LOTUS Education Jurnal
Universitas Muhammadiyah Sidenreng Rappang
Vol. 1 – No. 1, year (2024), page 33-39
https://jurnal.umsrappang.ac.id/LOTUS/about
ISSN 20XX20XXX (Print) / 25XX-04XX) (Online) /

Enhancing Students' Conceptual Understanding through the Generative Learning Model on the Topic of 'Light

Roni
[1]*ITkes Muhammadiyah Sidrap*
.
* Corresponding Author. E-mail: auliaroni86@gmail.com

Abstract

This study aimed to investigate the effect of the generative learning model on students' conceptual understanding of the topic "Light" at SMA Muhammadiyah Pangsid. The research utilized a pre-experimental design with a one-group pretest-posttest approach. The population consisted of all students at SMA Muhammadiyah Pangsid, and the sample was selected through simple random sampling. A multiple-choice test was used as the research instrument to measure students' conceptual understanding before and after implementing the generative learning model. Data were analyzed using paired t-tests, and the results revealed a significant improvement in students' understanding, with a -tobs value (-59.73) less than -ttable (-2.093) at a significance level of $\alpha = 0.05$. These findings demonstrate that the generative learning model effectively enhances students' conceptual understanding of physics, particularly in the topic of "Light." The study emphasizes the importance of active learning models in fostering deeper conceptual comprehension among students.

Keywords: generative learning model, conceptual understanding, physics education, light, SMA Muhammadiyah Pangsid.

Abstrak

Penelitian ini bertujuan untuk mengkaji pengaruh model pembelajaran generatif terhadap pemahaman konseptual siswa pada topik "Cahaya" di SMA Muhammadiyah Pangsid. Penelitian ini menggunakan desain pra-eksperimen dengan pendekatan one-group pretest-posttest. Populasi penelitian mencakup seluruh siswa di SMA Muhammadiyah Pangsid, dengan sampel dipilih menggunakan teknik random sampling sederhana. Instrumen penelitian berupa tes pilihan ganda digunakan untuk mengukur pemahaman konseptual siswa sebelum dan sesudah penerapan model pembelajaran generatif. Analisis data dilakukan menggunakan uji t berpasangan, dan hasilnya menunjukkan peningkatan signifikan dalam pemahaman siswa, dengan nilai -tobservasi (-59,73) lebih kecil dari -ttabel (-2,093) pada tingkat signifikansi $\alpha = 0,05$. Temuan ini menunjukkan bahwa model pembelajaran generatif efektif meningkatkan pemahaman konseptual siswa pada topik "Cahaya." Penelitian ini menekankan pentingnya model pembelajaran aktif dalam mendorong pemahaman konsep yang lebih mendalam di kalangan siswa.

Kata Kunci: model pembelajaran generatif, pemahaman konseptual, pendidikan fisika, cahaya, SMA Muhammadiyah Pangsid.

INTRODUCTION

Physics is a branch of science that studies natural phenomena observable by the human senses. It encompasses facts, concepts, and principles derived from systematic observations of phenomena. Ideally, physics should be taught in a way that sparks students' interest, making the learning process enjoyable, engaging, and motivating, thereby encouraging active participation (Subana, 2011).Conceptual understanding is a fundamental and essential stage in learning physics. It allows students to grasp the material provided by the teacher and validate their understanding effectively. However, many students find physics challenging due to a lack of comprehension of the concepts taught. This issue has been observed through interviews with students and subject teachers, as well as through assessments of students' conceptual understanding (Rosdianto, Murdani, & Hendra, 2017).

To address the low levels of conceptual understanding, it is necessary to apply an appropriate teaching approach. A constructivist learning model, such as the generative learning model, can encourage students to discover, process, and formulate their own understanding. This approach aligns with the generative learning model, which views the human brain not as a passive receiver of information but as an active processor that interprets and draws conclusions from information (Osborne & Wittrock, 1985). Generative learning involves active mental engagement, enabling learners to follow and internalize the learning process effectively (Ritchie & Volkl, 2000; Flick, 1996).

This research focuses on the application of the generative learning model to improve students' conceptual understanding of the topic "Light." It is expected that this model will foster greater engagement and comprehension among students.

LITERATURE REVIEW

The generative learning model is rooted in the constructivist theory, emphasizing that knowledge is actively constructed by learners rather than passively absorbed. According to Osborne and Wittrock (1985), the generative learning model posits that the human mind processes information actively, interpreting and organizing it to form meaningful conclusions. This approach is particularly beneficial in science education, as it encourages students to engage with and internalize complex concepts.

Generative learning involves key mental activities such as organizing, integrating, and synthesizing information. Ritchie and Volkl (2000) highlighted that this model effectively enhances students' conceptual understanding by allowing them to link new knowledge with prior experiences. This process not only improves retention but also deepens comprehension of scientific principles.In the context of physics education, conceptual understanding is vital for students to master abstract topics like "Light." Previous research by Flick (1996) indicated that implementing generative learning strategies leads to significant improvements in students' ability to grasp and apply physics concepts. Additionally, Rosdianto (2017) demonstrated that generative learning models foster active participation, which is critical for developing a deeper understanding of physics principles.In this study, the generative learning model was applied to the topic of "Light" to assess its impact on students' conceptual understanding. The model’s emphasis on active engagement and self-directed discovery aligns with the requirements of physics education, where understanding fundamental concepts forms the foundation for further learning.

.

RESEARCH METHOD

This study employed a quantitative approach using a pre-experimental design with a one-group pretest-posttest method (Sugiyono, 2012). The design involves assessing the same group of participants before and after the intervention to determine the effect of the treatment. The research was conducted with students from class VIII E at SMA Muhammadiyah Pangsid, selected using a simple random sampling technique. This method ensures that every individual in the population has an equal chance of being selected.

Research Design

The design can be described as follows:

Pretest (O_1) Treatment (X) Posttest (O_2)

- O_1: Pretest to measure students' initial conceptual understanding.
- X: Treatment using the generative learning model.
- O_2: Posttest to measure conceptual understanding after the treatment.

Variables

- Independent Variable: The generative learning model.
- Dependent Variable: Students' conceptual understanding of the topic "Light."

Population and Sample

The population included all eighth-grade students at SMA Muhammadiyah Pangsid. The sample consisted of students from class VIII E, selected randomly to ensure objectivity.

Instruments

A multiple-choice test consisting of 30 items was used to assess students' conceptual understanding. The test was validated through a trial process before being implemented in the study. Data collection included pretests and posttests to evaluate the effect of the generative learning model.

Data Analysis

Data were analyzed using statistical techniques:

1. Normality Test: To verify whether the data followed a normal distribution, a Chi-square test was used. The criteria were as follows: if χ^2obs < χ^2table, the data is considered normally distributed.
2. Paired t-test: This test was applied to compare the pretest and posttest scores to determine the significance of the treatment. The hypotheses were:
    - H_0: The generative learning model has no significant effect on students' conceptual understanding.
    - H_a: The generative learning model significantly improves students' conceptual understanding.

The decision rule was based on the calculated t-value: if -tobs < -ttable, H_0 is rejected, indicating a significant improvement in students' understanding due to the treatment.

FINDINGS AND DISCUSSION

Findings

The findings of this study are based on the analysis of pretest and posttest scores to assess the impact of the generative learning model on students' conceptual understanding of the topic "Light." The results are summarized in Table 1.

Table 1. Pretest and Posttest Results

Measurement	Pretest	Posttest	Difference
Average Score	60.67	74.00	13.33
Standard Deviation	3.02	2.85	-
Highest Score	66.67	80.00	-
Lowest Score	53.33	66.67	-

The average posttest score (74.00) was significantly higher than the pretest score (60.67), showing an improvement of 13.33 points. This increase indicates that the generative learning model effectively

enhanced students' understanding of the concept.

The normality test was performed to determine if the data followed a normal distribution. The results are shown in Table 2.

Table 2. Normality Test Results

Test Score	χ^2obs (Pretest)	χ^2table (Pretest)	χ^2obs (Posttest)	χ^2table (Posttest)	Result
Normality Test	1.616	5.991	0.785	5.991	Normal

The pretest and posttest scores were found to be normally distributed, which allowed the use of parametric statistical analysis.

Using a paired t-test, the calculated t-value was -tobs = -59.73, which is less than the critical t-value (-ttable = -2.093) at a significance level of $\alpha = 0.05$. Therefore, the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted, confirming that the generative learning model had a significant positive effect on students' conceptual understanding.

Discussion

The findings demonstrate that the generative learning model is an effective teaching strategy for enhancing students' conceptual understanding. Prior to the intervention, traditional teacher-centered methods dominated the learning process, leading to passive participation and limited engagement among students. After implementing the generative learning model, students became more active in the learning process, leading to improved comprehension of the topic.

These results align with the theoretical framework of generative learning, which emphasizes active mental engagement and the construction of knowledge through meaningful learning activities (Osborne & Wittrock, 1985). Similar findings have been reported in previous studies, such as those by Ritchie & Volkl (2000) and Flick (1996), which highlight the model's effectiveness in improving conceptual understanding in science education.

This study reaffirms the importance of employing active learning strategies, particularly in subjects like physics, where conceptual understanding forms the foundation for more complex topics. By actively engaging with the material, students can link new information to prior knowledge, fostering deeper and more sustainable learning outcomes.

CONCLUSION

Based on the findings and discussion, it can be concluded that the generative learning model significantly enhances students' conceptual understanding of the topic "Light" in class VIII E at SMA Muhammadiyah Pangsid. The implementation of this model resulted in a measurable improvement in students' performance, as evidenced by the significant increase in posttest scores compared to pretest scores.

The generative learning model's emphasis on active engagement, self-directed discovery, and mental involvement fosters a deeper understanding of concepts, making it an effective strategy for teaching physics. This study highlights the potential of the generative learning model to transform traditional teacher-centered methods into more interactive and meaningful learning experiences for students.

Future studies are encouraged to explore the application of the generative learning model in other topics and subjects to further validate its effectiveness and adaptability in various educational settings.

REFERENCES

1. Arikunto, S. (2010). *Dasar-Dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara.
2. Flick, L. B. (1996). Understanding a Generative Learning Model of

Instruction. *Journal of Science Teacher Education*, 7(2), 115–126.
3. Osborne, R., & Wittrock, M. C. (1985). The Generative Learning Model and Its Implications for Science Education. *Studies in Science Education*, 12(1), 59–87.
4. Ritchie, D., & Volkl, C. (2000). Effectiveness of Two Generative Learning Strategies in the Science Classroom. *School Science and Mathematics*, 100(2), 83–89.
5. Rosdianto, H. (2017). Pengaruh Model Generative Learning terhadap Hasil Belajar Ranah Kognitif Siswa pada Materi Hukum Newton. *Jurnal Pendidikan Fisika dan Keilmuan*, 3(2), 66–69.
6. Rosdianto, H., Murdani, E., & Hendra. (2017). The Implementation of POE (Predict Observe Explain) Model to Improve Student's Concept Understanding on Newton's Law. *Jurnal Pendidikan Fisika*, 6(1), 55–57.
7. Subana, M. (2011). *Dasar-dasar Penelitian Ilmiah*. Bandung: Pustaka Setia.
8. Sugiyono. (2007). *Statistika untuk Penelitian*. Bandung: Alfabeta.
9. Sugiyono. (2012). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
10. Taber, K. S. (2001). Constructivism as Educational Theory: Contingency in Learning, and Optimally Guided Instruction. *Educational Studies*, 27(1), 39–54.
11. Mayer, R. E. (2009). *Multimedia Learning* (2nd ed.). Cambridge: Cambridge University Press.
12. Bruner, J. S. (1960). *The Process of Education*. Cambridge: Harvard University Press.
13. Duit, R., & Treagust, D. F. (2003). Conceptual Change: A Powerful Framework for Improving Science Teaching and Learning. *International Journal of Science Education*, 25(6), 671–688.
14. Novak, J. D., & Gowin, D. B. (1984). *Learning How to Learn*. Cambridge: Cambridge University Press.
15. Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge: Harvard University Press.
16. Jonassen, D. H. (1991). Objectivism versus Constructivism: Do We Need a New Philosophical Paradigm? *Educational Technology Research and Development*, 39(3), 5–14.
17. Hake, R. R. (1998). Interactive-engagement versus Traditional Methods: A Six-thousand-student Survey of Mechanics Test Data for Introductory Physics Courses. *American Journal of Physics*, 66(1), 64–74.
18. Slavin, R. E. (2006). Educational Psychology: Theory and Practice. Boston: Allyn & Bacon.
19. Piaget, J. (1952). *The Origins of Intelligence in Children*. New York: International Universities Press.
20. Driver, R., Asoko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing Scientific Knowledge in the Classroom. *Educational Researcher*, 23(7), 5–12.