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The Ability to Understand Students' Mathematical Concepts Through the PDEODE Cooperative Learning Model Based on Assessment for Learning (AFL)

R Widyastuti^{1*}, WA Lestari¹, U Fadhilah¹, R Nurfarida¹, Rosidin¹

¹Raden Intan State Islamic University of Lampung, Jl. Lieutenant Colonel H. Endro Sutratmin Sukarame, Bandar Lampung, Indonesia 35131

*layu58124@gmail.com

Abstract This study was conducted to determine whether there is an influence of cooperative learning model based PDEODE Assessment For Learning (AFL) in terms of the mathematical disposition of the ability of learners understanding of mathematical concepts. The population in this study was the students of class VII MTs Al-Ma'Ruf Margodadi. Samples were taken two classes of the population using random technique classes. Prerequisite test analysis was performed using test Lilliefors normality test and homogeneity test using test Bartlet. Based on the calculation Lilliefors test result that each sample derived from a normally distributed population and Bartlet test result that both samples came from the same population (homogeneous). While testing the hypothesis using ANOVA (analysis of variance) two paths. It is concluded that there are significant cooperative learning model PDEODE based Assessment For Learning (AFL) on the ability of understanding mathematical concepts, there is influence between students who have the disposition of mathematical high, medium and low on the ability of understanding mathematical concepts, and there is no interaction between models mathematical disposition towards learning and understanding of the concept of mathematical ability.

1. Introduction

In line with the development paradigm of the world about the meaning of education, education faced a number of challenges of an increasingly severe. One of the real challenges is that education should be able to produce human resources who have the competence intact [1]. Education has a very important role in human life skills, education can affect the development of human resources in all aspects of the personality and life [2]. Based on the Law on national education systems THE REPUBLIC Article 3 No. 20 of 2003 states that education aims to develop the overall ability of individuals in both the intellectual ability, emotional, and spiritual. It is expected to form a human person that is able to compete in the times filled with science and technology [3].

Field of science that is in every level of education was mathematics. Math is a subject that is structured, organized, and tiered, meaning that the material of the other materials related to each other [4]. Therefore, mathematics is one of the basic sciences that has an important role in the development of science and technology. Science and technology quickly demand the quality of human resources. To master and create technology in the future, it takes mastery of mathematics from an early age. This is the reason for the conceptual mind and is able to solve problems in everyday life.



Based on observations to the school, which the authors obtained information from mathematics educators MTs Al-Ma'Ruf Margodadi, problems in school is the learning process is still using the conventional model by using a lecture, so that when educators active in the learning process. Students who do not understand the concept of matter can only perform the same problem with the example given. For example, in this type of question the story, students often have difficulty in presenting it into a mathematical model. When learning in the classroom, students have difficulty describing the material in a sequence which produces students in solving problems by using inappropriate measures. Based on the description it can be seen that the ability to understand math concepts students can be said to be low, because there are several indicators of the concept of understanding is not met. Moreover, the mathematics training given to the students is in the form of homework and will be discussed at the next meeting. As a result of the exercise, the possibility of the process instead of the result of their own. Students can deceive her, or perhaps aided by others in doing so.

Understanding math is to understand the true concept of mathematical concepts, that is able to translate, interpret and deduce the mathematical concept is based on the formation of his own knowledge, not just memorize. The need to develop a conceptual understanding of learners in mathematics, as outlined in the policy document and the recommendation means that educators must have a deep understanding of mathematics. As a result, part of the preparation of educators is to provide activities and tasks that deepen conceptual understanding among educators [5]. With the understanding of concepts, students can develop their skills in mathematics, students can apply the concepts they have learned to solve simple to complex problems [6]. According to the Ministry of Education No. 506 / C / Kep / PP / 2004 11 November 2004 on the report, explained that the indicators of the concept of understanding capable of 1) restates each concept 2) classify objects according to certain characteristics (in accordance with the concept) 3) Provide examples and non-examples of the concept 4) presents the concept in various forms of mathematical representation 5) develops requirements necessary or sufficient condition for the concept of 6) use, exploit and selecting the procedure or specific operations 7) apply the concept or problem-solving algorithm [7].

To improve the ability to understand mathematical concepts students need appropriate learning models in learning activities so that student learning outcomes are more optimal [8]. One learning model that can be given is PDEODE (Predict cooperative learning model, Discuss I, Explain I, Observe, Discuss II, Explain II) based on Assessment For Learning (AFL). PDEODE teaching strategy stems from POE. The aim of the POE strategy used by White and Gunstone (1992) is to enable students to understand any event or situation presented to them. Its most important feature is providing students with opportunities to become aware of their alternative concepts about the topic and to be able to discuss their ideas [9].

The first stage is to predict, each student will predict a given problem and stating the reasons based on prior knowledge that they have. The second phase is discussed first, students will discuss and exchange opinions with the group to solve a given problem. The third stage was explained to me, the group presents the results of the discussion. The fourth phase is observed, the students together with teachers observe the results presentation. The fifth stage is the second discussion, students discuss again the answer to the problem is given by observation. The last step is explained II, one of the group repeated the results of discussions, the truth of the matter. At the end of this phase, students will be given individual training with the results of the exercise were corrected by their own friends (peers). According to Kolari and Ranne, the PDEODE type cooperative model is a model that provides opportunities for students to express their initial knowledge about the material provided. There is a collaboration between students during the discussion, there is an exchange of opinions between students and other students, and there is a conceptual change in student knowledge. The use of this model can continuously provide positive feedback and develop student-centered learning [10].

In the learning assessment system is also very influential. One assessment system that can be used is the Assessment For Learning (AFL). Assessment for Learning had changed the principal ideas about classroom assessment and affected the learning management to Become something more than just regulating student's learning [11]. AFL is the process of collecting information about student learning

from a wide variety of assessment practices and using this information to modify teaching and learning in order to better meet students' needs [12]. AFL draft has to provide insight into the learning benefits to students and teachers. The benefits that could be derived for the students items, namely (a) they will become confident learners because they were able to see themselves and (b) they were able to understand what the meaning of responsibility for reviews their own learning to monitor greater success in their futures (c) they were motivated to learn, and (d) the learning progress could be delivered inaccurate information [13].

Assessment for Learning (AFL) with student peer assessment will be doing the exercises and correct at the same meeting at the end of the learning process. This assessment will also make students more active and enthusiastic because the students will correct their answers and find out whether their answers were right or salah. Penilaian for Learning (AFL) with this peer assessment of students will do exercises and fix it at the same meeting, it is different of assessment is already in school. In the final assessment of school by providing training materials in the form of homework and will be discussed at the next meeting. This leads to the result of the exercise may not be fully derived from the ability of the students themselves.

Based on these descriptions, it can be said that the cooperative learning model PDEODE based Assessment For Learning (AFL) is a six-step learning model, predict, I discuss, explain I, observing, discussing II, and explains II. During the learning process, students will conduct group discussions twice with the goal of students become more aware of the material being taught. In the final phase, the students will do exercises using Assessment For Learning (AFL) using peer assessment. The results of the training students will be examined by their own friends, with the intention that students will be more active because students want to check the results of training their friends and want to know whether they are a right or wrong answer. This shows that the cooperative learning model PDEODE based Assessment for Learning (AFL) to be very important in influencing the students' ability to understand math concepts.

In addition to the learning model, students' mathematical disposition also affects the ability to understand math concepts students. Sumarmo define mathematical disposition as desire, consciousness, dedication and a strong tendency for students to think and act mathematically in a positive way and based on the belief, piety and noble cause [14], Disposition Mathematically is the attitude and the trend showed an interest in mathematics. As a result, it raises the confidence to solve mathematical problems and dare to communicate ideas. With this, students will have the persistence to perform mathematical tasks [15].

The purpose of this study was to determine whether there is influence of cooperative learning model PDEODE (Predict, Discuss, Explain, Observe, Discuss, Explain) based Assessment For Learning (AFL) on the ability to understand the concepts of math students, to determine whether there is influence between students and disposition higher mathematics, medium, and low on the ability to understand mathematical concepts, and to determine whether there is an interaction between the learning model given by the students' mathematical disposition of the ability to understand mathematical concepts.

2. Method

The method used in this study is quas-Experimental Design, the design of which has a control group but not fully functional for controlling external variables that affect the performance of an experiment [16]. The population in this study were students of class VII MTs Al-Ma'Ruf Margodadi. The sample is taken part of the population. Samples were selected by using a random lottery class VII and class C is selected as the experimental class and class VII B as the control class. In the experimental group cooperative learning model PDEODE based Assessment For Learning (AFL) is applied, whereas in the control class conventional model is applied. Before conducting the study, the researchers conducted a test instrument that tests the ability to understand the concepts of mathematics and mathematical disposition questionnaire. Test instruments to find validity, reliability, power differences and level of difficulty, while questionnaire tests to find validity and reliability. After conducting the study, researchers will take prerequisite tests using test Liliefors to test for normality and Bartlet test for homogeneity. Analysis of

the data used in this study is the ANOVA (analysis of variance) two way and further testing using the Scheffe method.

3. Results and Discussion

3.1 Calculation Results of ANOVA (Analisis Varians) Two Paths

Table 1 Results of Two-Way ANOVA Test Analysis

SK	JK	db	KT	Fhitung	Ftabel
Line (A)	2063.172	2	1031.586	4.871	3.179
Column (B)	906.814	1	906.814	4.282	4.03
Interaction (AB)	446.169	2	223.085	1,053	3.179
error	10800.661	51			
Total	14216.816	56			

Based on Table 1 it can be seen that it can be concluded that H0A rejected it means no influence among students who received cooperative learning model PDEODE based Assessment For Learning (AFL) with students who received conventional learning models on the ability to understand a mathematical concept, it can be concluded that H0B rejected meaning that there is influence between the students with mathematical disposition of high, medium, and low in the ability to understand mathematical concepts. Then from the calculation of two-way ANOVA was also obtained it can be concluded that H0AB accepted meaning there is no interaction between learning models and mathematical disposition on the ability to understand math concepts students. $F_{A\ count} > F_{A\ table}$ $F_{B\ count} > F_{B\ table}$ $F_{AB\ count} < F_{AB\ table}$

3.2 Advanced Test Calculation Results After Anava

Table 2 Summary of Mean and Mean Marginal

Learning model	Disposition Mathematically			Marginal Mean
	High	Moderate	Low	
Cooperative mode based AFL PDEODE	79.4	58.37	56.1	64.62
conventional	61.8	50.61	57.75	56.72
Marginal Mean	70.6	54.49	56.93	

To determine the learning model which is better, no need to test the double comparison between rows, because to see which is better enough to see the average marginal between lines of both learning models. Table 2 shows that the average marginal space between rows for cooperative learning model PDEODE based AFL is greater than the average marginal for conventional learning.

PDEODE cooperative learning model based Assessment For Learning (AFL) is a model of learning in which consists of several small groups that will work together to accomplish a common goal. At the time of learning, learners will conduct group discussions twice, the goal so that learners better understand the concept of the material they are learning. During the discussion of the first group is done, the educator will give the observations in the form of directives steps to resolve the problem of properly. Furthermore, learners discussion back to the group for discussion of the latter. The discussion was held to settle back in the given problem by using the steps that have been directed by educators so as to obtain the right result. At the end of learning, teachers provide individual exercises to students. The exercise aims to train learners to solve problems.

Assessment of the training results using Assessment For Learning (AFL) is by assessing peers. The execution and assessment results of the exercise will be examined by a friend at the same meeting, it is intended that the results of the exercise commensurate with their own abilities because other people can

not differ with homework help and probably not entirely the result of the ability of learners. Rate colleagues will also make more enthusiastic learners, and learners will be stimulated to be thorough in answering a conventional question. Learning is the first traditional learning because this method has been used as a communication tool during the learning educator. The cooperative learning model is a model that is less likely to require critical thinking, a low absorption rate, and quickly disappear because during the learning process of students just listen and hear what is delivered by educators.

Based on that, then the ability to understand mathematical concepts generated by learners better if taught using cooperative learning model based PDEODE AFL rather than using conventional learning models. In accordance with the results of this research, learners who obtain cooperative learning model based AFL PDEODE better than learners who obtain conventional learning models on the ability to understand mathematical concepts.

Table 3 Calculation Method of Scheffe '

No.	Interaction	Fhitung	Ftabel	Conclusion
1	$(\mu_1 \text{ vs } \mu_2)$	9.726	4.030	H0 is rejected
2	$(\mu_1 \text{ vs } \mu_3)$	4.182	4.030	H0 is rejected
3	$(\mu_2 \text{ vs } \mu_3)$	0.205	4.030	H0

Based on the results of multiple comparison test calculations between columns in Table 3 it can be concluded that the obtained that. Thus it can be concluded that the H0 is rejected, meaning that there are significant differences between the ability to understand mathematical concepts students who have a high mathematical disposition and being on learners who obtain PDEODE cooperative learning model based AFL and conventional learning models. While the obtained that. Thus it can be concluded that the H0 is rejected, meaning that there are significant differences between the ability to understand mathematical concepts students who have high and low mathematical disposition on learners who obtain PDEODE cooperative learning model based AFL and conventional learning models. Then, the obtained that. Thus it can be concluded that H0 is accepted, meaning that there is no significant difference between the ability to understand mathematical concepts learners who have moderate and low mathematical disposition on learners who obtain PDEODE cooperative learning model based AFL and conventional learning models. $\mu_1 \text{ vs } \mu_2 F_{hitung} > F_{tabel}$ $\mu_1 \text{ vs } \mu_3 F_{hitung} > F_{tabel}$ $\mu_2 \text{ vs } \mu_3 F_{hitung} < F_{tabel}$

The results of the same study conducted by Fajar Lestari, Mardiyana, and Sri Subanti that the mathematics achievement of students was given a cooperative learning model with AFL PDEODE same with mathematics achievement of students given PDEODE cooperative learning model with a conventional assessment. Disposition Mathematically students said to be good if the student likes the problems is a challenge and involve itself directly in the find / solve the problem. In addition, students feel himself experiencing a learning process when completing the challenge. In the process, students feel the emergence of self-confidence, hope, and awareness to look back at the results of his thinking [16].

Based on the results of students who have high mathematical disposition tends to be more active when the learning process, such as asking questions, diligently working on questions and challenged to work hard questions. Students who have a mathematical disposition bit more passive than students who have a high mathematical disposition, rarely ask questions, sometimes easily give up in working on and a little challenged to work hard questions. Meanwhile, students who have a lower mathematical disposition is more passive than students who have a high mathematical disposition, never asked, easy to give in conducting questions and just do the easy questions. This leads to the ability to understand math concepts students who have a high mathematical disposition better than students who have moderate and low mathematical disposition, whereas among the students who had a mathematical disposition low- and no significant difference.

4. Conclusion

Based on data analysis and hypothesis testing that has been done, it can be concluded that: 1) There is the influence of cooperative learning model PDEODE (Predict, Discuss, Explain, Observe, Discuss, Explain) based Assessment For Learning (AFL) on the ability to understand the mathematical concept of participants students 2) there is influence between students who have a mathematical disposition of high, medium, and low in the ability to understand mathematical concepts 3) there is no interaction between learning models and mathematical disposition with the ability to understand mathematical concepts.

References

- [1] T. Dupalaya, H. Susilo, A. D. Corebima, P. Biologi, and P. N. Malang 2016 Pengaruh Strategi Pembelajaran PDEODE (Predict-Discuss-Explain-Observe-Discuss- Explain) Pada Kemampuan Akademik Berbeda Terhadap Keterampilan Komunikasi Siswa 1713–1720
- [2] L. Agustina 2016 Jurnal eksakta volume 1, 2016 1 *J. Eksakta*. **1** 1
- [3] F. Lestari & S. Subanti 2016 Eksperimentasi Model Pembelajaran Kooperatif Tipe Predict Discuss Explain Observe Discuss Explain (PDEODE) Dengan Assessment For Learning (AFL) dan PDEODE dengan Penilaian Konvensional Pada Materi Peluang Ditinjau dari Gaya Belajar Siswa Kelas XII SMK **4** 6 608–619
- [4] R. Widyastuti 2015 Proses Berpikir Siswa dalam Menyelesaikan Masalah Matematika berdasarkan Teori Polya ditinjau dari Adversity Quotient Tipe Climber *Lampung, I.* **6** 2 183–193
- [5] M. O’Leary 2017 Measuring Teachers’ Assessment for Learning (AFL) Classroom Practices in Elementary Schools *Int. J. Educ. Methodol* **3** 2 103–115
- [6] S. Dewimarni 2017 Kemampuan Komunikasi Dan Pemahaman Konsep Aljabar Linier Mahasiswa Universitas Putra Indonesia ‘YPTK’ Padang *J. Al-Jabar* **8** 1
- [7] D. Rahmawati & M. J. Saragih 2016 Meningkatkan Pemahaman Konsep Siswa Kelas XI- IPSdalam Belajar Matematika melalui Metode Guided Discovery Instruction *J. POLYGLOT*, **12** 2
- [8] Saregar, A. 2016 Pembelajaran Pengantar Fisika Kuantum dengan Memanfaatkan Media PhET Simulation dan LKM Melalui Pendekatan Saintifik: Dampak pada Minat dan Penguasaan Konsep Mahasiswa *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*. **5** 1 53–60
- [9] H. Demircioğlu 2017 Effect of PDEODE Teaching Strategy on Turkish Students Conceptual Understanding : Particulate Nature of Matter *J. Educ. Train. Stud.* **5** 7
- [10] N. W. S. Muliartini, N. D. M. S. Adnyawati & D. S. Wahyuni 2013 Penerapan Model Pembelajaran PDEODE (Predict Discuss Explain Observe Discuss Explain) Untuk Meningkatkan Hasil Belajar Teknologi Informasi dan Komunika *KARMAPATI*. **2** 6
- [11] S. Chueachot, B. Srisard & Y. Srihamongkol 2013 The Development of an Assessment for Learning Model for Elementary Classroom **6** 9 119–124
- [12] D. Baas, J. Castelijn, M. Vermeulen, R. Martens & M. Segers 2015 The relation between Assessment for Learning and elementary students ’ cognitive and metacognitive strategy use 33–46
- [13] W. Retnaningsih 2017 Developing Model Assesement for Learning (AFL) to Improve Quality and Evaluation in Pragmatic Course in IAIN Surakarta **10** 5 97–103
- [14] N. Widyasari, J. A. Dahlan & S. Dewanto 2016 Meningkatkan Kemampuan Disposisi Matematis Siswa SMP Melalui Pendekatan Metaphorical Thinking *J. Pendidik. Mat. Mat.* **2** 2
- [15] E. Y. P. Nasution 2016 Analisis Terhadap Disposisi Matematis Siswa SMK Pada Pembelajaran Matematika *J. Logaritma*. **4** 1
- [16] Sugiyono 2016 *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*, 23rd ed (Bandung: Alfabeta)
- [17] T. Nopriana 2015 Disposisi Matematis Siswa Melalui Model Pembelajaran Geometri Van Hiele *FIBONACCI Jurnal Pendidikan Matematika & Matematika*. 80–94