

**PENGARUH EXAMPLE BASED LEARNING DALAM PEMBELAJARAN
SISTEM RESPIRASI BERBASIS MASALAH TERHADAP PENGUASAAN
KONSEP DAN KEMAMPUAN BERPIKIR KREATIF SISWA SMA**

SKRIPSI

diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar
Sarjana Pendidikan Biologi



Oleh:

Lina Amelia

NIM 2000154

PROGRAM STUDI PENDIDIKAN BIOLOGI
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN
ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
BANDUNG

2024

**PENGARUH EXAMPLE BASED LEARNING DALAM PEMBELAJARAN
SISTEM RESPIRASI BERBASIS MASALAH TERHADAP PENGUASAAN
KONSEP DAN KEMAMPUAN BERPIKIR KREATIF SISWA SMA**

Oleh:

Lina Amelia

Skripsi ini diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana
Pendidikan pada Program Studi Pendidikan Biologi Fakultas Pendidikan
Matematika dan Ilmu Pengetahuan Alam

© Lina Amelia

UNIVERSITAS PENDIDIKAN INDONESIA

2024

Hak cipta dilindungi Undang-undang Skripsi ini tidak boleh diperbanyak
seluruhnya atau sebagian dengan dicetak ulang, difotokopi, atau cara lainnya
tanpa izin dari penulis

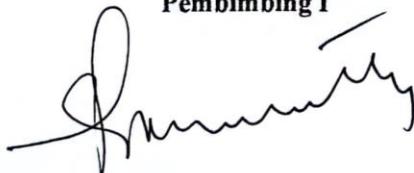
LEMBAR PENGESAHAN

LINA AMELIA

**PENGARUH EXAMPLE BASED LEARNING DALAM PEMBELAJARAN
SISTEM RESPIRASI BERBASIS MASALAH TERHADAP PENGUASAAN
KONSEP DAN KEMAMPUAN BERPIKIR KREATIF SISWA SMA**

Disetujui dan disahkan oleh:

Pembimbing I



Dra. Soesy Asiah Soesilawaty, M. S.

NIP 195904011983032002

Pembimbing II



Dr. rer. nat. Adi Rahmat M.Si.

NIP 196512301992021001

Mengetahui,

Ketua Program Studi Pendidikan Biologi



Dr. Kusnadi, M.Si.

NIP. 196805091994031001

ABSTRAK

Pembelajaran berbasis masalah adalah model pembelajaran yang telah terbukti efektif meningkatkan pembelajaran siswa. Namun, terkadang siswa merasa kesulitan dalam melaksanakan pembelajaran berbasis masalah. Tujuan dari penelitian ini adalah untuk mendapatkan informasi terkait pengaruh *example based learning* dalam pembelajaran sistem respirasi berbasis masalah terhadap penguasaan konsep dan kemampuan berpikir kreatif siswa. Metode penelitian yang digunakan adalah *quasy experiment* dengan desain penelitian *non-equivalent control group design*. Subjek penelitian terdiri dari 27 siswa kelas eksperimen yang diberi perlakuan dengan penerapan *example based learning* dalam pembelajaran sistem respirasi berbasis masalah dan 24 siswa kelas kontrol dengan pembelajaran sistem respirasi berbasis masalah. Data penelitian didasarkan pada hasil *pre-test* dan *post-test* penguasaan konsep berupa soal pilihan ganda, *post-test* kemampuan berpikir kreatif berupa soal uraian, dan angket respons siswa terhadap pembelajaran *example based learning* dalam pembelajaran sistem respirasi berbasis masalah. Temuan pada penelitian ini menunjukkan terdapat perbedaan hasil yang signifikan antara penguasaan konsep siswa kelas eksperimen dan kelas kontrol. Sedangkan tidak terdapat perbedaan yang signifikan antara kemampuan berpikir kreatif siswa kelas eksperimen dan kelas kontrol. Terdapat hubungan yang signifikan antara penguasaan konsep dengan kemampuan berpikir kreatif siswa di kelas eksperimen. Hasil respons siswa berdasarkan pengalaman belajar dan keinginan siswa terhadap pembelajaran menunjukkan respons yang positif. Simpulan hasil penelitian menyatakan bahwa *example based learning* berpengaruh signifikan terhadap penguasaan konsep siswa, tetapi tidak berpengaruh secara signifikan terhadap kemampuan berpikir kreatif siswa pada materi sistem respirasi.

Kata Kunci: *example based learning*, pembelajaran berbasis masalah, penguasaan konsep siswa, kemampuan berpikir kreatif siswa, sistem respirasi.

ABSTRACT

Problem-based learning is a learning model that has been proven to be effective in improving student learning. However, sometimes students find it difficult to carry out problem-based learning. The aim of this research is to obtain information regarding the influence of example based learning in problem-based learning of the respiratory system on students' mastery of concepts and creative thinking abilities. The research method used was a quasi experiment with a non-equivalent control group design. The research subjects consisted of 27 experimental class students who were treated with the application of example based learning in problem-based learning of the respiratory system and 24 control class students with problem-based learning. Research data is based on the results of pre-test and post-test mastery of concepts in the form of multiple choice questions, post-test creative thinking in the form of description questions, and student responses questionnaires for example-based learning in problem-based learning of the respiratory system. The findings in this study show that there is a significant difference in results between students' mastery of concepts in the experimental class and the control class. Meanwhile, there was no significant difference between the creative thinking abilities of experimental class and control class students. There is a significant relationship between concept mastery and students' creative thinking abilities in the experimental class. The results of student responses based on learning experiences and students' desires for learning show positive responses. The conclusion of the research results states that example based learning has a significant effect on students' mastery of concepts, but does not have a significant effect on students' creative thinking abilities in the respiratory system material.

Keywords: *example based learning, problem based learning, students' mastery of concepts, students' creative thinking abilities, respiratory system.*

DAFTAR ISI

PENGARUH <i>EXAMPLE BASED LEARNING</i> DALAM PEMBELAJARAN SISTEM RESPIRASI BERBASIS MASALAH TERHADAP PENGUASAAN KONSEP DAN KEMAMPUAN BERPIKIR KREATIF SISWA SMA	ii
PERNYATAAN TENTANG KEASLIAN SKRIPSI DAN PERNYATAAN BEBAS PLAGIARISME.....	iv
KATA PENGANTAR	v
UCAPAN TERIMA KASIH.....	vi
ABSTRAK.....	ix
<i>ABSTRACT</i>	x
DAFTAR ISI.....	xi
DAFTAR TABEL.....	xiii
DAFTAR GAMBAR	xv
DAFTAR LAMPIRAN.....	xvi
BAB I.....	1
PENDAHULUAN	1
1.1 Latar Belakang Penelitian	1
1.2 Rumusan Masalah Penelitian	4
1.3 Tujuan Penelitian.....	4
1.4 Manfaat Penelitian.....	5
1.5 Batasan Masalah Penelitian.....	5
1.6 Asumsi dan Hipotesis Penelitian.....	6
1.7 Struktur Organisasi Skripsi	6
BAB II.....	8
2.1 <i>Example Based Learning</i>	8
2.2 Pembelajaran Berbasis Masalah	10
2.3 Kemampuan Berpikir Kreatif (<i>Creative Thinking</i>)	14
2.4 Penguasaan Konsep	16
2.5 Pembelajaran Sistem Respirasi	18
BAB III	23
METODE PENELITIAN.....	23
3.1 Definisi Operasional.....	23
3.2 Subjek Penelitian.....	24
3.3 Metode dan Desain Penelitian.....	24

3.4	Instrumen Penelitian.....	25
3.5	Pengembangan Instrumen Penelitian	29
3.6	Prosedur Penelitian.....	41
3.7	Analisis Data	43
3.9	Alur Penelitian.....	47
	BAB IV	48
	TEMUAN DAN PEMBAHASAN	48
4.1	Temuan.....	48
4.2	Pembahasan.....	55
	BAB V	65
	SIMPULAN, IMPLIKASI, DAN REKOMENDASI	65
5.1	Simpulan Penelitian.....	65
5.2	Implikasi Penelitian	65
5.3	Rekomendasi Penelitian	66
	DAFTAR PUSTAKA	67

DAFTAR TABEL

Tabel 2.1 Sintaks Pembelajaran Berbasis Masalah.....	11
Tabel 2. 2 Karakteristik Berpikir Kreatif Menurut Guilford (Munandar, 2002) ..	15
Tabel 2. 3 Kompetensi Dasar Materi Sistem Respirasi	20
Tabel 3. 1 Desain Penelitian.....	25
Tabel 3. 2 Jenis Instrumen Penelitian	25
Tabel 3. 3 Kisi-Kisi Soal Pilihan Ganda Penguasaan Konsep Sistem Respirasi ..	26
Tabel 3. 4 Kisi-Kisi Soal Uraian Kemampuan Berpikir Kreatif.....	27
Tabel 3. 5 Kisi-Kisi Angket Respons Siswa.....	28
Tabel 3. 6 Skala Likert Angket Respons Siswa	28
Tabel 3. 7 Interpretasi Koefisien Reliabilitas Butir Soal	29
Tabel 3. 8 Hasil Uji Reliabilitas Soal Penguasaan Konsep	29
Tabel 3. 9 Interpretasi Validitas Butir Soal.....	30
Tabel 3. 10 Hasil Uji Validitas Soal Penguasaan Konsep	30
Tabel 3. 11 Interpretasi Nilai Daya Pembeda	31
Tabel 3. 12 Hasil Uji Daya Pembeda Soal Penguasaan Konsep.....	31
Tabel 3. 13 Interpretasi Nilai Tingkat Kesukaran.....	32
Tabel 3. 14 Hasil Uji Tingkat Kesukaran Soal Penguasaan Konsep	32
Tabel 3. 15 Hasil Uji Efektivitas Distraktor Soal Penguasaan Konsep	33
Tabel 3. 16 Klasifikasi Kualitas Butir Soal.....	33
Tabel 3. 17 Rekapitulasi Hasil Uji Coba Tes Penguasaan Konsep Siswa	35
Tabel 3. 18 Hasil Uji Uji Reliabilitas Soal Kemampuan Berpikir Kreatif	37
Tabel 3. 19 Hasil Uji Validitas Soal Kemampuan Berpikir Kreatif	37
Tabel 3. 20 Hasil Uji Daya Pembeda Soal Kemampuan Berpikir Kreatif.....	38
Tabel 3. 21 Hasil Uji Tingkat Kesukaran Soal Kemampuan Berpikir Kreatif	39
Tabel 3. 22 Rekapitulasi Hasil Uji Coba Tes Kemampuan Berpikir Kreatif Siswa	40
Tabel 3. 23 Kegiatan Penelitian Pada Kedua Kelas Penelitian.....	41
Tabel 3. 24 Ketentuan Pengambilan Keputusan Uji Prasyarat	44
Tabel 3. 25 Keputusan Hasil Uji Prasyarat	44
Tabel 3. 26 Skor Respons Siswa.....	45
Tabel 3. 27 Kategori Skala Angket Respons Siswa.....	46

Tabel 4. 1 Rekapitulasi Data Hasil Pre-test Penguasaan Konsep Siswa.....	49
Tabel 4. 2 Hasil Rekapitulasi Analisis Statistik <i>Pre-Test</i> Penguasaan Konsep siswa	49
Tabel 4. 3 Rekapitulasi Data Hasil <i>Post-test</i> Penguasaan Konsep Siswa.....	50
Tabel 4. 4 Hasil Rekapitulasi Analisis Statistik <i>Post-Test</i> Penguasaan Konsep siswa	51
Tabel 4. 5 Rekapitulasi Data Hasil <i>Post-test</i> Kemampuan Berpikir Kreatif Siswa	52
Tabel 4. 6 Rekapitulasi Hasil Analisis Statistik Kemampuan Berpikir Kreatif Siswa	53
Tabel 4. 7 Hasil Uji Korelasi Penguasaan Konsep Siswa dengan Berpikir Kreatif Kelas Eksperimen	54
Tabel 4. 8 Hasil Uji Korelasi Penguasaan Konsep Siswa dengan Berpikir Kreatif Kelas Kontrol	54
Tabel 4. 9 Rekapitulasi Data Hasil Respons Siswa	55

DAFTAR GAMBAR

Gambar 2. 1 Diagram Pemecahan Masalah dalam PBL.....	12
Gambar 3. 1 Diagram Alur Penelitian	47
Gambar 4. 1 Persentase Penguasaan Konsep Akhir Siswa pada Setiap Level Kognitif.....	51
Gambar 4. 2 Ketercapaian Kemampuan Berpikir Kreatif Siswa.....	52
Gambar 4. 3 Perbandingan Rata-rata Nilai <i>Post-test</i> Penguasaan Konsep dengan Kemampuan Berpikir Kreatif Siswa.....	53

DAFTAR LAMPIRAN

Lampiran 1. 1 Surat Izin Penelitian Uji Coba Soal.....	77
Lampiran 1. 2 Surat Izin Penelitian Pengambilan Data	78
Lampiran 1. 3 Surat Balasan Penelitian Pengambilan Data	79
Lampiran 2. 1 Rencana Pelaksanaan Pembelajaran Kelas Eksperimen	81
Lampiran 2. 2 Rencana Pelaksanaan Pembelajaran Kelas Kontrol	90
Lampiran 3. 1 Instrumen Penguasaan Konsep	97
Lampiran 3. 2 Instrumen Kemampuan Berpikir Kreatif.....	106
Lampiran 3. 3 Rubrik Penilaian Soal Berpikir Kreatif	113
Lampiran 3. 4 Angket Respons Siswa	117
Lampiran 4. 1 Hasil Uji Validitas Soal Penguasaan Konsep	119
Lampiran 4. 2 Hasil Uji Reliabilitas Soal Penguasaan Konsep	119
Lampiran 4. 3 Hasil Uji Daya Pembeda Soal Penguasaan Konsep	120
Lampiran 4. 4 Hasil Uji Tingkat Kesukaran Soal Penguasaan Konsep.....	121
Lampiran 4. 5 Hasil Uji Efektivitas Distraktor Soal Penguasaan Konsep.....	122
Lampiran 4. 6 Rekap Hasil Analisis Soal Berpikir Kreatif.....	123
Lampiran 5. 1 Tabulasi Nilai <i>Pre-Test</i> Penguasaan Konsep Siswa Kelas Eksperimen	125
Lampiran 5. 2 Tabulasi Nilai <i>Pre-Test</i> Penguasaan Konsep Siswa Kelas Kontrol	126
Lampiran 5. 3 Tabulasi Nilai <i>Post-Test</i> Penguasaan Konsep Siswa Kelas Eksperimen	127
Lampiran 5. 4 Tabulasi Nilai <i>Post-Test</i> Penguasaan Konsep Siswa Kelas Kontrol	128
Lampiran 6. 1 Hasil Uji Normalitas <i>Pre-Test</i> Penguasaan Konsep	130
Lampiran 6. 2 Hasil Uji Homogenitas <i>Pre-Test</i> Penguasaan Konsep	130
Lampiran 6. 3 Hasil Uji Beda Rata-Rata <i>Pre-Test</i> Penguasaan Konsep	130
Lampiran 6. 4 Hasil Uji Normalitas <i>Post-Test</i> Penguasaan Konsep	131
Lampiran 6. 5 Hasil Uji Homogenitas <i>Post-Test</i> Penguasaan Konsep	131
Lampiran 6. 6 Hasil Uji Beda Rata-Rata <i>Post-Test</i> Penguasaan Konsep	131

Lampiran 7. 1 Tabulasi Nilai <i>Post-Test</i> Kemampuan Berpikir Kreatif Siswa Kelas Eksperimen	133
Lampiran 7. 2 Tabulasi Nilai <i>Post-Test</i> Kemampuan Berpikir Kreatif Siswa Kelas Kontrol	134
Lampiran 8. 1 Hasil Uji Normalitas <i>Post-Test</i> Kemampuan Berpikir Kreatif ...	136
Lampiran 8. 2 Hasil Uji Homogenitas <i>Post-Test</i> Kemampuan Berpikir Kreatif	136
Lampiran 8. 3 Hasil Uji Beda Rata-Rata <i>Post-Test</i> Kemampuan Berpikir Kreatif	136
Lampiran 9. 1 Hasil Uji Linearitas Kelas Eksperimen.....	138
Lampiran 9. 2 Hasil Uji Linearitas Kelas Kontrol.....	138
Lampiran 9. 3 Hasil Uji Korelasi Penguasaan Konsep dengan Kemampuan Berpikir Kreatif Siswa Kelas Eksperimen	139
Lampiran 9. 4 Hasil Uji Korelasi Penguasaan Konsep dengan Kemampuan Berpikir Kreatif Siswa di Kelas Kontrol	139
Lampiran 10. 1 Dokumentasi Pelaksanaan Pembelajaran	141
Lampiran 10. 2 Dokumentasi Hasil Laporan Siswa	142
Lampiran 10. 3 Penggerjaan Instrumen Penelitian	142
Lampiran 11. 1 Biodata Penulis	144

DAFTAR PUSTAKA

- Adams, D. & Muthiah, V. (2020). School Principals and 21St Century Leadership Challenges: a Systematic Review. *Journal of Nusantara Studies (JONUS)*, 5(1), 189–210. <https://doi.org/10.24200/jonus.vol5iss1pp189-210>
- Adeniji, S. M. & Baker, P. (2023). Effects of Worked Example on Students' Learning Outcomes in Complex Algebraic Problems. *International Journal of Instruction*, 16(2), 229–246. <https://doi.org/10.29333/iji.2023.16214a>
- Akcay, B. (2009). Problem-Based Learning in Science Education. *Journal of Turkish Science Education*, 6(1), 26–36.
- Adi, N. P & Hasani, Z. M. (2022). Analisis Kemampuan Literasi Sains Siswa Melalui Pengembangan Science Worked Example dalam Konteks Kearifan Lokal Wonosobo. *Jurnal Al-Qalam*. 23(2), 69–74.
- Almazroa, H. & Alotaibi, W. (2023). Teaching 21st Century Skills: Understanding the Depth and Width of the Challenges to Shape Proactive Teacher Education Programmes. *Sustainability (Switzerland)*, 15(9). <https://doi.org/10.3390/su15097365>
- Amabile, T. M., Amabile, T. M., Collins, M. A., Conti, R., Phillips, E., Picariello, M., Ruscio, J. & Whitney, D. (2018). Creativity in Context. In *Creativity in Context*. <https://doi.org/10.4324/9780429501234>
- Annisa. (2021). Pengaruh Penggunaan Aplikasi Quizizz terhadap Hasil Belajar IPA Siswa di Sekolah Dasar. *Jurnal Basicedu*, 5(5), 3660–3667. <https://jbasic.org/index.php/basicedu/article/view/1376>
- Arends. R. I. (2011). *Learning to Teach*. McGraw-Hill.
- Arikunto, S. (2010). *Prosedur Penelitian : Suatu Pendekatan Praktik*. Rineka Cipta
- Arikunto, S. (2012). *Dasar-Dasar Evaluasi Pendidikan*. Rineka Cipta
- Arikunto, S. (2016). *Dasar-Dasar Evaluasi Pendidikan* (2ed.) Bumi Aksara
- Aritia, E. & Suyanto, S. (2019). The Effect of Problem based Learning Model and Concept Map Strategy for Problem Solving and Understanding of the Ecosystem Concept of High School Students. *Journal of Physics: Conference Series*, 1233(1), 0–8. <https://doi.org/10.1088/1742-6596/1233/1/012005>
- Atkinson, R. K., Derry, S. J., Renkl, A. & Wortham, D. (2000). Learning from examples: Instructional principles from the worked examples research. *Review of Educational Research*, 70(2), 181–214. <https://doi.org/10.3102/00346543070002181>
- Atkinson, R. K., Renkl, A. & Merrill, M. M. (2003). Transitioning From Studying Examples to Solving Problems: Effects of Self-Explanation Prompts and Fading Worked-Out Steps. *Journal of Educational Psychology*, 95(4), 774–783. <https://doi.org/10.1037/0022-0663.95.4.774>
- Awang, H. & Ramly, I. (2008). Through Problem-Based Learning : Pedagogy and Practice in the Engineering Classroom. *International Journal of Human and*

- Social Sciences*, 2(4), 18–23.
- Ayvaz, C. A. (2021). The effect of worked examples method on primary school students' fractions achievement. *International Online Journal of Primary Education* (IOJPE), 10(2), 361-382
- Azhary, L. & Ratmanida. (2021). The Implementation of 21st Century Skills (Communication, Collaboration, Creativity and Critical Thinking) in English Lesson Plan at MTsN 6 Agam. *Journal of English Language Teaching*, 10(4), 608–623. <https://doi.org/10.24036/jelt.v9i4.114944>
- Azizah, N. & Retnowati, E. (2017). Desain Worked Example untuk Mengajarkan Matematika pada Siswa Disabilitas Netra. *Seminar Nasional Matematika Dan Pendidikan Matematika UNY 2017*, 517–524.
- Barrows, H. S. (1996). Problem-based learning in medicine and beyond: A brief overview. *New Directions for Teaching and Learning*, 1996(68), 3–12. <https://doi.org/10.1002/tl.37219966804>
- Bourne, L. E., Goldstein, S. & Link, W. E. (1964). Concept learning as a function of availability of previously presented information. *Journal of Experimental Psychology*, 67(5), 439–448. <https://doi.org/10.1037/h0043205>
- Budiyono, A.W. & Husna, H. (2020). Pengaruh Penerapan Model PBL Terintegrasi STEAM Terhadap Kemampuan Berpikir Kreatif Ditinjau dari Pemahaman Konsep Siswa. *EDUSAINS*, 12(2), 166–176.
- Candiasa, I. M., Santiyadnya, N., Sukajaya, N. & Sindu, I. G. (2019). Example Based Learning For Vocational Education: Adopted From Balinese Heuristics. *Jurnal Pendidikan Vokasi*, 9(3), 229–237.
- Chan, Z. C. Y. (2013). A systematic review of creative thinking/creativity in nursing education. *Nurse Education Today*, 33(11), 11382–11387. <https://doi.org/10.1016/j.nedt.2012.09.005>
- 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>
- Coppens, L. C., Hoogerheide, V., Snippe, E. M., Flunger, B. & van Gog, T. (2019). Effects of problem-example and example-problem pairs on gifted and nongifted primary school students' learning. *Instructional Science*, 47(3), 279–297. <https://doi.org/10.1007/s11251-019-09484-3>
- Crippen, K. J. & Earl, B. L. (2004). Considering the effectiveness of web-based worked example in introductory chemistry. *Journal of Computers in Mathematics and Science Teaching*, 23(2), 151–167.
- Crippen, Kent J. & Earl, B. L. (2007). The impact of web-based worked examples and self-explanation on performance, problem solving, and self-efficacy. *Computers and Education*, 49(3), 809–821. <https://doi.org/10.1016/j.compedu.2005.11.018>

- Dewi, S. P. & Widodo, A. (2016). Analisis Konsepsi Siswa dalam Materi Sistem Respirasi. *Jurnal Pendidikan Biologi*, 361–368. [https://www.conference.unsri.ac.id/index.php/semnasipa/article/view/703](http://www.conference.unsri.ac.id/index.php/semnasipa/article/view/703)
- Djamahar, R., Ristanto, R. H., Sartono, N. & Darmawan, E. (2020). Approaches to Respiratory and Excretion Systems Teaching: An Innovative Learning through Cirsia. *Universal Journal of Educational Research*, 8(6), 2204–2210. <https://doi.org/10.13189/ujer.2020.080602>
- Djamahar, R., Ristanto, R. H., Sartono, N., Ichsan, I. Z. & Muhlisin, A. (2018). CIRSA: Designing Instructional Kits to Empower 21st Century Skill. *Educational Process: International Journal*, 7(3), 200–208. <https://doi.org/10.22521/edupij.2018.73.4>
- Dochy, F., Segers, M., Van den Bossche, P. & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. *Learning and Instruction*, 13(5), 533–568. [https://doi.org/10.1016/S0959-4752\(02\)00025-7](https://doi.org/10.1016/S0959-4752(02)00025-7)
- Duch, B. J. (2008). Problem-based learning in physics: Making connections with the real world. 557, 557–566. <https://doi.org/10.1063/1.53153>
- Dyer, J., Hudon, A., Montpetit-tourangeau, K., Charlin, B. & Mamede, S. (2015). Example-based learning : comparing the effects of additionally providing three different integrative learning activities on physiotherapy intervention knowledge. 1–16. <https://doi.org/10.1186/s12909-015-0308-3>
- Ekasari, A. (2023). Peningkatan Penguasaan Konsep dengan Menerapkan Problem Based Learning (PBL) Berbantuan Simulasi PhET. *Al Jahiz: Journal of Biology Education Research*, 4(1), 1. <https://doi.org/10.32332/al-jahiz.v4i1.6292>
- El-Hashash, A. (2018). Lung Stem Cell Behavior. *Lung Stem Cell Behavior*, 1–105. <https://doi.org/10.1007/978-3-319-95279-6>
- Elita, G. S., Habibi, M., Putra, A. & Ulandari, N. (2019). Pengaruh Pembelajaran Problem Based Learning dengan Pendekatan Metakognisi terhadap Kemampuan Pemecahan Masalah Matematis. *Mosharafa: Jurnal Pendidikan Matematika*, 8(3), 447–458. <https://doi.org/10.31980/mosharafa.v8i3.517>
- Fathurrozi, T. (2022). Efektivitas Pembelajaran Worked Example pada Materi Energi terhadap Kemampuan Transfer Konsep Siswa Kelas X SMA. *Prosiding Seminar Nasional 2019*, 2587, 5–21.
- Firdaus, H. M., Widodo, A. & Rochintaniawati, D. (2018). Analisis Kemampuan Berpikir Kreatif dan Proses Pengembangan Kemampuan Berpikir Kreatif Siswa SMP pada Pembelajaran Biologi. *Assimilation: Indonesian Journal of Biology Education*, 1(1), 21–28. <https://doi.org/10.17509/aijbe.v1i1.11452>
- Flamboyant, F. U., Murdani, E. & Soeharto, S. (2018). Pengaruh Model Problem Based Learning Terhadap Higher Order Thinking Skills Siswa SMA Negeri di Kota Singkawang pada Materi Hukum Archimedes. *Variabel*, 1(2), 51. <https://doi.org/10.26737/var.v1i2.810>

- Gafour, W. (2021). *Creative Thinking skills – A Review article*. February.
- Gog, T. Van & Rummel, N. (2010). Example-Based Learning : Integrating Cognitive and Social-Cognitive Research Perspectives. 155–174. <https://doi.org/10.1007/s10648-010-9134-7>
- Handayani, T., Aditia, E. & Diana, I. (2023). Peningkatan Kemampuan Berpikir Kreatif Siswa Sekolah Dasar Melalui Model Mind Mapping. *MOTEKAR: Jurnal Multidisiplin Teknologi dan Arsitektur*, 1(2), 173–174.
- Hariyanto, St. Maryam M & Zainal, Z. (2021). Penerapan Model Pembelajaran Example Non-Example Untuk Meningkatkan Hasil Belajar Siswa Sekolah Dasar Di Kabupaten Barru. *Pinisi Journal of Education*, 1(1), 239–256.
- Hendarto, P., Rinanto, Y. & Ramli, M. (2019). Penerapan Desain Pembelajaran Sistem Respirasi berbasis Guided Inquiry Learning dipadu AfL untuk Mengubah Kemampuan Berargumentasi Siswa Kelas SMA. *Bio-Pedagogi*, 8(1), 30. <https://doi.org/10.20961/bio-pedagogi.v8i1.35548>
- Hermawanto, Kusairi, S. & Wartono. (2013). Pengaruh Blended Learning Terhadap Penguasaan Konsep dan Penalaran Fisika Siswa Kelas X. *Jurnal Pendidikan Fisika Indonesia*, 9(57), 67–76.
- Hoogerheide, V. & Roelle, J. (2020). Example-based learning: New theoretical perspectives and use-inspired advances to a contemporary instructional approach. *Applied Cognitive Psychology*, 34(4), 787–792. <https://doi.org/10.1002/acp.3706>
- Huang, X. (2017). Example-based learning: Effects of different types of examples on student performance, cognitive load and self-efficacy in a statistical learning task. *Interactive Learning Environments*, 25(3), 283–294. <https://doi.org/10.1080/10494820.2015.1121154>
- Hutasoit, S. A. (2021). Pembelajaran Teacher Centered (TCL) dan Project Based Learning (PBL) dalam Pengembangan Kinerja Ilmiah dan Peninjauan Karakter Siswa. *Jurnal Pendidikan Indonesia (Japendi)*, 2(10), 1775–1799.
- Ichsan, I. Z. & Fatimah, O. Z. S. (2022). HOTS-Resyenvair: Pengembangan Pembelajaran Sistem Respirasi Manusia Berbasis Masalah Pencemaran Lingkungan Hidup di Udara. *Jurnal Biotek*, 10(2), 155–166. <https://doi.org/10.24252/jb.v10i2.33708>
- Idrus, S. W. Al. (2022). Pengembangan Instrumen Penilaian Kreativitas Mahasiswa pada Matakuliah Kimia Lingkungan. *Empiricism Journal*, 3(2), 160–167. <https://doi.org/10.36312/ej.v3i2.989>
- Intan, I. N. & Rosyid, A. (2020). Peningkatan Kemampuan Pemahaman Matematis Siswa Menggunakan Worked Example. *Jurnal Matematika Dan Pendidikan Matematika*, 5(1), 26–36. <https://doi.org/10.31943/mathline.v5i1.127>
- Irnaningtyas, Y. I. (2016). *Buku Guru Biologi Kelas XI SMA/MA Kelas XI Kurikulum 2013*. Jakarta: Erlangga
- Julianingsih, E., Retnowati, E. & Ng, K. T. (2023). A Worked Example Design

- with ARCS Motivational Model. *Learning Science and Mathematics Issue*, 0832(18), 32–45. http://www.recsam.edu.my/sub_lsmjournal
- Kadir, Lucyana & Satriawati, G. (2017). The implementation of open-inquiry approach to improve students' learning activities, responses, and mathematical creative thinking skills. *Journal on Mathematics Education*, 8(1), 103–114. <https://doi.org/10.22342/jme.8.1.3406.103-114>
- Kalyuga, S. (2011). Cognitive Load Theory: How Many Types of Load Does It Really Need? *Educational Psychology Review*, 23(1), 1–19. <https://doi.org/10.1007/s10648-010-9150-7>
- Karthwohl. (2002). A Revision of Bloom ' s Taxonomy : An Overview David R . Krathwohl. *ReVision*, 41(4), 212–218.
- Karyanto, P. (2022). Hubungan Antara Kemampuan Pemahaman Konsep Materi Gerak dan Gaya dengan Kemampuan Berpikir Kreatif Siswa SMP Kelas VIII SMP Negeri 1 Kebakkramat. *Jurnal Pendidikan IPA*, 11(1), 22–28. <https://doi.org/10.20961/inkuiri.v11i1.54919>
- Khairaty, N. I., Taiyeb, A. M. & Hartati. (2018). Identification of Students Misconception on Circulatory System Using Three-Tier Test in Class XI IPA 1 SMA Negeri 1 Bontonompo. *Jurnal Nalar Pendidikan*, 6(1), 7.
- Kusuma, Y. W., Sulianto, J. & Purnamasari, V. (2018). Keefektifan Model Examples Non Examples Terhadap Hasil Belajar Materi Pengukuran Kelas. *Mimbar Ilmu*, 23(2). <https://doi.org/10.23887/mi.v23i2.16423>
- Kusumaningtyas, N., Sikumbang, D., Hasnunidah Pendidikan Biologi, N., Keguruan dan Ilmu Pendidikan, F., Lampung, U., Soemantri Brojonegoro No, J. & Lampung, B. (2020). Pengaruh Model Project Based Learning (PjBL) Terhadap Kemampuan Berpikir Kreatif Siswa. *Jurnal Bioterdidik*, 8(2), 11–19. <https://doi.org/10.23960/jbt.v8.i2.02>
- Magdalena, R. (2016). Penerapan Model Pembelajaran Problem Based Learning (PBL) serta Pengaruhnya terhadap Hasil Belajar Biologi Siswa SMA Negeri 5 Kelas XI Kota Samarinda Tahun Ajaran 2015. *Proceeding Biology Education Conference*, 13(1), 299–306.
- Marzano, R., Brandit, R., Hughes, C. & Jones, B. (1988). Dimension of Thinking a Framework for Curriculum and Instruction. In *Assosiation for Supervisions and Curriculum Development (ASCD)* (Vol. 4, Issue 1).
- Mashitoh, N. L. D., Sukestiyarno, Y. & Wardono. (2019). Analisis Kemampuan Berpikir Kreatif Berdasarkan Teori Wallas pada Materi Geometri Kelas VIII. *Seminar Nasional Pascasarjana*, 21(1), 229–234.
- Mergendoller, J. R., Maxwell, N. L. & Bellisimo, Y. (2006). The Effectiveness of Problem-Based Instruction: A Comparative Study of Instructional Methods and Student Characteristics. *Interdisciplinary Journal of Problem-Based Learning*, 1(2), 11–17. <https://doi.org/10.7771/1541-5015.1026>
- Minasari, U. & Susanti, R. (2023). Penerapan Model Problem Based Learning

- Berbasis Berdiferensiasi berdasarkan Gaya Belajar Siswa pada Pelajaran Biologi. *Ideguru: Jurnal Karya Ilmiah Guru*, 8(2), 282–287. <https://doi.org/10.51169/ideguru.v8i2.543>
- Munandar, S. U. (2002). Kreativitas & Keterbakatan: Strategi Mewujudkan Potensi Kreatif dan Bakat. Jakarta: Gramedia Pustaka Utama.
- Newman, P. M. & DeCaro, M. S. (2019). Learning by exploring: How much guidance is optimal? *Learning and Instruction*, 62(November 2018), 49–63. <https://doi.org/10.1016/j.learninstruc.2019.05.005>
- Noerhandayani, T., Suhara, S. & Solihat, R. (2021). Penggunaan POE-inquiry melalui blended learning terhadap hasil belajar siswa pada pembelajaran materi sistem respirasi. *Assimilation: Indonesian Journal of Biology Education*, 4(1), 44–49. <https://doi.org/10.17509/aijbe.v4i1.34826>
- Nugraha, W. S. (2018). Peningkatan Kemampuan Berpikir Kritis Dan Penguasaan Konsep Ipa Siswa Sd Dengan Menggunakan Model Problem Based Learning. *EduHumaniora: Jurnal Pendidikan Dasar Kampus Cibiru*, 10(2), 115. <https://doi.org/10.17509/eh.v10i2.11907>
- Purnama, P. W. & Retnowati, E. (2020). The effectiveness of goal-free problems for studying triangle similarity in collaborative groups. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 6(1), 32–45. <https://doi.org/10.23917/jramathedu.v6i1.11198>
- Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 Dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia*, 13(1).
- Risdiana, H., Suyatno, S. & Poedjiastuti, S. (2017). Implementasi Model 5E Learning Cycle Untuk Meningkatkan Penguasaan Konsep Dan Kemampuan Berpikir Kreatif Siswa Sma. *JPPS (Jurnal Penelitian Pendidikan Sains)*, 3(2), 367. <https://doi.org/10.26740/jpps.v3n2.p367-375>
- Riskawati & Saad, R. (2021). Kemampuan Berpikir Kreatif: Problem Based Learning Vs Discovery Learning. *PHYDAGOGIC Jurnal Fisika Dan Pembelajarannya*, 4(1), 43–50. <https://doi.org/10.31605/phy.v4i1.1513>
- Rizkianto, F. & Murwaningsih, T. (2018). Penerapan problem based learning untuk meningkatkan kemampuan berpikir kritis dan berpikir kreatif siswa. *Prosiding Seminar Nasional Pendidikan Administrasi Perkantoran (SNPAP) 2018*, 160–175.
- Rosnaeni, R. (2021). Karakteristik dan Asesmen Pembelajaran Abad 21. *Jurnal Basicedu*, 5(5), 4341–4350. <https://doi.org/10.31004/basicedu.v5i5.1548>
- Sani, Y., Sari, N. F. & Harahap, R. D. (2019). Analisis Kesulitan Belajar Siswa pada Materi Biologi. *Jurnal Berkala Mahasiswa*, 1(3), 13–20. <https://jurnal.ulb.ac.id/index.php/berkala/article/view/1696>
- Sanjaya,W. (2006). *Strategi Pembelajaran*. Jakarta: Kencana Prenada Media Group.
- Sentz, J. & Stefaniak, J. (2019). Instructional Heuristics for the Use of Worked

- Examples to Manage Instructional Designers' Cognitive Load while Problem-Solving. *TechTrends*, 63(2), 209–225. <https://doi.org/10.1007/s11528-018-0348-8>
- Siregar, R. N., Mujib, A. & Karnasih, I. (2020). Peningkatan Kemampuan Berpikir Kreatif Siswa Melalui Pendekatan Matematika Realistik. *Edumaspul-Jurnal Pendidikan*, 4(1), 56–62.
- Sudarisman, S. (2013). Implementasi pendekatan kontekstual dengan variasi metode berbasis masalah untuk meningkatkan kualitas pembelajaran biologi. *Jurnal Pendidikan IPA Indonesia*, 2(1), 23–30. <https://doi.org/10.15294/jpii.v2i1.2506>
- Sudjana, N. (2000). *Dasar-dasar Proses Belajar Mengajar*. Bandung: Sinar Baru.
- Sungur, S., Tekkaya, C. & Geban, Ö. (2006). Improving achievement through problem-based learning. *Journal of Biological Education*, 40(4), 155–160. <https://doi.org/10.1080/00219266.2006.9656037>
- Susilowati, S. M. E., Delima, A. & Widyaningrum, P. (2017). Pengaruh Model Pembelajaran Problem Based Learning (PBL) Berbantuan Lks Kreasi Sistem Respirasi Terhadap Hasil Belajar Siswa SMA. *Satya Widya*, 33(2), 154–164. <https://doi.org/10.24246/j.sw.2017.v33.i2.p154-164>
- Sweller, J. (2006). The worked example effect and human cognition. *Learning and Instruction*, 16(2 SPEC. ISS.), 165–169. <https://doi.org/10.1016/j.learninstruc.2006.02.005>
- Sweller, J. (2011). Cognitive Load Theory. In *Psychology of Learning and Motivation - Advances in Research and Theory* (Vol. 55). Elsevier Inc. <https://doi.org/10.1016/B978-0-12-387691-1.00002-8>
- Sweller, J. & Cooper, G. A. (1985). The Use of Worked Examples as a Substitute for Problem Solving in Learning Algebra. *Cognition and Instruction*, 2(1), 59–89. https://doi.org/10.1207/s1532690xci0201_3
- Syaharani, A. (2018). Pengaruh model pembelajaran kooperatif dan kemandirian belajar terhadap penguasaan konsep Biologi (Studi Kasus Siswa SMP Negeri 1 Kota Tangerang). *ALFARISI: Jurnal Pendidikan MIPA*, 1(1), 9–20. <https://journal.lppmunindra.ac.id/index.php/alfarisi/article/view/2887>
- Syahwati, F. & Arif, S. (2022). Analysis of the Effect of Scientific Literacy and Questioning Ability on Science Learning Outcomes. *INSECTA: Integrative Science Education and Teaching Activity Journal*, 3(2), 150–157. <https://doi.org/10.21154/insecta.v3i2.5127>
- Tan, O. S. (2003). *Problem-Based Learning Innovation: Using Problems to Power Learning in the 21st Century*.
- Tandiseru, S. R. (2015). The effectiveness of local culture-based mathematical heuristic-KR learning towards enhancing student's creative thinking skill. *Journal of Education and Practice*, 6(12), 74–82. <https://www.iiste.org/Journals/index.php/JEP/article/view/21884/22200>

- Tanjung, Y. I. & Nasution, I. R. (2023). The Development of Creative Thinking Test Instruments with Torrance Indicators on Direct Current Electricity Materials. *Jurnal Pendidikan Fisika Indonesia*, 18(2), 134–143. <https://doi.org/10.15294/jpfi.v18i2.32117>
- Tarmizi, R. A. & Sweller, J. (1988). Guidance During Mathematical Problem Solving. *Journal of Educational Psychology*, 80(4), 424–436. <https://doi.org/10.1037/0022-0663.80.4.424>
- Tennyson, R. D., Woolley, F. R. & Merrill, M. D. (1972). Exemplar and nonexemplar variables which produce correct concept classification behavior and specified classification errors. *Journal of Educational Psychology*, 63(2), 144–152. <https://doi.org/10.1037/h0032368>
- Torrance, E. P. (2018). *Torrance Tests of Creative Thinking: Norms—Technical Manual*. 16.
- Trihastuti, I., Sundayaga, C. & Pratiwi, H. Y. (2019). Dampak Penerapan Model Problem Based Learning (Pbl) Terhadap Penguasaan Konsep Dan Kerja Ilmiah Siswa Smp Pada Materi Tekanan Zat Cair. *RAINSTEK: Jurnal Terapan Sains & Teknologi*, 1(2), 73–81. <https://doi.org/10.21067/jtst.v1i2.3550>
- Tyas, R. (2017). Kesulitan Penerapan Problem Based Learning dalam Pembelajaran. *Tecnoscienza*, 2(1), 44-52.
- Van Gog, T., Kester, L. & Paas, F. (2011). Effects of worked examples, example-problem, and problem-example pairs on novices' learning. *Contemporary Educational Psychology*, 36(3), 212–218. <https://doi.org/10.1016/j.cedpsych.2010.10.004>
- Van Gog, T., Paas, F. & Van Merriënboer, J. J. G. (2004). Process-oriented worked examples: Improving transfer performance through enhanced understanding. *Instructional Science*, 32(1–2), 83–98. <https://doi.org/10.1023/b:truc.0000021810.70784.b0>
- Van Harsel, M., Hoogerheide, V., Verkoeijen, P. & van Gog, T. (2019). Effects of different sequences of examples and problems on motivation and learning. *Contemporary Educational Psychology*, 58, 260–275. <https://doi.org/10.1016/j.cedpsych.2019.03.005>
- VanLehn, K. (1999). Rule-Learning Events in the Acquisition of a Complex Skill: An Evaluation of Cascade. *Journal of the Learning Sciences*, 8(1), 71–125. https://doi.org/10.1207/s15327809jls0801_3
- Wafi, M. Al, Lisdiana, L. & Susilogati Sumarti, S. (2022). Development of STEAM-Based Human Respiratory System Teaching Materials to Improve Students' Critical Thinking Skills. *Jise*, 11(3), 295–304. <http://journal.unnes.ac.id/sju/index.php/jise>
- Widia, W., Sarnita, F., Fathurrahmaniah, F. & Atmaja, J. P. (2020). Penggunaan Strategi Mind Mapping Untuk Meningkatkan Penguasaan Konsep Siswa. *Jurnal Ilmiah Mandala Education*, 6(2), 467–473.

<https://doi.org/10.58258/jime.v6i2.1459>

Yandhari, I. A. V., Alamsyah, T. P. & Halimatusadiah, D. (2019). Penerapan Strategi Pembelajaran Problem Based Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa Kelas IV. *Kreano, Jurnal Matematika Kreatif-Inovatif*, 10(2), 146–152. <https://doi.org/10.15294/kreano.v10i2.19671>

Yazar Soyadı, B. B. (2015). Creative and Critical Thinking Skills in Problem-based Learning Environments. *Journal of Gifted Education and Creativity*, 2(2), 71–71. <https://doi.org/10.18200/jgedc.2015214253>

Yuliawanti, E. & Ariyanto, J. (2019). Pengaruh Model Problem Based Learning dengan Scaffolding Learning Activities terhadap Kemampuan Memecahkan Masalah Siswa. *Bio-Pedagogi: Jurnal Pembelajaran Biologi*, 8(1), 23-29.

Yusnaeni, Y., Corebima, A. D., Susilo, H. & Zubaidah, S. (2017). Creative thinking of low academic student undergoing search solve create and share learning integrated with metacognitive strategy. *International Journal of Instruction*, 10(2), 245–262. <https://doi.org/10.12973/iji.2017.10216a>

Zainul, A. & Nasution, N. (2001.) *Penilaian Hasil Belajar*. Direktorat Pendidikan Tinggi

Zhu, X. & Simon, H. A. (1987). Learning Mathematics From Examples and by Doing. *Cognition and Instruction*, 4(3), 137–166. https://doi.org/10.1207/s1532690xci0403_1