# Comparison of The Open-Ended Approach with The Scientific Approach towards Students' Reflective Thinking Abilities YPLP PGRI 1 Vocational School Makassar

Mirdayanti, Rukli, Haerul Syam
Universitas Muhammadiyah Makassar, Indonesia
E-mail:Mirdahikaru@yahoo.co.id,a_rukli@yahoo.co.id,haerulsyam.unismuh@gmail.com

## ABSTRACT

This research is a quasi-experimental research. The population in this study were all class XI AP SMK YPLP PGRI 1 Makassar. The sample in this study was class XI AP 1 as the Experimental class and XI AP 2 as the control class. The sampling technique used cluster sampling. The instrument used in this study was an essay test of reflective thinking skills given before and after learning in the Experimental class and the Control class which had been validated by the validator team. The collected data were analyzed descriptively and inferentially. The results of the research and discussion obtained several conclusions, namely the reflective thinking skills of class XI AP 1 students of SMK YPLP PGRI 1 Makassar with learning using the Open-Ended approach were generally in the high category. The reflective thinking skills of class XI AP 2 students of SMK YPLP PGRI 1 Makassar with learning using the Scientific approach were generally in the high category. There is no significant difference in students' reflective thinking skills between those taught through the Open-Ended approach and those taught with the scientific approach in class XI AP 1 and class XI AP 2 of SMK YPLP PGRI 1 Makassar. For further researchers, it is recommended to examine the comparison between the Open-Ended approach and the Scientific approach on other thinking skills such as creative, intuitive, and other thinking skills.

**Keywords**: *Comparison, Open-Ended Approach, Scientific Approach, Reflective Thinking*

## INTRODUCTION

Mathematics is one of the subjects that students must master. Mathematics is the source of other sciences. Many sciences depend on mathematics for their discovery and development. According to Johnson and Rising(Toyyibah, 2012)says that: "Mathematics is a pattern of thinking, a pattern of organizing, logical proof, Mathematics is a language that uses terms that are defined carefully, clearly and accurately, its representation, with symbols and solid, more of a symbolic language about ideas than about sounds."

In solving problems, many solutions are needed to obtain the results used, one of which is the ability to think reflectively. Dewey stated that reflective thinking is an active, persistent, and careful consideration of a belief or form of expected knowledge, of the grounds that support that knowledge, and the further conclusions from which that knowledge leads. Learners are aware of and control their learning by actively participating in reflective thinking – assessing what they know, what they need to know, and how they bridge the gap during the learning situation.(Ahmad, 2018).

To realize students' reflective thinking skills, the learning process must involve students actively (student-centered) to build their own understanding of the subject matter being taught and bring out students' intuition.(Dian, 2016).

Therefore, the open-ended approach and the scientific approach are two approaches that can be applied to improve students' reflective thinking skills. The open-ended approach is problem-based learning that encourages students to think holistically about the problem presented. Open-ended problems train students to think reflectively because they make educated guesses in solving the problem.(Mardiah, 2016).

The goal is none other than to maximize students' mathematical thinking skills and to communicate each student's creative activities through the learning process. This is the core

idea of Open-Ended Learning, namely learning that builds interactive activities between mathematics and students, thus inviting students to answer problems through various strategies.(Yanti, 2015).

Meanwhile, the Scientific Approach is a learning process that is designed in such a way that students actively construct concepts, laws or principles through the stages of observing (to identify or find problems), formulating problems, proposing or formulating hypotheses, collecting data using various techniques, analyzing data, drawing conclusions and communicating the concepts, laws or principles that are discovered.(Sweet, 2019).

## METHOD

The type of research used by the author in conducting the research is*quasi-experiment*.*Quasi experiment*is research where the researcher creates a research atmosphere according to what is desired and then examines the results, so this type is appropriate for this research.(Suhartsaputra, 2012).

The design used in this study is the Control Group Pretest-Posttest Design, because this design involves two groups, namely the experimental group and the control group.The population in this study was all class XI AP students of SMK YPLP PGRI 1 Makassar in the 2018/2019 academic year.

The research sample taken in this study was two classes, consisting of an experimental class and a control class. The samples used in this study were selected using the cluster sampling technique.The sample in this study was class XI AP 1 students with a total of 37 students selected as the experimental class, while class XI AP 2 with a total of 37 students was selected as the control class.

The data in this study used a test instrument for students' reflective thinking abilities which was presented in 3 questions in the Pretest and Posttest.

The guidelines for scoring students' reflective thinking skills are presented in the following table:

**Table 1 Scoring Guidelines for Students' Reflective Thinking Skills**

| Aspect | Reflective Thinking Indicators | Score |
|---|---|---|
| **Reacting** | **Able to identify the knowledge possessed related to the given mathematical problem** | |
| | a. Students can write down everything they know correctly | 3 |
| | Students can write down what they know but it is incomplete or incorrect. The accuracy value is above 25%. | 2 |
| | Students can write down what they know but the truth is less than 25% | 1 |

| | | |
|---|---|---|
| | There is no answer, even if there is one it only shows a lack of understanding of the concept so the information provided means nothing. | 0 |
| | b. Students can write down everything that is asked correctly | 3 |
| | Students can write what is asked, but it is incomplete or incorrect. The correctness score is above 25%. | 2 |
| | Students can write what is asked but the accuracy is less than 25% | 1 |
| | There is no answer, even if there is, it only shows a lack of understanding so that the information provided means nothing. | 0 |
| **Comparing** | **Able to identify mathematical concepts in the form of formulas, properties that are appropriate to use to solve the given problem.** | |
| | **a.** Students can create and define methods or concepts that are considered effective for solving problems correctly. | 3 |
| | Students can create and define mathematical methods or concepts, but they are not very accurate. The accuracy score is above 25%. | 2 |
| | Students can create and define mathematical methods or concepts but the accuracy is less than 25% | 1 |
| | There is no answer, even if there is one it only shows a lack of understanding of the concept so the information provided means nothing. | 0 |
| | **b.** Students can write down methods/concepts that are considered effective for solving problems. | 3 |
| | Students can write down methods/concepts that are considered effective for solving problems but are not quite accurate. The accuracy value is above 25%. | 2 |
| | Students can write down methods/concepts that are considered effective for solving problems but the accuracy is above 25% | 1 |

| | | |
|---|---|---|
| | There is no answer, even if there is one it only shows a lack of understanding of the concept so the information provided means nothing. | 0 |
| **Contemplating** | **Able to identify and revise the results of work or solving mathematical problems carried out** | |
| | a. Students can solve the questions correctly | 3 |
| | Students can solve the problem but are not very accurate. The correctness score is above 25%. | 2 |
| | Students can solve the questions but the correctness is less than 25% | 1 |
| | There is no answer, even if there is one it only shows a lack of understanding of the concept so the information provided is fine | 0 |
| | b. Students can make conclusions correctly | 3 |
| | Students can draw conclusions, but they are not entirely accurate. The accuracy value is above 25%. | 2 |
| | Students can make conclusions but the accuracy is less than 25% | 1 |
| | There is no answer, even if there is one it only shows a lack of understanding of the concept so that the information provided is meaningless and does not mean anything. | 0 |

Source: (Asriani, 2018)

So we get the following categories of reflective thinking ability:

**Table 2 Average Criteria for Reflective Thinking Ability**

| No | Average value | Interpretation |
|---|---|---|
| 1. | 84 $100< rata-rata \leq$ | Very high |
| 2. | 68 $84< rata-rata \leq$ | Tall |
| 3. | 52 $68< rata-rata \leq$ | Currently |
| 4. | 36 $52< rata-rata \leq$ | Low |
| 5. | 0 $36< rata-rata \leq$ | Very low |

Source: (Restu, 2016)

## RESULTS AND DISCUSSION

Frequency distribution of reflective thinking ability in the pretest of the Experimental class with 37 students with the frequency distribution of students' reflective thinking ability as many as 8 students are in the low category with a percentage of 22%, while 29 students out of

37 students in the class are in the very low category with a presentation of 78%. Frequency distribution of reflective thinking ability in the pretest of the control class with 37 students, shows that 10 of them are in the low category with a percentage of 27%, while the remaining 27 students are in the very low category with a percentage of 73%.

So it can be concluded that the reflective thinking ability of both the Experimental class with the Open-Ended approach and the Control class with the Scientific approach is in the very low category.

Furthermore, the results of the frequency distribution of the experimental class after (Postest) being taught using the Open-Ended approach showed that 8 out of 37 students were in the very high category with a percentage of 22%, 18 students were in the high category with a percentage of 49%, and 11 students were in the medium category with a percentage of 29%. The results of the frequency distribution of the control class after using (Postest) the scientific approach showed that as many as 8 out of 37 students were in the very high category with a percentage of 22%, 17 students were in the high category with a percentage of 46%, while 12 out of 37 people were in the medium category with a percentage of 32%.

So it can be concluded that the ability to think reflectively after being given treatment, both in the Experimental class with an Open-Ended approach and in the Control class with a Scientific approach, is high with a percentage of 49% in the experimental class and 46% in the control class.

Based on inferential data analysis using unpaired two-sample t-test (independent samples t-test)Using Windows SPSS 23, the results can be seen in Table 3 below:

**Table 3unpaired two-sample t-test (independent samples t-test)**

| | | Levene's Test for Equality of Variances | t-test for Equality of Means | |
|---|---|---|---|---|
| | | Sig. | t | Sig. (2-tailed) |
| Results | Equal variances assumed | 0.547 | 0.461 | 0.646 |

**Source: Appendix**

Based on table 3obtained the Sig. value at *Levene's test for equality of variances* of 0.5470.05. This indicates that the variance of both data is homogeneous. The value in the t column is the calculated t obtained through the calculation results. The t value in Equal variances assumed is 0.461, which is the t-test result indicating that the variance of both data is homogeneous. The Sig. (2-tailed) value is 0.646, so H0 is accepted and H1 is rejected. This means there is no$> > 0,05$There is a significant difference between the Open-Ended approach and the Scientific approach to the reflective thinking skills of students at SMK YPLP PGRI 1 Makassar..

## CONCLUSION AND SUGGESTIONS

### A. Conclusion

Based on the research results and discussions, the following conclusions were obtained:

1. The reflective thinking ability of class XI AP 1 students at SMK YPLP PGRI 1 Makassar with learning using the Open-Ended approach is generally in the high category.
2. The reflective thinking ability of class XI AP 2 students of SMK YPLP PGRI 1 Makassar with learning using the Scientific approach is generally in the high category.
3. There is no significant difference in students' reflective thinking abilities between those taught using the Open-Ended approach and those taught using the scientific approach in class XI AP 1 and class XI AP 2 of SMK YPLP PGRI 1 Makassar.

### B. Suggestions

Based on the research results and discussions obtained, the researcher provides several things to be used as consideration, including:

1. Can combine the Open-Ended approach with the Scientific approach to improve students' reflective thinking skills
2. The Open-Ended approach can be used as an alternative learning approach that can be applied in schools to improve students' reflective thinking skills, because if this learning approach is applied well and correctly, it will provide maximum results.
3. Future researchers are expected to optimize these two approaches when applied to the learning process, observing and guiding students throughout. This ensures that students already understand what they are going to do during the learning process and doesn't waste time on other learning phases.
4. For further researchers, it is recommended to examine the comparison between the Open-Ended approach and the Scientific approach to other thinking abilities such as creative, intuitive and other thinking abilities.

## BIBLIOGRAPHY

Abidin, Z. (2018). Open-Ended Approach in Mathematics Learning, Journal of Mathematics Education Vol.2, p.39.

Adawiyah, R. (2016). The Effect of Learning with an Open-Ended Approach on Students' Mathematical Inductive-Creative Reasoning Abilities. Open-Ended Approach, Vol. 5 No. 1 80-95

Ahmad. (2018, 11-12). Reflective Thinking. Retrieved September 17, 2019, from Reflective Thinking: Http//ahmadbinhanbal.wordpress.com

Asriani, S. (2018). The Effect of Implementing an Open-Ended Approach on the Reflective Thinking Skills of Grade VII Students of SMP Negeri 1 Sinjai Barat (p. 87). Makassar: Muhammadiyah University of Makassar.

Chee. (2012). Reflective Thinking. Reflective Thinking in Mathematics Learning, Vol.1 No.2 105. Retrieved from: http://media.neliti.com

Dian. (2016). Analysis of Reflective Thinking Ability in Solving Mathematical Story Problems on the Subtopic of Two-Variable Linear Equation Systems of Grade X Power Generation Students of SMK 2 Jamber. Jamber: Jamber University.

Euis Eti Rohaeti, HH (2018). Innovative Mathematics Learning with Values and Character Education Nuances. Bandung: Refika Aditama.

Huda, M. (2013). Models of Teaching and Learning (p. 278). Malang: Student Library.

Ilmu, B. (2016, March 1). Open-Ended Approach. Retrieved Wednesday 9, 2019, from https://www.google.com/search?q=hasil+penelitian+yang+relevan+tentang+dekatatan+open+ended&safe=strict&client=firefoxa&rls=org.mozilla:enUS:official&source=lnms&sa=X&ved=0ahUKEwjbjMLjmoLjAhXDRo8KHWmUBHMQ_AUICSgA

Jahrir. (2016). Effectiveness of the Application of the Open-Ended Problem (OEP) Approach on Mathematics Learning Outcomes of Class VIII Students of SMP Negeri 3 Binamu, Jeneponto Regency, 10.

Kasmina, T. (2018). Mathematics for Vocational High School/Vocational Islamic High School Grade XI. Jakarta: Erlangga.

Lailatun. (2018). Analysis of Students' Reflective Thinking in Solving Semantic, Figurative, and Symbolic Problems on the Subject of Function, (p.86-87). Thesis. Surabaya: IAIN Sunan Ampel

Manis, S. (2019, July 1). Understanding the scientific approach, characteristics, principles. Retrieved 9 3, 2019, from Understanding the scientific approach, characteristics, principles: https://powermathematics.blogspot.com/2015/11/persepsi-guru-tentang-dekatatan.html

Mardiah. (2016). Application of Open-Ended Learning Strategy to Students' Reflective Mathematical Thinking Ability in Mathematics Subjects of Grade V, Journal of Education and Technology, Vol: 5 No. 1 p. 65

Mulyani. (2017). Improving Students' Mathematical Communication and Critical Thinking Skills and Self-Confidence through a Scientific Approach. , Research Journal, vo.:5, 2019

Novitasari. (2016, June 2). Advantages and Disadvantages of the Scientific Approach. Retrieved September 3, 2019, from Scientific Approach: http://novitasari1431060.blogspot.com/2016/06/pembelajaran-saintifik-diajukan-untuk.html

Restu, W. (2016). Students' Reflective Thinking Ability in Solving Mathematical Problems on the Material of Two-Variable Linear Equation Systems (SPLDV) Based on Gender of Class VIII at Mts Tanjunganom. Kediri: Universitas Nusantara PGRI Kediri.

Riandi, M. (2019, May Monday). Understanding the Scientific Approach and its Application. Retrieved September Wednesday, 2019, from Understanding the Scientific Approach and its Application: https://www.google.com/search?q=dekatatan+saintifik&safe=strict&biw=1366&bih=664&source=lnms&sa=X&ved=0ahUKEwjz4MiGtdjkAhUXH48KHXtyAJMQ_AUICSgA#

Rini. (2018). The Influence of the Open-Ended Approach on Students' Mathematical Intuitive Thinking Skills (p. 20). Jakarta: http://repository.ar.ac.id.

Rohaeti, EE (2018). Innovative Mathematics Learning with Values and Character Education Nuances. Bandung: PT Refika Aditama.

Rohaniyati, Adi et al. (2006). Improving High School Students' Critical, Creative, and Reflective Thinking Skills Through Open-Ended Learning, Research Journal, Vol. 3. Issue 2, .44-49

Sholihat, E. (2018). An Open-Ended Approach to Students' Creative Thinking Skills in Mathematics Learning at Mtsn Makassar. Thesis. Makassar: Alauddin Islamic University Makassar.

Suhartsaputra, U. (2012). Quantitative, Qualitative, and Action Research Methods. Kalapagunung: PT. Refika Aditama.

Toyyibah, A. (2012). Efforts to Improve Critical Thinking and Creativity in Mathematics Learning Through an Open-Ended Approach in AK-PM Class Students of Muhammadiyah 2 Surakarta Vocational School. Thinking Skills, vol.1, pp.88-99, 2019.

Yanti, H. (2015). Thematic Learning Using a Scientific Approach and Authentic Assessment to Support the Implementation of the 2013 Curriculum. Jakarta: UIN PRESS.

Yusuf. (16, May 3). Definition of Learning According to Experts. Retrieved October 2, 2018, from http://www.zonareferensi.com/pengertian-pengertian-pembelajaran/

Yulianto, H. (2011). Optimizing Mathematics Lessons for the Subject of Mathematics, Topic of Quadrilaterals Through an Open-Ended Problem Approach. Jakarta: UIN PRESS

Zulfi. (2019, August 8). Open-Ended Approach in Mathematics Learning. Retrieved September 17, 2018, from: http://zulfikarnation.wordpress.com/2011/09/17/dekatatan-open-ended-dalam belajar-matematika