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Proceedings

" The Global challenges on the development and the education of mathematics and science "

3rd ICRIEMS

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The Global Challenges on The Development and
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Faculty of Mathematics and Science
Yogyakarta State University

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- Mathematics & Mathematics Education
- Physics & Physics Education
- Chemistry & Chemistry Education
- Biology & Biology Education
- Science Education

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Board of Reviewer

Preface

Bless upon God Almighty such that this proceeding on 3rd International Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS) may be compiled according to the schedule provided by the organizing committee. All of the articles in this proceeding are obtained by selection process by the reviewer team and have already been presented in the Conference on 16 – 17 May 2016 in the Faculty of Mathematics and Natural Sciences, Yogyakarta State University. This proceeding comprises 9 fields, that is mathematics, mathematics education, physics, physics education, chemistry, chemistry education, biology, biology education, and science education.

The theme of this 3rd ICRIEMS is '*The Global Challenges on The Development and The Education of Mathematics and Science*'. The main articles in this conference are given by six keynote speakers, which are Prof. Allen Price, Ph.D (Emmanuel College Boston USA), Ana R. Otero, Ph.D (Emmanuel College Boston USA), Dr. Michiel Doorman (Utrecht University, Netherlands), Prof. Dr. Marsigit, M.A (Yogyakarta State University), Asst. Prof. Dr. Warakorn Limbut (Prince of Songkla University, Thailand), and Prof. Dr. Rosly Jaafar (Universiti Pendidikan Sutan Idris, Malaysia). Besides the keynote and invited speakers, there are also parallel articles that presented the latest research results in the field of mathematics and sciences, and the education. These parallel session speakers come from researchers from Indonesia and abroad.

Hopefully, this proceeding may contribute in disseminating research results and studies in the field of Mathematics and Sciences and the Education such that they are accessible by many people and useful for the Nation Building.

Yogyakarta, May 2016

The Editor Team

Forewords From The Head Of Committee

Assalamu'alaikum warahmatullahi wabarakatuh

May peace and God's blessings be upon us all

First of all, allow me to thanks to God, Allah SWT, who has been giving us blessing and mercies so we can join this conference. Ladies and Gentlemen, it is my great honor to welcome you to Indonesia, a unique country which has more than 17,000 islands, more than 1,300 ethnic groups, and more than 700 local languages, and I am also very happy to welcome you to Yogyakarta, the city of education, culture, tourism, and a miniature of Indonesia. We wish you be happy and comfortable in attending the conference in this city.

The third International Conference on Research, Implementation, and Education of Mathematics and Science (ICRIEMS 3rd) 2016 is organized by the Faculty of Mathematics and Science, State University of Yogyakarta. In this year, theme of the conference is : The Global Challenges on The Development and The Education of Mathematics and Science. This conference are dedicated to the 52nd anniversary of Yogyakarta State University and to face challenges of Asean Economic Community in 2016.

This conference facilitates academics, researchers and educators to publish and disseminate their research in the fields of pure, application and education of Science and Mathematics. Furthermore, the purposes of the conference are to establish interaction, communication, and cooperation among academics, researchers and educators at an international level.

On behalf of the committee of this conference, I would like to express our highest appreciation and gratitude to the keynote speakers, including:

1. Allen Price, Ph.D. (Associate Professor of Emmanuel College, Boston USA)
2. Ana R. Otero, Ph.D. (Emmanuel College, Boston USA)
3. Dr. L.M. (Michiel) Doorman (Associate Professor of Utrecht University, Netherland)
4. Prof. Dr. Marsigit, MA. (FMIPA, Universitas Negeri Yogyakarta)
5. Asst. Prof. Dr. Warakorn Limbut (Faculty of Science, Prince of Songkla University, Thailand)
6. Prof. Dr. Rosly Jaafar (Faculty of Physics, Universiti Pendidikan Sultan Idris, Malaysia)

Furthermore, we inform you that the papers presented in this conference are about 200 papers from 302 applicants, who come from various countries and various provinces throughout Indonesia. Therefore, I would like to give my appreciation and many thanks to the presenters and participants who have been actively involved in this seminar.

Finally, I would like to thank the committee members who have been working very hard since half a year ago to ensure the success of the conference. However, if you find any shortcomings and inconveniences in this conference, please forgive us. We would very

happy to receive your suggestions for improvement in the next conference. Thank you very much.

Wassalamu'alaikum warohmatullahi wabarakatuh.

Yogyakarta, May 2016

Dr. Warsono, M.Si.

Forewords From The Dean Of Faculty Of Mathematics And Sciences, Yogyakarta State University

Assalamu'alaikum warahmatullahi wabarakatuh. My greetings for all of you. May peace and God's blessings be upon us all.

On behalf of the Organizing Committee, first of all allow me to extend my warmest greeting and welcome to the International Conference on Research, Implementation, and Education of Mathematics and Sciences, the third to be held by the Faculty of Mathematics and Science, State University of Yogyakarta, one of the excellent and qualified education universities in Indonesia. This conference is also celebrate the 52th Anniversary of State University of Yogyakarta.

This conference proudly presents keynote speeches by six excellent academics, these are: Allen Price, Ph.D., Ana R. Otero, Ph.D., Dr. Michiel Doorman, Prof. Dr. Marsigit, MA., Asst. Prof. Dr. Warakorn Limbut, and Prof. Dr. Rosly Jaafar, and around 200 regular speakers.

The advancement of a nation will be achieved if education becomes a priority and firmly supported by the development of technology. Furthermore, the development of technology could be obtained if it is supported by the improvement of basic knowledge such as mathematics, physics, chemistry, and biology. The empowerment of this fundamental knowledge may be achieved by conducting research which is then implemented in developing the technology and the learning process in schools and universities.

This international conference is aimed to gather researchers, educators, policy makers, and practitioners to share their critical thinking and research outcomes. Moreover, through this conference it is expected that we keep updated with new knowledge upon recent innovative issues and findings on the development and the education of mathematics and science, which is in accord with the theme of the conference this year. All material of the conference which are compiled in the abstract book and proceedings can be useful for our reference in the near future.

This conference will be far from success and could not be accomplished without the support from various parties. So let me extend my deepest gratitude and highest appreciation to all committee members who have done an excellent job in organizing this conference. I would also like to thank each of the participants for attending our conference and bringing with you your expertise to our gathering. Should you find any inconveniences and shortcomings, please accept our sincere apologies.

To conclude, let me wish you fruitful discussion and a very pleasant stay in Yogyakarta.

Wa'alaikumsalam warahmatullahi wabarakatuh

Yogyakarta, May 2016
Dean Faculty of Mathematics and Science
Yogyakarta State University

Dr. Hartono, M.Si.

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Probabilistic Thinking of Elementary School Students in Solving Contextual and Non Contextual Probability Tasks

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***Abstract*—**The aim of this research was to describe the probabilistic thinking of elementary school students in solving contextual and non contextual probability tasks. The subject was a student of fifth grade and a communicative boy. The triangulation of data of subject was used in difference time. The data analysis was categorizing, reducing, explaining, interpreting and concluding data. The result showed that in non contextual probability tasks, he could determine all possible outcomes in one-dimensional but failed in two-dimensional sample space. He failed in event and comparison probability tasks. He thought all events had opportunity to occur. However, in contextual probability tasks, he determined all possible outcomes in one- and two-dimensional sample space by using *odometer* strategy. Meanwhile, he used *numerator* strategy in solving probability event task to examine the part that corresponds to the event. In solving comparison probability task, he thought that a situation would give much more opportunity for target event, if it had a little bit sample space than other situation. This result was important for curriculum developer to introduce probability to elementary school students by probability contextual tasks related to their childhood.

Keywords:*Probabilistic Thinking, Elementary School Students, Contextual Probability Task, Non Contextual Probability Task*

I. INTRODUCTION

Advances in science and technology can not be separated from the human mind. A lot of scientists who have done some experiments as result of his thinking in develop science and technology and can be useful for humans in implementing for their survival. It is clear that the scientists just do not do the deterministic thinking in his job, but they also need to do probabilistic thinking. Because probabilistic thinking can provide a rational framework for making inferences and test hypotheses based on uncertainempirical data. For example, a scientist states that the drug has been produced, 99% could increase the child's appetite, after doing some research in the laboratory.

The example above show that the scientists provide conclusions related to events that will occur at the drug was produced by stating that the drug has been produced 99% could increase the child's appetite. 99% shows the degree of confidence of scientists to the drugs that has been produced. This confidence level appears based on the probabilistic thinking. Itmeans that scientist has estimated the success of the drug to the increase child's appetite with a notice things, so that it appears as a measure of the quantity estimation results.

One of the concepts to study the quantity of the magnitude of the degree of confidence is the probability. Further,[1]stated that the probability was the study of likelihood and uncertainty. It played a critical role in all of the professions and in most everyday decisions.[2]stated that the probability was the mathematical way to deal with problems of uncertainty. It was a tool for measuring the appearance chance of events. [3]explainsed that the probability was an old mathematical discipline dealing with calculating the probability of various events.[4]suggested that the probability of any event was expressed as a ratio of the number of potential outcomes that may be Considered successful over the number of all possible outcomes, successful plus unsuccessful. This was in line with the opinion of[5] which stated that the probability was an assigned value (actually an estimate) given to the likelihood of a particular outcome occurring in a random situation. It was calculated by forming a part-whole fraction; the numerator being the number of times an outcome can occur and the denominator being the total number of possible outcomes. While [6]stated that the probabilistic thinking was a mode of reasoning is

attempting to quantify uncertainty, as a tool for decision making. In the study [7]the term probabilistic thinking would be used to describe children's thinking in response to any probability situation. Further [8]stated that a probabilistic reasoning implied to reason under uncertainty. This reasoning took in consideration two important components: the variability of the result and randomness. Thus there is a relationship between probabilistic thinking and probability. If probabilistic thinking is the mental activity of a person in response to a situation which contains an element of uncertainty, then the probability is the branch of mathematics that studies the issues that contain elements of uncertainty.

Based on probabilistic thinking and probability explanation, then in an effort to develop probabilistic thinking of students as a preparation to face the science and technology, needs to be done by introducing the material probability to students in primary school. [9]suggested that the probability need to be introduced to students ranging from elementary level, as the foundation of students to study the probability at higher levels.

Lately a lot of researches related to probabilistic thinking of elementary students in response probability tasks. [3]had done research on low-grade students were kindergartens and elementary schools to differentiate among certain, possible and impossible events, and compare the probability of various events. The result of this study was students coulddifferentiate between three events. Further [10]in his study of 404 students in 2^{th} to 6^{th} grade with instruments related to differentiate among certain, possible and impossible events, and compare the probability of various events, determine events most likely to occur, determine the two boxes of the most may produce white or black ball. The results of this study concluded that the majority of students could recognize different events and categorized them based on the probability. Two results of this study stated that elementary students succeed in responding to the standard probability tasks (non-contextual).

In addition, [11] in his study of 29 students aged 14 to 16 years. Types of tasks provided are (1) advertising involving sex of a baby, (2) black and white marble problem, and (3) red and blue marble problem Box A and Box B. Two of the first task were a context task. The analysis was based on four categories of response is non response, non statistical response, partial statistical response and statistical response. The results of this research focused on non statistical response, that wasmany students used strategies based on the experience of culture (beliefs, everyday experience and school) and intuitive strategy. This was in line with the results of the study [12]of the fifth grade elementary school students low math skill in response probability tasks. The subject gave non statistical response that students gave reasons which refered to everyday experience. Student's responded that if Ivan selected the meatball, then he selected tea ice, lemon ice and coconut ice. But when the student answered that Ivan selected a soup, then he selected tea ice and lemon ice while coconutice is impossible. When researcher askedhis reason, the subject replied that the soup did not match with coconut ice. As well as if Ivan selected chicken noodle, then Ivan selectedtea ice and lemon ice. While coconut ice was not suitable for chicken noodle. When the researcher asked why did not match?, subject replied that according to him was not delicious if after eating chicken noodles, drinking coconut ice. This response showed the subjectivity of student is influenced by everyday experience.

Based on the explanations that have been presented, then there are differences of probabilistic thinking of elementary school students in solving contextual and non-contextual probability tasks. This difference becomes the focus of researcher to explore probabilistic thinking of elementary students in solving contextual and non contextual probability tasks. Aspects of probabilistic thinking can be seen from the responses and strategies are used by students in solving probability tasks. [11]developed the four categories of student's responses are non response, non statistical response, partial statistical response and statistical response. The tasks related with list or identify the complete set of possible outcomes in one-dimensional and two-dimensional, [13]in his study stated that there are six strategies could be used by children in completing tasks bear dressed with tops and pants. The strategies were solution strategy A (random selection of items with no rejection of inappropriate items), solution strategy B (trial and error procedure with random item selection and rejection of inappropriate items), solution strategy C (emerging pattern in item selestion, with rejection of inappropriate items), solution strategy D (consistent and complete cyclical pattern in item selection, with rejection of inappropriate items), solution strategy E (emergence of an "odometer" pattern in item selection, with possible item rejection), solution strategy F (complete odometer pattern in the selection of items, with no rejection of items). Furthermore, [14]in his study of 9-year-old students with high ability and low ability, described how the student could construct mathematical ideas for solving problems. When students lack of formal knowledge, they relied on informal model of the problem situation by using a strategy to produce a solution. And there were three strategies used by students in solving a problem, that are non planing, transitional and odometer. And then elaborated again by [15]into 5 strategies were trial and error strategy, emerging strategy, a cyclic pattern

strategy, odometer with errors strategy, odometer strategy. The task related with identify and justify which of two or three events are most likely or least likely to occur, [16]stated that there were three strategies used by students in completing the task of this probability, namely (a) a numerator strategy in the which they only examine the part of the set that corresponds to the target of the event, (b) an incomplete denominator strategy in the which they examine the part that corresponds to the complement of the event, and (c) an integrating strategy in the which they relate the number of the target elements with the total number of elements in the set. Further, The task relate with determine and justify: (a) which probability situation is more likely to generate the target event in a random draw, [16]identified three strategies used by students, namely (a) set with more target event, (b) set with less non target event, and (c) set with the greater difference in favor of the target event.

In addition to the response and strategy aspects, there is other aspect that relate to probabilistic thinking is representation. The representation is the result of a person's mental activity that can be seen by naked eye. In connection with the representation of students in solving probability tasks, [7] found that students used the language of an invention or a conventional language to described the part-whole. Meaning of the language of the present invention that one or more students suggested their different ways in describing probability. This language was used either verbally or in writing. As an example of the invention is the use of language "one of three" to described the probability rather than used a conventional language was one-third. And one of the results of research [17]stated that students pay attention of whole with whole description of the spinner with 100% representation. Model area and description of 50% and the phrase "half"were seen familiar to two students at the initial interview.

Based on the explanations that have been presented, the study aims to describe probabilistic thinking of elementary school students in solving contextual and non contextual probability tasks. So the results of this study can provide benefits, especially for curriculum developers to introduce probability to Elementary School by designing an approach or strategy that can accommodate aspects of probabilsitic thinking of students. In addition, the results of this study can complement theories that already exist on probabilistic thinking especially for elementary school students.

II. METHOD

This study will describe probabilistic thinking of elementary school students in solving contextual and non contextual probability tasks. The research reveals a natural phenomenon (naturalistic) of the subject when solving probability tasks and the main instrument is the researcher. Therefore, this type of research is exploratory research, whereas this is a qualitative research approach.

A. Subject

Research's subject is a 5th grade student of elementary school with certain criteria, the boy who has high math skill and able to communicate fluently. The reason to choose boy student because according to research [18]boys had scored higher than girls on probabilistic reasoning, while the results of [19]showed that boy have fewer misconceptions than girl. While the selection of students with high math skill because research [20]stated that students with high math skill were able to respond to probability tasks by using a specific strategy and representation.

B. Instrument

The main instrument in this study was researcher. And supporting instruments, namely (a) the instrument of mathematical ability of students, (b) instrument probability tasks, and (c) the instrument guided interview. Each contextual and non contextual probability tasks contained about: (1) the sample space was related to identify the complete set of outcomes in a one and two-dimension problem, (2) the probability of an event was related to identify and justify which of event are most likely to occur, and (3) the probability comparison was related to determine and justifywhich probability situation is more likely to generate the target event in a random draw.

C. Prosedure

Collecting data in this study was done 2 times, namely the collection of data on probabilistic thinking of elementary school students in solving contextual probability task and non contextual probability task. 1) In non contextual task, the data collection process was begun with the provision of instrument probability task to the research's subject. Subject did probability task according to his ability and write his answer according to what he think. Researcher recorded the subject's behavior (expression), including the unique of the subject when solving probability tasks. Furthermore, researcher interviewed

subject related to the aspects about probabilistic thinking. Triangulation of the interview data in this study useddifferent time triangulation, that was comparing and checking data or information from the result of completion probability task without experimentation with different time. 2) After all of the data collection process related to probabilistic thinking of elementary school students in solving non contextual probability task was complete, the process of collecting data to describe probabilistic thinking of elementary school students in solving contextual probability tasks was begun by giving instrument of contextual probability to the research's subject. Researcher recorded the subject's behavior (expression), including the unique things of the subject when solving probability tasks through experiments. Furthermore, researcher interview subject related to aspects the probabilistic thinking. Triangulation of the interview data in this study used triangulation time.

D. Analysis

The process of data analysis in this study consist of:

1. Categorization/Data Classification
   Categorization in this study was defined as the process of selecting and grouping of data that had the same meaning when it was associated with aspects of probabilistic thinking of elementary students.
2. Data Reduction
   Reduction of data in this study was defined as the process of data reduction, that was less unnecessary and irrelevant.
3. Presentation of Data
   Presentation of data in this study was defined as the process of writing the data was already categorized, further examination of the data to determine the consistency of the information was given by subject in order to obtain credible research data (data triangulation).
4. Interpretation of Data
   Interpretation of the data in this study was defined as a process of understanding the meaning of a set of data that had been presented. Furthermore, the discussion and comparing data from credible research with the literature and the particular theory.
5. Conclusion
   Conclusions in this study was defined as the process of formulating the meaning of research of result based on discussions of the data collected. This conclusion meant to described probabilistic thinking of elementary school students in solving contextual and non contextual probability tasks.

III. RESULT

A. Probabilistic Thinking of Elementary School Student in Solving Non Contextual Probability Task

1. Sample Space

A statistical response was given by subject in solving task to identify what color of the ball could be drawn from a box which containing 4 red balls, 3 blue balls and 2 green balls. The subject could determine outcomes in drawn of ball. The strategy was used by the subject showed no trial and error strategy because the subject was not answer the question by trial and error, but the subject gave a reason. The reason of subject is that because ball was randomly drawn from the box. This could be seen in the following interview transcript.

PLTT1N112: What is your answer?
SLTT1N112: It can be red, blue and green
PLTT1N113: The reason?
SLTT1N113: Because in the box, is randomized then taken
PLTT1N114: What does it mean randomized then taken?
SLTT1N114: Because in the box they were randomized and thenit's taken, you can receive red, blue or green colours

Representation was used by the subject in this issue by list all thepossible outcomes.

However, in the sampel space two dimension task he failed to identify a couple of number and color in spinner, when two spinners were playing together. Subject mentioned that the results may be designated by the arrow was the number 1, 2, and blue, yellow, red, green and purple. It could be seen from the transcript of the interview follows.

PLTT1N210: What is your answer?
SLTT1N210: The numbers can be 1 and 2, colors are blue, yellow, red, green, purple
PLTT1N211: The reason?

SLTT1N211: Because when spinner is rotated, it can get number 1 and number 2, and the color blue, yellow, red, green, purple
PLTT1N212: So, it means how many pairs of numberand color that can be designated by the arrow?
SLTT1N212: Seven, here is 5 (pointing spinner color) and 2 ishere (pointing spinner number)
PLTT1N213: What are the seven?
SLTT1N213: Blue, yellow, red, green, purple, 1, and 2

Based on the transcript of the interview above, indicated that the subject did not pair numbers and colors on the spinner.

2. Probability of an Event

Subject failed to determine what was most likely of the ball was picked up from a box containing 4 red balls, 3 blue balls and 2 green balls. The subject replied that most probably drawn ball was a ball of red, blue and green. Subject thought that the three colors of the balls had the same chance.

The subject also failed to determine which were most likely to appear,dice more than 3or less than 3 of throwing the dice. Students thought that by throwing dice, a person did not know how many dice that would appear, dice more than 3and less than 3had a same chance to emerge. The transcript of the interview can be seen follow.

PLTT1N315: What is your reason, why are the most likely to appear on the dice that could be more than 3 or less than 3?
SLTT1N315: Because when inflated can be get more than 3 and less than 3
PLTT1N316: How can they are the most likelythe to appear?
SLTT1N316: When inflated can be more than three or less than three
PLTT1N317: What does it mean how can be more than three, less than 3? Why?
SLTT1N317: Yes possibility
PLTT1N318: What is mean of possibility?
SLTT1N318: If inflated upward, typically more than three or less than three
PLTT1N319: Your mean, you do not know will get which?
SLTT1N319: Yes
PLTT1N320: Why did not know?
SLTT1N320: Because when inflated get many numbers

3. ProbabilityComparison

The subject also failed to determine where the boxes were most likely to get the black marker, if there were two boxes, the first box contains 3 blue markers and 2 black markers and the second box contains 4 blue markers and 3 black markers. The transcript of the interview can be seen follow.

PLTT1N408: If you want to get a black marker, where the box should you take out?
SLTT1N408: Box I and II
PLTT1N409: Why are I and II boxes?
SLTT1N409: Because box I and II contains a black marker

Based on the transcript of the interview above, indicatesd that the subject could not compare boxes were most likely to produce a black markers in decision markers. Subject thought that the two boxes together contain black marker, so that in taking one of the markers in the box, I and II boxes produce black color markers.

The subject also failed to determine of the spinner which most likely refers to the red color, if there were two different spinners. The transcript of the interview can be seen follow.

PLTT1N505: What spinner should give most likely to the red color?
SLTT1N505: My answer, could spinner A and B
PLTT1N506: How can be spinner A and B?
SLTT1N506: Because when I rotated can get the red color also
PLTT1N508: But if you're asked to choose, what will you choose?The A or B?
SLTT1N508: A and B,Miss
PLTT1N510: The reason?
SLTT1N510: Because when I rotated I can get the red color also
PLTT1N511: How can it get red color, in the A and B?
SLTT1N511: Because when it's rotated it can get the red color also
PLTT1N512: Yeah why you choose both can get the red color?

SLTT1N512: Because in the two spinner, there are red

Based on the transcript of the interview above, indicated that the subject could not compare the spinner which were most likely to produce a red color. In fact, when the researcher asked the subject to choose one spinner, subject still chose A and B. The subject's reason indicated that the subject thought that on both of spinner equally there were red, so that both spinner gave the opportunity to appoint the color red.

B. Probabilistic Thinking of Elementary School Student in Solving Non Contextual Probability Task

1. Sample Space

The statistical respon was given by student to choose one food and one drink that could be ordered by Dinda, since the subject could list all the probably outcomes. The most efficient strategy, namely the strategy odometer was used by subject. This was because the subject chose one food as a constant item which was paired with 3 different drinks to get all couples of food and drink. Representations were written by the subject can be seen in Figure 2.1.

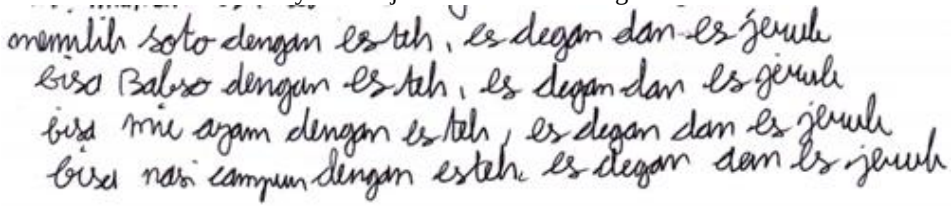

FIGURE 1. Representation of Subjects in Solving 2 Dimensions Sample Space Task

2. Probability of an Event

Partial statistical response was given by subject in solving the probability of an event task. This was because the subject's reason refered to the proportionality misconception, that was the subject chose colors on the spinner which hadnumbers more than others. The transcript of the interview can be seen follow.

PLTT1N706: What color will you choose in order to win this game?
SLTT1N706: I will choose blue, Mam
PLTT1N707: Why do you choose the blue?
SLTT1N707: Because in this spinner mostly blue
PLTT1N708: How many blue?
SLTT1N708: There are 2
PLTT1N709: yellow?
SLTT1N709: 1
PLTT1N710: The Green?
SLTT1N710: 1
PLTT1N711: Do all colors have same size?
SLTT1N711: Same

Based on the interview above, showed that subject used a numerator strategy, because the subject checked the size of each color on the spinner. And colors with the larger size was the color most likely designated by arrows.

3. ProbabilityComparison

Partial statistical response was given by subject in solving comparison statistical of probability task. This was because the subject's reason refered to the proportionality misconception, that was the subject selected a coin because had two sample space, and a dice with many 6 sample space. The transcript of the interview can be seen follow.

PLTT1N808: You're one of the players, do you want to choose to use a coin or use dice?
SLTT1N808: Coin
PLTT1N809: Why do you choose a coin?
SLTT1N809: Because there are 2 pictures
PLTT1N810: What about the dice?
SLTT1N810: There are many pictures, Miss, there are 6
PLTT1N811: But why if the pictures are 2and the other is 6, you will choose the one which has 2 pictures?

SLTT1N811: It can get the number 500 easily
PLTT1N812: What about the dice?
SLTT1N812: To get the number 3 and 5 is difficult
PLTT1N813: Why difficult?
SLTT1N813: Because there are the numbers 1 to 6

IV. DISCUSSION

Overall, students had failed to respond non contextual probability tasks. It appeared that the students failed to respond a couple of numbers and colors when two spinners were rotated, and the students also failed to choose which color ball was most likely to be drawn from the box and which figure was most likely to appear on the tossed of the dice. Students also failed to select box and spinner which were most likely to get a target event. The failure of these students is because students thought that all events had the opportunity to occur.

However, the contextual probability task, student was able to respond to tasks using a variety of strategies and representations. In two-dimensional sample space, student gave statistical response because he could list all possible outcomes with odometer strategy. And students gave partial statistical response on probability of an event. The student's reason refered to proportionality misconception. The numerator strategy was used by students to examine the part of the set that corresponds to the target of the event. In comparison probability task, a partial statistical response was used by student. The student's reason refered to proportionality misconception. Student chose a coin to play. This was because the coin had space samples less than dice, so it more likely had a great chance to win. Itmeans student thought that a situation would give much more opportunity for the target event, if it had a fewer sample space than other situation.

Based on the responses of students in solving contextual and non contextual probability tasks, obviously there are differences. Student is more successful in solving contextual probability tasks. Because, student understand the purpose of the questions easier. In addition, student will think based on his experience in daily life so that student are able to respond and use strategies in solving problems. This is in accordance with the opinion of [14]and [21]which stated that the task of the probability associated with contextual would be easier for students to respond to the task of probabilities, because the task could bring students in everyday life, so that students were able to respond to the task though using their own strategy. However, such a strategy could be redeveloped into a formal mathematical rules. It is important to teach probability for elementary school students, it means the probability can be introduced to elementary school students by probability contextual tasks related to their childhood, such as games etc.

V. CONCLUSION

In non contextual probability tasks, student could determine all possible outcomes in one-dimensional but failed in two-dimensional sample space. Student failed in probability events and comparison probability tasks. Student thought that all events have the opportunity to occur. However, in the contextual probability tasks, student determined all possible outcomes in one- and two-dimensional sample space by using odometer strategy. Meanwhile, student used numerator strategy in solving probability event task to examine the part that corresponds to the event. In solving comparison probability task, student thought that a situation would give much more opportunity for the target event, if it had a little bit sample space than other situation. This result is important for curriculum developers to introduce probability to elementary school students by contextual probability tasks related to their childhood. The result can be used as input for the elementary mathematics curriculum developers to be able to introduce probability in primary level by associating the student's childhood, such as games. Furthermore, the result can be used as input for teachers and other researchers associated with the strategy and approach that must be done to introduce probability for elementary students. In addition, for other researchers need to examine more deeply about probabilistic thinking of elementary school students views of other aspects, so that the study of the probabilistic thinking of elementary school students will be more complete and perfect.

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Yogyakarta, May 17, 2016
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