

THE INFLUENCE OF CONCEPTUAL UNDERSTANDING PROCEDURES (CUPS) LEARNING MODELS CONCEPT OF UNDERSTANDING OF CONCEPT STUDENT MATH

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Abstract

This study aims to determine differences in the ability to understand mathematical concepts of students taught using the Conceptual Understanding Procedures (CUPS) learning model with the ability to understand mathematical concepts of students taught by using direct learning models in class VIII students of SMPN 2 Langke Rembong NTT, Indonesia. Quasi-Experimental Research with Posttest-Only Control Group Design design involved 358th-grade students of SMP 2 Langke Rembong, totaling 355 people. 65 sample members were selected using random sampling. Data analysis used parametric statistics through a t-test which was preceded by conducting analysis prerequisite tests. Effect size calculations are done to see how much influence the CUPS learning model has on students' understanding of mathematical concepts using the Hedges equation. As a result of the analysis, it was concluded that the ability to understand mathematical concepts of students taught using the CUPS learning model is better than the ability to understand mathematical concepts of students taught using direct learning models, at a significance level of 0.05. Further analysis obtained an effect size of 0, 53 showing that the effect of CUPS on students' ability to understand mathematical concepts is in the medium category. This means that the application of the CUP model does not have a major effect on students' mathematical concept understanding abilities. This fact provides consideration for educators and researchers to consider the variability that might mediate the effect of CUPS on students' mathematical concept understanding abilities.

Keywords: Conceptual Understanding Procedures (CUPS) Learning Model, Concept Understanding Ability, Effect Size

Abstrak

Penelitian ini bertujuan untuk mengetahui perbedaan kemampuan pemahaman konsep matematika dari siswa yang diajar dengan menggunakan model pembelajaran Conceptual Understanding Procedures (CUPS) dengan kemampuan pemahaman konsep matematika siswa yang diajar dengan menggunakan model pembelajaran langsung pada siswa kelas VIII SMPN 2 Langke Rembong NTT, Indonesia. Penelitian Quasi Experimental dengan desain Posttest-Only Control Group Design melibatkan siswa kelas VIII SMPN 2 Langke Rembong yang berjumlah 355 orang. Anggota sampel sebanyak 65 siswa yang dipilih menggunakan random sampling. Analisis data menggunakan statistik parametris melalui uji-t yang didahului dengan melakukan uji prasyarat analisis. Perhitungan effect sizes dilakukan untuk melihat seberapa besar pengaruh model pembelajaran CUPS terhadap kemampuan pemahaman konsep matematika siswa dengan menggunakan persamaan Hedges'g. Sebagai hasil analisis disimpulkan bahwa kemampuan pemahaman konsep matematika siswa yang diajar dengan menggunakan model pembelajaran CUPS lebih baik dibandingkan dengan kemampuan pemahaman konsep matematika siswa yang diajar dengan menggunakan model pembelajaran langsung, pada tingkat signifikansi 0,05. Analisis lanjutan diperoleh ukuran efek sebesar 0.53 menunjukkan bahwa pengaruh CUPS terhadap kemampuan

pemahaman konsep matematis siswa berada pada kategori sedang. Artinya penerapan model CUPs tidak berpengaruh besar terhadap kemampuan pemahaman konsep matematis siswa. Fakta ini memberikan pertimbangan bagi pendidik dan peneliti untuk mempertimbangkan variabelitas yang mungkin memediasi pengaruh CUPs terhadap kemampuan pemahaman konsep matematis siswa.

Kata Kunci: Model Pembelajaran Conceptual Understanding Procedures (CUPs), Kemampuan Pemahaman Konsep, Ukuran Efek

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INTRODUCTION

Developing and deepening understanding of mathematical concepts is an important foundation in teaching mathematics (Ali & Reid, 2012; Hadi & Kasum, 2015; Serhan & Almeqdadi, 2020; Tamur et al., 2018). With a good understanding of mathematical concepts, students will easily remember, use, and rearrange a concept that has been learned and can solve various variations of mathematical problems. This indicates that understanding the mathematical concepts is important to be instilled in students as early as possible so that they can solve problems better (Prahmana, 2013; Marlana & Nugrheni, 2019; Tamur & Kurnila, 2014).

Basically, to achieve quality education can be improved through the use of appropriate learning models (Haidich, 2010; Freeman-Green et al., 2015). Meanwhile, the learning process that starts with a simple demonstration by gathering information about the initial concepts of each student can increase their understanding of concepts (Nurlina et al., 2020; Tamur & Kurnila, 2014). One learning model that fulfills these characteristics is the Model Conceptual Understanding Procedures (CUPs). The CUP model is based on a constructivism flow in which students can build an understanding of their concepts by broadening or modifying their own experiences (Ibrahim et al., 2017; Prastiwi et al., 2014; Putri et al., 2020; Tamur, 2012).

Related studies have been conducted to examine the effect of CUPs on students' mathematical understanding abilities (Ardianti, 2019; Gita et al., 2018; Hikmah et al., 2014; Nurdiyah et al., 2018; Putri et al., 2020; Salsabila, 2019; Safitri et al., 2017). Most of the research conducted has reported the influence of CUPs on student learning outcomes and activities, students' mathematical abilities, and also overcoming students' misconceptions. Research that has been carried out has a combination of diverse models such as media-assisted CUPs and didactic design module-assisted CUPs. However, all of these studies have not analyzed the effect size, namely the magnitude of the effect of the CUP model on students' mathematical understanding abilities. On the other hand, effect sizes are very important for Education practitioners to consider their practices in the future (Tamur et al., 2020).

This study was conducted to fill this gap by examining the effect of CUPs and examining the effect sizes of applying CUPs models to students' mathematical understanding abilities. Effect size complements statistical hypothesis testing, and plays an important role in power analysis, and sample size planning. Thus, the findings of this study make a significant contribution to educators and researchers to evaluate the use of CUPs in the future based on the index of effect size obtained.

METHOD

This type of research is a quantitative research that is research that uses numerical information that is data collection, and interpretation of data to process and summarize information (Bacon-Shone, 2015). According to the research objectives, the research method used is the

experimental research design research Posttest-Only Control Group Design with a scheme suggested by (Ary et al., 2010) as table 1.

Table 1. Posttest-Only Control Group Design

Class	Independent Variable	Posttest
Experiment	X	Y ₂
Control	-	Y ₂

Information :

X : Treatment by applying models (CUPs)

Y₂ : Posttest two classes

The population in this study were all eighth-grade students of SMPN 2 Langke Rembong, Manggarai NTT, totaling 355 people and spread out in 11 (eleven) classes. The sample in this study consisted of two classes chosen randomly (random class) namely class VIII D with a total of 32 students as an experimental class taught using the CUPs model and class VIII F with a total of 33 students as a control class taught using conventional learning models namely direct learning. Before choosing these two classes randomly, a class equality test was previously carried out using even semester test scores for class VII T / A 2018/2019. The data was analyzed using the separated variance formula. The results of the data analysis show all classes are expressed equally in terms of mathematical ability.

The instrument used was a test in the form of essays (descriptions) totaling five (5) numbers. This test has been given at the end of the research activity so that data obtained about the ability to understand students' mathematical concepts. This test instrument was compiled based on indicators of the ability to understand mathematical concepts, and validity and reliability tests were performed. The data in this study were obtained from the results of tests of students' mathematical concept understanding abilities from the experimental and control classes on the coordinate system material provided after learning was completed. Analysis of the data used is descriptive and inferential statistical analysis. Hypothesis testing namely the difference test is done through t-test with a significance level of 0.05 where previously the prerequisite test is the normality test which is done by comparing the calculated Chi with Chi tables, with degrees of freedom (df) = k - 1 and $\alpha = 0.05$, and homogeneity test using the Fiser test.

Further analysis was carried out to measure the magnitude of the effect of the CUPs model on students' mathematical concept understanding abilities by calculating the effect size index of the CUPs model. The sample size used in this study is more than 30, then the effect size index uses the Hedges equation. The effect size calculation for this single study uses the effect size calculator program. Table 2 presents effect sizes based on classification Thalheimer & Cook (2002).

Table 2. Interpretation of Effect Size

Range of Effect Size	Effect Size Classification
-0.15 ES < 0.15	no effect
0.15 ES < 0.40	Low effect
0.40 ES < 0.75	Medium effect
0.75 ES < 1.10	High effect
1.10 ES < 1.45	Very high effect
ES 1.45	excellent effect

RESULTS AND DISCUSSION

Results

The results of descriptive statistics on the ability to comprehend mathematical concepts of students as a whole are presented in the following table 3:

Table 3. Descriptive Statistics Score Ability to understand students' mathematical concepts

Ideal Score	Experiment Class					Control Class				
	N	x_m	x_m	\bar{x}	S_d	N	x_m	x_m	\bar{x}	S_d
100	32	47	87	68.18	10.79	33	40	80	62.09	11.70

Table 3 shows that descriptively students who get CUPs learning are better than students who get conventional learning. Tables 4a, 4b, and 4c show the results of the normality test, homogeneity test, and T-test with a significance of 0.05.

Table 4a. Data Normality Test of Students' Mathematical Concept Understanding Ability

Class	N	$\chi^2_{c_i}$	$\chi^2_{t_i}$
Experiment	32	8.9249	9.8477
Control	33	4.2569	9.8477

Based on table 4a, it can be seen that both the experimental class and the control class $\chi^2_{c_i} < \chi^2_{t_i}$, which means that both classes are normally distributed.

Table 4b. Homogeneity of Students' Mathematics Understanding Ability Test Data

Class	α	F	F_{t_i}	Conclusion
Experiment	0,05	1.1757	1.7934	Homogeneous
Control				

Based on table 4b, it can be seen that $F_{c_i} = 1.1757 < F_{t_i} = 1.7934$, which means that the variance of both groups is homogeneous. Furthermore, to investigate whether there are significant differences in the ability to understand mathematical concepts between the two classes, parametric tests conducted with the t-test with the hypotheses tested are:

H_0 : The ability to understand mathematical concepts of students who are taught using the CUPs learning model is no better than those taught using the direct learning model.

H_1 : The ability to understand students' mathematical concepts taught by using the CUPs learning model is better than those taught using the direct learning model.

Table 4c. Uji Perbedaan Kemampuan Pemahaman Matematis Siswa

Class	N	α	t_{c_i}	t_{t_i}
Eksperiment	32	0.05	2.1809	1.6694
Control	33			

Based on Table 4c, it appears that $t_{c_i} > t_{t_i}$ means that H_0 is rejected or H_1 is accepted. Thus, the ability to understand mathematical concepts of students taught with the learning model Conceptual Understanding Procedures (CUPs) is better than students taught with the direct learning model

Further analysis is examining the size of the effect of the CUP model on students' mathematical concept understanding abilities. Based on the results of calculations using the effect size calculator the hedges effect size index obtained by 0.53 means that the effect of the CUP model on students' mathematical concept comprehension ability is in the medium category.

Discussion

Based on the results of the analysis it was concluded that the ability to understand the mathematical concepts of students taught by using CUPs learning models is better than the ability to understand mathematical concepts of students taught by using direct learning models, at a significance level of 0.05. Further analysis obtained an effect size of 0, 53 showing that the effect of CUPs on students' ability to understand mathematical concepts is in the medium category. This means that the application of the CUP model does not have a major effect on the ability to understand students' mathematical concepts.

CONCLUSION

Based on the results of the analysis it was concluded that the ability to understand the mathematical concepts of students taught by using CUPs learning models is better than the ability to understand mathematical concepts of students taught by using direct learning models, at a significance level of 0.05. Further analysis obtained an effect size of 0, 53 showing that the effect of CUPs on students' ability to understand mathematical concepts is in the medium category. This means that the application of the CUP model does not have a major effect on the ability to understand students' mathematical concepts.

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REFERENCES

- Ali, A. A., & Reid, N. (2012). Understanding mathematics: Some key factors. *European Journal of Educational Research*, 1(3), 283–299. <https://doi.org/10.12973/eu-jer.1.3.283>
- Ardianti, N. (2019). Pengaruh Model Pembelajaran Kooperatif Tipe Conceptual Understanding Procedures (Cups) Terhadap Hasil Belajar Matematika Siswa Kelas VII. *Inspiramatika*, 5(1), 34–42.
- Ary, D., Jacobs, L. C., Sorensen, C., & Razavieh, A. (2010). *Introduction to Research in Education* (8th ed.). Wadsworth Publishing.
- Bacon-Shone, J. (2015). *Introduction to Quantitative Research Methods: A Guide for Research Postgraduate Students at The University of Hong Kong* (Issue February). <https://doi.org/10.13140/2.1.4466.3040>
- Coe, R. (2002). It ' s the Effect Size , Stupid. *Educational Research*, September, 1–18.
- Freeman-Green, S. M., O'Brien, C., Wood, C. L., & Hitt, S. B. (2015). Effects of the SOLVE strategy on the mathematical problem solving skills of secondary students with learning disabilities. *Learning Disabilities Research and Practice*, 30(2), 76–90. <https://doi.org/10.1111/ldrp.12054>
- Gita, A., Murnaka, N. P., & Sukmawati, K. I. (2018). Penerapan Model Pembelajaran Conceptual Understanding Procedures (CUPS) sebagai Upaya Mengatasi Miskonsepsi Matematis Siswa. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, 2(1), 65. <https://doi.org/10.31331/medives.v2i1.521>

- Hadi, S., & Kasum, M. U. (2015). Pemahaman Konsep Matematika Siswa SMP Melalui Penerapan Model Pembelajaran Kooperatif Tipe Memeriksa Berpasangan (Pair Checks). *EDU-MAT: Jurnal Pendidikan Matematika*, 3(1), 59–66. <https://doi.org/10.20527/edumat.v3i1.630>
- Haidich, A. B. (2010). Meta-analysis in Medical Research. *Hippokratia*, 14(Supp 1), 29–37. <https://pubmed.ncbi.nlm.nih.gov/21487488/>
- Hikmah, N., Baidowi, B., & Kurniati, N. (2014). Penerapan Model Pembelajaran Conceptual Understanding Procedures (Cups) Untuk Meningkatkan Aktivitas Dan Hasil Belajar Matematika Siswa Kelas X Sma Negeri 7 Mataram. *Jurnal Pijar Mipa*, 9(2), 84–88. <https://doi.org/10.29303/jpm.v9i2.50>
- Ibrahim, I., Kosim, K., & Gunawan, G. (2017). Pengaruh Model Pembelajaran Conceptual Understanding Procedures (CUPS) Berbantuan Lkpd Terhadap Kemampuan Pemecahan Masalah Fisika. *Jurnal Pendidikan Fisika Dan Teknologi*, 3(1), 14. <https://doi.org/10.29303/jpft.v3i1.318>
- Marlena, L., & Nugrheni, E. A. (2019). Probit Regression Analysis in Estimating the Effect of Learning Assisted by Cabri 3D on Students' Mathematical Understanding Ability. *Al-Jabar : Jurnal Pendidikan Matematika*, 10(2), 319–326. <https://doi.org/10.24042/ajpm.v10i2.4729>
- Nurdiyah, Suyitno, H., & Junaedi, I. (2018). Education Research Mathematical Connections Ability Based on Personality Types in Conceptual Understanding Procedures Model Article Info. *Unnes Journal of Mathematics*, 7(1), 9–17. <http://journal.unnes.ac.id/sju/index.php/ujmer>
- Nurlina, N., Lestari, R. A., & Riskawati, R. (2020). Application of learning models conceptual understanding procedures by using experimental methods on understanding physics concepts of students Application of learning models conceptual understanding procedures by using experimental methods on understandin. *The 9th International Conference on Theoretical and Applied Physics*, 1–7. <https://doi.org/10.1088/1742-6596/1572/1/012009>
- Prahmana, R. C. I. (2013). Designing Division Operation Learning In The Mathematics. *The First South East Asia Design/Development Research (SEA-DR), April 2013*, 391–398.
- Prastiwi, I., Soedjoko, E., & Mulyono. (2014). Efektivitas Pembelajaran Conceptual Understanding Procedures Untuk Meningkatkan Kemampuan Siswa Pada Aspek Koneksi Matematika. *Kreano: Jurnal Matematika Kreatif-Inovatif*, 5(1), 41–47. <https://doi.org/10.15294/kreano.v5i1.3276>
- Putri, D. A., Istihana, I., & Putra, R. W. Y. (2020). Pengaruh Pembelajaran Conceptual Understanding Procedures Berbantuan Modul Desain Didaktis Terhadap Kemampuan Pemahaman Konsep. *Prima: Jurnal Pendidikan Matematika*, 4(1), 64. <https://doi.org/10.31000/prima.v4i1.1652>
- Safitri, Ikshsan, M., & Susanti. (2017). Penerapan Model Pembelajaran Conceptual Understanding Procedures. 6(3), 53–61. [https://doi.org/10.1016/S0928-0987\(02\)00057-X](https://doi.org/10.1016/S0928-0987(02)00057-X)
- Salsabila, F. (2019). Pengaruh Model Pembelajaran Conceptual Understanding Procedures (Cups) Berbantuan Media Handout Terhadap Kemampuan Pemahaman Konsep Ditinjau Dari Gaya Belajar di SMK N 3 Pekalongan. *Delta: Jurnal Ilmiah Pendidikan Matematika*, 7(1), 37. <https://doi.org/10.31941/delta.v7i1.922>
- Serhan, D., & Almeqdadi, F. (2020). Students' Perceptions of Using MyMathLab and WebAssign in Mathematics Classroom. *International Journal of Technology in Education and Science*, 4(1), 12–17. <https://doi.org/10.46328/ijtes.v4i1.23>
- Tamur, M. (2012). *Pembelajaran Kooperatif Tipe Stad Berbasis Etnomatematika Sebagai Upaya Meningkatkan Kemampuan Pemahaman Dan Komunikasi Matematis Mahasiswa*

- PGSD : Mengintegrasikan Tarian Caci Ke dalam Bahan Ajar di STKIP St Paulus Ruteng - Flores NTT* [Universitas Pendidikan Indonesia]. <http://repository.upi.edu/7778/>
- Tamur, M., Juandi, D., & Adem, A. M. G. (2020). Realistic Mathematics Education in Indonesia and Recommendations for Future Implementation : A Meta-Analysis Study. *Jurnal Teori Dan Aplikasi Matematika*, 4(1), 17–27. <https://doi.org/10.31764/jtam.v4i1.1786>
- Tamur, M., & Kurnila, V. S. (2014). *Pengaruh Pembelajaran Menggunakan pendekatan Induktif Berbasis DGS Software Cabri 2d Untuk Meningkatkan Kemampuan Pemahaman Matematis Siswa Sekolah Dasar*. 6(2), 97–106.
- Tamur, M., Sennen, E., & Men, F. E. (2018). *Konsep Dasar Matematika Berbasis CAS dan DGS*. STKIP St. Paulus Ruteng.
- Thalheimer, W., & Cook, S. (2002). *Effect_Sizes_pdf5.pdf*. *Work Learning Research*, August, 1–9. https://pdfs.semanticscholar.org/d7f0/c3a171ffd6bad4297feeb708a2d79e06da8b.pdf?_ga=2.149295606.1950164162.1568100777-2068894367.1568100777