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Comparison of Male and Female Primary School Student Reasoning Profiles in Solving Fractional Problems

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ABSTRACT

This study aims to describe the comparison of students male and female primary school students reasoning problems in solving fractional problems. This research includes explorative research with qualitative approach which reveal the symptoms that occur in the subject of research. The results of the study showed that female students in solving the problem of fractions presented the mathematical statement orally by looking at the word or phrase that existed on the problem, connecting the facts in Known problems with the questions asked; Create a solution plan by looking at the key words in the problem; Complete the multiplication of fractions by the technique of crossing out and using the formula; Re-examine the results of the solution by doing mental calculations, rework the problem in the same way. Students believe the result is correct because the result must be the same, there is no other way. A male student in solving a fractional problem presents an oral mathematical statement by looking at the word or phrase that exists in the problem, linking the facts in the problem of what is known to the question; Make a plan of solution by paying full attention to the meaning of the sentence, by experimenting in order that the results are not negative; Complete the multiplication of fractions by the technique of crossing out and using the formula; Re-examine the results by doing mental calculations, recalculating.

KEYWORDS
Fractional Problems, Reasoning, Elementary School Students

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Introduction

Reasoning is necessary in learning mathematics. Mathematical matter and mathematical reasoning are two inseparable maths that are understood through reasoning and reasoning understood and trained through learning mathematics (Depdiknas, 2002: 6). In addition Mueller & Maher (2009: 34) says "Generally, the researchers concur that reasoning and proof form is the crucial for growth in mathematical knowledge." Generally, researchers agree that

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reasoning and The form of proof is the foundation of mathematical understanding and that learning to reason and provide a very important reason for the growth of mathematical knowledge. Ball & Bass (in Yankelewitz: 2009) says "mathematical understanding is impossible without emphasizing reasoning". Mathematical understanding is impossible without emphasizing reasoning.

The ability to reason becomes one of the abilities that every human must possess. Shadiq (2004: 3) says "The reasoning abilities are not only needed by students when they are learning math or other subjects, but are needed by every human being when solving a problem or when deciding." With the power of human reason able to think to continue to survive and his descendants, humans can create and create technology that can facilitate his life (Kariadinata: 2012). The importance of reasoning for every citizen is implied in the statement of former US President Thomas Jefferson as quoted by Copi in Shadiq (2007) as: "In a republican nation, whose citizens are to be led by reason and persuasion and not by force, the art of reasoning becomes Of first importance ". The statement shows the importance of reasoning and argumentation learned and developed in a country so that every citizen will be able to be led by reason (brain) rather than with strength (muscle) alone.

School students generally consist of men and women. The ability of male students and female students has been viewed as having differences. Zhu (2007: 187) says "In recent decades, research has repeatedly reported gender differences in mathematical performance on a number of standardized math tests". Further Zhu (2007: 199) says "These gender differences are obvious in high school and in college and vary across mathematical tasks". These gender differences generally occur in High School and in Higher Education and vary on different mathematical tasks.

Hyde et al. (In Royer and Garofoli, 2005) reported that in primary and secondary schools the mathematics test scores of female students tended to be higher than for male students. Some experts argue that female students are more rigorous in some respects than male students. This is in line with the opinion of Jensen (2011: 44) who says that women generally excel over men in good motor skills skills, counting tests, producing smooth words, and others. While men generally outperform women in skills to expand focus and concentration, mathematical reasoning and problem-solving skills, navigation with geometric properties of space, most spatial tasks, and so on.

Differences in ability between men and women, will certainly affect the reasoning of each. Several studies have examined the reasoning in solving the problem, among others Artzt (1999), Sukayasa (2011) and Bancong et al (2013). Artzt (1999) examines the reasoning of mathematics in small groups of students during problem solving. Bancong (2013) examines logical reasoning profiles based on thinking styles in solving physics problems. While Sukayasa (2011) examines the characteristics of junior high school students' reasoning in solving geometric problems in terms of gender differences. Given the importance of reasoning in solving problems, then research in this field needs to be done further.

Based on the above description, the researcher is interested to know "How is the comparison of reasoning profile of primary school male and female in

solving fractional problem?" The purpose of this research is to describe: (1) Profile of Primary School Female Students' reasoning in solving the fraction problem. (2) The profile of primary school boys' reasoning in solving fractional problems.

This research is expected to provide several benefits, namely (1) contributing theoretical (in cognitive psychology) about how the primary school students' reasoning in solving the problem of fractions; (2) as a reference in designing the lesson, by knowing the reasoning of the students, can be developed the tools and selected strategies, approaches, appropriate learning methods; (3) as a consideration for the development of research related to the elementary school students' reasoning profile in solving the fractional problem.

Theoretical Review

Reasoning or reasoning is a process of thinking of achieving logical conclusions based on relevant facts and sources (Shurter and Pierce in Sumarmo, 1987: 31). Meanwhile, according Keraf (1982: 5) reasoning or often also called the mind is a process of thinking that seeks to relate the known facts to a conclusion. Reasoning is a process of thinking in drawing a conclusion in the form of knowledge (Suriasumantri: 1988). Reasoning is a mental / cognitive activity in solving problems by thinking logically and analytically (Subanji, 2007: 10). While reasoning is defined as the process of thinking, especially logical thinking or thinking solving problems. Krulik and Rudnick (1995: 2) reveal "... reasoning to be the part of thinking that goes beyond the recall level".

The Ministry of National Education in the Regulation of the Directorate General of Higher Education at No. 506/C/PP/2004 (in Sadiq, 2009) provides indicators/activities that show the following reasoning: (1) Present mathematical statements orally, in writing, drawings, and diagrams; (2) Conjectures; (3) Conducting mathematical manipulation; (4) Drawing conclusions, compiling evidence, giving reasons or evidence against some solution; (5) Drawing conclusions from statements; (6) Checking the validity of an argument; (7) Finding the pattern or nature of mathematical phenomena to make generalizations.

The reasoning in this study is the process of individual logical thinking with regard to making conclusions or making statements. Logical thinking is defined as the observable mental activity of the apparent behavior of statement and problem solving results in accordance with previously known and true and reasonable knowledge. Reasoning activity is indicated by (1) Presenting mathematical statements orally, written, drawing, or diagrams; (2) Filing allegations; (3) Conducting mathematical manipulation; (4) Drawing conclusions; (5) provide reasons or evidence against some solution or statement; (6) Checking the truth of an answer, conclusion; (7) Using patterns or properties of mathematical phenomena to make generalizations.

Reasoning activities are inseparable from troubleshooting. Problems can be interpreted as situations or questions facing an individual or group when they have no rules, algorithms / procedures or laws that can be used immediately to find the answer (Siswono, 2008: 34). Hudojo (1979) suggests two necessary conditions for a question to be a problem for the student: (1) the question must be understood by the student, but it is a challenge for him to

answer, and (2) the question can not be answered by a known routine procedure Students.

The problem in this research is the situation in the form of questions/problems that require a solution where the way to obtain the settlement can not be seen directly. So the problem of fractions is the situation in the form of question/problems associated with fractions that require settlement where the way to obtain the settlement can not be seen directly.

In line with the understanding of the problem, Polya (1973) defines problem solving as an attempt to find a way out of a difficult situation, achieving a goal that is not immediately achievable. Furthermore Solso (1995: 440) says "problem solving is thinking that is directed toward the solving of a specific problem that involves both the formation of responses and the selection between possible responses". The purpose of the above quotation is problem solving is a thinking activity directed at solving a particular problem involving both the formation of responses and selection between possible responses). Polya (1973) describes the problem-solving steps consisting of (1) understanding the problem, (2) making a devising plan, (3) completing the carrying out plan, and (4) check back (looking back). Artzt and Armor-Thomas (in Artzt and Yaloz-Femia: 1999) explain troubleshooting steps consisting of reading, understanding, exploring, analyzing, planning, implementing, verify, watch and listen. The researcher uses the phases of problem solving according to Polya, on the grounds that the activities in each phase proposed by Polya implicitly cover all phases presented by other experts.

Pape (2004) conducted a study on "Problem-solving Behavior of Secondary School Children: A Cognitive Analysis from a Reading Perspective Perspective". Pape found 5 patterns of problem-solving behavior on understanding the story, namely (1) Direct Translation Approach (DTA) - proficient, These students automatically and efficiently translate the problem elements for mathematical calculations without rereading or referring to the problem after the reading early. (2) DTA - not proficient, These students demonstrate a lack of competence and difficulty reading problems, frequently re-reading problems, calculations may be weak in meaning and problem solving only. (3) DTA-limited context, Students directly translate the elements of the problem for arithmetic calculations. In some cases there is still limited use of context issues. Context is limited to single words or re-readings followed directly by calculations. (4) Meaning-Based Approach (MBA) -full context. These students read or emphasize each sentence of the problem and record information from the statement with the appropriate context, which is used to support the calculation. The final answer is often given as a sentence that expresses an understanding of the answer in the context of the problem. (5) MBA-Justification. These students provide evidence of all the behavior of the MBA category-full context. In addition, they provide a reason for every step of the solution. This study has not been linked to reasoning and has not considered gender.

The ability of male students and female students has been viewed as having differences, although some say the same. Some experts argue that female students are more rigorous in some respects than male students. Hyde et al. (In Royer and Garofoli, 2005: 100) reported that in primary and secondary schools the scores of female math tests tend to be higher than for male students.

Meanwhile, Santrock (2003: 375) said the performance of men is better than women in mathematical ability, only in certain parts, for example in gifted children. Gender factors also influence how to acquire mathematical knowledge.

Method

This research includes explorative research with qualitative approach. The subjects of the study were V grade elementary students who had studied the fractional material, including the introduction of fractions, the denominations, the sums, the deductions, the multiplication, and the division of the fractions. Researchers choose the subject of class V SD (Primary School), because in class V all the fractional materials and operations have been taught entirely, so that students are expected to solve various fractional problems.

Instruments used in this study there are two types, namely the main instrument and supporting instruments. The main instrument is the researchers themselves, because the existence of researchers can not be replaced by others or something else. Researchers can understand the meaning of interaction between humans, reading the movement face, dive in the feelings and values contained in speech or deeds of respondents. Implementation of this research requires the presence of researchers at the study site. The presence of researchers at the research site is preferred, as data collection should be conducted in real situations.

In addition to the main instruments are also used other supporting instruments, namely the test of fractional problems and interviewing guidelines. Instruments of the issue of fractions in the form of a description of the fractions. Researchers used two fractional problems, namely problem 1 (M1) and problem 2 (M2). M1 is a fractional problem involving addition and subtraction operations, whereas M2 is a fractional problem involving multiplication and division operations. Other supporting instruments are interview guides. The interview guidelines the researcher uses are guidelines for task-based interviews. The interview guide contains the main tasks and questions that will be submitted to the subject of research.

The process of collecting data on qualitative research is basically done on an ongoing basis, from the first meeting proceeding to the next meetings. The procedures performed in the data collection during the implementation of this research is with in-depth interview techniques. In order to obtain the information obtained maximally in accordance with the purpose of the interview above, the interview was conducted more than once. To obtain credible data continuous observation is done by increasing persistence, triangulation and give a check.

Data analysis was carried out during the data collection process in the field and ended until the preparation of the research report. Researchers do data analysis gradually. Data analysis techniques used consist of data categorization/data exposure, data reduction, data presentation of reduction result, data interpretation, and conclusion.

Results and Discussion

The following will be presented the results and discussion based on the subject category of research, namely the subject of women and men. The problem of fractions that become the object of research is :

(1) Iqbal wants to make toys from wire. The toy requires $\frac{5}{6}$ meters of wire. If he already had $\frac{1}{4}$ of a meter and his uncle gave him $\frac{1}{3}$ of a meter. How many meters of wire Iqbal still need?

(2) The Master has $\frac{4}{5}$ kg of candy. Half of these candies will be put into plastic bags. If the contents of plastic bags $\frac{1}{6}$ kg. How many plastic bags are needed?

Profile of Female Subject Reasoning in Solving Fractional Problems

The reasoning profile of the subject of women in the activity presents an oral and written mathematical statement that involves either addition and subtraction operations or multiplication and distribution operations; The subject speaks the facts in full and in order, noticing the word or phrase that is in the problem. Here's one interview quote that the researcher did with the subject of the study.

P	Try now tell me what you know from that matter
SP	Toys need $\frac{5}{6}$ meter wire (answer while looking at script about)
SP	Already has $\frac{1}{4}$ meter and uncle gave him $\frac{1}{3}$ meter (SP stopped reading)
P	Anything else is known?
SP	Already
P	Who asked what?
SP	Because that's all that matter (while looking at the script matter)
P	Who asked what?
SP	How many meters of wire is still needed Iqbal?
P	Why is that asked?
SP	Because he already has $\frac{1}{4}$ meter and given $\frac{1}{3}$ meter, whereas the toy need $\frac{5}{6}$ meter (answer while reading script about)

The subject draws conclusions and gives reasons by using the words that are in the problem as well as connecting the facts in the matter between the known and the asked. Especially for known conclusions, the subject gives a reason because that's all there is to the problem. Subjects can distinguish between what is known and clearly asked.

Subjects write down strategies that will be used in orderly and precise. The subject raises the allegation about the strategy to be used by looking at the key words in the problem. The proposed strategy is right and some are wrong. The right strategy defines the word "giving" with " + " operations.

P	In what way does it work?
SP	$\frac{1}{4}$ plus $\frac{1}{3}$. Then later $\frac{5}{6}$ is reduced by this result (pointing $\frac{1}{4}+\frac{1}{3}$)
P	Why $\frac{1}{4}+\frac{1}{3}$?
SP	Because he already has $\frac{1}{4}$ of a meter and his uncle gave him $\frac{1}{3}$ meter. That means he already has $\frac{1}{4}$ plus $\frac{1}{3}$

The word "from" means the operation "×".

P	How to do it?
SP	$\frac{1}{2}$ times $\frac{4}{5}$ divided $\frac{1}{6}$
P	Why multiply $\frac{1}{2}$
SPT	Because $\frac{1}{2}$ of the candy will be put into plastic bag
P	Why is it divided by $\frac{1}{6}$?
SPT	Because it takes a lot of plastic bags that contain $\frac{1}{6}$

While the wrong strategy occurs when placing the operation used. Although it gives the same meaning but the placement is not appropriate. For multiplication and division problems, there is a subject that makes "$\frac{4}{5}:\frac{1}{2}$", but the reason given "because it's right Half of the candy "This is an incorrect conclusion, so the reason given partially does not support the conclusions taken. The problem-solving behavior of female includes DTA, because the subject of women tends to translate directly from the existing key words.

Subjects perform mathematical manipulations for fractional problems involving addition and subtraction operations in the form of converting the original fractions into fractions of its value by equalizing the denominator of each denomination. The pattern used to equate denominational fractions by dividing the denominator of the new fraction with the denominator of the old fraction then multiplied by the old fractional numerator. Subjects perform mathematical manipulations for fractional problems involving division operations in the form of changing operations ":" to "×" and changing the fraction of the divisor by the inverse. The calculation process in solving the fractional

multiplication is based on conceptual knowledge. Patterns used crossed technique.

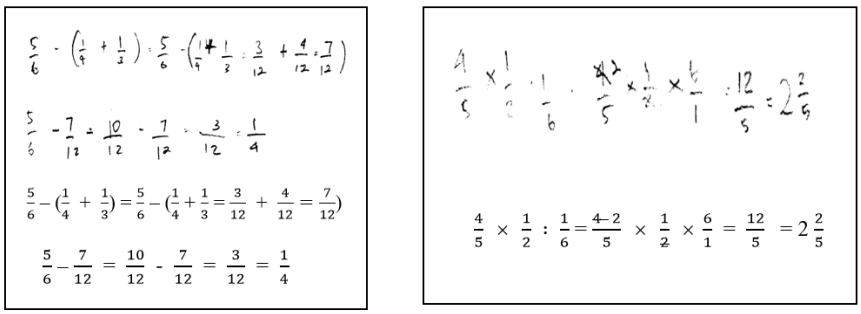


Figure 1. Results of Women Subject Work for Problem 1 and Problem 2

The subject checks the truth of the answer to both problems involving addition and subtraction operations as well as multiplication and division operations by retracing one by one calculations that have been made and doing mental calculations. The subject believes the answer is correct because the result must be the same and there is no other way.

Male Subject Reasoning Profile in Solving Fractional Problems

The male subject reasoning profile of the activity presents an oral and written mathematical statement for fractional problems involving addition and subtraction operations, the subject uttering the facts in a complete and ordered way, writing out the strategies to be used in orderly and precise order.

P	What is known about the matter?
SL	Iqbal wants to make toys. The toy requires $\frac{5}{6}$ meters of wire. He already had $\frac{1}{4}$ of a meter and his uncle gave him $\frac{1}{3}$ of a meter.
P	Why is that all that is known?
SL	Since the required wire meter is not yet known.
P	Who asked what?
SL	Meter wire required Iqbal.
P	Why is that asked?
SL	Because the wire meter is unknown.
P	Why is that all that is known?
SL	Since the required wire meter is not yet known.

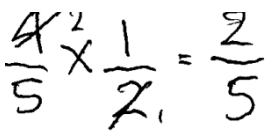
The subject draws the conclusion by linking the facts in the matter between the known and the asked. Subjects can distinguish between what is known and clearly asked. The subject gives a reason by using the words that are in the problem.

The subject proposes a guess about the strategy to be used by looking at the meaning of the whole sentence in its entirety. Therefore the problem solving behavior of the subject includes an MBA-full context. For example the operation "×" the conclusion of the sentence "because half of the candy". Operation " : " the conclusion of the sentence "because the contents of the bag $\frac{1}{6}$".

P	How to solve such a problem?
SL	It's $\frac{5}{6}$ meter minus $\frac{1}{4}$ meter and minus $\frac{1}{3}$ meter
P	Why $\frac{5}{6}$ minus $\frac{1}{4}$then $\frac{1}{3}$minus
SL	Because Iqbal already has $\frac{1}{4}$meter and uncle gave him $\frac{1}{3}$ meter

While the interview results for the second problem as follows

P	Now how to do this?
SL	(SL directly write)



P	$\frac{4}{5}\times\frac{1}{2}$ what does that mean?
SL	Half of the candy (SLT replied while pointing to the section in question)
P	Why multiplied
SL	Because P half of the candy.
P	Try how to do this whole thing
SL	$\frac{4}{5}$ multiplied by half (SLT replied while pointing at the problem section, then paused for a while, seemed to be thinking next step) divided by $\frac{1}{6}$
P	Why divided by $\frac{1}{6}$
SL	Because the contents of his bag is $\frac{1}{6}$

The subject concludes that 12 KPKs of 3, 4, and 6 because he believes that 12 can be divided by 3, 12 can be divided by 4, and 12 can be divided 6. The subject concludes that the required plastic bag is 3 pieces, because if the two have the rest. This indicates that the subject has been able to relate the problem being done with the real problem.

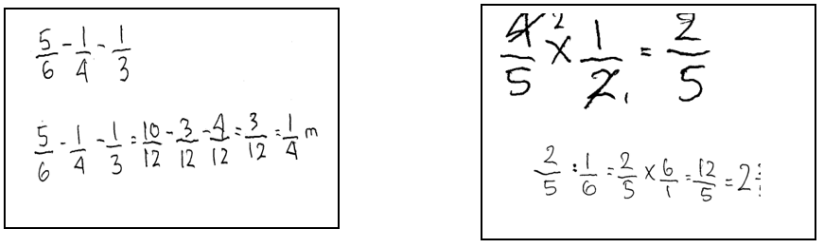


Figure 2. Results of Male Subject Work for Problem 1 and Problem 2

Subjects perform mathematical manipulations for fractional problems involving addition and subtraction operations in the form of converting the original fractions into fractions of value by equalizing the denominator of each denomination. The pattern used to equate denominational fractions by dividing the denominator of the new fraction with the denominator of the old fraction then multiplied by the old fractional numerator. Subjects perform mathematical manipulations for fractional problems involving multiplication and division operations in the form of changing operations ":" to "×". There are also subjects who perform mathematical manipulations in the form of converting the existing fractions into fractions of value so that all denominations are equal "$\frac{4}{5} = \frac{24}{30}$" and "$\frac{1}{6} = \frac{5}{30}$" and change the operation ":" to "×" And change the "divisor" by "inverse". The reason given "So easy to calculate".

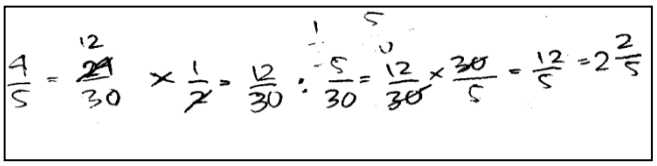


Figure 3. Results of Male Subject Work

The calculation process in completing the multiplication and division of fractions is based on conceptual knowledge. The pattern used is a crossed out technique.

The subject examines the truth of the answer to a fractional problem involving addition and subtraction operations by tracing back one by one the calculations have been made. Subjects do the examination by doing mental calculations. The subject believes that the result is correct, because the result must be the same and there is no other way. As for the fractional problem involving multiplication and division operations, the subject is convinced that

the result is true because there is no other way, or to change the number to a decimal number. The subject concluded that the required plastic bag is 3 pieces, because if two there are the rest.

Considering the discussion of the reasoning profiles of the subject in solving the fractional problem based on the illustration that differences in male and female students' reasoning profiles occur in only a few activities. This is in line with the opinion of Santrock (2003: 375) who said that the performance of men better than women on mathematical ability, only in certain parts of it. The most obvious difference seen in the activity makes a conjecture. Subjects of women tend to notice key words and punctuation. Male subjects tend to pay attention to the meaning of whole sentences, while the subject of some women pay attention to the key words some of them pay attention to the meaning of the sentence intact. Therefore, the problem solving behavior of women subject tend to Direct Translation Approach (DTA) while the male subject tends to Meaning Based Approach (MBA)

Conclusion

After data analysis, in accordance with the research objectives that have been formulated obtained the following conclusions.

1. Female student's reasoning profile in solving the fractional problem as follows: The subject of the woman presents an oral mathematical statement by noting the word or phrase that exists on the problem, linking the facts in the problem between the known and the questioned, making the plan of solving by noticing the word - the key words that exist in the problem, using the crossed out technique in solving the fractional multiplication, re-examine the results of the solution by performing a mental calculation.Subject sure the result is correct because the result must be the same and there is no other way.The behavior of problem solving women subject tend to Direct Translation Approach (DTA).

2. The subject of the man presents an oral mathematical statement with regard to the word or phrase that exists on the problem, connecting the facts in the matter between the known and the questioned, making the plan of solving by taking into account the full meaning of the sentence, using the scratching technique in solving Multiplication of fractions, re-examine the results of the solution by doing mental calculations. The subject believes the result is correct, because the result must be the same and there is no other way. The male problem-solving behavior tends to Meaning Based Approach (MBA)

Suggestion

In this study has been studied about the profile of primary school students' reasoning in solving the problem fractions. Based on the results of research that has been produced, researchers propose suggestions as follows.

1. For teachers, knowledge of students 'reasoning in solving fractional problems can be used to design learning models or strategies aimed at improving students' reasoning.

(1) The results show that there is a subject that can answer correctly through writing, but can not explain by word of mouth. We recommend that

teachers train students to learn to express opinions orally from an early age, for example by the method of discussion.

(2) We recommend that teachers in instilling a concept begin by giving the real problems known by the students.

2. For the developers of the learning model can use the results of this study as inputs to develop learning models that emphasize the reasoning and problem solving.

Disclosure statement

The Authors reported that no competing financial interest.

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References

Artzt, Alice F. and Yaloz-Femia, Shirel. (1999). "Mathematical reasoning during small-group problem solving". In Lee V. Stiff and Frances R. Curcio (Ed). *Developing mathematical reasoning in grades K-12*, 115-126. Reston, Virginia:National Council of Teachers of Mathematics.

Bancong, H., Subaer. (2013). "Profil penalaran logis berdasarkan gaya berpikir dalam memecahkan masalah fisika peserta didik". *Jurnal Pendidikan IPA Indonesia.* JPII 2 (2) (2013) 195-202

Chaplin, J.P. (1989). *Kamus lengkap psikologi* (terjemahan Kartini Kartono). Jakarta: Rajawali Press.

Depdiknas. *Kamus besar bahasa Indonesia.* Jakarta : Balai Pustaka.

Depdiknas. (2002). *Kurikulum berbasis kompetensi mata pelajaran matematika*. Jakarta: Pusat Kurikulum-Balitbang.

Depdiknas. (2006). *Standar kompetensi dan kompetensi dasar.* Jakarta:Badan Standar Nasional Pendidikan.

Hudojo, Herman. (1979). *Pengembangan kurikulum matematika dan pelaksanaannya di depan kelas*. Surabaya : Usaha Nasional.

Jensen, Eric. (2011). *Pemelajaran berbasis otak paradigma pengajaran baru.* Edisi Kedua. Jakarta:PT Indeks.

Kamus Bahasa Indonesia Online. http://kamusbahasaindonesia.org/mampu. Diakses tanggal 15 Okteober 2014.

Kariadinata, R. (2012). "Menumbuhkan daya nalar (power of reason) siswa melalui pembelajaran analogi matematika". *Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung* Vol. 1 No.1

Keraf, G. (1982). *Argumen dan narasi. Komposisi lanjutan III.* Jakarta:Gramedia.

Krulik, Stephen & Rudnick, Jesse A. (1995). *The new sourcebook for teaching reasoning and problem solving in Elementary School.* Boston:Allyn and Bacon.

Mueller,Mary & Maher,Carolyn. (2009). "Learning to reason in an informal math after-school program". *Mathematics Education Research Journal* Vol. 21, No. 3, 7-35

Pape, Stepen J. (2004). "Middle School children's problem-solving Behavior: a Cognitive Analysis from a reading comprehension perspective". *Journal for Research in Mathematics Education* Vol. 35, No. 3, 187-219.

Polya. (1973). *How to solve it*. Princetown, NJ: Princetown University Press.

Robbins, Stephen P.; Judge, Timothy A. (2008). *Perilaku organisasi buku 1*, Jakarta: Salemba Empat.

Royer, James M. dan Garofoli,Laura M. (2005). *Cognitive contributions to sex differences in math performance.* in *gender defferences in mathematics an integrative psychological approach.* Cambridge University Press.

Santrock, John W. (2003). *Adolescense perkembangan remaja. Edisi Keenam*. Alih Bahasa: Dra. Shinto B. Adelar, M.Sc. Jakarta:Erlangga.

Sasongko, Sri Sundari. (2009). *Konsep dan teori gender*. Pusat Pelatihan Gender dan Peningkatan Kualitas Perempuan, BKKBN.

Shadiq, F. (2004). *Pemecahan masalah, penalaran, dan komunikasi*. Yogyakarta: Depdiknas, dirjendikdasmen PPPG Matematika.

Shadiq, F. (2007). *Penalaran atau reasoning, mengapa perlu dipelajari di sekolah*. https://fadjarp3g.files.wordpress.com/2007/09/okpenalaran_gerbang_pdf.

Shadiq, F. (2009). *Kemahiran matematika*. Yogyakarta: Pusat Pengembangan dan Pemberdayaan Pendidik dan Tenaga Kependidikan Dirjen Peningkatan Mutu Pendidik dan Tenaga Kependidikan Depdiknas.

Siswono, Tatag Yuli Eko. (2008). *Model pembelajaran matematika berbasis pengajuan dan pemecahan masalah untuk meningkatkan kemampuan berpikir kreatif*. Surabaya:Unesa University Press.

Solso. (1995). *Cognitive psychology*. Boston : Allyn and Bacon.

Subanji. (2007). *Proses berpikir pseudo penalaran kovariasional dalam mengkonstruksi grafik fungsi kejadian dinamik berkebalikan.* (Disertasi doktor tidak dipublikasikan). Universitas Negeri Surabaya.

Sukayasa. (2011). *Karakteristik penalaran siswa SMP dalam memecahkan masalah geometri ditinjau dari perbedaan gender*. (Disertasi doktor tidak dipublikasikan). Universitas Negeri Surabaya.

Sumarmo, Utari. (1987).*Kemampuanpemahamandan penalaranmatematika siswa SMA dikaitkandengan kemampuan penalaranlogic siswadanbeberapaunsur proses belajar mengajar*.(Disertasi doktor tidak dipublikasikan). FPS IKIP Bandung.

Suriasumantri, Jujun S. (1988). *Filsafat ilmu sebuah pengantar populer*. Jakarta:Pustaka Sinar Harapan.

Yankelewitz, Dina. (2009). *The development of mathematical reasoning in Elementary School students' exploration of fraction ideas*. A dissertation submitted to the Graduate School of Education Rutgers. The State University of New Jersey in partial fulfillment of the requirements for the degree Doctor of Education Graduate Program in Mathematics Education. http://mss3.libraries.rutgers.edu/dlr/TMP/rutgers-lib_28410-PDF-1.pdf.

Zhu, Zheng. (2007). "Gender differences in mathematical problem solving patterns: A review of literature". *International Education Journal*, 8(2), 187-203