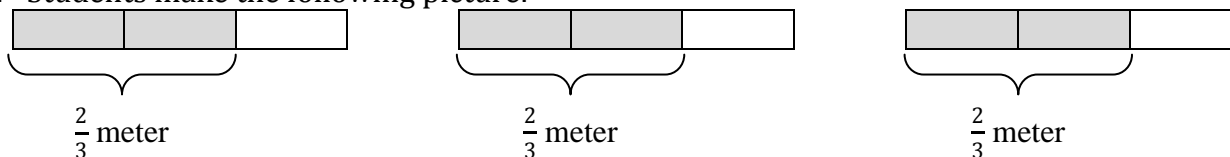
**Possible answers for the problem:**

a. Students made the following picture:



Thus, the length of the ribbon that needed to be purchased by Kiki was 2 meters.

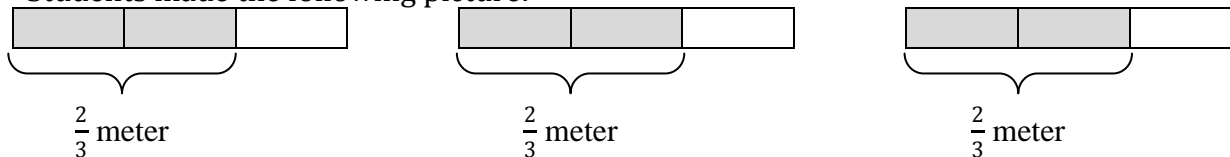
b. Students make the following picture:



Students then made the following calculations:  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{2+2+2}{3} = \frac{6}{3} = 2$ .

Thus, the length of the ribbon that needed to be purchased by Kiki was 2 meters.

c. Students made the following picture:



Students then made the following calculations:  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = 3 \times \frac{2}{3} = \frac{3 \times 2}{3} = \frac{6}{3} = 2$ .

Thus, the length of the ribbon that needed to be purchased by Kiki was 2 meters.

- d. Students made the following calculations:  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{2+2+2}{3} = \frac{6}{3} = 2.$
- e. Students made the following calculations:  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = 3 \times \frac{2}{3} = \frac{3 \times 2}{3} = \frac{6}{3} = 2$
- f. Students made the following calculations:  $3 \times \frac{2}{3} = \frac{3 \times 2}{3} = \frac{6}{3} = 2.$

**The path of the teaching and learning process:**

- a. Students formed discussion groups consisting of 2-3 students.
- b. Students were required to discuss how to solve the problem of Kiki and wrote the results of their discussions on the poster paper.
- c. When students did group discussion, a teacher observed how students solved the problem. If a student was having problems, the teacher could help students. Help teachers can be accomplished by (1) asking the students to describe the three pieces of ribbon that will be purchased by Kiki, (2) provided guiding questions, for example: how to add fractions same denominator ?, how to write  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3}$  in the form of multiplication?, etc..
- d. After all the groups complete the discussion, ask two or three groups who have different strategies to present the results of group discussions.
- e. Make a class discussion. Bring the discussions that the students came to the conclusion that in order to obtain the result of multiplying an integer by a fraction could be done by multiplying integers with the fractional numerator, and then divided by the fractional denominator.

**Answer made by students:** from 6 possible answers, there were only 5 emerging, namely the possibility of b, c, d, e, and f.

**2. The problem was given to students:**

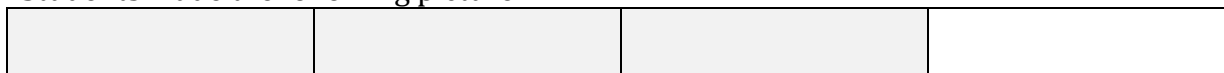
Gofil had  $\frac{3}{4}$  kg of oranges.

Gofil gave half part of oranges owned to Berto.

How many kg of oranges would be given by Gofil to Berto?

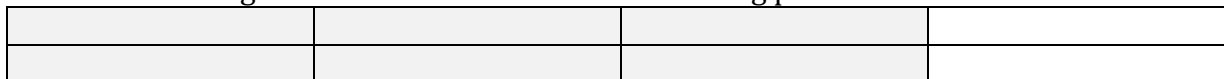
**Possible answers for the problem:**

- a. Students made the following picture:

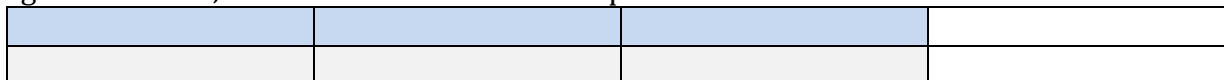


The gray shaded area was the heavy of the orange that owned by Gofil, ie  $\frac{3}{4}$  kg.

Then, students shared the Gofil' orange into two equal parts. Students would get half part of the Gofil' orange. Students would make the following picture:



Then, students shaded with different colour to show the half part of the Gofil's orange given to Berto, so students would make the picture as follows:



- 1) The blue shade indicated the area of the Gofil' orange given to Berto, that is equal to  $\frac{3}{8}$  kg. Because there were 3 blue shade parts of 8 parts of a whole.
- 2) The blue shade indicated the area of the Gofil' orange given to Berto, that is equal to  $\frac{1}{2}$  part of  $\frac{3}{4} = \frac{3}{8}$  kg. Because there were 3 blue shade parts of 8 parts of a whole.
- b. Students made the following picture:

--	--	--	--

$$\frac{3}{4}$$

Students annotate the boundary area that showed  $\frac{3}{4}$ , so the weight of the Gofil' orange was represented by the left area of the boundary.

Then, students share the Gofil' orange into two equal parts. Students would get half part of the Gofil' orange. Students would make the following picture:

 $\frac{1}{2}$ 


$$\frac{3}{4}$$

Students annotate the boundary area that showed  $\frac{1}{2}$  part of  $\frac{3}{4}$  kg, so half of the Gofil' orange weight was represented by the upper area of the boundary.

Then, students shaded to indicate the area of Gofil' orange given to Berto, as shown in the following picture:

 $\frac{1}{2}$ 


$$\frac{3}{4}$$

- 1) The gray shade indicated the areas of Gofil' orange given to Berto, that is equal to  $\frac{3}{8}$  kg. Because there were three blue shade parts of eight parts of a whole.
- 2) The gray shade indicated the areas of Gofil' orange given to Berto, that is equal to  $\frac{1}{2}$  part of  $\frac{3}{4} = \frac{3}{8}$  kg. Because there were 3 blue shade parts of 8 parts of a whole.

**The path of the teaching and learning process:**

- a. Students formed discussion groups consisting of 2-3 students.
- b. Students were required to discuss how to solve the Gofil problem and wrote the results of their discussions on poster paper.
- c. When students did group discussion, a teacher observed how students solve the problem. If a student was having trouble, the teacher could help the student. Help teachers could be accomplished by (1) asking the students to make a picture that described the Gofil' orange. After that, the teacher asked the students to describe half part of the Gofil' orange. Then the teacher asked to students, how many kg of oranges given Gofil to Berto?; (2) providing the guided questions and orders, for example: how many kg Gofil' orange?; please, try to draw the Gofil' orange heavy, how many part of the Gofil' orange given to Berto?; please, try to draw the Gofil' orange given to Berto; how many kg of orange given by Gofil to Berto?, etc.
- d. After all the groups completed the discussion, the teacher asked one or two groups who had different strategies to present the results of group discussions.
- e. The teacher explains to the students that  $\frac{1}{2}$  part of  $\frac{3}{4}$  could be written as  $\frac{1}{2} \times \frac{3}{4}$ . Thus, we would obtain  $\frac{1}{2}$  part of  $\frac{3}{4} = \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ .
- f. Bring the discussions that the students came to the conclusion that in order to obtain the result of multiplying two fractions could be done by multiplying both the numerator of the fraction and the denominator of the two fractions. In this case, we would obtain  $\frac{1}{2} \times \frac{3}{4} = \frac{1 \times 3}{2 \times 4} = \frac{3}{8}$ .

**Answer made by students:**the four possible answers appear in the results of the student discussion.

3. **The problem was given to students:**Find the widest part of A!

...

A	

**Possible answers for the problem:**

a. Students completed the picture and fill in the empty spots in order to obtain the following picture:

$\frac{1}{3}$	A	
$\frac{1}{3}$		
$\frac{1}{3}$		

$\frac{1}{2}$

b. Students calculated, the widest part of A =  $\frac{1}{3}$  part of  $\frac{1}{2} = \frac{1}{6}$ .

Because there was one gray shade part of six parts of a whole.

c. Students calculated, the widest part of A =  $\frac{1}{3}$  part of  $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$ .

d. Students calculated, the widest part of A =  $\frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$ .

**The path of the teaching and learning process:**

- Students were required to solve the problem of seeking the widest part A individually.
- When students solved the area problem, the teacher observed how students solve the problem. If a student was having trouble, the teacher could help students. Help teachers could be accomplished by (1) asking questions so that students completed the picture that were in the problem such the students could get the picture which would like in the possibility student' answer, (2) asking students to fill spots still vacant in the picture. If students had difficulty filling in the blanks, then the teacher could help students by providing guided questions, for example: pay attention to the process of sharing large rectangle using the lines of the vertical, how many parts were formed by the division of a rectangle using the vertical line.
- Two or three students who have different answers asked by the teacher to present the results of its work.
- Make a class discussion. Remind students about the results of previous class discussions could be concluded that multiplying two fractions could be done by multiplying both the numerator of the two fractions and the denominator of the two fractions. Navigate the discussion so that students could conclude that the widest part A was  $\frac{1}{3}$  part of  $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$ .
- Directed students so that they could conclude again that to obtain the result of multiplying two fractions could be done by multiplying both the numerator of the two fractions and multiplying the denominator of the two fractions.

**Answer made by students:**the three possible answers appear in the results of student work.

4. **The problem was given to students:**

Use the follow rectangle to illustrate the statement  $\frac{1}{4}$  part of  $\frac{1}{2}$  and calculate the results.

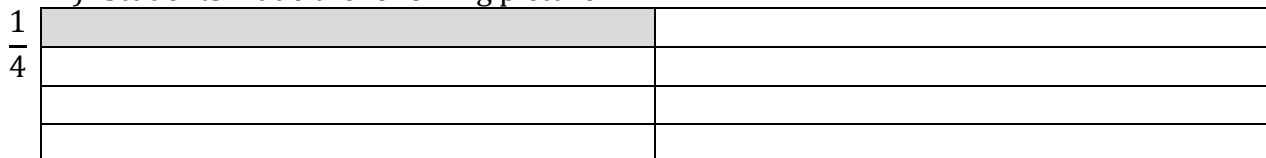




**Possible answers for the problem:**

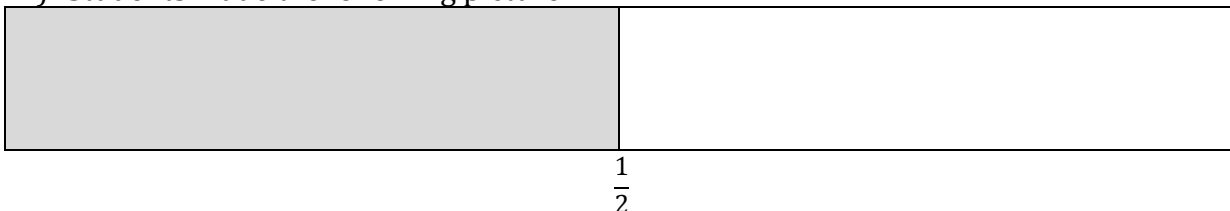
a. The possible answers were made by the student to describe  $\frac{1}{4}$  part of  $\frac{1}{2}$

1) Students made the following picture:



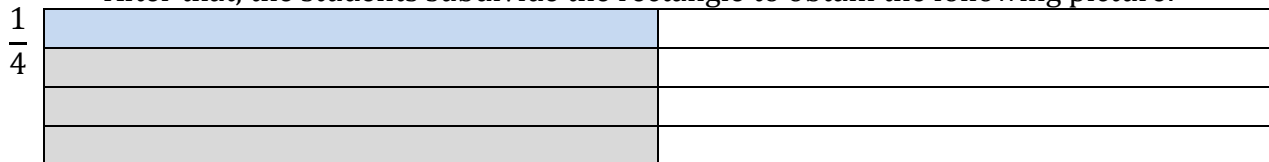
Students stated that the shaded area was  $\frac{1}{4}$  part of  $\frac{1}{2}$ .

2) Students made the following picture:



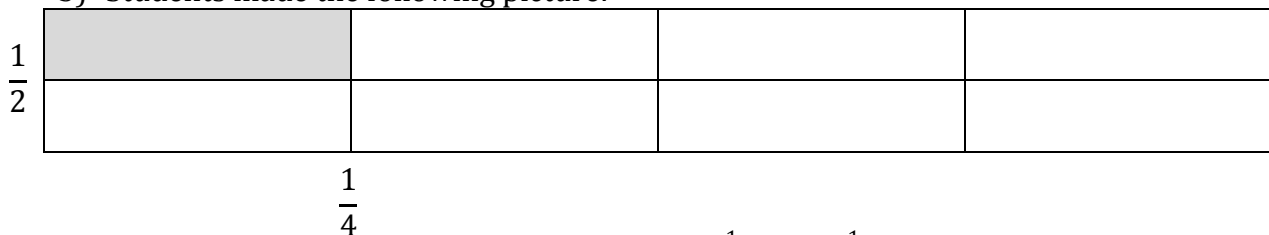
Students stated that the gray area shaded was  $\frac{1}{2}$ .

After that, the students subdivide the rectangle to obtain the following picture:



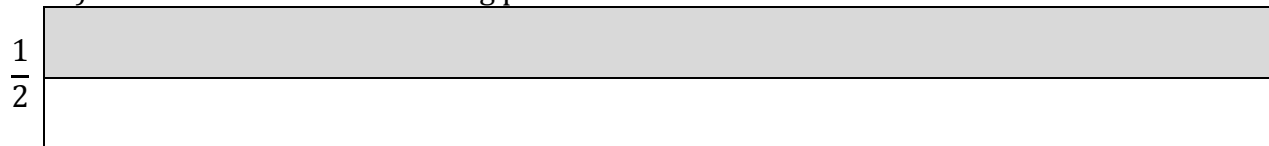
Students stated that the blue shaded area was  $\frac{1}{4}$  part of  $\frac{1}{2}$ .

3) Students made the following picture:



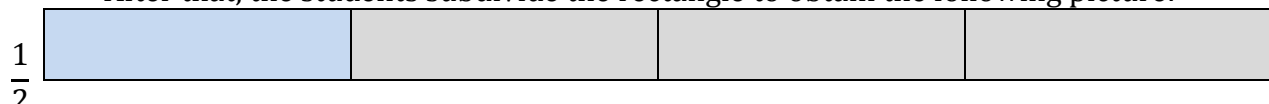
Students stated that the gray shaded area was  $\frac{1}{4}$  part of  $\frac{1}{2}$ .

4) Students made the following picture:



Students stated that the gray shaded area was  $\frac{1}{2}$ .

After that, the students subdivide the rectangle to obtain the following picture:



--	--	--	--

$$\frac{1}{4}$$

Students stated that the blue shaded area was  $\frac{1}{4}$  part of  $\frac{1}{2}$ .

b. Then, to calculate the amount of  $\frac{1}{4}$  part of  $\frac{1}{2}$ , the possibility undertaken by students were as follows:

1) Students answered  $\frac{1}{4}$  part of  $\frac{1}{2} = \frac{1}{8}$ . Because there was one gray shade parts of 8 parts of a whole.

2) Students calculated that  $\frac{1}{4}$  part of  $\frac{1}{2} = \frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$ .

3) Students calculated that  $\frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$ .

**The path of the teaching and learning process:**

a. Students were required to solve the problem of describing and calculating  $\frac{1}{4}$  part of  $\frac{1}{2}$  individually.

b. When students solved this problem, the teacher went around observing how students solve the problem. If a student was having trouble, the teacher could help students. If students had difficulty to describe  $\frac{1}{4}$  part of  $\frac{1}{2}$ , then the teacher could do so (1) asking the students describe  $\frac{1}{2}$  on the rectangle that was available; (2) after that, students were asked to write or shading which part of the rectangle which stated  $\frac{1}{2}$ ; and (3) the students were asked to describe the fourth part of the shaded area. If students have difficulty to calculate  $\frac{1}{4}$  part of  $\frac{1}{2}$ , then the teacher could help students by providing guided questions, for example: (1) pay attention to the first division process, how many parts were formed by the division process; (2) pay attention to the second division process, how many parts were formed by the division process; and (3) consider the result of two of division process, how many parts were formed by the first and second division process.

c. Two or three students who have different answers asked by the teacher to present the results of its work.

d. Make a class discussion. Remind students about the results of previous class discussions could be concluded that to obtain the result of multiplying two fractions could be done by multiplying both the numerator of the two fractions and multiplying the denominator of the two fractions. Navigate the discussion so that students could conclude that  $\frac{1}{4}$  part of  $\frac{1}{2}$  was  $\frac{1}{4} \times \frac{1}{2} = \frac{1 \times 1}{4 \times 2} = \frac{1}{8}$ .

e. Directed students so that they could conclude again that to obtain the result of multiplying two fractions could be done by multiplying both the numerator of the two fractions and multiplying the denominator of the two fractions.

**Answer made by students:** the four possible answers about drawing  $\frac{1}{4}$  part of  $\frac{1}{2}$  and the three possible answer about calculating  $\frac{1}{4}$  part of  $\frac{1}{2}$  appear in the results of student work.

5. **The problem was given to students:** calculate the follow multiplication  $5 \times \frac{3}{7}$ .

**Possible answers for the problem:**

a.  $5 \times \frac{3}{7} = \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} = \frac{3+3+3+3+3}{7} = \frac{15}{7} = 2\frac{1}{7}$ .

b.  $5 \times \frac{3}{7} = \frac{5 \times 3}{7} = \frac{15}{7} = 2\frac{1}{7}$ .

**The path of the teaching and learning process:**

- a. Students were required to calculate  $5 \times \frac{3}{7}$ .
- b. When students did group discussion, a teacher went around observing how students solve the problem. If a student was having trouble, the teacher could help students. The teacher aid process could be done as follows: (1) ask the students to describe or write down what it means  $5 \times \frac{3}{7}$ , and (2) if the student had not been able to interpret what was the meaning of  $5 \times \frac{3}{7}$  then the teacher asked what that means  $2 \times 3$ .
- c. One or two students who have different answers asked by the teacher to present the results of its work.
- d. Make a class discussion. If the student answers that appear only in the first possibility, the teacher could remind about the class discussion results on the previous meeting, i.e. students conclude that in order to obtain the result of multiplying an integer by a fraction could be done by multiplying integers such as the numerator fractional and divided by the denominator fractional. Navigate the discussion so that students can conclude that  $5 \times \frac{3}{7} = \frac{5 \times 3}{7} = \frac{15}{7} = 2 \frac{1}{7}$ .
- e. Directed students so that they could conclude again that to obtain the result of multiplying an integer by a fraction could be done by multiplying integers with the fractional numerator and divided by the denominator fractional.

**Answer made by students:**the two possible answers appear in the results of student work.

6. **The problem was given to students:**calculate the follow multiplication  $\frac{5}{6} \times \frac{12}{15}$

**Possible answers for the problem:**

- a.  $\frac{5}{6} \times \frac{12}{15} = \frac{5 \times 12}{6 \times 15} = \frac{60:30}{90:30} = \frac{2}{3}$ .
- b.  $\frac{5}{6} \times \frac{12}{15} = \frac{5}{6} \times \frac{4}{5} = \frac{5 \times 4}{6 \times 5} = \frac{20:10}{30:10} = \frac{2}{3}$ .

**The path of the teaching and learning process:**

- a. Students were required to calculate  $\frac{5}{6} \times \frac{12}{15}$  individually.
- b. When students solved this problem, the teacher went around observing how students solve the problem. If a student was having trouble, the teacher could help students. If the student was difficult to calculate the fractional multiplication, then ask the student to describe what was the meaning of  $\frac{5}{6} \times \frac{12}{15}$ . If students had difficulty describing  $\frac{5}{6} \times \frac{12}{15}$  that was interpreted as  $\frac{5}{6}$  part of  $\frac{12}{15}$ , then the teacher could do so (1) asking the students describe  $\frac{12}{15}$  by using a rectangle; (2) after that, students were asked to write or shade which part of the rectangular section that stated  $\frac{12}{15}$ ; and (3) the students were asked to describe the  $\frac{5}{6}$  part of the shaded area. If students have difficulty calculating  $\frac{5}{6}$  part of  $\frac{12}{15}$ , then the teacher could help students by providing guided questions, for example: (1) pay attention to the first division process of the rectangle, how many parts were formed by the division process; (2) pay attention to the second division process of the rectangle, how many parts were formed by the division process; and (3) consider the result of the first and second division process, how many parts were formed by the division process.
- c. Two or three students who had different answers asked by the teacher to present the results of its work.

- d. Make a class discussion. Directed students so that they could conclude again that to obtain the result of multiplying two fractions could be done by multiplying both the numerator fractional of the two fractions and multiplying the denominator fractional of the two fractions.

**Answer made by students:**the two possible answers appear in the results of student work.

## CONCLUSIONS

The student learning materials has been tried out on students in the 5th grade at a private elementary school in Yogyakarta. The results of the trial were as follows:

1. Kiki problem could lead students to the conclusion that to obtain the result of multiplying an integer by a fraction could be done by multiplying integers with the fractional numerator and divided by the denominator fractional.
2. Gofil' orange problem could lead students to get the conclusion that to obtain the result of multiplying two fractions could be done by multiplying both the numerator fractional of the two fractions and multiplying the denominator fractional of the two fractions.
3. The problem about calculating  $5 \times \frac{3}{7}$  could bestrengthen students' understanding about the meaning and the procedur of multiplication between an integer and a fraction.
4. Problem (a) seek the widest part, (b) describe and calculate the results of the  $\frac{1}{4}$  part of  $\frac{1}{2}$ , and (c) calculating  $\frac{5}{6} \times \frac{12}{15}$  could strengthen students' understanding about the meaning and the procedure of multiplication of two fractions.
5. The context ofthe Kiki' ribbon and the Gofil'orange could help students to construct about (a) the meaning and the procedure of multiplication of an integer and a fraction, and (b) the meaning and the procedure of multiplication of two fractions.

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