

**PENGARUH STRATEGI PEMBELAJARAN *Predict- Discuss I- Explain I- Observe- Discuss II- Explain II* (PDEODE) TERHADAP BEBAN KOGNITIF DAN KEMAMPUAN PEMECAHAN MASALAH SISWA SMA PADA MATERI SISTEM EKSKRESI**

**SKRIPSI**

*Diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar Sarjana  
Pendidikan Biologi*



disusun oleh :

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FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM  
UNIVERSITAS PENDIDIKAN INDONESIA  
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2022**

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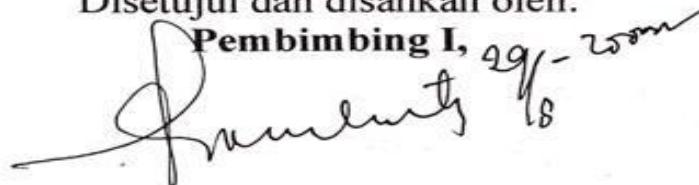
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**NUR'AENI PRATIWI**

**PENGARUH STRATEGI PEMBELAJARAN**  
*Predict- Discuss I- Explain I- Observe- Discuss II-*  
*Explain II PDEODE TERHADAP BEBAN*  
**KOGNITIF DAN KEMAMPUAN PEMECAHAN**  
**MASALAH SISWA SMA PADA MATERI SISTEM**  
**EKSKRESI**

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## **ABSTRAK**

Penelitian ini berjudul pengaruh strategi pembelajaran *Predict-Discuss I-Explain I-Observe-Discuss II-Explain II* (PDEODE) terhadap beban kognitif dan kemampuan pemecahan masalah siswa SMA pada materi sistem ekskresi. Tujuan penelitian ini adalah untuk menganalisis pengaruh strategi pembelajaran *Predict-Discuss I-Explain I-Observe-Discuss II-Explain II* (PDEODE) terhadap beban kognitif dan kemampuan pemecahan masalah siswa SMA pada materi sistem ekskresi. Desain penelitian ini menggunakan *non-equivalent control group design* dengan subjek penelitian adalah siswa SMA kelas XI IPA yang terdiri dari kelas eksperimen yang menggunakan strategi pembelajaran PDEODE dan kelas kontrol yang menggunakan pembelajaran konvensional yaitu diskusi dan presentasi. Instrumen penelitian yang digunakan untuk beban kognitif (*intrinsic cognitive load, extraneous cognitive load* dan *germane cognitive load*) berupa kuesioner *Subjective Rating Scale*, sementara untuk kemampuan pemecahan masalah digunakan soal tes berupa soal uraian dan angket respon siswa serta lembar observasi keterlaksanaan penerapan strategi pembelajaran PDEODE. Berdasarkan instrumen penelitian didapatkan data hasil penelitian bahwa tidak terdapat beban kognitif baik pada kelas eksperimen maupun kelas kontrol sementara untuk kemampuan pemecahan masalah baik kelas eksperimen maupun kelas kontrol tidak berbeda signifikan. Namun, tidak terdapat korelasi antara GCL dengan hasil kemampuan pemecahan masalah. Hasil respon siswa setelah pembelajaran dengan strategi PDEODE sangat positif. Berdasarkan data hasil penelitian tersebut dapat disimpulkan bahwa strategi pembelajaran PDEODE tidak berpengaruh terhadap beban kognitif dan kemampuan pemecahan masalah pada materi sistem ekskresi.

**Kata kunci :** Strategi pembelajaran PDEODE, beban kognitif, dan kemampuan pemecahan masalah.

## **ABSTRACT**

This study is entitled the application of the Predict-Discuss I-Explain I-Obsvserve-Discuss II-Explain II (PDEODE) learning strategy to the cognitive load and problem-solving ability of high school students on the excretory system material. The purpose of this study is to obtain information about the effect of the application of the Predict-Discuss I-Explain I-Obsvserve-Discuss II-Explain II (PDEODE) learning strategy on the cognitive load and problem-solving ability of high school students on the excretory system material. The design of this study used a non-equivalent control group design with the research subjects being high school students of class XI science consisting of experimental classes and control classes. The research instruments used for cognitive load (intrinsic cognitive load, extraneous cognitive load and germane cognitive load) are in the form of a Subjective Rating Scale questionnaire, while for problem solving ability, test questions are used in the form of description questions and to obtain information about obstacles obtained from student response questionnaires and observation sheets for the implementation of PDEODE learning strategies. Based on the research instruments, data from the study obtained that there was no cognitive load in both the experimental class and the control class while for problem-solving ability, both the experimental class and the control class did not differ significantly. However, there is no correlation between the GCL and the results of the problem-solving ability. The results of student responses after learning with the PDEODE strategy are very positive. Based on the data from the study, it can be concluded that the PDEODE learning strategy has no effect on cognitive load and problem-solving ability in the excretory system material.

**Key word:** PDEODE learning strategies, cognitive load, and problem-solving ability.

## DAFTAR ISI

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## **DAFTAR PUSTAKA**

- Anagün, S. S. (2018). Teachers' perceptions about the relationship between 21st century skills and managing constructivist learning environments. *International Journal of Instruction*, 11(4), 825–840. <https://doi.org/10.12973/iji.2018.11452a>
- Arikunto, S. (2013). *Prosedur Penelitian: Sebuah Pendekatan Praktik* (R. Cipta (ed.)).
- Borowski, T. (2019). P21 framework for 21st century learning. *The Battelle for Kids, August*.
- Bransford, J. D., Sherwood, R. D., & Sturdevant, T. (1984). *Teaching thinking and problem solving. Technical report series 85.1.2.* 1–37.  
<http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED262755&site=ehost-live>
- Chu, J., Rittle-Johnson, B., & Fyfe, E. R. (2017). Diagrams benefit symbolic problem-solving. *British Journal of Educational Psychology*, 87(2), 273–287.  
<https://doi.org/10.1111/bjep.12149>
- Cooper, G. (1990). Cognitive load theory as an aid for instructional design. *Australasian Journal of Educational Technology*, 6(2). <https://doi.org/10.14742/ajet.2322>
- Coştu, B. (2008). Learning science through the PDEODE teaching strategy: Helping students make sense of everyday situations. *Eurasia Journal of Mathematics, Science and Technology Education*, 4(1), 3–9. <https://doi.org/10.12973/ejmste/75300>
- Creswell, J. . (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4 ed.). Sage.
- de Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science*, 38(2), 105–134.  
<https://doi.org/10.1007/s11251-009-9110-0>
- Dharma. (2008). Pembangunan Pendidik Tenaga Kependidikan Menghadapi Tantangan Abad 21. *Kuliah Umum Bagi Mahasiswa Program Pascasarjana UM Tahun Akademik 2008/2009*.
- Ferdinand, F., & Ariebowo, M. (2009). *Praktis Belajar Biologi 2 untuk SMA/MA Kelas XI* (D. A. Sobardan (ed.)). Departemen Pendidikan Nasional.

- Hanum, E. L. (2009). *Biologi 2 : Kelas XI SMA dan MA*. Pusat Perbukuan, Departemen Pendidikan Nasional, 2009.
- Ilma Rizki Nur Afifah. (2016). *Method Reviewed From Man Yogyakarta Students ' Learning Achievement. 2*.
- Irnaningtyas. (2019). *Biologi Untuk SMA/MA Kelas XI*. Erlangga.
- Johari, J., Sahari, J., Abd Wahab, D., Abdullah, S., Abdullah, S., Omar, M. Z., & Muhamad, N. (2011). Difficulty index of examinations and their relation to the achievement of programme outcomes. *Procedia - Social and Behavioral Sciences*, 18, 71–80. <https://doi.org/10.1016/j.sbspro.2011.05.011>
- Jonassen, D. H., & Tessmer, M. (1996). An outcomes-based taxonomy for the design, evaluation, and research on instructional systems. *Training Research Journal*, 2, 97–109. <http://tecfa.unige.ch/staf/staf-e/vimare/staf18/Documentation/cidrtax.pdf>
- Kalyuga, S. (2010). Schema acquisition and sources of cognitive load. *Cognitive Load Theory*, 48–64. <https://doi.org/10.1017/CBO9780511844744.005>
- Kalyuga, S. (2011). Informing: A cognitive load perspective. *Informing Science*, 14(1), 33–45. <https://doi.org/10.28945/1349>
- Kementerian Pendidikan dan Kebudayaan. (2018). *Silabus Mata Pelajaran Sekolah Menengah Atas/Madrasah Aliyah*. Kemendikbud.
- Klepsch, M., Schmitz, F., & Seufert, T. (2017). Development and validation of two instruments measuring intrinsic, extraneous, and germane cognitive load. *Frontiers in Psychology*, 8(NOV), 1–18. <https://doi.org/10.3389/fpsyg.2017.01997>
- Knight, M. J., & Tlauka, M. (2017). Interactivity in map learning: The effect of cognitive load. *Spatial Cognition and Computation*, 17(3), 185–198. <https://doi.org/10.1080/13875868.2016.1211661>
- Kolari, S., Viskari, E. L., & Savander-Ranne, C. (2005). Improving student Learning in an environmental engineering program with a research study project. *International Journal of Engineering Education*, 21(4 PART I AND II), 702–711.
- Lavoie, D. R. (1993). The development, theory, and application of a cognitive-network model of prediction problem solving in biology. *Journal of Research in Science Teaching*, 30(7), 767–785. <https://doi.org/10.1002/tea.3660300713>
- Luthfi, I. A., Muharomah, D. R., Ristanto, R. H., & Miarsyah, M. (2019). Pengembangan tes kemampuan pemecahan masalah pada isu pencemaran lingkungan. *Jurnal BIOEDUIN*, 9(2), 11–21. <http://journal.uinsgd.ac.id/index.php/bioeduin/article/view/5892>
- Maranges, H. M., Schmeichel, B. J., & Baumeister, R. F. (2017). Comparing cognitive load and self-regulatory depletion: Effects on emotions and cognitions. *Learning and Instruction*, 51(November), 74–84. <https://doi.org/10.1016/j.learninstruc.2016.10.010>
- Mayer, R. E. (2002). Rote versus meaningful learning. *Theory into Practice*, 41(4), 226–232. [https://doi.org/10.1207/s15430421tip4104\\_4](https://doi.org/10.1207/s15430421tip4104_4)
- Meissner, B., & Bogner, F. (2013). Towards Cognitive Load Theory as Guideline for

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- Instructional Design in Science Education. *World Journal of Education*, 3(2), 24–37. <https://doi.org/10.5430/wje.v3n2p24>
- Meissner, B., & Bogner, F. X. (2012). Science teaching based on cognitive load theory: Engaged students, but cognitive deficiencies. *Studies in Educational Evaluation*, 38(3–4), 127–134. <https://doi.org/10.1016/j.stueduc.2012.10.002>
- Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63(2), 81–97. <https://doi.org/10.1037/h0043158>
- Moray, N. (1979). *Mental workload: Its theory and measurement* (Planum (ed.)).
- Moreno, R., & Park, B. (2010). Cognitive load theory: Historical development and relation to other theories. *Cognitive Load Theory*, 7–28. <https://doi.org/10.1017/CBO9780511844744.003>
- Mukhopadhyay, D. R. (2013). Problem Solving In Science Learning - Some Important Considerations of a Teacher. *IOSR Journal of Humanities and Social Science*, 8(6), 21–25. <https://doi.org/10.9790/0837-0862125>
- Nugraheni, S. W. (2011). Penerapan Model POE (Predict, Observe, Explain) untuk Meningkatkan Pembelajaran IPA Siswa Kelas III SDN Karangbesuki 4 Malang. *Skripsi Universitas Negeri Makassar*.
- Peng, C. N. (2004). *Successful Problem-Based Learning for Primary and Secondary Classrooms*. Federal Publications.
- Qudsyi, H., Indriaty, L., Herawaty, Y., Saifullah, -, Khaliq, I., & Setiawan, J. (2011). Pengaruh Metode Pembelajaran Kooperatif (Cooperative Learning) Dan Motivasi Belajar Terhadap Prestasi Belajar Siswa Sma. *Proyeksi*, 6(2), 34. <https://doi.org/10.30659/p.6.2.34-49>
- Rahmat, A., & Hindriana, A. F. (2014). Beban Kognitif Mahasiswa dalam Pembelajaran Fungsi Terintegrasi Struktur Tumbuhan berbasis Dimensi Belajar. *Jurnal Ilmu Pendidikan*, 20(1), 66–74.
- Rahmat, A., Soesilawaty, S. A., Fachrunnisa, R., Wulandari, S., Suryati, Y., & Rohaeni, H. (2014). Beban Kognitif Siwa SMA pada Pembelajaran Biologi Interdisiplin Berbasis Dimensi Belajar. *Prosiding Mathematics and Science Forum 2014*, 475–480.
- Rindah, M. A. K., Dwiaستuti, S., & Rinanto, Y. (2019). Excretory system learning in senior high school: comparative analysis of students' problem solving skills. *Biosfer*, 12(2), 249–257. <https://doi.org/10.21009/biosferjpb.v12n2.249-257>
- Roger, T., & Johnson, D. W. (2002). *Overview Learning of Cooperative*. 1–35.
- Scharfenberg, F. J., & Bogner, F. X. (2010). Instructional efficiency of changing cognitive load in an out-of-school laboratory. *International Journal of Science Education*, 32(6), 829–844. <https://doi.org/10.1080/09500690902948862>
- Setyadi, I. M. A., Sudiarta, I. G. P., & Mertasari, N. M. S. (2019). The effect of predict-observe-explain (POE) learning model using open-ended problem (OEP) towards students' mathematical problem solving skill. *Jurnal Pendidikan Dan Pengajaran*, Nur'aeni Pratiwi, 2022
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52(3), 133–144.

- Slavin, R. E. (1980). Cooperative Learning. *Review of Educational Research*, 50(2), 315–342. <https://doi.org/10.3102/00346543050002315>
- Slavin, R. E. (1995). *Cooperative Learning: Theory, research, and practice*. Allyn & Bacon.
- Soegiyono. (2011). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*.
- Suparmi, S. (2013). Pembelajaran Kooperatif dalam Pendidikan Multikultural. *Jurnal Pembangunan Pendidikan: Fondasi Dan Aplikasi*, 1(1), 108–118. <https://doi.org/10.21831/jppfa.v1i1.1055>
- Suwarno. (2009). *Panduan Pembelajaran Biologi XI untuk SMA & MA* (Riswanti (ed.)). Departemen Pendidikan Nasional.
- Sweller, J. (1988). Cognitive Load During Problem Solving: Effects on Learning - Sweller - 2010 - Cognitive Science - Wiley Online Library. *Cognitive Science*, 285, 257–285. [https://doi.org/10.1016/0364-0213\(88\)90023-7](https://doi.org/10.1016/0364-0213(88)90023-7)
- White, R. T., & Gunstone, R. F. (1992). *Probing Understanding* (F. Press (ed.)).
- Wijaya, E. Y., Sudjimat, D. A., & Nyoto, A. (2016). Transformasi Pendidikan Abad 21 Sebagai Tuntutan Pengembangan Sumber Daya Manusia di era Global. *Jurnal Pendidikan*, 1, 263–278.
- Yamin, M., & Ansari, B. I. (2008). *Taktik mengembangkan kemampuan individual siswa*. Gaung Persada Press.
- Zainul, A. & Nasoetion, N. (2001). *Penilaian Hasil Belajar*. Direktorat Jendral Pendidikan Tinggi.
- Zubaidah, S. (2016). Keterampilan Abad Ke-21: Keterampilan Yang Diajarkan Melalui Pembelajaran. *Seminar Nasional Pendidikan Dengan Tema “Isu-Isu Strategis Pembelajaran MIPA Abad 21, Desember*, 1–17.
- Zulfah. (2017). Pengaruh Penerapan Model Pembelajaran Kooperatif Tipe Think Pair Share dengan Pendekatan Heuristik terhadap Kemampuan Pemecahan Masalah Matematis Siswa MTS Negeri Naumbai Kecamatan Kampar. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 1(2), 1–12. <https://doi.org/10.31004/cendekia.v1i2.23>.