

**PENGUASAAN KONSEP DAN BERPIKIR KREATIF PESERTA DIDIK
SEKOLAH DASAR KELAS V PADA MATERI KALOR MELALUI
MODEL PEMBELAJARAN RADEC DI MASA *NEW NORMAL***

TESIS

Diajukan untuk memenuhi sebagian syarat memperoleh
gelar Magister Pendidikan pada Program Studi Pendidikan Dasar



Oleh
Desy Merisa Susanti
NIM 2317259

**PROGRAM STUDI PENDIDIKAN DASAR
FAKULTAS ILMU PENDIDIKAN
UNIVERSITAS PENDIDIKAN INDONESIA
BANDUNG
2025**

=====

PENGUASAAN KONSEP DAN BERPIKIR KREATIF PESERTA DIDIK SEKOLAH DASAR KELAS V PADA MATERI KALOR MELALUI MODEL PEMBELAJARAN RADEC DI MASA NEW NORMAL

Oleh
Desy Merisa Susanti

S.Pd Universitas Pendidikan Indonesia, 2008

Sebuah Tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Pendidikan (M.Pd.) pada Fakultas Pendidikan Bahasa dan Seni

© Desy Merisa Susanti 2025
Universitas Pendidikan Indonesia
Januari 2025

Hak Cipta dilindungi undang-undang.
Tesis ini tidak boleh diperbanyak seluruhnya atau sebagian,
dengan dicetak ulang, difoto kopi, atau cara lainnya tanpa ijin dari penulis.

Desy Merisa Susanti

**PENGUASAAN KONSEP DAN BERPIKIR KREATIF PESERTA DIDIK
SEKOLAH DASAR KELAS V MELALUI MODEL PEMBELAJARAN
RADEC DI MASA *NEW NORMAL***

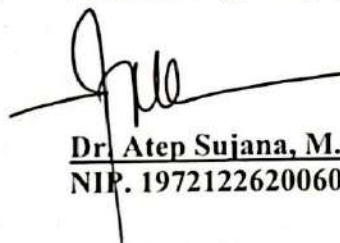
Disetujui dan disahkan oleh:

Pembimbing/Penguji I



Dr. Hj. Ernawulan Syaodih, M.Pd.
NIP. 196510011998022001

Pembimbing/Penguji II



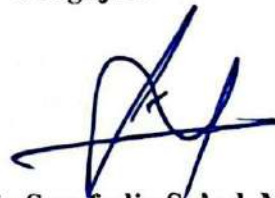
Dr. Atep Sujana, M.Pd.
NIP. 197212262006041001

Penguji III



Dr. Arie Rakhmat Riyadi, M.Pd.
NIP. 198204262010121005

Penguji IV



Prof. Dr. Udin Syaefudin Sa'ud, M.Ed.
NIP. 920230819530612101

Mengetahui

Ketua Program Studi Pendidikan Dasar



Dr. Arie Rakhmat Riyadi, M.Pd.
NIP. 198204262010121005

**PENGUASAAN KONSEP DAN BERPIKIR KREATIF PESERTA DIDIK
SEKOLAH DASAR KELAS V PADA MATERI KALOR MELALUI
MODEL PEMBELAJARAN RADEC DI MASA *NEW NORMAL***

Oleh:

Desy Merisa Susanti

2317259

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran RADEC (*Read Answer Discuss Explain Create*) pada materi kalor terhadap penguasaan konsep dan berpikir kreatif peserta didik di kelas V Sekolah Dasar. Metode yang digunakan dalam penelitian ini adalah kuasi eksperimen dengan *nonequivalent control group design* sebagai desain penelitian. Subjek penelitian ini yaitu 55 orang peserta didik kelas V Sekolah Dasar yang terdiri dari 29 orang peserta didik di kelas eksperimen dan 26 orang peserta didik di kelas kontrol. Instrumen yang digunakan yaitu tes penguasaan konsep dan berpikir kreatif serta observasi keterlaksanaan pembelajaran. Kelompok eksperimen menerapkan model pembelajaran RADEC, sedangkan kelas kontrol tanpa menerapkan model pembelajaran RADEC. Hasil penelitian menunjukkan bahwa terdapat perbedaan peningkatan penguasaan konsep peserta didik yang signifikan antara kelompok kelas eksperimen dan kelompok kelas kontrol yang terlihat dari hasil uji t N-gain yaitu 0,000 dengan rata-rata N-gain kelompok eksperimen yaitu 0,55 dan kelompok kontrol yaitu 0,22. Hasil penelitian berpikir kreatif peserta didikpun memperlihatkan perbedaan yang signifikan antara kelompok eksperimen dan kelompok kontrol dengan hasil uji t N-gain yaitu 0,000 dengan rata-rata N-gain kelompok eksperimen yaitu 0,40 dan kelompok kontrol 0,16. Jadi dapat disimpulkan bahwa model pembelajaran RADEC memberikan pengaruh terhadap peningkatan penguasaan konsep dan berpikir kreatif yang lebih tinggi dibandingkan pembelajaran tanpa model RADEC. Berdasarkan temuan penelitian ini, model pembelajaran RADEC dapat diterapkan secara lebih luas dalam proses pembelajaran di berbagai mata pelajaran dan tingkat pendidikan untuk memaksimalkan peningkatan penguasaan konsep serta keterampilan berpikir kreatif peserta didik. Salah satu caranya adalah dengan merumuskan kebijakan yang mendukung standarisasi penggunaan model ini di berbagai institusi pendidikan.

Kata kunci: RADEC (*Read Answer Discuss Explain Create*), penguasaan konsep, dan berpikir kreatif

**MASTERY OF CONCEPTS AND CREATIVE THINKING
FOR V GRADE ELEMENTARY SCHOOL STUDENTS ON HEAT
MATERIAL THROUGH
THE RADEC LEARNING MODEL IN THE NEW NORMAL**

By:

Desy Merisa Susanti

2317259

ABSTRACT

This study aims to examine the effect of the RADEC (Read, Answer, Discuss, Explain, Create) learning model on the mastery of concepts and creative thinking of fifth-grade students in elementary school, specifically in the topic of heat. The research method used is a quasi-experimental design with a nonequivalent control group. The study subjects consisted of 55 fifth-grade students, with 29 students in the experimental group and 26 students in the control group. The instruments used were tests of concept mastery and creative thinking, as well as observations of the implementation of the learning process. The experimental group applied the RADEC learning model, while the control group did not. The results showed a significant difference in the improvement of concept mastery between the experimental and control groups, as evidenced by the N-gain t-test result of 0.000, with an average N-gain of 0.55 for the experimental group and 0.22 for the control group. The results for creative thinking also revealed a significant difference between the experimental and control groups, with an N-gain t-test result of 0.000, and an average N-gain of 0.40 for the experimental group and 0.16 for the control group. Therefore, it can be concluded that the RADEC learning model has a positive effect on enhancing both concept mastery and creative thinking to a greater extent compared to learning without the RADEC model. Based on these findings, it is recommended that the RADEC learning model be more widely implemented in various subjects and educational levels to optimize the improvement of concept mastery and the development of students' creative thinking skills. One way is to formulate policies that support the standardization of the use of this model in various educational institutions.

Keywords: RADEC (Read Answer Discuss Explain Create), mastery of concepts, and creative thinking

DAFTAR ISI

HALAMAN PENGESAHAN	i
HALAMAN PERNYATAAN KEASLIAN	ii
KATA PENGANTAR	iii
HALAMAN UCAPAN TERIMA KASIH	iv
ABSTRAK	vi
DAFTAR ISI.....	viii
DAFTAR TABEL	x
DAFTAR GAMBAR	xii
DAFTAR LAMPIRAN.....	xiii
BAB I PENDAHULUAN	1
1.1 Latar Belakang.....	1
1.2 Rumusan Masalah	9
1.3 Tujuan Penelitian.....	10
1.4 Manfaat Penelitian.....	10
1.5 Struktur Organisasi tesis	11
BAB II KAJIAN PUSTAKA	13
2.1 Model Pembelajaran RADEC	13
2.2 Penguasaan Konsep	25
2.3 Berpikir Kreatif	30
2.4 Pembelajaran IPA di Sekolah Dasar	42
2.5 Kalor	51
2.6 Pembelajaran di Masa Pandemi Covid-19 dan <i>New Normal</i> ...	57
2.7 Hasil Penelitian yang Relevan.....	62
2.8 Hipotesis Penelitian	63
BAB III METODE PENELITIAN	64
3.1 Metode dan Desain Penelitian	64
3.2 Populasi dan Sampel Penelitian.....	66
3.3 Definisi Operasional	67
3.4 Instrumen Penelitian.....	68

3.5 Teknik Pengumpulan Data	78
3.6 Prosedur Penelitian	79
3.7 Analisis Data	84
BAB IV HASIL PENELITIAN DAN PEMBAHASAN	88
4.1 Keterlaksanaan Model Pembelajaran RADEC di Masa Pandemi Covid-19 terhadap Penguasaan Konsep dan Berpikir Kreatif.....	88
4.2 Penguasaan Konsep Peserta Didik di Kelas yang Menerapkan Model Pembelajaran RADEC dengan Kelas yang Tidak Menerapkan Model Pembelajaran RADEC	106
4.3 Berpikir Kreatif Peserta Didik di Kelas yang Menerapkan Model Pembelajaran RADEC dengan Kelas yang Tidak Menerapkan Model Pembelajaran RADEC	112
BAB V SIMPULAN, IMPLIKASI, DAN REKOMENDASI.....	119
5.1 Simpulan	119
5.2 Implikasi	120
5.3 Rekomendasi	120
DAFTAR PUSTAKA	122
LAMPIRAN	137

DAFTAR TABEL

Tabel	Halaman
Tabel 2.1 Penerapan Model Pembelajaran RADEC	22
Tabel 2.2 Kompetensi Materi Perpindahan Kalor	51
Tabel 3.1 Desain <i>Nonrandomized pretest-posttest control group design</i>	65
Tabel 3.2 Lembar Observasi Keterlaksanaan Model Pembelajaran RADEC	68
Tabel 3.3 Hasil Validasi Hasil Lembar Observasi Keterlaksanaan Model Pembelajaran RADEC	70
Tabel 3.4 Hasil Revisi Validasi Hasil Lembar Observasi Keterlaksanaan Model Pembelajaran RADEC	70
Tabel 3.5 Kisi-kisi Tes Penguasaan Konsep	71
Tabel 3.6 Kriteria Korelasi Koefisien Validitas	72
Tabel 3.7 Hasil Uji Validitas Tes	72
Tabel 3.8 Interepetasi Reliabilitas Instrumen.....	73
Tabel 3.9 Hasil Uji Realiabilitas Tes.....	74
Tabel 3.10 Hasil Uji Reliabilitas	75
Tabel 3.11 Daya Pembeda Tes	75
Tabel 3.12 Klasifikasi Tingkat Kesukaran	76
Tabel 3.13 Tingkat Kesukaran Tes.....	77
Tabel 3.14. Hasil Validasi Rencana Pembelajaran Model RADEC.....	79
Tabel 3.15 Kriteria n-gain	87
Tabel 4.1 Keaktifan Peserta Didik Kelas Eksperimen pada Tahap Explain	100
Tabel 4.2 Keaktifan Peserta Didik Kelas Kontrol	100
Tabel 4.3 Hasil Observasi Implementasi Pembelajaran RADEC	103
Tabel 4.4 Hasil Observasi Implementasi Pembelajaran nonRADEC	104
Tabel 4.5 Hasil Pretes Penguasaan Konsep.....	106
Tabel 4.6 Hasil Postest Penguasaan Konsep	107
Tabel 4.7 N-Gain Penguasaan Konsep.....	107
Tabel 4.8 Rata-rata Indikator Penguasaan Konsep	110
Tabel 4.9 Hasil Pretest Berpikir Kreatif.....	112

Tabel 4.10 Hasil Posttest Berpikir Kreatif	113
Tabel 4.11 N-Gain Berpikir Kreatif	113
Tabel 4.12 Rata-rata Indikator Berpikir Kreatif	116

DAFTAR GAMBAR

Gambar	Halaman
Gambar 3.1 Prosedur Penelitian	84
Gambar 4.1 Grafik Kebiasaan Membaca.....	91
Gambar 4.2 Grafik Nilai Rata-Rata Pertanyaan Pra Pembelajaran/Pretest	93
Gambar 4.3 Grafik Nilai Rata-Rata Postes	94
Gambar 4.4 Grafik Persentase Keaktifan Peserta Didik	99
Gambar 4.5 Grafik Nilai Tahap <i>Create</i>	102

DAFTAR LAMPIRAN

Lampiran	Halaman
Lampiran 1 Output Uji Validitas Instrumen	137
Lampiran 2 Output Uji Homogenitas Instrumen	140
Lampiran 3 Instrumen Tes	141
Lampiran 4 Output Uji Normalitas Pretes Penguasaan Konsep	154
Lampiran 5 Output Uji Homogenitas Pretes Penguasaan Konsep	155
Lampiran 6 Output Uji Normalitas Postes Penguasaan Konsep	156
Lampiran 7 Output Uji Homogenitas Postes Penguasaan Konsep	157
Lampiran 8 Output Uji Normalitas Pretes Berpikir Kreatif	158
Lampiran 9 Output Uji Homogenitas Pretes Berpikir Kreatif	159
Lampiran 10 Output Uji Normalitas Postes Berpikir Kreatif	160
Lampiran 11 Output Uji Homogenitas Postes Berpikir Kreatif	161
Lampiran 12 Output Uji t Pretes Penguasaan Konsep	162
Lampiran 13 Output Uji t Postes Penguasaan Konsep	163
Lampiran 14 Output Mann Whitney Pretes Berpikir Kreatif	164
Lampiran 15 Output Uji t Postes Berpikir Kreatif	165
Lampiran 16 Rencana Pelaksanaan Pembelajaran (RPP)	166
Lampiran 17 Bahan Bacaan	172
Lampiran 18 Pertanyaan Pra-Pembelajaran	184
Lampiran 19 Pertanyaan Postes	189
Lampiran 20 Lembar Kerja Peserta Didik (LKPD)	194
Lampiran 21 Dokumentasi Kegiatan	199

DAFTAR PUSTAKA

- Agustina, S., Sudin, A., & Sujana, A. (2020). Berpikir kreatif dan penguasaan konsep siswa melalui model pembelajaran radec berbasis whatsapp group pada materi siklus air. *Jurnal Pena Ilmiah*, 3(2). <https://doi.org/https://doi.org/10.17509/jpi.v3i2.27628>
- Agustinova, D. E. (2018). Penerapan kurikulum 2013 pada mata pelajaran sejarah pada sekolah menengah atas. *ISTORIA: Jurnal Pendidikan Dan Ilmu Sejarah*, 14(1). <https://doi.org/10.21831/istoria.v14i1.19396>
- Aisah, S. (2020). Analisis pemahaman guru tentang konsep hakikat ipa dan pengaruhnya terhadap sikap ilmiah siswa sekolah dasar di depok. *Al-Mubin; Islamic Scientific Journal*, 3(1), 16–26. <https://doi.org/10.51192/almubin.v3i1.66>
- Al Iftitah, I. I., & Syamsudin, A. (2022). Penerapan pembelajaran tatap muka terbatas di masa pandemi covid-19 pada lembaga paud. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, 6(3), 2334–2344. <https://doi.org/10.31004/obsesi.v6i3.2079>
- Aljraiwi, S. (2019). Effectiveness of gamification of web-based learning in improving academic achievement and creative thinking among primary school students. *International Journal of Education in Practice*, 7(3), 242–257. <https://doi.org/10.18488/journal.61.2019.73.242.257>
- Amanda, F. F., Sumitro, S. B., Lestari, S. R., & Ibrohim, I. (2022). Developing complexity science-problem based learning model to enhance conceptual mastery. *Journal of Education and Learning (EduLearn)*, 16(1). <https://doi.org/10.11591/edulearn.v16i1.20408>
- Amri, F., & Sulistyowati, S. N. (2022). Persepsi guru dan siswa tentang pembelajaran tatap muka terbatas di masa pandemi covid-19. *Jurnal PAJAR (Pendidikan Dan Pengajaran)*, 6(5), 1394. <https://doi.org/10.33578/pjr.v6i5.8956>
- Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2002). A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives. *College of Education, The Ohio University*, 41(4), 352.

https://doi.org/10.1207/s15430421tip4104_2

- Andriani, Y., & Riandi. (2016). Peningkatan penguasaan konsep siswa melalui pembelajaran argument driven inquiry pada pembelajaran ipa terpadu di smp kelas vii. *Jurnal Edusains*, 7(2), 114–120. <https://doi.org/10.15408/es.v7i2.1578>
- Arda, G. (2020). *Prinsip Dasar Pindah Kalor*. Universitas Udayana Press.
- Arisanti, W. O. L., Sopandi, W., & Widodo, A. (2016). Analisis penguasaan konsep dan keterampilan berpikir kreatif siswa sd melalui project based learning. *EduHumaniora: Jurnal Pendidikan Dasar*, 8(1), 82–95. <https://doi.org/ISSN 2085-1243>
- Artaga, R. C. (2021). Mastery of Science concepts improvess scientific attitude in elementary school students. *Jurnal Ilmiah Sekolah Dasar*, 5(4), 606–612. <https://doi.org/https://doi.org/10.23887/jisd.v5i4.37897>
- Asmawati, E., & Bintang Kejora, M. T. (2020). The effect of using simple aircraft concrete media on the mastery of concepts in inquiry science learning in elementary school students. *MUDARRISA: Jurnal Kajian Pendidikan Islam*, 12(2), 150–168. <https://doi.org/10.18326/mdr.v12i2.150-168>
- Astuti, D., Sarwanto, & Chumdari. (2020). The effectiveness of using teaching media toward the concept mastery based on classroom activity and learning style. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 17(7), 5568–5587.
- Astuti, L. S. (2017). Penguasaan Konsep IPA Ditinjau dari Konsep Diri dan Minat Belajar Siswa. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 7(1), 40–48. <https://doi.org/10.30998/formatif.v7i1.1293>
- Atmojo, S. E., Muhtarom, T., & Lukitoaji, B. D. (2020). The level of self-regulated learning and self-awareness in science learning in the covid-19 pandemic era. *Jurnal Pendidikan IPA Indonesia*, 9(4), 512–520. <https://doi.org/10.15294/jpii.v9i4.25544>
- Atthachakara, S. (2021). Developing practical skills through blended learning model using creativity-based learning activites that enhances creative thinking for education students majoring in social studies at mahasarakham. *Journal of Education and Learning*, 10(6), 126–131. <https://doi.org/10.5539/jel.v10n6p126>

- Atun, S., & Latupeirisa, V. P. S. (2021). Science kit teaching aid for the earthquake in improving students' collaboration skills and creative thinking in junior high school. *European Journal of Educational Research*, 10(1), 187–197. <https://doi.org/10.12973/eujer.10.1.187>
- Azhari, M. Z., Yulianti, L., & Suharti. (2017). Penguasaan konsep ipa siswa kelas v sd pada materi rangka tubuh. *Pros. Seminar Pend. IPA Pascasarjana UM*, 2, 978–602.
- Babincakova, M., & Bernard, P. (2024). Evolution after the revolution: how classical and online school chemistry teaching has changed during the covid-19 pandemic? *Journal of Chemical Education*, 101(3), 963–972. <https://doi.org/https://dx.doi.org/10.1021/acs.jchemed.3c00906>
- Surat Edaran PTMT Semester 2, Pub. L. No. PK.03.02/049-Disdik/I/2022, 1 (2022).
- Bao, L., & Koenig, K. (2019). Physics education research for 21st century learning. *Disciplinary and Interdisciplinary Science Education Research*, 1(1), 1–12. <https://doi.org/10.1186/s43031-019-0007-8>
- Batlolona, J. R., Diantoro, M., Wartono, W., & Latifah, E. (2019). Creative thinking skills students in physics on solid material elasticity. *Journal of Turkish Science Education*, 16(1), 48–61. <https://doi.org/10.12973/tused.10265a>
- Batlolona, J. R., & Talakua, M. (2021). Elementary students ' creative thinking skills in science in the Maluku Islands , Indonesia. *Creativity Studies*, 14(March). <https://doi.org/10.3846/cs.2021.11244>
- Beghetto, R. A. (2007). Does creativity have a place in classroom discussions ? Prospective teachers ' response preferences. *ELsevier Journal*, 2, 1–9. <https://doi.org/10.1016/j.tsc.2006.09.002>
- Bodrova, E., & Leong, D. (1998). Scaffolding emergent writing in the zone of proximal development. *Literacy, Teaching and Learning*, 3(2), 1.

- BSNP. (2006). Permendiknas RI No. 22 Tahun 2006 tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah. *Global Shadows: Africa in the Neoliberal World Order*, 44(2), 8–10.
- Chodriyah, L., Murtono, M., Santoso, S., & Ismaya, E. A. (2021). Implementation of mind mapping learning on students' creative thinking ability of elementary school students. *Inopendas Jurnal Ilmiah Kependidikan*, 4(2), 74–80. <https://doi.org/https://dx.doi.org/10.24176/jino.v4i2.6553>
- Cırt, D. K., & Aydemir, S. (2023). Online scratch activities during the covid-19 pandemic: computational and creative thinking. *International Journal of Evaluation and Research in Education*, 12(4), 2111–2120. <https://doi.org/10.11591/ijere.v12i4.24938>
- Creswell, J. W., & Creswell, J. david. (2018). Research Design Qualitative, quantitative and mixed methods research (Dörnyei). In *Introducing English Language*. <https://doi.org/10.4324/9781315707181-60>
- Dahar, R. (2011). *Teori-Teori Belajar dan Pembelajaran*. Erlangga.
- Delen, I., & Yuksel, T. (2022). Abrupt shift or caught off guard: a systematic review of k-12 engineering and stem education's response to the covid-19 pandemic. *Journal of Pre-College Engineering Education Research (J-PEER)*, 12(2), 108–120. <https://doi.org/10.7771/2157-9288.1353>
- Dewi, C. A., & Mashami, R. A. (2019). The effect of chemo-entrepreneurship oriented inquiry module on improving students' creative thinking ability. *Journal of Turkish Science Education*, 16(2), 253–263. <https://doi.org/10.12973/tused.10279a>
- Dilekli, Y., & Tezci, E. (2020). A cross-cultural study : Teachers' self-efficacy beliefs for teaching thinking skills. *Thinking Skills and Creativity*, 35(September 2019), 1–13. <https://doi.org/10.1016/j.tsc.2019.100624>
- Elfiani, F. (2017). Upaya meningkatkan kemampuan berpikir kreatif siswa kelas vii f m t s ma'arif nu 1 wangon melalui pembelajaran ideal problem solving. *AlphaMath Journal of Mathematics Education*, 3(2), 27–35. <https://doi.org/2549-9084>

- Erdem, A. R., & Adiguzel, D. C. (2019). The opinion of primary school teachers on their creative thinking skills. *Eurasian Journal of Educational Research*, 80(June 2016), 0–2. <https://doi.org/10.14689/ejer.2019.80.2>
- Ernawati, M Dwi Wiwik, Sudarmin, S., Asrial, A., Damris, M., Haryanto, H., Nevriansyah, E., Fitriani, R., & Putri, W. A. (2021). How scaffolding integrated with problem based learning can improve. *Eurasian Journal of Educational Research*, 11(3), 1349–1361. <https://doi.org/https://dx.doi.org/10.12973/eu-jer.11.3.1349>
- Ernawati, Margaret Dwi Wiwik, Rusdi, M., Asrial, A., Muhaimin, M., Wulandari, M., & Maryani, S. (2022). Analysis of problem based learning in the scaffolding design: students' creative-thinking skills. *Cypriot Journal of Educational Sciences*, 17(7), 2333–2348. <https://doi.org/https://dx.doi.org/10.18844/cjes.v17i7.7551>
- Faradhillah, Maharmi, & Hadiya. (2021). Application of Discovery Learning Models To Improve Conceptual Mastery of Newton Force And Law. *IJIS Edu: Indoensian J. Integr. Sci. Education*, 3(1), 69–77. <https://doi.org/https://dx.doi.org/10.29300/ijisedu.v3i1.4174>
- Febyronita, D., & Giyanto. (2016). Survei tingkat kemampuan siswa dalam mengerjakan tes berbentuk jawaban singkat (short answer test) pada mata pelajaran ips terpadu (geografi) kelas vii di smp negeri 1 mesuji tahun pelajaran 2015/2016. *Jurnal Swarnabhumii*, 1(1), 17–21.
- Finkelstein, A. (2010). *Science Is Golden: A Problem-Solving Approach to Doing Science with Children*. Michigan State University Press. <https://doi.org/https://dx.doi.org/10.5860/choice.40-1681>
- Fuadi, F. N., Sopandi, W., & Sujana, A. (2021). The mastery of grade 4 of elementary school students' concepts on energy through the implementation of the radec learning model. *Journal of Physics: Conference Series*, 1806(1), 1–7. <https://doi.org/10.1088/1742-6596/1806/1/012140>

- Gomba, A. M. (2019). Cloze test pocket worksheet as aid to mastery of science concepts. *Journal of Education and Learning (EduLearn)*, 13(1), 125–130. <https://doi.org/10.11591/edulearn.v13i1.11271>
- Gu, X., Dijksterhuis, A., & Ritter, S. M. (2019). Fostering children ' s creative thinking skills with the 5-I training program. *Thinking Skills and Creativity*, 32(May), 92–101. <https://doi.org/10.1016/j.tsc.2019.05.002>
- Gusniwati, M. (2015). Pengaruh kecerdasan emosional dan minat belajar terhadap penguasaan konsep matematika siswa sman di kecamatan kebon jeruk. *Jurnal Formatif*, 5(1), 26–41. <https://doi.org/10.30998/formatif.v5i1.165>
- Gutierrez, K. S., Kidd, J. J., Lee, M. J., Pazos, P., Kaipa, K., & Ayala, O. (2023). Preparing undergraduates for the post-pandemic workplace: Teams of education and engineering students teach engineering virtually. *Humanities and Social Sciences Communications*, 10(1), 1–18. <https://doi.org/10.1057/s41599-023-02383-6>
- Hadar, L. L., & Tirosh, M. (2019). Creative thinking in mathematics curriculum : An analytic. *Thinking Skills and Creativity*, 33(September 2018), 100585. <https://doi.org/10.1016/j.tsc.2019.100585>
- Hagi, N. A., & Mawardi, M. (2021). Model problem based learning untuk meningkatkan keterampilan berpikir kreatif siswa sekolah dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 3(2), 463–471. <https://doi.org/10.31004/edukatif.v3i2.325>
- Hamid, A., Setyosari, P., & Kuswandi, D. (2019). The implementation of mobile seamless learning strategy in mastering students ' concepts for elementary school. *Journal for the Education of Gifted Young Scientists*, 7(December), 0–3. <https://doi.org/https://doi.org/10.17478/jegys.622416>
- Handayani, H., Sopandi, W., Syaodih, E., Suhendra, I., & Hermita, N. (2019a). Radec: an alternative learning of higher order thinking skills (hots) students of elementary school on water cycle. *Journal of Physics: Conference Series*, 1351(1), 1–7. <https://doi.org/10.1088/1742-6596/1351/1/012074>
- Handayani, H., Sopandi, W., Syaodih, E., Suhendra, I., & Hermita, N. (2019b). RADEC: An Alternative Learning of Higher Order

Thinking Skills (HOTs) Students of Elementary School on Water Cycle. *Journal of Physics: Conference Series*, 1351(1). <https://doi.org/10.1088/1742-6596/1351/1/012074>

Handayani, Hany, Sopandi, W., Syaodih, E., Setiawan, D., & Suhendra, I. (2019). Dampak perlakuan model pembelajaran radec bagi calon guru terhadap kemampuan merencanakan pembelajaran di sekolah dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, IV(01), 79–93. <https://doi.org/10.23969/jp.v4i1.1857>

Harahap, L. J., Ristanto, R. H., & Komala, R. (2020). Evoking 21st-century skills: developing instrument of critical thinking skills and mastery of ecosystem concepts. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 5(1), 27–41. <https://doi.org/10.24042/tadris.v5i1.5943>

Hendon, S., & Abdullah, S. (2016). Transforming science teaching environment for the 21st century primary school pupils. *Malaysian Online Journal of Educational Technology*, 4(4), 68–76.

Heryanti, F. R., Sujana, A., & Saputra, Y. M. (2021). Keterampilan berpikir kritis dan penguasaan konsep siswa melalui pembelajaran radec menggunakan media zoom meeting pada materi perubahan wujud benda kelas v. *Jurnal Pena Ilmiah*, 4. <https://doi.org/https://doi.org/10.17509/jpi.v4i1.37868>

Hidajat, F. A. (2021). Students creative thinking profile as a high order thinking in the improvement of matematics learning. *Eurasian Journal of Educational Research*, 10(3), 1247–1258. <https://doi.org/2165-8714>

Hidayat, T., Susilaningsih, E., & Cepi, K. (2018). The effectiveness of enrichment test instruments design to measure students' creative thinking skills and problem-solving. *Thinking Skills and Creativity*, 29, 161–169. <https://doi.org/10.1016/j.tsc.2018.02.011>

Imanuel, S. A. (2015). Kesulitan belajar ipa peserta didik sekolah dasar. *Vox Edukasi*, 6(2), 108–122.

Surat Edaran Nomor 15 2020 Tentang Pedoman Penyelenggaraan Belajar Dari Rumah Dalam Masa Darurat Penyebaran Corona Virus Disease (Covid-19), (2020).

- Jamaluddin, J. (2010). Kemampuan berpikir kreatif siswa sd dalam pembelajaran ipa. *Jurnal Ilmu Pendidikan Universitas Negeri Malang*, 17(3), 103344.
- Jamaludin, J., Kakaly, S., & Batlolona, J. R. (2022). Critical thinking skills and concepts mastery on the topic of temperature and heat. *Journal of Education and Learning (EduLearn)*, 16(1), 51–57. <https://doi.org/10.11591/edulearn.v16i1.20344>
- Jankowska, D. M., Gajda, A., & Karwowski, M. (2019). How children ' s creative visual imagination and creative thinking relate to their representation of space. *International Journal of Science Education*, 0(0), 1–22. <https://doi.org/10.1080/09500693.2019.1594441>
- Jannah, A. N., Yuliati, L., & Parno. (2016). Penguasaan konsep dan kemampuan bertanya siswa pada materi hukum newton melalui pembelajaran inquiry lesson dengan strategi lbq. *Jurnal Pendidikan : Teori, Penelitian Dan Pengembangan*, 1(2), 409–420.
- Johan, H. (2018). *Grid analysis display system (grads) and multi modus visualization in earth science learning mastery and spiritual aspect to enhance concept*. 15(1), 109–127. <https://doi.org/10.12973/tused.10224a>
- Jumanto, J., Sa'Ud, U. S., & Sopandi, W. (2024). Development of ipas teaching materials with the radec model based on metacognitive strategies to enhance critical and creative thinking skills of elementary school students. *Jurnal Penelitian Pendidikan IPA*, 10(3), 1000–1008. <https://doi.org/10.29303/jppipa.v10i3.7010>
- Kan'An, A. (2018). The relationship between jordanian students' 21st century skills (cs21) and academic achievement in science. *Journal of Turkish Science Education*, 15(2), 82–94. <https://doi.org/10.12973/tused.10232a>
- Kemendikbud. (2014). *Permendikbud No 57 Struktur Kurikulum 2013*. Kementrian Pendidikan dan Kebudayaan.
- Khabibah, N. H., Suhartono, S., & Wahyudi, W. (2019). Analisis kemampuan siswa dalam menyelesaikan soal ipa tipe higher order

thinking skill (hots) pada materi gaya dan gerak di kelas iv sd negeri winong tahun ajaran 2021/2022. *Kalam Cendikia: Jurnal Ilmiah Kependidikan*, 11(01), 9–25.

Kodi, A. I., Hudha, M. N., & Ayu, H. D. (2019). Pengembangan media flipbook fisika berbasis android untuk meningkatkan prestasi belajar pada topik perpindahan kalor. *Prosiding Seminar Nasional Fisika (e-Jurnal)*, 1–8. <https://doi.org/2527-6670>

Krathwohl, D. R. (2002). *A Revision of Bloom's Taxonomy: An Overview. Theory Into Practice* (41st ed.). Autumn.

Kreis, Y., Haas, B., Weinhandl, R., & Lavicza, Z. (2024). Transitioning from lectures to online flipped classrooms: enhancing pre-service teacher education in Luxembourg. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2425895>

Kumala, F. N. (2016). Pembelajaran IPA Sekolah Dasar. In *Journal of Chemical Information and Modeling* (Vol. 8, Issue 9).

Lestari, H., Sopandi, W., Sa'ud, U. S., Musthafa, B., Budimansyah, D., & Sukardi, R. R. (2021). The impact of online mentoring in implementing radec learning to the elementary school teachers' competence in training students' critical thinking skills: A case study during covid-19 pandemic. *Jurnal Pendidikan IPA Indonesia*, 10(3), 346–356. <https://doi.org/10.15294/JPII.V10I3.28655>

Lusiani, L., Anggraeni, E. F., Rismaningsih, F., Sudirman, S., & Noor, I. (2020). *Perpindahan Kalor* (S. Haryanti (ed.); Issue 1). Media Sains Indonesia.

Lutvaidah, U. (2016). Pengaruh metode dan pendekatan pembelajaran terhadap penguasaan konsep matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 5(3), 279–285. <https://doi.org/10.30998/formatif.v5i3.653>

Ma'ruf, A. S., Wahyu, W., & Sopandi, W. (2020). Colloidal learning design using radec model with stem. *Journal of Educational Sciences*, 4(4), 758–765.

Mahlianurrahman, M. (2017). Pengembangan perangkat pembelajaran untuk meningkatkan kemampuan berpikir kreatif siswa sekolah

dasar. *AR-RIAYAH : Jurnal Pendidikan Dasar*, 1(1), 87. <https://doi.org/10.29240/jpd.v1i1.219>

Maryani, I., Estriningrum, U., & Nuryana, Z. (2023). Self-regulated learning and creative thinking skills of elementary school students in the distance education during the covid-19 pandemic. *Creativity Studies*, 16(2), 496–508. <https://doi.org/10.3846/cs.2023.15278>

Miftahurrohmah, M., Sujana, A., & Sudin, A. (2021). Berpikir kreatif dan penguasaan konsep siswa kelas iv pada materi gaya gesek melalui pembelajaran berbasis proyek menggunakan zoom meeting. *Pena Ilmiah*, 4. <https://doi.org/https://doi.org/10.17509/jpi.v4i1.37985>

Miftari, V., Dzogovic, S. A., Dzogovic, A., & Zdravkovska-Adamova, B. (2021). The efficiency of online learning during the covid-19 pandemic: Comparative analysis of southeast european countries as participants in the new path of education. *Human Research in Rehabilitation*, 11(2), 133–142. <https://doi.org/10.21554/hrr.092110>

Mirosavljević, A., Bognar, B., & Sablić, M. (2023). Opportunities and challenges in the work of natural science teachers during online teaching: teachers' beliefs and attitudes. In *Acta Paedagogica Vilnensia* (Vol. 50, pp. 88–106). <https://doi.org/10.15388/ActPaed.2023.50.6>

Mufidah, J., & Diantoro, M. (2020). Penguasaan konsep siswa dalam argument driven inquiry berbasis fenomena disertai penilaian formatif. *BRILIANT: Jurnal Riset Dan Konseptual*, 5(November), 749–761. <https://doi.org/https://dx.doi.org/10.28926/briliant.v5i4.516>

Murdani, E., Suhandi, A., Muslim, M., Setiawan, A., Samsudin, A., & Costu, B. (2023). Physics argumentation-based computer-supported collaborative hybrid learning to increase concept mastery and argumentation skills. *Jurnal Pendidikan IPA Indonesia*, 12(2), 232–240. <https://doi.org/10.15294/jpii.v12i2.42457>

Mutaqqin, M. Z. H., Sarjan, M. Z., Rokhmat, M., Muliadi, J., Azizi, A., Ardiansyah, A., Hamidi, B., Pauzi, H., Yamin, I., Rasyidi, M.,

- Rahmatiah, M., Sudirman, R., & Khery, S. (2022). Pemahaman nature of science (hakekat ipa) bagi guru ipa: solusi membelajarkan ipa multidimensi. *Jurnal Ilmiah Wahana Pendidikan*, 8(21), 8.
- Nabawiyah, K., Abtokhi, A., & Fisika, J. (2010). Penentuan nilai kalor dengan bahan bakar kayu sesudah pengarangan serta hubungannya dengan nilai porositas zat padat. *Jurnal Fisika, UIN Maulana Malik Ibrahim Malang*, 3(1), 44–55. <https://doi.org/1979-6374>
- Nurhayati, N., & Rahardi, R. (2021). Kemampuan Berfikir Kreatif Mahasiswa Dalam Mengembangkan Media Pembelajaran Matematika Saat Pandemi Covid-19. *JPMI, Jurnal Pembelajaran Matematika Inovatif*, 4(2), 331–342. <https://doi.org/10.22460/jpmi.v4i2.331-342>
- Ozdemir, E., Coramik, M., & Urek, H. (2020). Determination of conceptual understanding levels related to optics concepts: the case of opticianry. *International Journal of Education in Mathematics, Science and Technology*, 8(1), 53. <https://doi.org/10.46328/ijemst.v8i1.728>
- Ozgenel, M. (2018). Modeling the relationships between school administrators ' creative and critical thinking dispositions with decision making styles and problem. *Educational Science: Theory and Practice*, 673–700. <https://doi.org/10.12738/estp.2018.3.0068>
- Phonnong, I., & Keeratichamroen, W. (2023). Perspectives on steam education during the covid-19 pandemic at an underprivileged elementary school in thailand. *International Journal of Science, Mathematics and Technology Learning*, 30(2), 15–32. <https://doi.org/10.18848/2327-7971/CGP/v30i02/15-32>
- Pratama, Y. A., Sopandi, W., & Hidayah, Y. (2019). Model pembelajaran radec (read-answer-discuss-explain and create): pentingnya membangun keterampilan berpikir kritis dalam konteks keindonesiaan. *Indonesian Journal of Learning Education and Counseling*, 2(1), 1–8. <https://doi.org/10.31960/ijolec.v2i1.99>
- Rahmah, S., Yulianti, L., & Irawan, E. B. (2018). Penguasaan konsep ipa pada siswa sekolah dasar. *Prosiding Seminar Nasional*, 3(1), 35–40.

- Rahmawati, S., Kusairi, S., & Sutopo. (2020). Analisis penguasaan konsep siswa yang belajar materi momentum dan impuls berbasis scientific approach disertai formative assessment berbantuan web. *Jurnal Pembelajaran Sains*, 3(1), 21–23. <https://doi.org/2527-9157>
- Rhosalia, L. A., Laksono, K., & Sukartiningsih, W. (2016). Kemampuan berpikir kreatif dalam menulis naratif siswa kelas v sekolah dasar negeri di kecamatan gayungan surabaya. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan Dan Hasil Penelitian*, 2(2), 166–174. <https://journal.unesa.ac.id/index.php/PD/article/download/5058/2821>
- Ritonga, R. A., Sopandi, W., & Rosbiono, M. (2021). Student concept mastery on coloid material through radec learning. *Journal of Educational Sciences*, 5(3), 520. <https://doi.org/10.31258/jes.5.3.p.520-532>
- Rosen, Y., Stoeffler, K., & Simmering, V. (2021). *Imagine: design for creative thinking, learning, and assessment in schools*. *Journal of Intelligence*, 2021(Oecd 2019). <https://doi.org/https://dx.doi.org/10.3390/jintelligence8020016>
- Satriawan, Y., Imega, S. D., & Puspitasari, Y. D. (2022). Penerapan model pembelajaran window shopping terhadap penguasaan konsep ipa siswa pada materi bunyi di smpn 1 rejosu kabupaten nganjuk tahun pelajaran 2021/2022. 1–14.
- Sayekti, I. C. (2019). Analisis hakikat ipa pada buku siswa kelas iv sub tema i tema 3 kurikulum 2013. *Profesi Pendidikan Dasar*, 1(2), 129–144. <https://doi.org/10.23917/ppd.v1i2.9256>
- Scavarda, A., Dias, A., Reis, A., Silveira, H., & Santos, I. (2021). *A covid-19 pandemic sustainable educational innovation management proposal framework*. *Sustainability (Switzerland)*, 13(11), 1–21. <https://doi.org/10.3390/su13116391>
- Şener, N., Türk, C., & Tas, E. (2015). Improving Science Attitude and Creative Thinking through Science Education Project : A Design , Implementation and Assessment. *Journal of Education and Training Studies*, 3(4), 57–67. <https://doi.org/10.11114/jets.v3i4.771>
- Septinaningrum, Sopandi, W., Agustin, M., Gumala, Anggraeni, P., Rahayu, H., Tursinawati, Nugraha, & Khabibur, R. (2019).

Improving creative thinking ability of prospective elementary school teachers through read-answer-discuss-explain-and create (radec) project-oriented learning model. The 2nd International Conference on Elementary Education, 2(1), 1298–1308.

Setiawan, D., Sopandi, W., & Hartati, T. (2020). *The influence of read, answer, discuss, explain, and create (radec) learning model on the concept mastery of elementary school students on the water cycle topic. Journal of Physics: Conference Series, 1521(4).* <https://doi.org/10.1088/1742-6596/1521/4/042113>

Setiawan, D, Sopandi, W., & Handayani, H. (2020). Implementation of Read-Answer-Discuss-Explain-and Create Learning Model In Learning Explanation Text In Elementary School. *The 2nd International Conference on Elementary Educationon Elementary Education, 2(1).* <http://proceedings2.upi.edu/index.php/icee/article/view/788>

Setiawan, Dadan, Sopandi, W., & Hartati, T. (2019). Kemampuan menulis teks eksplanasi dan penguasaan konsep siswa sekolah dasar melalui implementasi model pembelajaran radec. *Premiere Educandum : Jurnal Pendidikan Dasar Dan Pembelajaran, 9(2), 130.* <https://doi.org/10.25273/pe.v9i2.4922>

Shidiq, A., Rochintaniawati, D., & Sanjaya, Y. (2017). The use of self construction animation learning software to improve the students concept mastery on structure and functions of plants. *Pancaran Pendidikan, 6(3).*

Siburian, J., Corebima, A. D., Ibrohim, I., & Saptasari, M. (2019). The corelation between critical and creative thinking skills on cognitive learning result. *Eurasian Journal of Educational Research, 81, 99–114.* <https://doi.org/10.14689/ejer.2019.81.6>

Silaban, B., & Nainggolan, J. (2022). The mastery of science concepts in solving physics problems for junior high school students. *JPI (Jurnal Pendidikan Indonesia), 11(4), 618–625.* <https://doi.org/10.23887/jpiundiksha.v11i4.54039>

Silva, H., Lopes, J., Dominguez, C., & Morais, E. (2022). Lecture, cooperative learning and concept mapping: any differences on critical and creative thinking development? *International Journal of Instruction, 15(1), 765–780.* <https://doi.org/https://dx.doi.org/10.29333/iji.2022.15144a>

- Siregar, L. S., Wahyu, W., & Sopandi, W. (2020). *Polymer learning design using read, answer, discuss, explain and create (radec) model based on google classroom to develop student's mastery of concepts*. *Journal of Physics: Conference Series*, 1469(1). <https://doi.org/10.1088/1742-6596/1469/1/012078>
- Sopandi, W. (2017). *The quality improvement of learning processes and achievements through the read-answer-discuss-explain-and create learning model implementation*. *Proceeding 8th Pedagogy International Seminar 2017: Enhancement of Pedagogy in Cultural Diversity Toward Excellence in Education*, 8(229), 132–139.
- Sopandi, W. (2019). Sosialisasi dan workshop implementasi model pembelajaran radec bagi guru-guru pendidikan dasar dan menengah [dissemination and implementation workshop of radec learning models for primary and secondary education teachers]. *PEDAGOGIA: Jurnal Pendidikan*, 8(1), 19. <https://doi.org/10.21070/pedagogia.v8i1.1853>
- Sopandi, W., Saud, U. S., Sujana, A., Sukardi, R. R., Suhendra, I., Yanuar, Y., Sutinah, C., & Sumirat, F. (2022). Pelatihan dan asistensi model pembelajaran radec untuk guru sekolah dasar di wilayah priangan timur jawa barat. *Pedagogia: Jurnal Ilmiah Pendidikan*, 14(2), 45–49. <https://doi.org/10.55215/pedagogia.v14i2.6453>
- Sopandi, W., Sudjana, A., Sukardi, rendi R., & Sutinah, C. (2021). *Model Pembelajaran RADEC Teori dan Implementasi di Sekolah* (B. Maftuh (ed.); I). UPI Press.
- Sopandi, W., & Sutinah, C. (2017). *Optimize the increase of students' conceptual understanding by optimize the increase of students' conceptual understanding by learning*. October 2016.
- Sriwongchai, A., Jantharajit, N., & Chookhampaeng, S. (2015). Developing the mathematics learning management model for improving creative thinking in thailand. *International Education Studies*, 8(11). <https://doi.org/10.5539/ies.v8n11p77>
- Sugiyono. (2011). *Statistika untuk Penelitian* (19th ed.). ALFABETA, CV.
- Sujiati, E., Handayani, B. S., Merta, I. W., Lestari, T. A., & Artayasa, I. P. (2020). The correlation between concept mastery and students moral reasoning stage through socio scientific issue approach on human reproduction system material. *Journal of Science*

and Education, 2(2), 77–83. <https://doi.org/10.29303/jossed.v2i2.959>

- Sukaesih, S., & Sutrisno. (2016). The effects of conceptual understanding procedures towards critical thinking skills of senior high school students. *Journal of Physics: Conference Series*, 755(1), 1–8. <https://doi.org/10.1088/1742-6596/755/1/011001>
- Sukardi, R. R., Sopandi, W., Riandi, Beeth, M. E., & Shidiq, A. S. (2022). What creative ideas came up about global warming in radec online class? *Asia Pacific Journal of Educators and Education*, 37(2), 51–83. <https://doi.org/10.21315/apjee2022.37.2.4>
- Sukardi, R. R., Sopandi, W., Sutinah, C., Yanuar, Y., Suhendra, I., & Sujana, A. (2021). Did online coaching increase teachers' capability in implementing radec to stimulate pupils' creativity in the topic of mixture separation and electricity? *Journal of Engineering Science and Technology*, 16, 73–80.
- Sukei, E., Emzir, E., & Akhadiyah, S. (2019). Reading habits, grammatical knowledge, creative thinking, and attainment in academic writing: evidence from bengkulu university, indonesia erni sukesi 1, emzir 2 & sabarti akhadiyah 3. *Journal of Social Studies Education Research*, 10(3), 176–192. <https://doi.org/13099108>
- Sukmawati, D., Sopandi, W., & Sujana, A. (2020). The application of read-answer-discuss-explain-and create (radec) models to improve student learning outcomes in class v elementary school on human respiratory system. *The 2nd International Conference on Elementary Education*, 2(1), 1734–1742.
- Sumirat, F., Sopandi, W., Nurhayeti, Y., Kusumastuti Astri, F., Restiana, R., & Sujana, A. (2022). Development and validation of mastery concept based pre-learning questions to support the implementation of radec (read- answer- discuss- explain-create). *Primary: Journal of Primary Education*, 6(2), 108–119. <https://doi.org/2580-7714>
- Suratno, J., & Sari, D. P. (2021). Analisis Komparatif Kurikulum Matematika di Indonesia, Korea Selatan, dan Singapura pada Jenjang Sekolah Menengah Atas. *Jurnal Pendidikan Guru Mateamtika*, 1(1), 64–72.
- Suratno, S., Komaria, N., Yushardi, Y., Dafik, D., & Wicaksono, I. (2019). *The Effect of Using Synectics Model on Creative Thinking*

and Metacognition Skills of Junior High School Students. 12(3), 133–150.

Suryandari, K. C., Rokhamiyah, R., & Wahyudi, W. (2021). *European Journal of Educational Research*. 10(3), 1329–1340.

Susanti, F. O., Muttaqin, M., & Listiawati, M. (2017). Pengaruh Model Inkuiri Terbimbing Terhadap Kemampuan Berpikir Kreatif Siswa Pada Materi Sistem Ekskresi. *Jurnal BIOEDUIN: Program Studi Pendidikan Biologi*, 7(1), 27. <https://doi.org/10.15575/bioeduin.v7i1.2450>

Sutantri, N., Sopandi, W., Wahyu, W., & Latip, A. (2023). *EduMatSains*. 7(2), 254–269.

Syafrial, S., Ashadi, A., Saputro, S., & Sarwanto, S. (2022). *Trend Creative Thinking Perception of Students in Learning Natural Science : Gender and Domicile Perspective*. 15(1), 701–716.

Syahrin, A., Suwignyo, H., & Priyatni, E. T. (2019). *Eurasian Journal of Educational Research* www.ejer.com.tr. 81, 21–36. <https://doi.org/10.14689/ejer.2019.81.2>

Tasoglu, A. K., & Bakac, M. (2014). The Effects of Problem Based Approach on Student's Conceptual Understanding in a University Mathematics Classroom. *Procedia - Social and Behavioral Sciences*, 152(September 2013), 704–707. <https://doi.org/10.1016/j.sbspro.2014.09.307>

Tican, C. (2019). *International Journal of Educational Methodology Pre-Service Primary School and Pre- School Teachers ' Perception of Individual Entrepreneurship and Opinions about Their Creative Thinking Tendency*. 5(4), 591–606. <https://doi.org/10.12973/ijem.5.4.591>

Tirono, M., & Sabit, A. (2011). *Efek Suhu Pada Proses Pengarangan Terhadap Nilai Kalor Arang Tempurung Kelapa (Coconut Shell Charcoal)*. 3(2), 143–152.

Titikusumawati, E., Sa'dijah, C., As'ari, A. R., & Susanto, H. (2020). *The e ffectiveness of the i ntegration of o pen- e nded and c*

collaborative (OE-C) learning strategies in reducing gaps of elementary school students' creative thinking skills. 19(1), 198–207. <https://doi.org/10.17051/ilkonline.2020>.

Tukarmi, Hadiyanto, N. (2022). *Jurnal Mantik The Influence Of Contextual Models On Processing Skills And Science Concept Mastery In Sd 207 Jambi*. 6(36), 609–616.

Tursinawati. (2013). Analisis Kemunculan Sikap Ilmiah Siswa dalam Pelaksanaan Percobaan pada Pembelajaran IPA di SDN Kota Banda Aceh. *Jurnal Pionir*, 1(1), 68.

Wagman, K. B., Blinder, E. B., Song, K., Vignon, A., Dworkin, S., Clegg, T., Vitak, J., & Chetty, M. (2023). We picked community over privacy": Privacy and Security Concerns Emerging from Remote Learning Sociotechnical Infrastructure During COVID-19. *Proceedings of the ACM on Human-Computer Interaction*, 7(CSCW2). <https://doi.org/10.1145/3610036>

Wicaksono, I., Supeno, & Budiarmo, A. S. (2020). Validity and practicality of the biotechnology series learning model to concept mastery and scientific creativity. *International Journal of Instruction*, 13(3), 157–170. <https://doi.org/10.29333/iji.2020.13311a>

Wilujeng, I., Suryadarma, I. G. P., Ertika, & Dwandaru, W. S. B. (2020). Local potential integrated science video to improve sps and concept mastery. *International Journal of Instruction*, 13(4), 197–214. <https://doi.org/10.29333/iji.2020.13413a>

Yulianti, M. T. (2023). *Pengaruh Model Pembelajaran RADEC (Read, Answer, Discuss, Explain and Create) terhadap Hasil Belajar*. 2(1), 33–40.

Yustina, Y., Mahadi, I., Ariska, D., Armentis, A., & Darmadi, D. (2022). *The Effect of E-Learning Based on the Problem-Based Learning Model on Students' Creative Thinking Skills During the Covid-19 Pandemic*. 15(2), 329–348.

Zhang, J., Kim, H., & Zhang, L. (2023). Impact of transition to a hybrid model of biochemistry course-based undergraduate research experience during the COVID-19 pandemic on student science self-efficacy and conceptual knowledge. *Discover Education*, 2(1). <https://doi.org/10.1007/s44217-023-00067-6>

