

Analysis of Student's abilities in Completing Mathematical Problems Dimension Three in Junior High School

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Abstract

Problems by junior high school students in learning mathematics is when solving math problems. Then conducted research aimed to find out the types and causes of errors made by students especially when completing mathematical questions on the inner circle and outer circle triangle to find alternative solutions and overcome the causes of the students' errors. The subjects of this study were students of class VIII5 junior high school 5 Siak Hulu and totaling 36 people. This study uses a qualitative descriptive method. Data analysis techniques are descriptive analysis techniques. The data collection method used is the test method. Based on the results of the study, there were still many students who made mistakes in solving math problems in the subject of inner circle and outer circle of triangles. the types of errors are: misconceptions, principle errors, and operating errors in which the most common mistakes are the misconceptions of painting the inner circle and the outer circle of the triangle with the number of errors 60 and the percentage of 44.44%. 54 and a percentage of 40%, and a principle error of 21 and a percentage of 15.55%.

Keywords

Dimension Three, Error Analysis of Students, Mathematical Problems, Geometry and inner circle of the outer circle of the committee.

1. Introduction

Education is a long-term investment in human resources that has strategic value for the survival of human civilization in the world. Therefore, almost all countries get education as an important and important in the context of national and state development. Educational research has recognized the value of transformation, which offers opportunities for research and rethink how appropriate and successful educational practices example in mathematics (W. Leal Filho et al. 2018).

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines and develops the human mind. Rapid development in information and communication technology, for the role of other possible dimensions of early mathematical abilities, such as, measurement, geometry, and patterns. The current study examines the dimensions of informal mathematical abilities by conducting analysis (Trelani F. Milburna et al. 2018). So that mastering and creating technology in the future requires strong mastery of mathematics from an early age.

Whereas from observations made by researchers by interviewing teachers in the field of mathematics in Class VIII5, Junior High School 4 Siak Hulu shows that the mathematics learning outcomes of students in the 2012-2013 school year are still below average. The repeat value of the inner circle and outer circle of the triangle is very low, the low value of students is due to the many students who make mistakes in working on the given questions. So that of the total number of students who work on the daily ulagan test there are 45% who have not met the MCC (Minimum Completion Criteria) that is equal to 75 and in the 2013-2014 school year students who do not meet the MCC on the replication of the inner circle and outer circle triangle material increase to 50%. Based on this, the researcher is interested in observing whether the factors that cause students to make mistakes in solving the inner circle and outer circle problems are included in the types of errors made. In order to help and make it easy for the teacher in the field of study to find out the problem solving of the cause of the error and the type of error done by the students in working on the given questions. So the author will discuss this through research Error Analysis of Students in Completing the Triangle and Outer Circle Mathematics Problems in Class VIII5 of Junior High School 4 Siak Hulu where this study uses a qualitative descriptive method. As for other studies that do the same thing, namely entitled ANALYSIS OF STUDENT ERRORS IN COMPLETING MATHEMATICAL PROBLEMS OF DISTRIBUTION OF CLASS VIII ALJABAR FORM Middle School (Evi Nuriati et al. 2015) but here I describe it clearly using qualitative descriptive methods.

2. Result / Experimental

2.1. Mathematical Characteristics

Mathematical characteristics in general are having abstract objects of study. objects of study that are abstract are mental or mental objects. The object of studying mathematics in school is facts, concepts, operations (skills), and principles.

In real life, however, most adults quite commonly use mathematics in everyday activities. Therefore, we can conclude that each individual, to a greater or lesser extent, have adopted the so-called **Mathematicalliteracy**:

- ❖ The ability to understand abstract mathematical concepts,
- ❖ The ability to understand the relationships between mathematical objects,
- ❖ The ability to work with mathematical objects (Jitka Vitovaa. 2015).

Understanding of mathematical concepts and symbols are essential components of mathematical knowledge, Expanded vocabularies allow learners to understand commonalities and differences between items (Frieder L. Schillingera et al. 2018).

2.2. Error In Completing Math Questions.

In the steps that discuss the problem called description, students do intellectual activities that are outlined in the paper work. From the paper can be seen the ability of students. Lack of ability can also be influenced by several things that can be done by several observers that are factors that cause students' abilities:

This stronger reaction to errors could be a factor contributing to the difficulties that HMA individuals experience in learning math and doing math tasks. Mistakes are frequent events causing a response oriented, with post-error

adjustments considered as an effect of attention. Because of their infrequency, errors occur unexpectedly (M. Isabel Núñez-Peña, b, e et al. 2017). Erroneous answers of students can be made possible because the process of receiving and organizing information that is not correct but still used by students for reasons of answering. Reading skills are well known, and there is an increase in coherence around the developing mathematical predictors as well. This achievement skill has a strong relationship. Less knowledge is, and in various types of reading and mathematics (Paul T. Cirino et al. 2017). Cause problems with inappropriate information. Mistakes made by students are reading based on language or misunderstanding. Facilities in understanding language in several important ways to learn mathematics (Philip C. Et al 1991). A student's accuracy on drug calculation tests may be influenced by maths anxiety, which can impede one's ability to understand and complete mathematics problems (Brett Williams et al. 2016). Mathematical anxiety (MA) affects students in various countries and at the education level. Including assessment of aspects of intelligence and ability (Frieder L. Schillingera et al. 2018). Revealed that positive reciprocal effects were found between (a) self-concept and achievement, (b) effort and achievement, and (c) interest and effort (Jianzhong Xu. 2018). Gender gap in mathematics the literature that has previously shown that boys outperform girls in math tests This math (Juan Sebastián Muñoz. 2018). Children would experience less math anxiety and feel more competent when they, independent of ability level, experienced high success rates in math. Comparable success rates were achieved by adapting problem difficulty to individuals' ability levels (Brenda R.J. Jansen. et al. 2013)

2.3. Review of Inner Circle Material and Triangle Outer Circles

2.3.1 Steps to paint the outer circle of a triangle:

- a) Paint an equilateral triangle
- b) Pay attention to the AB side, make any circular arc with the center of the point A. then, also make a circular arc with the center of point B and the same diameter as the previous arc, the two arcs will intersect at one point
- c) Connect the two intersection points of the arc - the arc is the line
- d) Repeat steps (2) and steps (3) on the AC and BC sides
- e) The three lines that you have made in step (3) and step (4) will intersect at a point in the triangle ABC. Name the intersection P.
- f) Point P is the center point of the outer circle of the triangle ABC AP, BP, and CP is the radius of the outer circle of the triangle.

As following figure :

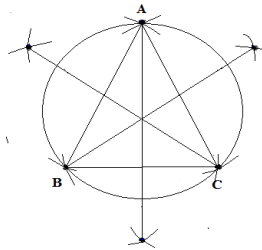


Figure 1. Outer Circle Of A Triangle

2.3.2 Painting Circles in Triangles.

The steps to paint the in circle of the triangle are as follows:

- a) Paint an equilateral triangle
- b) Attention $\angle CAB$. Make a circle with the center point of the arc A cut the AC and AB sides.
- c) Re-create the circle with the point that intersects the AC and AB sides so that there are two new points.
- d) Connect point A densatu point by using a line and memotog BC side
- e) Repeat 3 and step 4 on $\angle ABC$ and $\angle ACB$
- f) You will find point P as the intersection point of the three lines
- g) Point P is the purest point of the circle $\triangle ABC$. Then make a circle using the center point.

As following figure :

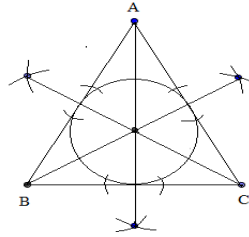


Figure 2. Iner circle of a triangle

2.3.3 Calculating the radius of a circle in a triangle.

The fingers in a triangle can be calculated using a formula

$$r = \frac{l}{s}$$

$$L = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{1}{2}(a+b+c)$$

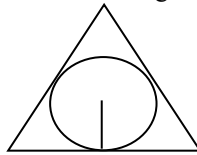


Figure 3. Radius of a circle in a triangle

2.3.4 Calculating the radius of the outer circle of the triangle.

Pay attention to the picture beside, you can find the fingers of the outer circle of the triangle with the following formula:

$$r = \frac{abc}{4L}$$

With r = the radius of the outer circle of the triangle

$$L = \sqrt{s(s-a)(s-b)(s-c)}$$

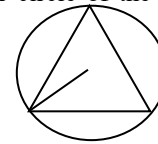


Figure 4. The radius of the outer circle of the triangle

$$s = \frac{1}{2}(a+b+c)$$

2.4. Research methods

In this study the method used is a qualitative descriptive method. that in-depth analysis can be achieved by conducting qualitative studies. content analysis techniques are used to get a broad and broad description of student solution strategies, (content analysis technique was employed to design a condensed and broad description of the students' solution strategies)(Talton, C. F.1973).

The purpose of descriptive research is to make systematic, factual, and accurate representation of facts and characteristics of certain regional populations.

Based on the above opinion, it can be concluded that descriptive research is designed to obtain information about a symptom at the time the study was carried out. This research is directed to determine the nature of a situation when an investigation is being carried out. In this study, researchers try to describe qualitative research. we argue that qualitative inquiry is essential to the scientific process(Joanna E.M. Saleet al. 2018).Qualitative findings in ways that are informative, useful, and dialogue provoking about regulatory issues must go beyond inserting long quotes with a single sentence explanation. Artfully capturing the participants' stories within the regulatory matter under study is vital for understanding potential and actual consequences of regulations (Allison Squires et al.2018).We are seeing the use of qualitative research methods more regularly in education(Ashley Castleberry et al.2018).The strengths of qualitative applications in mixed-methods research using an example from a recent ulcerative colitis drug trial that indicates how they can be integrated into study findings, add rich description, and enhance study outcomes (Frances Rapport et al. 2015).Exploration is central in most qualitative research and discussing the consequences this has on the planning and conduct of qualitative studies. Thereafter, a detailed description of theoretical and practical aspects of qualitative interviewing and participant observation is presented, followed by a discussion of qualitative data analysis and issues pertaining to the portability, applicability, and quality of qualitative research(Kåre Moen et al.2015).

2.5. Method of collecting data

Data collection method in this study is to use the results of interviews with students based on 5 essay tests or descriptions. A description test in the literature also called (essay examination) is the oldest tool for assessing learning outcomes. In general, this description test is a statement that requires students to answer it in the form of describing, explaining, discussing, comparing, giving reasons, and other similar forms in accordance with the demands of revelation by using their own words and language.

2.6. Data Analysis Techniques

- a) The data analysis technique in this study is descriptive analysis, with the following steps: Check student test results.
- b) The following steps are done is calculating the percentage of student errors in solving the description of the inner circle and the outer circle of the triangle

$$p = \frac{f}{N} \times 100 \%$$

Information :

p = percentage

f = frequency that is being searched for frequency

N = number of frequencies

3. Results and Discussion

In this study a written test was held. Before giving a written test, the researcher and the teacher tested the validity of the test questions by consulting a test made to the teacher of the VIII grade mathematics content study at Siak Hulu Middle School 4 which was presented in appendix 5. Then testing the questions followed by 37 students and attended by all students.

However, this test has a reliability level of 0.881 thus all items can be stated as tests that have high reliability (r11 is much greater than 0.70). So that it can be stated that the test results of learning outcomes for each item have good quality.

Then the researcher conducted an interview:

From the interview, it was found that the lack of female students in mathematics was because students made mistakes in solving problems. To see more clearly the researchers grouped the errors into 3 errors:

a. Concept Error

Errors in understanding concepts are mistakes made by students because of the weak concept of the steps in painting inner circles and the outer circle of triangles that are controlled by students.

b. Operation Error

The operating error meant in this study is that the error is related to the process of processing questions such as addition, subtraction, division or division. Because even though students have mastered the concept of inner circle and outer circle triangles, but if students do not master it well or in the calculation process it will also cause errors.

c. Principle Error

the principle error that is intended in solving the subject matter of the inner circle and the outer circle of the triangle is the error in the use of the formula, students must pay close attention to the existing formulas which will later be used. Because if students do not really remember the existing formula properly then it is not impossible that students will be wrong in applying the formula that will be used so that in the next work will also not get the right answer.

The most common mistakes students make are the misconceptions of painting inner circles and outer circles of triangles, namely the number of errors 60 and 44.44%.

Indications Of Types Of Errors And Causes Of Errors In Students In Solving Material Problems In The Inner Circle And Outer Circle Of The Triangle.

Table 1. the radius of the outer circle of the triangle

Number	Type Of Error	The Cause Of The Error
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1	Concept Error	Students forget and do not understand the concept used to paint outer circles and circles in triangles and then consider this material difficult and too much and some are aware of the concept of painting inner circles and outer circles of the triangle just forgetting the other steps that must be done.
2	Operation Error	Students are less careful about calculations and students consider difficult questions so that they do not solve them correctly, do not want to solve problems correctly because they are less diligent and lazy. As a result students leave their answers just before completing them correctly, in a hurry and not serious and no longer focus on working on the questions.
3	Principle Error	Students are confused to distinguish which formula is used to find the length of the radius of the inner circle and the outer circle of the triangle, it is not complete to write the formula and also really do not understand the formula.

We can discuss alternative problem solving. What can be attempted to overcome the mistakes of students in solving problems such as students must be diligent in repeating at home the lessons that have been obtained at school, more thoroughly in answering and reading questions, the teacher must familiarize students to solve problems with the correct problem solving steps and complete, the teacher should provide material and an easy way for students to be studied at home and the teacher asks the material at the next meeting for each student so that students are more motivated to learn.

4. Conclusion

Based on the research that has been conducted on students of class VIII5 of junior high school 4 Siak Hulu, it can be concluded that:

The types of errors that students carry out in solving math problems are the following topics: the inner circle and the outer circle of the triangle are as follows:

- a) Errors related to concepts
 - ❖ Error specifying the angle bisector
 - ❖ Error determining the location of the center point
- b) Errors related to Operations
 - ❖ Error in calculating
 - ❖ Error entering the known number
- c) Errors related to principles
 - ❖ Error using unrelated formulas
 - ❖ Error using the formula between the inner circle and the outer circle of the triangle.

The cause of the students' mistakes is that they do not want to solve problems correctly, are less diligent and lazy in memorizing formulas. As a result, students just leave the answer before completing it correctly, are less careful about the calculation and how to solve the problem that is done due to rush. forget the formula, because students do not take lessons and often sleep during the learning process. consider the problem difficult so that it doesn't solve it correctly. students forget and do not understand the concept used to paint outer circles and inner circles of triangles and consider this material difficult and too much.

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References

- Adams, D.M., McLaren, B.M., Durkin, K., Mayer, R.E., Rittle-Johnson, B., Isotani, S., van Velsen, M. Using erroneous examples to improve mathematics learning with a web-based tutoring system. *Comput. Hum. Behav.* 36, pp. 401–411, 2014.
- Allison Squires., Caroline Dorsen., Qualitative Research in Nursing and Health Professions Regulation, *Journal of Nursing Regulation*, Volume 9, Issue 3, Pages 15-26, 2018.
- Ashley Castleberry., Amanda Nolen., Thematic analysis of qualitative research data: Is it as easy as it sounds?, *Currents in Pharmac Teaching and Learning*, Volume 10, Issue 6, pp. 807-815, 2018.
- Benjamin Beran., Kristina Kaljo., Raj Narayan., Paul Lemen., An Analysis of Obstetrics-Gynecology Residency Interview Methods in a Single Institution, *Journal of Surgical Education*, 2018.
- Brenda R.J.Jansen., Jolien Louwerse., Marthe Straatemeier., Sanne H.G. Van der Ven., Sharon Klinkenberg., and Han L.J. Van der Maas., The influence of experiencing success in math on math anxiety, perceived math competence, and math performance, *Learning and Individual Differences*, Volume 24, pp. 190-197, 2013.
- Brett Williams., Samantha Davis., *Maths anxiety and medication dosage calculation errors: A scoping review*, pp. 139-46, 2016.
- Borasi, R., *Exploring mathematics through the analysis of errors*. Learn., pp. 2–8, 1987.
- Casey D. P., Failing students: a strategy of error analysis, *Aspects of Motivation, Mathematical Association of Victoria*, pp. 295–306, Melbourne, 1978.
- Evi Nurianti., Halini., Romal Ijudin., ANALISIS KESALAHAN SISWA DALAM MENYELESAIKAN SOAL MATEMATIKA MATERI PECAHAN BENTUK ALJABAR DI KELAS VIII SMP, *Journal of Education and Learning*, vol. 4 NO. 9. 2015.
- Fabiana Alceste., Timothy J. Luke., Saul M. Kassir., Holding Yourself Captive: Perceptions of Custody During Interviews and Interrogations, *Journal of Applied Research in Memory and Cognition*, Volume 7, Issue 3, pp. 387-397, 2018.
- Frances Rapport., Clare Clement., Marcus A. Doel., and Hayley A. Hutchings., *Qualitative research and its methods in epilepsy: Contributing to an understanding of patients' lived experiences of the disease*, *Epilepsy & Behavior*, Volume 45, Pages 94-100, 2015.
- Frieder L. Schillingera., Stephan E. Vogela., Jennifer Diedrichab., and Roland H. Grabnera., Math anxiety, intelligence, and performance in mathematics: Insights from the German adaptation of the Abbreviated Math Anxiety Scale (AMAS-G), *Learning and Individual Differences*, Volume 61, pp. 109-119, 2018.
- Jenny R. Root., Effects of explicit instruction on acquisition and generalization of mathematical concepts for a student with autism spectrum disorder, *Research in Autism Spectrum Disorders* 5, pp. 1–6, 2018
- Juan Sebastián Muñoz., The economics behind the math gender gap: Colombian evidence on the role of sample selection, *Journal of Development Economics*, Volume 135, pp. 368-391, 2018.
- Jianzhong Xu., Reciprocal effects of homework self-concept, interest, effort, and math achievement, *Contemporary Educational Psychology*. Volume 55, pp. 42-52, 2018.
- Jitka Vitovaa., Andrea Kovacsováb., Veronika Linhartová., and Jana Balcarová., *Mathematical concepts in Czech pre-schoolers*, pp. 713 – 716, 2015
- Joanna E.M. Sale., Stephen Thielke., *Qualitative research is a fundamental scientific process*. volume 102, pp. 129 - 133, 2018.
- Kåre Moen., Anne-Lise Middelthon., *Qualitative Research Methods in Research in Medical and Biological Sciences (Second Edition)*, 2015
- Kelsey Buckley., Samantha Karr., and Sarah A. Nisly., Kristi Kelley Evaluation of a mock interview session on residency interview skills, *Currents in Pharmacy Teaching and Learning*, Volume 10, Issue 4, pp. 511-516, 2018.
- Knifong J.D. and Holtan B., 'An analysis of children's written solutions to word problems', *Journal for Research in Mathematics Education* 7, pp. 106–112. 1976.
- M.A. (Ken) Clements., Analyzing children's errors on written mathematical task, *Educational Studies in Mathematics*, Volume 11, pp. 1–21, U.S. A, 1980.
- McLaren, B.M., Adams, D., Durkin, K., Gogvadze, G., Mayer, R.E., Rittle-Johnson, B., Van Velsen, M., To err is human, to explain and correct is divine: a study of interactive erroneous examples with middle school math students. *21st Century learning for 21st Century skills*, pp. 222–235. Springer, Berlin, 2012.
- McLaren, B.M., Adams, D.M., Mayer, R.E., Delayed learning effects with erroneous examples: a study of learning decimals with a web-based tutor. *Int. J. Artif. Intell. Educ.* 25 (4), pp. 520–542, 2015.
- M. Isabel Núñez-Peña, b.e., Elisabet Tubau, c., and Macarena Suárez-Pellicionid., Post-error response inhibition in high math-anxious individuals: Evidence from a multi-digit addition task, *Acta Psychologica* 177, pp. 17–22, University of Barcelona, 2017

- Missy Wolfman., Deirdre Brown, Paul Jose.,*The Use of Visual Aids in Forensic Interviews with Children*,*Journal of Applied Research in Memory and Cognition*, In press, 2018.
- Nicholas J. Farber.,Christopher J. Neylan.,Amy Kaplan.,Eric A. Singer.,Sammy E. Elsamra.,*The Urology Match and Post-Interview Communication Urology*, 2018.
- Nicole M. Chandler., Cristen N. Litz., Henry L. Chang.,Paul D. Danielson...Efficacy of Videoconference Interviews in the Pediatric Surgery Match,*Journal of Surgical Education*, 2018
- Paul T.Cirino.,Amanda E.Child., and Kelly T.Macdonald.,Longitudinal predictors of the overlap between reading and math skills,*Contemporary Educational Psychology*,Volume 54, pp 99-111, 2018.
- Philip C., Clarkson., and Mercy Campu.,LANGUAGE COMPREHENSION ERRORS: A FURTHER INVESTIGATION. *Mathematics Education Research Journal*, Vol.3, No.2, Australian Catholic University, 1991
- RadatzH., 'Error analysis in mathematics education', *Journal for Research in Mathematics Education* 10, 163–172. 1979.
- Sheryl J. Rushto.,Teaching and learning mathematics through error analysis,*Mathematics Education Journal*,2018.
- Stamatis Voulgaris.,Anastasia Evangelidou.,*Understanding of three dimensional arrays of cubes - Children in transition*.
- Talton, C. F., , An investigation of selected mental, mathematical, reading and personality assessments as predictors of high achievers in sixth grade mathematical verbal problem solving. D. Ed. dissertation, Northwestern State University of Louisiana, ERIC ref. ED 079 697. 1973.
- Trelani F.Milburna.,Christopher J.Lonigan.,bLydia De Florioc.,and Alice Kleind.,Dimensionality of preschoolers' informal mathematical abilities,*Early Childhood Research Quarterly*, 2018.
- Williams B., and Davis S., Maths anxiety and medication dosage calculation errors,*Nurse Education Pract*,pp. 139-46. 2016.
- W.LealFilhoaj.,S.Raathb.,B.Lazzarinic.,V.R.Vargasd.,L.deSouzab.,R.Anholone.,O.L.G.Quelhas.,fR.Haddadg.,M.Klavinsh.,and V.L.Orlovici.,The role of transformation in learning and education for sustainability,*Journal of Cleaner Production* ,Volume 199, pp. 286-295. 2018.
- Yildirim, A. & Simsek, H.,*Sosyal bilimlerde nitel araştırma teknikleri [Qualitative research techniques in social sciences]*. Ankara, Turkey: Seçkin Yayınevi. 2000.

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