

**KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN
PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA
PEMBUATAN INDIKATOR ASAM BASA ALAMI
BERBAHAN DAUN-DAUNAN**

TESIS

*Diajukan untuk Memenuhi Sebagian Syarat untuk Memperoleh Gelar
Magister Pendidikan Kimia*



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UNIVERSITAS PENDIDIKAN INDONESIA
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BERBAHAN DAUN-DAUNAN**

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S.Pd. Universitas Islam Negeri Sultan Syarif Kasim Riau, 2018

Sebuah tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar
Magister Pendidikan (M.Pd) pada Program Studi Magister Pendidikan Kimia

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LEMBAR PENGESAHAN TESIS

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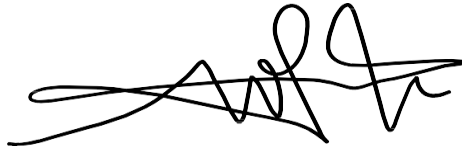
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PERNYATAAN

Dengan ini saya menyatakan bahwa tesis dengan judul “Kelayakan Model PBL untuk Melatih Keterampilan Pemecahan Masalah dan Kreativitas Siswa pada Pembuatan Indikator Asam Basa Alami Berbahan Daun-Daunan” ini sepenuhnya karya saya sendiri. Tidak ada bagian di dalamnya yang merupakan plagiat dari karya orang lain dan saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika keilmuan yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini saya siap menanggung resiko/sanksi yang dijatuhkan kepada saya apabila ditemukan adanya pelanggaran terhadap etika keilmuan dalam karya saya ini, atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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ABSTRAK

Penelitian ini bertujuan untuk memperoleh model pembelajaran PBL yang layak untuk melatih keterampilan pemecahan masalah dan kreativitas siswa pada pembuatan indikator asam basa alami berbahan daun-daunan. Metode penelitian pada penelitian ini adalah deskriptif-evaluatif dengan desain penelitian *Design-based-Research* (DbR) oleh Tel & Amiel yang dibagi menjadi 4 tahap, yaitu identifikasi dan analisis masalah dengan kegiatan analisis literatur dimana ditemukan bahwa pada siswa masih kurang dituntut untuk menghasilkan karya kreatif sebagai solusi dari permasalahan, kemudian perancangan model pembelajarannya uji coba terbatas dengan hasil observasi keterlaksanaan model PBL, keterampilan pemecahan masalah, kreativitas siswa, dan TCOF, kemudian yang terakhir adalah refleksi. Hasil uji kelayakan internal menunjukkan bahwa model PBL sangat layak untuk melatih keterampilan pemecahan masalah dan kreativitas siswa. Hasil uji kelayakan eksternal dan hasil observasi aktivitas siswa terkait pencapaian indikator keterampilan pemecahan masalah dan kreativitas selama uji coba terbatas juga berkategori sangat baik. Hasil observasi TCOF terhadap model PBL berada pada level tinggi. Sehingga dapat disimpulkan bahwa model PBL sangat layak digunakan untuk melatih keterampilan pemecahan masalah dan kreativitas siswa dalam pembuatan indikator asam basa alami berbahan daun-daunan ditinjau dari kelayakan internal, eksternal, dan TCOF.

Kata kunci: Model Pembelajaran PBL, Keterampilan Pemecahan Masalah, Kreativitas, Indikator Alami

ABSTRACT

This study aims to obtain a proper PBL learning model to train students' problem-solving skills and creativity in making natural acid-base indicators made from leaves. The research method is descriptive-evaluative research design Design-based-Research (DbR) by Tel & Amiel which is divided into 4 stages, namely identification and analysis of problems with literature analysis activities where it was found that in previous research related to training problem solving skills and students' creativity were still less required to produce creative work as solutions to problems, then designing learning models, trials limited by the results of observations of the implementation of the PBL model, problem solving skills, and student creativity, and TCOF, then the last one is reflection. The results of the internal feasibility test show that the PBL model is very feasible to train students' problem solving and creativity skills. The results of the external feasibility test and the results of observing student activities related to the achievement of indicators of problem solving skills and creativity during the limited trial were also categorized as very good. The results of TCOF's observations of the PBL model are at a high level. So it can be concluded that the PBL model is very suitable to be used to train students' problem solving skills and creativity in making natural acid-base indicators made from leaves in terms of internal, external, and TCOF feasibility.

Keywords: PBL Learning Model, Problem Solving Skills, Creativity, Natural Indicator

KATA PENGANTAR

Puji syukur ke hadirat Allah SWT karena rahmat dan pertolongan-Nya akhirnya penulis dapat menyelesaikan tesis ini. Tesis ini disusun untuk menjawab permasalahan yang dihadapi oleh guru khususnya guru kimia dilapangan dalam memenuhi keterampilan abad 21 siswa yaitu keterampilan pemecahan masalah dan kreativitas. Salah satu model pembelajaran yang dianggap mampu untuk melatih keterampilan pemecahan masalah dan kreativitas siswa adalah model *Problem Based Learning* (PBL). Sebelum penggunaan model PBL yang bertujuan untuk melatih keterampilan pemecahan masalah dan kreativitas siswa maka perlu dilakukan uji kelayakan terlebih dahulu agar dapat digunakan untuk melatih keterampilan pemecahan masalah kreativitas siswa dimana dalam penelitian ini dikhususkan pada materi pembuatan indikator asam basa alami. .

Penelitian ini bertujuan untuk mendapatkan model pembelajaran PBL yang layak digunakan untuk melatih keterampilan pemecahan masalah dan kreativitas siswa pada pembuatan indikator asam basa alami berbahan daun-daunan. Penelitian ini juga bertujuan untuk memenuhi syarat pemerolehan gelar Magister Pendidikan di Universitas Pendidikan Indonesia (UPI). Peneliti menyadari bahwa tesis ini masih jauh dari kata sempurna dan memiliki beberapa kelemahan yang dapat diperbaiki. Peneliti sangat mengharapkan kritik dan saran yang dapat membangun karya ini menjadi lebih baik. Semoga tesis ini dapat berguna bagi semua pembaca khususnya untuk kemajuan dalam pengajaran kimia.

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DAFTAR PUSTAKA

- Abdulla, A. M., & Cramond, B. (2018). The Creative Problem Finding Hierarchy: A Suggested Model for Understanding Problem Finding. *Creativity. Theories–Research-Applications*, 5(2), 197-229.
- Abdullah, Ridwan. (2014). *Pembelajaran Santifik untuk Implemetasi Kurikulum 2013*. Jakarta: Bumi Aksara.
- Aggraini, P., Sularno., & Mulya. D. P. (2021). *Optimasi Penggunaan STREAM Labs Untuk Penunjang Pembuatan Materi Daring Dosen Prodi Sistem Informasi Unidha*. 3(1), 185–190.
- Agustin, N.H., Sarwanto., & Supriyanto, A. (2021). Problem Based Learning on Newton's Law: Can It Improve Student Creativity?. *Jurnal Pendidikan Sains Indonesia*, 9(4), 528-539.
- Agustina, K., Sahidu, H., & Gunada, I. (2020). Pengaruh model pembelajaran inkuiri terbimbing berbantuan media phet terhadap kemampuan pemecahan masalah dan berpikir kritis fisika peserta didik sma. *Jurnal Pendidikan Fisika dan Teknologi*, 6(1), 17-23.
- Akben, N. (2020). Effects of The Problem-Posing Approach on Students' Problem Solving Skills and Metacognitive Awareness In Science Education. *Research in Science Education*, 50(3), 1143–1165.
- Alexander, B., Imran, A., Sahle Tewelde, H. A., Ghebray, A., & Roop, C. (2018). Studies of Eco-Friendly Natural Acid-Base pH Indicators Properties of Two Fowering Plants from Adi-Nifas and Mai-Nefhi Eritrea. *Journal of Pharmacognosy And Phytochemistry*, 7(5), 1817-1822
- Alkhaf. (2020). Increasing Student Absorption in Natural Symptoms Materials Through The Demonstration Method. *Journal Of Chemical Information And Modeling*, 1(3), 1-13.
- Alkan, F. (2018). *The Effect of Inquiry Based Chemistry Experiments Practices on Inquiry Skills and Scientific Creativity The Effect of Inquiry Based Chemistry Experiments Practices on Inqui Ry Skills and Scientific Creativity*. 9, 36–41.
- Alonso-Geta, P. M. P. (2009). Researching, Measuring and Teaching Creativity and Innovation: A Strategy for The Future. *Measuring Creativity*, 305.
- Al-Abdali, N. S., & Al-Balushi, S. M. (2016). Teaching for Creativity by Science Teachers in Grades 5–10. *International Journal of Science and Mathematics Education*, 14(April), 251–268.
- Amabile, T. (2011). *Componential Theory of Creativity*. Boston, MA: Harvard Business School.

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- Amalia, V., Sukmawardani, Y., Nurramdani, S. F., & Supriadin, A. (2021). Use of Butterfly Pea (*Clitoria Ternatea*) Extract as An Indicator in Acid Base Titration. *ICONISTECH*, 1-8.
- Amiel, T., & Reeves, T. C. (2008). Design-Based Research and Educational Technology: Rethinking Technology And The Research Agenda. *Educational Technology And Society*, 11(4), 29–40.
- Amijaya, L. S., Ramdani, A., & Merta, I. W. (2018). Pengaruh model pembelajaran inkuiri terbimbing terhadap hasil belajar dan kemampuan berpikir kritis peserta didik. *Jurnal Pijar Mipa*, 13(2), 94-99.
- Arfiana, A., & Wijaya, A. (2018). Problem Solving Skill of Students of Senior High Schools and Islamic High Schools in Tegal Regency in Solving The Problem of PISA Based on Polya's Stage. *Jurnal Riset Pendidikan Matematika*, 5(2), 211-222.
- Arif, M. N., & Sumbawati, M.N. (2016). Pengembangan game edukasi interaktif pada mata pelajaran komposisi foto digital kelas XI di SMK negeri 1 Surabaya. *IT-Edu: Jurnal Information Technology and Education*, 1(02).
- Arikunto, Suharsimi. (2009). *Dasar-dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara.
- Armagan, F. O., Sagır, S. U., & Celik, A. Y. (2009). The Effects of Students' Problem Solving Skills on Their Understanding of Chemical Rate and Their Achievement on This Issue. *Procedia-Social And Behavioral Sciences*, 1(1), 2678-2684.
- Awamleh, H., Al Farah, Y., & El-Zraigat, I. (2012). The Level of Creative Abilities Dimensions According to Torrance Formal Test (B) and Their Relationship with Some Variables (Sex, Age, GPA). *International Education Studies*, 5(6), 138-148.
- Badan Standar Nasional Pendidikan. (2010). Paradigma Pendidikan Nasional Abad XXI. *Paradigma Pendidikan Nasional Abad XXI*, 1–59.
- Baer, J. (2016). Creativity Doesn't Develop in A Vacuum. *New Directions for Child and Adolescent Development*, 2016(151), 9-20.
- Beghetto, R. A. (2006). Creative Self-Efficacy: Correlates in Middle and Secondary Students. *Creativity Research Journal*, 18(4), 447-457.
- Beghetto, R. A. (2007). Ideational Code-Switching: Walking The Talk About Supporting Student Creativity in The Classroom. *Roeper Review*, 29(4), 265-270.
- Beghetto, R. A. (2009). Correlates of Intellectual Risk Taking in Elementary School Science. *Journal of Research in Science Teaching: The Official Journal of The National Association for Research in Science Teaching*, 46(2), 210-223.

- Beghetto, R. A. (2016). Creative Learning: A Fresh Look. *Journal of Cognitive Education and Psychology*, 15(1), 6-23.
- Beghetto, R. A., & Kaufman, J. C. (2007). Toward A Broader Conception of Creativity: A Case For" Mini-C" Creativity. *Psychology Of Aesthetics, Creativity, and The Arts*, 1(2), 73.
- Beghetto, R. A., & Kaufman, J. C. (2014). Classroom Contexts for Creativity. *High Ability Studies*, 25(1), 53-69.
- Blamires, M., & Peterson, A. (2014). Can Creativity Be Assessed? Towards An Evidence-Informed Framework for Assessing and Planning Progress in Creativity. *Cambridge Journal of Education*, 44(2), 147-162.
- Bruton, D. (2011). Learning Creativity and Design for Innovation. *International Journal Of Technology And Design Education*, 21(3), 321-333.
- Bywater, J. P., Chiu, J. L., Hong, J., & Sankaranarayanan, V. (2019). The Teacher Responding Tool: Scaffolding The Teacher Practice of Responding to Student Ideas in Mathematics Classrooms. *Computers & Education*, 139, 16-30.
- Beattie, D. K. (2000). Creativity in Art: The Feasibility of Assessing Current Conceptions in The School Context. *Assessment in Education: Principles, Policy And Practice*, 7(2), 175–192.
- Bhise SH, Shinde, NG, Surve, BS, Pimpodkar NV, Shikalgar SS. (2014). Acalypha Wilkesiana As Natural pH Indicator. *Int J Nat Prod Res*, 4(1), 33-35.
- Brilhante, S. E. T., Valdevino, F. S., Neto, F. O., Silva, F. F. M., Bertini, L. M., & Alves, L. A. (2015). Evaluation of Vegetable Extracts from The Semi-Arid As Natural pH Indicator. *Holos*, 1, 3-12.
- Brueckner, L.J. (1961). *Developing Mathematical Understanding. Inggris: Great Britian and in The British Dominion.*
- Capobianco, B. M., Delisi, J., & Radloff, J. (2018). Characterizing Elementary Teachers' Enactment of High-Leverage Practices Through Engineering Design-Based Science Instruction. *Science Education*, 102(2), 342-376.
- Carpenter, T. P., & Moser, J. M. (2020). The Development of Addition and Subtraction Problem-Solving Skills. *Addition And Subtraction*. Routledge.
- Ceker, E., Ozdamli, F. (2016). Features and Characteristics of Problem Based Learning. *Educational Science*. 11(4), 195-202.
- Chitra., Poddar, S. (2015). Creativity and Innovation: A Business Practice to Realize The Concept of Make in India. *International Journal of Business Management*, 2(1), 702-713..
- Craft, A., Hall, E., & Costello, R. (2014). Passion: Engine of Creative Teaching in An

- English University?. *Thinking Skills and Creativity*, 13, 91-105.
- Csapó, B., Funke, J. (2017). *The Nature of Problem Solving. Using Research to Inspire 21st Century Learning*.
- Dahar, R.W. (2011). *Teori-Teori Belajar*. Jakarta: Erlangga.
- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013). Creative Learning Environments in Education—A Systematic Literature Review. *Thinking Skills and Creativity*, 8, 80-91.
- De Graaf, E., & Kolmos, A. (2003). Characteristics of Problem-Based Learning. *International Journal of Engineering Education*, 19(5), 657-662.
- Deek, F. P., Turoff, M., & Mchugh, J. A. (1999). A Common Model for Problem Solving and Program Development. *IEEE Transactions on Education*, 42(4), 331-336.
- Demirhan, E., & Şahin, F. (2019). The Effects of Different Kinds of Hands-On Modeling Activities on The Academic Achievement, Problem-Solving Skills, and Scientific Creativity of Prospective Science Teachers. *Research In Science Education*, 1-19.
- Dewi, C. A. (2019). Improving Creativity of Prospective Chemistry Teacher Through Chemoentrepreneurship Oriented Inquiry Module on Colloid Topics. *Journal of Physics: Conference Series*, 1156(1).
- Direktorat Pengembangan Pendidikan ITB. (2020). *Google Meet: Panduan Mengelola Web Conference*. ITB.
- Dixon, R. A., & Brown, R. A. (2012). Transfer of Learning: Connecting Concepts During Problem Solving. *Journal Of Technology Education*, 24(1), 2-17.
- Dolmans, D. H., Loyens, S. M., Marcq, H., & Gijbels, D. (2016). Deep and Surface Learning in Problem-Based Learning: A Review of The Literature. *Advances in Health Sciences Education*, 21(5), 1087-1112.
- Dougall, D. K., & Baker, D. C. (2008). Effects of Reaction Mixture and Other Components on The Determination of The Equilibrium and Rate Constants of The Hydration Reactions of Anthocyanins. *Food Chemistry*, 107, 473–482.
- Ekasari, E., & Ningsih, P. (2020). Utilization of Extract of Sambang Getih Leaves (*Hemigraphis Colorata*. Hall. F) As A Acid-Base Indicator. *Jurnal Akademika Kimia*, 9(1), 7-15.
- Ekasari, R. R., Gunawan, G., & Sahidu, H. (2016). Pengaruh Model pembelajaran langsung berbantuan media laboratorium terhadap kreatifitas fisika siswa SMA. *Jurnal Pendidikan Fisika dan Teknologi*, 2(3), 106-110.
- Ericsson, K. A. (2006). The Influence of Experience and Deliberate Practice on The

- Development of Superior Expert Performance. *The Cambridge Handbook of Expertise and Expert Performance*, 38(685-705), 2-2.
- Fazelian, P., & Azimi, S. (2013). Creativity in Schools. *Procedia-Social And Behavioral Sciences*, 82, 719-723.
- Fessenden, R. J., & Fessenden, J.S. (1999). *Kimia Organik Jilid 2*. Jakarta: Erlangga.
- Ferrari, A., Cachia, R., & Punie, Y. (2009). Innovation and Creativity in Education and Training in The EU Member States: Fostering Creative Learning and Supporting Innovative Teaching. *JRC Technical Note*, 52374, 64.
- Fitri, S. F. N. (2021). Problematika Kualitas Pendidikan di Indonesia. *Jurnal Pendidikan Tambusai*, 5(1), 1617-1620.
- Florida, R., Mellander, C., & King, K. (2015). The Global Creativity Index 2015. *Martin Prosperity Institute*, 53-57.
- Foshay, R., & Kirkley, J. (2003). Principles for Teaching Problem Solving. *Technical Paper*, 4.
- Fourniyati, I. R., Nuswowati, M., & Cahyono, E. (2020). The Effects of Projects Based Chemistry Learning Model, Assisted by Chemsong Video to Students's Learning Completeness and Creativity. *Journal of Innovative Science Education*, 9(3), 314-320.
- Funke, J., & Greiff, S. (2017). *Dynamic Problem Solving: Multiple-Item Testing Based on Minimally Complex Systems*. 427-443.
- Furst, G., & Grin, F. (2018). A Comprehensive Method for The Measurement of Everyday Creativity. *Thinking Skills And Creativity*, 28, 84-97.
- Gallagher, S. A., Sher, B. T., Stepien, W. J., & Workman, D. (1995). Implementing Problem-Based Learning in Science Classrooms. *School Science and Mathematics*, 95(3), 136-146.
- Gianto, Bibin Rubini, L. H. (2020). Characteristics of Chemistry Teaching Material Voltaic Cells on Students' Creativity and Concept Mastery. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 8(2), 218-227.
- Gok, T. (2010). The General Assessment of Problem Solving Processes and Metacognition in Physics Education. *Eurasian Journal of Physics and Chemistry Education*, 2(2), 110-122.
- Gorghiu, G., Drăghicescu, L. M., Cristea, S., Petrescu, A. M., & Gorghiu, L. M. (2015). Problem-Based Learning-An Efficient Learning Strategy in The Science Lessons Context. *Procedia-Social And Behavioral Sciences*, 191, 1865-1870.
- Gu, X., Chen, S., Zhu, W., & Lin, L. (2015). An Intervention Framework Designed to Develop The Collaborative Problem-Solving Skills of Primary School

- Students. *Educational Technology Research and Development*, 63(1), 143-159.
- Gulacar, O., Eilks, I., & Bowman, C. R. (2014). Differences in General Cognitive Abilities and Domain-Specific Skills of Higher-And Lower-Achieving Students in Stoichiometry. *Journal Of Chemical Education*, 91(7), 961-968.
- Harefa, N., & Purba, L. S. L. (2020). Problem Solving Skills Improvement and The Impact on Students' Learning Outcomes: Learning Based E-Project. *Journal of Physics: Conference Series*, 1567(2), 022038.
- Hariyanto, A. (2016). Pengaruh discovery learning berbantuan paket program simulasi PhET terhadap prestasi belajar fisika. *Jurnal Pendidikan dan Kebudayaan*, 1(3), 365-378.
- Harjono, A., & Sahidu, H. (2018, April). Improving Students' Creativity Using Cooperative Learning with Virtual Media on Static Fluida Concept. *Journal of Physics: Conference Series*, 1006(1), 012016.
- Hasibuan, M. H. E., Fuldiaratman, F., Dewi, F., Sulistiyo, U., & Hindarti, S. (2020). Jigsaw Learning Strategy in A Diverse Science-Classroom Setting: Feasibility, Challenges, and Adjustment. *Jurnal Cakrawala Pendidikan*, 39(3), 733-745.
- Heppner, P. P., Baumgardner, A., & Jackson, J. (1985). Problem-Solving Self-Appraisal, Depression, and Attributional Style: Are They Related?. *Cognitive Therapy and Research*, 9(1), 105-113.
- Hertiavi, M. A., Langlang, H., & Khanafiyah, S. (2010). Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw untuk Peningkatan Kemampuan Pemecahan Masalah Siswa SMP. *Jurnal Pendidikan Fisika Indonesia*, 6(1), 53-57.
- Hestiana, H., & Rosana, D. (2020). The Effect of Problem Based Learning Based Sosio-Scientific Issues on Scientific Literacy and Problem-Solving Skills of Junior High School Students. *Journal Of Science Education Research*, 4(1), 15-21.
- Hidayati, R. M., & Wagiran, W. (2020). Implementation of Problem-based Learning to Improve Problem-Solving Skills in Vocational High School. *Jurnal Pendidikan Vokasi*, 10(2), 177-187.
- Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn?. *Educational Psychology Review*, 16(3), 235-266.
- Hocevar, D. (1981). Measurement of Creativity: Review and Critique. *Journal of Personality Assessment*, 45(5), 450-464.
- Holbrook, J. (2005). Making chemistry teaching relevant. *Chemical education international*, 6(1), 1-12.

Hosnan, M. (2014). *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad Nafisah*, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
 Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

21 Kunci Sukses Implementasi Kurikulum 2013. Bogor: Ghalia Indonesia.

- Hosseini, A. S., & Watt, A. P. (2010). The Effect of A Teacher Profesional Development in Facilitating Students Creativity. *Educational Research and Reviews*, 5(8), 432-438.
- Hung, W., Moallem, M., & Dabbagh, N. (2019). Social Foundations of Problem-Based Learning. *The Wiley Handbook of Problem-Based Learning*, 51-79.
- Hutabarat, H. D., & Hasibuan, F. A. (2020). Peningkatan Kreativitas Siswa Melalui Media Pembelajaran Berbasis E-Learning Pada Siswa Kelas X Sma Negeri 1 Angkola Timur. *JURNAL EDUCATION AND DEVELOPMENT*, 8(4), 508-508.
- Ijirana, I., & Mansyur, J. (2020). Patterns of Metacognitive Skills and External Representation of Students in Chemistry Problem Solving. *Jurnal Ilmu Pendidikan*, 25(2), 58-65
- Ikokuwu. (2019). Underlining Issues in Optimizing. *South Eastern Journal of Reseach and Sustainable Development*, 2(2), 42–60.
- Incebacak, B. B., & Ersoy, E. (2016). Problem Solving Skills of Secondary School Students. *China-USA Business Review*, 15(6), 275-285.
- Ivankovic, Et Al. (2018). Possibilities of Applying Natural Extracts As Acid-Base Indicators. *Physical Chemistry*, 853-856.
- Jackson, N. (2006). Creativity in Higher Education. Creating Tipping Points for Cultural Change. *Sceptre Scholarly Paper*, 3(1), 1-25.
- Jaenudin, D., Kurniasih, S., & Amalia, G. R. (2020, May). Improving Students Ability in Problem Solving and Creativity Through Project-Based Learning. *4th Asian Education Symposium (AES 2019)*, 259-262. Atlantis Press.
- Jayadi, A., Putri, D. H., & Johan, H. (2020). Identifikasi Pembekalan Keterampilan Abad 21 pada Aspek Keterampilan Pemecahan Masalah Siswa SMA Kota Bengkulu dalam Mata Pelajaran Fisika. *Jurnal Kumparan Fisika*, 3(1), 25–32.
- Jonassen, D. H. (1997). Instructional Design Models for Well-Structured and III-Structured Problem-Solving Learning Outcomes. *Educational Technology Research and Development*, 45(1), 65-94.
- Jua, S. K. (2018, May). The Profile of Students' Problem-Solving Skill in Physics Across Interest Program in The Secondary School. *Journal Of Physics: Conference Series*, 10(1), 012027.
- Juniartini, NME., Rasna, IW. (2020). Pemanfaatan Aplikasi Google Meet dalam Keterampilan Menyimak dan Berbicara untuk Pembelajaran Bahasa pada Masa Pandemi Covid-19. *Jurnal Pendidikan dan Pembelajaran Bahasa Indonesia*,

Nafisah, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

9(2), 133-141.

- Kanematsu, H., & Barry, D. M. (2016). *STEM and Creativity. STEM and ICT Education in Intelligent Environments*, 15-23. Cham:Springer.
- Kaplan, D. E. (2019). *Creativity in Education: Teaching for Creativity Development. Psychology*, 10(2), 140-147.
- Kastur, A., Mustaji., & Riyanto, Y. (2020). Feasibility of Developing Direct Learning Models With a Life Based Learning Approach. *IJORER: International Journal of Recent Educational Research*, 1(3), 261-270.
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond Big and Little: The Four C Model of Creativity. *Review Of General Psychology*, 13(1), 1-12.
- Keiner, L., Graulich, N., Göttlich, R., & Pietzner, V. (2020). Comparison of Beginner and Advanced Chemistry Student Teachers' Perspective on Creativity-Does It Play A Role in The Chemistry Classroom? *Chemistry Education Research and Practice*, 21(2), 608–621.
- Kenedi. (2017). Pengembangan Kreativitas Siswa dalam Proses Pembelajaran di Kelas II SMP Negeri 3 Rokan IV Koto. *Jurnal Ilmu Pendidikan Sosial, Sains, dan Humaniora*, 3(2), 329–348.
- Khalid, M., Saad, S., Hamid, S. R. A., Abdullah, M. R., Ibrahim, H., & Shahrill, M. (2020). Enhancing Creativity and Problem Solving Skills Through Creative Problem Solving in Teaching Mathematics. *Creativity Studies*, 13(2), 270-291.
- Kind, P. M., & Kind, V. (2007). *Creativity in Science Education: Perspectives and Challenges for Developing School Science*.
- Klegeris, A., & Hurren, H. (2011). Impact of Problem-Based Learning in A Large Classroom Setting: Student Perception and Problem-Solving Skills. *Advances in Physiology Education*, 35(4), 408-415.
- Krumm, G., Filippetti, V. A., Lemos, V., Koval, J., & Balabanian, C. (2016). Construct Validity and Factorial Invariance Across Sex of The Torrance Test of Creative Thinking–Figural Form A in Spanish-Speaking Children. *Thinking Skills and Creativity*, 22, 180-189.
- Kusmanto, H. (2014). Pengaruh Berpikir Kristis terhadap Kemampuan Siswa Dalam Memecahkan Masalah Matematika (Studi Kasus Di Kelas VII SMP Wahid Hasyim Moga). *Eduma : Mathematics Education Learning and Teaching*, 3(1), 92-106.
- Kusumaningrum, S., & Djukri, D. (2016). Pengembangan perangkat pembelajaran model project based learning (PjBL) untuk meningkatkan keterampilan proses sains dan kreativitas. *Jurnal Inovasi Pendidikan IPA*, 2(2), 241-251.
- Lavi, R., Shwartz, G., & Dori, Y. J. (2019). *Metacognition in Chemistry Education: A Nafisah, 2022*
KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
 Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- Literature Review. *Journal of Chemistry*, 59(6-7), 583-597.
- Lee, E., & Hannafin, M. J. (2016). A Design Framework for Enhancing Engagement in Student-Centered Learning: Own It, Learn It, and Share It. *Educational Technology Research And Development*, 64(4), 707-734.
- Lestari, K. A. N. S., Mahayukti, G. A., & Mertasari, N. M. S. (2020). Peningkatan kemampuan pemecahan masalah dan keaktifan belajar siswa sma melalui means-ends analysis. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 4(2), 263-278.
- Lidiana, H., Gunawan, G., & Taufik, M. (2018). Pengaruh Model Discovery Learning Berbantuan Media PhET Terhadap Hasil Belajar Fisika Peserta Didik Kelas XI SMAN 1 Kediri Tahun Ajaran 2017/2018. *Jurnal Pendidikan Fisika dan Teknologi*, 4(1), 33-39.
- Liu, W. C., Liau, A. K., & Tan, O. S. (2009). E-Portfolios for Problem-Based Learning: Scaffolding Thinking and Learning in Preservice Teacher Education. *Problem-Based Learning and Creativity*, 205-224.
- Lindstrom, L. (2006). Creativity: What Is It? Can You Assess It? Can It Be Taught? *International Journal of Art and Design Education*, 25(1), 53–66.
- Lubart, T. I. (1994). *Product-Centered Self-Evaluation and The Creative Process* (Doctoral Dissertation, Yale University).
- Lubis, F. A. (2018). Upaya Meningkatkan Kreativitas Siswa Melalui Model Project Based Learning. *Peteka*, 1(3), 192-201.
- Lucas, B. (2016). A Five-Dimensional Model of Creativity and Its Assessment in Schools. *Applied Measurement in Education*, 29(4), 278–290.
- Maharani, R. (2013). *Perspektif John Dewey : Scientific Method pada Kurikulum 2013 dan Implementasinya*. Tadris Matematika IAIN Kudus.
- Marco, P. H., Poppi, R. J., Scarminio, I. S., & Tauler, R. (2011). Investigation of The pH Effect and UV Radiation on Kinetic Degradation of Anthocyanin Mixtures Extracted from Hibiscus Acetosella. *Food Chemistry*, 125(3), 1020-1027.
- Mcvicker, C. J. (2007). Comic Strips As A Text Structure for Learning to Read. *The Reading Teacher*, 61(1), 85–88.
- Miskawati, M. (2019). Upaya Meningkatkan Kreativitas Anak dalam Pembelajaran Seni Tari Melalui Strategi Belajar Sambil Bermain di TK Islam Sa'adatul Khidmah Tahun Pelajaran 2016/2017. *Jurnal Ilmiah Dikdaya*, 9(1), 45-54.
- Muhamad, S., Harun, J., Halim, N. D. A., Surif, J., & Omar, S. S. (2016). Chemistry Authentic Learning : Problem Solving in Electrolysis. *Proceedings of The International University Carnival on E-Learning (IUCEL)*, 116-118.

- Muna, M. N., & Mulyanti, S. Indikator Asam-Basa dari Alam: Riview Literatur Berdasarkan Teori dan Praktek. *PROSIDING*, 62.
- Munandar, U. (1992). *Mengembangkan Bakat dan Kreativitas Anak Sekolah: Petunjuk Bagi Para Guru dan Orang Tua*. Jakarta: Grasindo.
- Munro, J. (2011). Insights into The Creativity Process: The Components of Creativity. *The Centre for Exceptional Learning and Gifted Education at The University of Melbourne, Australia*, 12(7), 248-262.
- Mustafa, L. K., & Suyanta. (2019). Exploring Students' Integrated Ability and Creativity: Using 7e Learning Cycle Model in Chemistry Learning. *Journal of Physics: Conference Series*, 1-9.
- Musyaffa, A. F., Rosyidah, N. D., & Supriana, E. (2019). Model Problem Based Learning (PBL) untuk Meningkatkan Scientific Reasoning Pesertadidik. *Fkip E-Proceeding*, 4(1), 129-133.
- National Research Council 2005. *How Students Learn: History, Mathematics, and Science in The Classroom*. Washington, DC: The National Academies Press.
- Neber, H., & Neuhaus, B. J. (2013). Creativity and Problem-Based Learning (PBL): A Neglected Relation. *Creativity, Talent and Excellent*, 43-56. Springer, Singapore.
- NGSS Lead States. (2013). Next Generation Science Standards: for States, by States (Appendix F – Science And Engineering Practices). *Achieve, Inc. On Behalf Of The Twenty-Six States and Partners that Collaborated on The NGSS, November*, 1–103.
- Nufida, B. A., Muntari, M., & Purwoko, A. A. (2013). Pengaruh Model Jembatan Analogi Terhadap Pemahaman Aspek Mikroskopik Siswa dengan Gaya Belajar Berbeda pada Materi Pelajaran Kimia. *Jurnal Pijar MIPA*, 8(1).
- Nurfazillah. (2018). Pemanfaatan Lembar Kerja Peserta Didik (LKPD) Berbasis Problem Based Learning (PBL) Terhadap Keterampilan Berfikir. *Skripsi*. UIN Ar Raniry Banda Aceh.
- Nurhayati, S., & Natasukma, M. M. (2019). Profil Miskonsepsi Peserta Didik pada Pembelajaran Multirepresentasi Materi Asam Basa Melalui Model Blended Learning. *Chemistry In Education*, 8(2), 17-23.
- Nuryanti, S., Matsjeh, S., Anwar, C., & Raharjo, T. J. (2010). Indikator Titrasi Asam-Basa dari Ekstrak Bunga Sepatu (*Hibiscus Rosa Sinensis L.*). *Agritech*, 30(3), 178–183.
- Normarita, F., Nyeneng, I., & Ertikanto, C. (2015). Pengembangan LKS dengan Scientific Approach untuk Meningkatkan Keterampilan Berpikir Kreatif. *Jurnal Pembelajaran Fisika Universitas Lampung*, 3(3), 1-12.

Nafisah, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- Nyachwaya, J. M., Warfa, A. R. M., Roehrig, G. H., & Schneider, J. L. (2014). College Chemistry Students' Use of Memorized Algorithms in Chemical Reactions. *Chemistry Education Research and Practice*, 15(1), 81-93
- OECD. (2019). *What is PISA*, 11–20.
- Overton, T., & Potter, N. (2008). Solving Open-Ended Problems, and The Influence of Cognitive Factors on Student Success. *Chemistry Education Research and Practice*, 9(1), 65-69.
- Pamungkas, A., Subali, B., & Linuwih, S. (2017). Implementasi Model Pembelajaran IPA Berbasis Kearifan Lokal untuk Meningkatkan Kreativitas dan Hasil Belajar Peserta Didik. *Jurnal Inovasi Pendidikan IPA*, 3(2), 118-127.
- Pachriatul, F. 2017. Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Problem Based Learning pada Materi Sistem Ekskresi untuk Siswa Kelas XI SMA Negeri 1 Bajeng Barat. *Jurnal Bioedu*. Vol 7 (2). Hal 105-115.
- Pang, W. (2015). Promoting Creativity in The Classroom: A Generative View. *Psychology of Aesthetics Creativity And The Arts*, 9(2), 122-127.
- Paristiowati, M., Moersilah, M., Stephanie, M. M., Zulmanelis, Z., Idroes, R., & Puspita, R. A. (2019, December). Rosa sp and Hibiscus sabdariffa L Extract in Ethanol Fraction as Acid Base indicator: Application of Green Chemistry in Education. In *Journal of Physics: Conference Series* (Vol. 1402, No. 5, p. 055041). IOP Publishing.
- Pedersen, S., & Liu, M. (2002). The Transfer of Problem-Solving Skills From A Problem-Based Learning Environment: The Effect of Modeling An Expert's Cognitive Processes. *Journal of Research on Computing in Education*, 35(2), 303-320.
- Petrucci, H. Ralph; Wiliam, S. Harwood; Geoffrey, F, Herring; Dan Jeffrey D. Madura. (2008). *Kimia Dasar (Prinsip – Prinsip dan Aplikasi Modern) Edisi Kesembilan Jilid 2*. Jakarta: Erlangga.
- Phungsuk, R., Viriyavejakul, C., & Ratanaolarn, T. (2017). Development of A Problem-Based Learning Model Via a Virtual Learning Environment. *Kasetsart Journal of Social Sciences*, 38(3), 297-306.
- Plucker, J. A., & Makel, M. C. (2012). Assessment of Creativity. *The Cambridge Handbook of Creativity, March 2016*, 48–73.
- Plomp, T., & Nieveen, N. (2007). *An Introduction to Educational Design Research*. Netherlands Institute for Curriculum Development.
- Polya, G. (1973). *How To Solve It: A New Aspect of Mathematical Method Second Edition*. New York: Doubleday.
- Poikela, S., Vuoskoski, P., & Kärnä, M. (2009). Developing Creative Learning
- Nafisah, 2022
KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
 Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Environments in Problem-Based Learning. *Problem-Based Learning And Creativity*, 67-85.

- Polya, G. (1954). *How To Solve It*. USA: Princeton University Press.
- Pradeep, D. J., & Dave, K. (2013). A Novel, Inexpensive and Less Hazardous Acid-Base Indicator. *Journal Of Laboratory Chemical Education*, 1(2), 34-38.
- Pratiwi, I. (2019). Efek Program PISA Terhadap Kurikulum di Indonesia. *Jurnal Pendidikan Dan Kebudayaan*, 4(1), 51-71.
- Puccio, G. J., Burnett, C., Acar, S., Yudess, J. A., Holinger, M., & Cabra, J. F. (2020). Creative Problem Solving in Small Groups: The Effects of Creativity Training on Idea Generation, Solution Creativity, and Leadership Effectiveness. *The Journal of Creative Behavior*, 54(2), 453-471.
- Pusca, D., & Northwood, D. O. (2018). Design Thinking and Its Application to Problem Solving. *Global Journal of Engineering Education*, 20(1), 3.
- Rein, M. (2005). Copigmentation Reactions and Color Stability of Berry Anthocyanins (Dissertation). *University of Helsinki, Department of Applied Chemistry and Microbiology. EKT Series, 1331*, 88.
- Rhodes, M. (1961). An Analysis of Creativity. *The Phi Delta Kappan*, 42(7), 305-310.
- Richardson, C., & Mishra, P. (2018). Learning Environments that Support Student Creativity: Developing The SCALE. *Thinking Skills and Creativity*, 27, 45-54.
- Riduwan. (2015). *Dasar-Dasar Statistika*. Bandung: Alfabeta.
- Robertson, A. D., Scherr, R. E., & Hammer, D. (Eds.). (2016). *Responsive Teaching in Science and Mathematics*. New York: Routledge.
- Rusman. (2012). *Model-Model Pembelajaran*. Depok: PT Rajagrafindo Persada.
- Sambada, D. (2012). Peranan Kreativitas Siswa Terhadap Kemampuan Memecahkan Masalah Fisika dalam Pembelajaran Kontekstual. *Jurnal Penelitian Fisika dan Aplikasinya (JPFA)*, 2(2), 37-47.
- Santrock, J. W. (2011). *Educational Psychology Fifth Edition*. New York: Mcgraw-Hill.
- Saputri, N. A., & Asngad, A. (2018). Uji Kertas Indikator Asam Basa dari Ekstrak Bunga Pacar Air dengan Variasi Jenis Pelarut dan Lama Penyimpanan. Prosiding Seminar Nasional Pendidikan Biologi dan Saintek Ke-3.
- Sastrawati, E., Rusdi, M., & Syamsurizal. (2011). Problem-Based Learning, Strategi Metakognisi dan Keterampilan Berpikir Tingkat Tinggi Pesertadidik. *Tekno-Pedagogi*, 1(2), 1-14.
- Savery, J. R. (2015). Overview Of Problem-Based Learning: Definitions and
- Nafisah, 2022
- KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN**
- Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Distinctions. *Essential Readings In Problem-Based Learning: Exploring and Extending The Legacy of Howard S. Barrows*, 9(2), 5-15.

- Schweizer, F., Wüstenberg, S., & Greiff, S. (2013). Validity of The Microdyn Approach: Complex Problem Solving Predicts School Grades Beyond Working Memory Capacity. *Learning and Individual Differences*, 24, 42-52.
- Scott, L. C. (2015). The Futures of Learning 3: What Kind of Pedagogies for The 21st Century?.
- Selvaratnam, M. (2011). Chemistry Students' Competence Throughout Their BSC Course in Some Problem-Solving Strategies. *South African Journal of Chemistry*, 64, 44-48.
- Semmler, L., & Pietzner, V. (2018). Views of German Chemistry Teachers on Creativity in Chemistry Classes and in General. *Chemistry Education Research and Practice*, 19(3), 711–731.
- Sharp, C. (2004). Developing Young Children's Creativity, What Can We Learn from Research.
- Shofiyah, N., & Wulandari, F. E. (2018). Model Problem Based Learning (PBL) dalam Melatih Scientific Reasoning Peserta Didik. *Jurnal Penelitian Pendidikan IPA*, 3(1), 33-38.
- Sevilla, G. (2020). Zoom Vs. Microsoft Teams Vs. Google Meet: Which Top Video Conferencing App Is Best. *PC Mag*.
- Shanahan, M. C., & Nieswandt, M. (2009). Creative Activities and Their Influence on Identification in Science: Three Case Studies. *Journal Of Elementary Science Education*, 21(3), 63–79.
- Silva, A. B. D., Santos, G. T. D., & Bispo, A. C. K. A. (2017). The Comics As Teaching Strategy in Learning of Students in An Undergraduate Management Program. *Mackenzie Management Review*, 18(1), 40-65.
- Singh, R., & Awasthi, S. (2020). Updated Comparative Analysis on Video Conferencing Platforms-Zoom, Google Meet, Microsoft Teams, Webex Teams And Gotomeetings. *EasyChair Preprint*, 4026, 1-9.
- Schmidt, H. G., Rotgans, J. I., & Yew, E. H. (2011). The Process of Problem-Based Learning: What Works and Why. *Medical Education*, 45(8), 792-806.
- Shubina, I., & Kulakli, A. (2019). Pervasive Learning and Technology Usage for Creativity Development in Education. *International Journal of Emerging Technologies in Learning*, 14(1).
- Siagan, M. V., Saragih, S., & Sinaga, B. (2019). Development of Learning Materials Oriented on Problem-Based Learning Model to Improve Students' Mathematical Problem Solving Ability and Metacognition Ability.

Nafisah, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

International Electronic Journal of Mathematics Education, 14(2), 331-340.

- Siregar, L. S. (2019). *Desain Pembelajaran Polimer Menggunakan Model Read, Answer, Discuss, Explain Dan Create (RADEC) Berbasis Google Classroom Untuk Mengembangkan Penguasaan Konsep Dan Kreativitas Siswa Smk Pada Pembuatan Bioplastik* (Doctoral dissertation, Universitas Pendidikan Indonesia).
- Sopandi, W., Pratama, Y.A., Handayani, H. (2019). Sosialisasi dan Workshop Implementasi Model Pembelajaran RADEC Bagi Guru-Guru Pendidikan dasar dan Menengah. *PEDAGOGIA: Jurnal Pendidikan*, 8(1), 19-34.
- Spendlove, D. (2008). Creativity in Education: A Review. *Design and Technology Education: An International Journal*, 10(2).
- Starko, A.J. (2010). *Creativity in The Classroom-School of Curious Delight Fourth Edition*. New York: Routledge.
- Sternberg, R. J. (1988). Mental Self-Government: A Theory of Intellectual Styles and Their Development. *Human Development*, 31(4), 197-224.
- Sternberg, R. J. (2006). Creativity Research Journal. *The Natureo of Creativity*, 18(1), 87-98.
- Sternberg, R. J., & Lubart, T. I. (1993). Investing in Creativity. *Psychological Inquiry*, 4(3), 229-232.
- Sternberg, R. J., & Williams, W. M. (2003). *Teaching for Creativity: Two Dozen Tips*. 1-11.
- Steviani, D.S. (2020). Presentasi Interaktif dalam Pembelajaran Daring. *Ekasakti Jurnal Penelitian & Pengabdian*, 1(1), 153-162.
- Stoeger, H. (2013). Learning as A Creative Process. *Creativity, Talent and Excellence* . Springer, Singapore.
- Suardana, I. N., Redhana, I. W., Sudiatmika, A. A., & Selamat, I. N. (2018). Students' Critical Thinking Skills in Chemistry Learning Using Local Culture-Based 7E Learning Cycle Model. *International Journal of Instruction*, 11(2), 399-412.
- Subodro, R. (2012). Ekstrak Pewarna Antosianin Bunga Mawar Merah Sebagai Pewarna Alami pada Sel Surya Dye-Dye Sensitized Solar Cell (DSSC). *J. Politeknosains*, 10, 32-41.
- Sulistyowati, N., Widodo, A.T., & Sumarni, W. (2012). Efektivitas Model Pembelajaran Guided Discovery Learning Terhadap Kemampuan Pemecahan Masalah Kimia. *Chemistry In Education*, 1(2), 49-55.
- Subur, J. (2001). *Analisis Kreativitas Siswa dalam Memecahkan Masalah Matematika Berdasarkan Tingkat Kemampuan Matematika di Kelas*.

Nafisah, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- Sukemi, S., Usman, U., Putra, B. I., Purwati, W., Rahmawati, N. N., & Pradani, S. D. A. (2018). Acid Base Indicator from Shoot-Leaves Ethanol Extract of Pucuk Merah (*Syzygium Oleana*). *JKPK (Jurnal Kimia dan Pendidikan Kimia)*, 2(3), 139.
- Supena, I., Darmuki, A., & Hariyadi, A. (2021). The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes. *International Journal of Instruction*, 14(3), 873-892.
- Susanto, Ahmad. (2012). *Teori Belajar dan Pembelajaran Di Sekolah Dasar*. Jakarta: Kencana
- Suva, M. A. (2014). *Opuntia Ficus Indica (L .)* Fruit Extract as Natural Indicator in Acid-Base Titration. *Journal of Pharmascitech*, 3(2), 85–87.
- Syahmani, S., Iriani, R., & Aisyah, N. (2018). The Effect of E-Learning Based Schoology on The Learning Outcomes and Problem Solving Skills in Chemistry. *1st International Conference on Creativity, Innovation, Technology in Education (IC-CITE 2018)* (274). Universitas Lambung Mangkurat.
- Talavera. (2006). Bioavailability Of A Bilberry Anthocyanin Extract and Its Impact on Plasma Antioxidant Capacity. *J. Sci. Food Agric*, 86, 90–7.
- Talukder S, Mendiratta SK, Kumar RR, Agarwal RK, Soni A, Chand S, Singh TP, Sharma H. (2017). Development of Plant Extracts Based Indicator for Monitoring Quality of Fresh Chicken Meat During Storage at Room Temperature (25 ± 1 C). *J Anim Res*, 7(4), 751–755.
- Tan, L. S., Lee, S. S., Ponnusamy, L. D., Koh, E. R., & Tan, K. C. K. (2016). Fostering Creativity in The Classroom for High Ability Students: Context Does Matter. *Education Sciences*, 6(4), 36.
- Tan, O. S. (2003). *Problem Based Learning Innovation: Using Problems to Power Learning in The 21st Century*. Singapore: Thomson Learning.
- Tan, O. S. (2021). *Problem-Based Learning Innovation: Using Problems to Power Learning in The 21st Century*. Gale Cengage Learning.
- Tan, O. S., Chye, S., & Teo, C. T. (2009). Problem-Based Learning and Creativity: A Review of the Literature. *Problem-Based Learning and Creativity*, 15-38.
- Thomson, S., Rowe, K., Underwood, C., & Peck, R. (2021). Looking Back in Problem Solving with Future Primary School Teachers. *Broadening Experiences in Elementary School Mathematics*, 157.
- Tran, T. B. L., Ho, T. N., Mackenzie, S. V., & Le, L. K. (2017). Developing assessment criteria of a lesson for creativity to promote teaching for creativity. *Thinking skills and creativity*, 25, 10-26.

Treffinger, D. J., Young, G. C., Selby, E. C., Shepardson, C., Sener, N., & Tas, E. Nafisah, 2022

KELAYAKAN MODEL PBL UNTUK MELATIH KETERAMPILAN PEMECAHAN MASALAH DAN KREATIVITAS SISWA PADA PEMBUATAN INDIKATOR ASAM BASA ALAMI BERBAHAN DAUN-DAUNAN
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- (2002). Assessing Creativity: A Guide for Educators. *Journal of Education and Learning*.
- Tomasevic, B., & Trivic, D. (2014). Creativity in Teaching Chemistry: How Much Support Does The Curriculum Provide? *Chemistry Education Research and Practice*, 15(2), 239–252.
- Triyono, Senam, Jumadi, & Wilujeng, I. (2017). Pengaruh Pembelajaran IPA Berbasis Creative Problem Solving terhadap Kreativitas Siswa SMP. *Jurnal Kependidikan*, 1(2), 214–226.
- Trna, J., & Trnova, E. (2013). Implementation of Connectivism in Science Teacher Training. *Journal of Educational and Instructional Studies in The World*, 3(1), 191–196.
- Underwood, A., & R.A Day, 1986. Analisa Kimia Kuantitatif, Jakarta: Erlangga
- Venisari, R., Gunawan, G., & Sutrio, S. (2017). Penerapan Metode Mind Mapping pada Model Direct Instruction untuk Meningkatkan Kemampuan Pemecahan Masalah Fisika Siswa SMPN 16 Mataram. *Jurnal Pendidikan Fisika dan Teknologi*, 1(3), 193.
- Verkoeijen, P. P. J. L., Rikers, R. M. J. P., Te Winkel, W. W. R., & Van Den Hurk, M. M. (2006). on The Necessity of Student-Generated Learning Issues: An Experimental Approach. *Advances in Health Sciences Education*, 11, 337–347.
- Vidal, R. V. V. (2005). Creativity for Operational Researchers. *Investigacao Operacional*, 25(1), 1-24.
- Virliantari, D. A., Maharani, A., Lestari, U., & Ismiyati, I. (2018). Pembuatan Indikator Alami Asam-Basa dari Ekstrak Kulit Bawang Merah (*Allium Ascalonicum L.*). *Prosiding Semnastek*.
- Voogt, J., & Roblin, N. P. (2012). A Comparative Analysis of International Frameworks For 21 St Century Competences: Implications for National Curriculum Policies. *Journal of Curriculum Studies*, 44(3), 299–321.
- Al Wadani, F., & Khan, A. R. (2014). Problem-Based Learning in Ophthalmology: A Brief Review. *Oman Journal of Ophthalmology*, 7(1), 1.
- Wahyu, W., Suryatna, A., Amalia, G. (2019). The Implementation of SSCS (Search-Solve-Create-Share) Model with Worksheet to Build Students' Creativity on Making Simple Water Purifier in Chemistry Classroom. *Unnes Science Education Journal*, 8(3), 362-368.
- Wahyuni, Sri, Et Al. (2019). Physics Learning Devices Based on Guided Inquiry with Experiment to Improve Students' Creativity. *Journal of Physics: Conference Series*, 1233(1), 012034.

Wallace, B. (1986). Creativity: Some Definitions: The Creative Personality; The Nafisah, 2022

- Creative Process; The Creative Classroom. *Gifted Education International*, 4(2), 68-73.
- Walker, A., & Leary, H. (2009). A Problem Based Learning Meta Analysis: Differences Across Problem Types, Implementation Types, Disciplines, and Assessment Levels. *Interdisciplinary Journal of Problem-Based Learning*, 3(1), 6.
- Widodo, S., & Kartikasari, K. (2017). Pembelajaran Pemecahan Masalah Matematis Siswa Sekolah Dasar dengan Model Creative Problem Solving (CPS). *Prisma*, 6(1).
- Widoyoko, E. P. (2014). *Penilaian Hasil Pembelajaran di Sekolah*. Yogyakarta: Pustaka Pelajar.
- Wijayanti, P. S. (2013). Pengaruh Pendekatan Meas Terhadap Kemampuan Pemecahan Masalah , Komunikasi The Effects of The Instructional Approach of Meas on The Students ' Problem Solving Skill , Mathematics Communication, and Self-Confidence. *Pythagoras: Jurnal Pendidikan Matematika*, 8(2), 181–192.
- Wijnia, L., Loyens, S. M., & Rikers, R. M. (2019). The Problem-Based Learning Process: An Overview of Different Models. *The Wiley Handbook of Problem-Based Learning*, 273-295.
- Witoko, R., & Wardono, W. (2019, February). Analisis Model Pembelajaran Open-Ended Learning (OEL) dengan Assessment for Learning (AFL) ditinjau dari Kreativitas Belajar Matematika. *PRISMA, Prosiding Seminar Nasional Matematika*, 2, 748-753.
- Wustenberg, S., Greiff, S., & Funke, J. (2012). Complex Problem Solving—More than Reasoning?. *Intelligence*, 40(1), 1-14.
- Wyse, D., & Ferrari, A. (2016). Creativity in Education: An Overview of The Implications of Creativity in Curricula.
- Yanti, A. H. (2017). Penerapan Model Problem Based Learning (PBL) Terhadap Kemampuan Komunikasi dan Kemampuan Pemecahan Masalah Matematika Siswa Sekolah Menengah Pertama Lubuklinggau. *Jurnal Pendidikan Matematika Raflesia*, 2(2).
- Yeh, C. H. (2018). Creative Learning and Learning Creativity: Scrutinising The Nature of Creativity and Developing Strategies to Foster Creativity in Education.
- Yew, E. H., Chng, E., & Schmidt, H. G. (2011). Is Learning in Problem-Based Learning Cumulative? *Advances in Health Sciences Education*, 16(4), 449-464.
- Yew, E. H., & Goh, K. (2016). Problem-Based Learning: An Overview of Its Process and Impact on Learning. *Health Professions Education*, 2(2), 75-79.

- Yuriev, E., Capuano, B., & Short, J. L. (2016). Crossword Puzzles for Chemistry Education: Learning Goals Beyond Vocabulary. *Chemistry Education Research and Practice*, 17(3), 532-554.
- Yuriev, E., Naidu, S., Schembri, L. S., & Short, J. L. (2017). Scaffolding The Development of Problem-Solving Skills in Chemistry: Guiding Novice Students Out of Dead Ends and False Starts. *Chemistry Education Research and Practice*, 18(3), 486–504.
- Yusuf, A. G., Najiyah, N., Mulyono, E. W. S., & Abdilah, F. (2021). Studi Literatur Potensi Ekstrak Zat Warna Alam sebagai Indikator Asam Basa Alternatif. *Fullerene Journal of Chemistry*, 6(2), 124-134.
- Yusuf, I., Asrifan, A. 2020. Peningkatan Aktivitas Kolaborasi Pembelajaran Fisika Melalui Pendekatan STEM dengan Purwarupa pada Siswa Kelas XI IPA SMAN 5 Yogyakarta. *Uniqbu Journal of Exact Sciences (UJES)*, 1(3), 32-48.
- Zhou, C. (2015). Bridging Creativity and Group by Elements of Problem-Based Learning (PBL). In *Pattern Analysis, Intelligent Security and The Internet of a*
- Zhou, C., Kolmos, A., & Nielsen, J. F. D. (2012). A Problem and Project-Based Learning (PBL) Approach to Motivate Group Creativity in Engineering Education. *International Journal of Engineering Education*, 28(1), 3-16
- Zuhaida, A. (2018). Implementation of Basic Chemistry Experiment based on Metacognition to Increase Problem-Solving and Build Concept Understanding. *Journal of Physics: Conference Series*, 1006(1), 1-7.