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Effectiveness of Various Practicum Models in Increasing Students' Scientific Creativity: A Systematic Literature Review

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ABSTRACT

Scientific creativity is an important competency in higher education, especially in science and technology. Various practicum models have been developed to increase student creativity. This article aims to systematically review the effectiveness of various practicum models in increasing students' scientific creativity. The method used is a systematic literature review of articles from relevant accredited national journals and reputable international journals in the last 10 years. The results of the review showed that project-based learning, discovery learning, open inquiry, OPPEMEI, and the use of interactive media/virtual laboratory models have a positive impact on increasing students' scientific creativity. The Project-Based Learning model has been proven to be effective and consistent in improving students' scientific creativity. The implication of these findings is the need for the integration of effective practicum models in the Higher Education curriculum to develop students' scientific creativity.

KEYWORDS

Practicum Model, Scientific Creativity, Project Based Learning, Systematic Literature Review

INTRODUCTION

The development of the world very quickly encourages all humans to change their lives, including the development of science and technology, especially in the field of education (Fitriani et al., 2024). Education is one of the important aspects in life because it is able to produce humans who are needed for the future (Asy'ari & Hamami, 2020). To achieve this, development is needed in the world of education, namely through self-development and directed and programmed student abilities (Rawung et al., 2021). In a research by (Mukarramah et al., 2021), adjusting the education curriculum is one of the government's focuses in facing many challenges in the 21st century. The adjustment of the education curriculum certainly aims to improve student skills, namely communication skills, collaboration, scientific creativity, and critical thinking). One of the skills that need to be developed in students currently is scientific creativity (Umam & Jiddiyyah, 2021). Scientific creativity is an essential competency in 21st century higher education. Students are not only required to understand knowledge content, but also to be able to create innovative solutions based on their knowledge (OECD, 2018). Creativity refers to a student's ability to develop and implement new ideas that may be unusual or even seem strange, but still logical in the context of learning. Creativity is often considered a natural talent possessed by certain individuals, while others do not, and is the result of various forms of education (Munandar et al., 2019). Based on the context of science and technology education, scientific creativity includes the ability to think divergently, ask critical questions, and independently design and evaluate scientific experiments (Hu & Adey, 2002).

A learning model that is believed to be able to encourage the development of students' scientific creativity is practicum(Hermansyah et al., 2017). Practicum is one of the significant ways to increase students' scientific creativity (Gunawan et al., 2017). Practicum not only introduces students to empirical experience, but also opens up space for exploration, interpretation of data, and testing of new ideas. This is in agreement with (Widiarini et al., 2024) that learning will be more effective if students are in direct contact with the objects being studied and objects in the surrounding environment. Unfortunately, many practicums are still procedural and rigidly structured, which potentially limits the space for student creativity (Aini et al., 2020) ; (Simamora & Hutagalung, 2021). In addition, the utilization of today's technology-based equipment with and without networks is still limited.

As a response to these limitations, various alternative practicum models have been developed, including: Project-Based Learning (PjBL), Discovery Learning, Open-Ended Laboratory, and the

use of virtual laboratories/interactive media (Rahman et al., 2011). For example, the PjBL model is able to encourage students to complete real projects that are relevant to the world of work and daily life, while integrating knowledge among fields (Saad & Zainudin, 2022). Project Based Learning is "A learning process that directly involves students to produce a project (Sari & Angreni, 2018). Basically, this learning model develops solving skills in working on a project that can achieve a product. Moreover, discovery learning requires students to discover scientific principles or concepts by themselves through explorative practicum experiences (Abrahamson & Kapur, 2018). Discovery learning is a learning model where students discover information independently and actively participate in learning (Ardianto et al., 2019). The discovery learning model consists of several stages which include the stimulation stage, the problem statement stage, the data collection stage, the data processing stage, and the data verification stage (Jana & Fahmawati, 2020). The discovery learning model can increase students' creativity and ability to find a concept (Yuliana, 2018). Furthermore, a model that can be used to increase student creativity using the Open-Ended Laboratory model. In 2008, the Open-Ended Laboratory model has been used as an effort to provide a learning environment that is suitable for the needs of students in increasing creativity. Department of Chemical & Process Engineering Universiti Kebangsaan Malaysia implements open ended laboratory for students who are studying in the first semester. This has been implemented since the 2008/2009 academic year. The use of this learning model aims to enable students to build new ideas and communicate them through the creativity of each student (Rahman et al., 2011).

Research by (Liu et al., 2024) showed that the integration of digital media in practicum, such as virtual laboratories, has a significant impact on the development of creativity with an effect size of 0.596. This indicated that not only pedagogical approaches, but also technological innovations have a contribution in supporting students' scientific creativity. In Indonesia, several studies have shown the effectiveness of innovative practicum models on student creativity. For example, research by (Putri & Handayani, 2024) showed that the use of the PjBL model in a waste management course was able to increase students' scientific creativity by 27%. In addition, (Ekaputra, 2023) noted an increase in creativity of up to 88.3% in students who took practicum with a discovery learning approach.

Scientific creativity is the ability to generate new and original ideas in a scientific context, which includes critical thinking, problem solving and innovation. In higher education, developing students' scientific creativity becomes one of the main goals, especially in the field of science and technology. Practicum is one of the learning methods that can be used to develop students'

scientific creativity. Various practicum models have been developed and implemented to increase learning effectiveness and student creativity. This article aims to systematically review the effectiveness of various practicum models in increasing students' scientific creativity. The results of this study are expected to provide guidance for educators in designing learning strategies that are more effective and relevant to the needs of students in this modern era through what learning models are effectively used.

METHOD

In this article, a Systematic Literature Review (SLR) approach is used to systematically identify, evaluate and synthesize all relevant research evidence to answer the research questions that have been previously set. SLR is a structured and transparent research method that aims to provide a comprehensive overview of a particular topic or phenomenon by collecting and analyzing existing literature objectively and systematically. The SLR method involves several main stages, including the formulation of specific research questions, literature search through academic databases, study selection based on inclusion and exclusion criteria, study quality assessment, relevant data extraction, and data synthesis and analysis to draw valid and justifiable conclusions (Triandini et al., 2019). This systematic literature review was conducted in three phases, namely planning, collecting and analyzing relevant articles from accredited national and reputable international journals (Latifah & Ritonga, 2020). Inclusion criteria included:

1. Articles that discuss practicum models in the context of Higher Education.
2. Articles that examine the effect of practicum models on student scientific creativity.
3. Articles published in the last 10 years.

Article searches were conducted through the Publish or Perish (PoP) software to obtain samples to be used in this study. After going through the selection process, a number of articles were obtained that met the criteria for further analysis. The number of samples used was 30 articles obtained from Scopus, Google Scholar, accredited national journal portals, and reputable international journals. The distribution of the samples studied is shown in the following diagram:

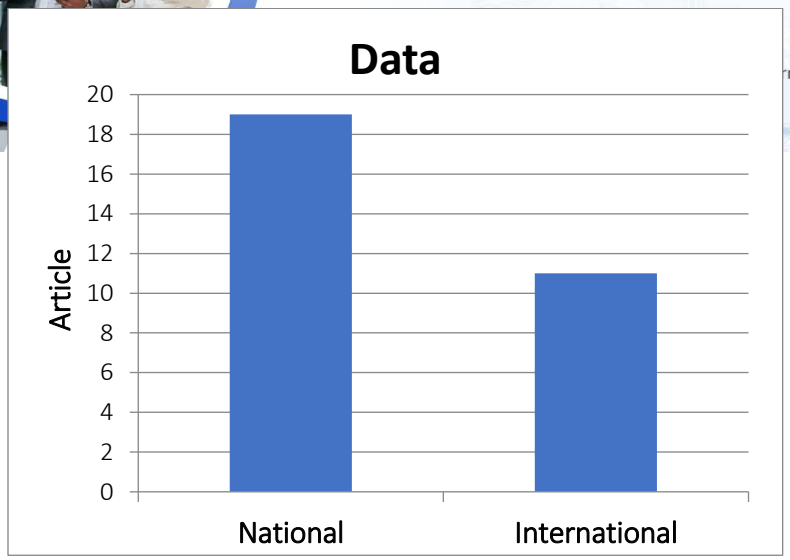

Diagram 1. Research Data Distribution

RESULT AND DISCUSSION

Based on the screening of articles on the effectiveness of practicum models, articles were obtained with several learning models applied. The articles obtained were extracted and data analysis was carried out such as author's name, journal name, article title, research method, and research results. The following are the results of data processing on the effectiveness of practicum learning models by applying various additional models presented in the table below:

Project-Based Learning Model

Table 1. Article Review Data on the Effectiveness of the Project-Based Model

No.	Article Identity	Result
1.	(Zainudin, 2016)	Project-based Laboratory Learning (PjBL) is effective in improving students' scientific creativity compared to direct learning.
2.	**(Putri & Handayani, 2024)**.	Learning using the PjBL model effectively increases creativity by 27% and student learning outcomes.
3.	(Sirait et al., 2023)	Students' creativity in the Basic Physics course can be effectively increased by implementing a project-based learning model.
4.	(Pan et al., 2023)	The group of students who were treated using the project-based learning method had superior creativity compared to other students, so it was concluded that the use of the method was effective.
5.	(Hidayati et al., 2024)	The using of the PjBL method effectively increases student creativity at each meeting.
6.	**(Wicaksana & Sanjaya, 2022)**; (Wahyuningsih et al., 2021)	The implementation of the PjBL learning model effectively increases student creativity in online courses and offline learning processes.
7.	(Lesmana et al., 2023)	The implementation of the PjBL model effectively affects the increase in student creativity as evidenced by the results of hypothesis testing, namely by statistical testing.
8.	(Shalihah et al., 2020) ; (Setyarini et al., 2020)	Project-Based Learning is effective in improving students' creative thinking skills in solving contextual division problems and can effectively to improve students' creative thinking skills in nursing courses.

Model Discovery Learning

Table 2. Article Review Data on the Effectiveness of the Discovery Learning Model

No.	Article Identity	Result
1.	(Juniarso, 2020)	The results showed that creative thinking taught using discovery learning was more effective than classical learning.
2.	(Bahtiar et al., 2022)	The discovery learning model in science practicum effectively encourages students' creative and critical thinking skills.
3.	(Ekaputra, 2023) ; (Ekaputra, 2024)	The implementation of the discovery learning model in inorganic chemistry practicum is effective in increasing student creativity by 88.3% and There is a significant increase in 4C skills through practicum learning with a discovery learning model.
4.	(Mulbar et al., 2021)	Learning discovery learning with a scientific approach effectively gives a good and positive influence on students' mathematical creative thinking skills.
6.	(Haris, 2023)	Discovery Learning model is effective in terms of mathematical creative thinking ability and students' interest in mathematics.
7.	(Jauziati et al., 2024); (Istiqomah & Suparman, 2020)	The discovery learning model is considered effective to be implemented in classroom learning, because this learning model requires students' ability to cooperate with others and be creative.

Open Inquiry Laboratory Model

Table 3. Article Review Data on the Effectiveness of the Open Inquiry Laboratory Model

No.	Article Identity	Result
1.	(Chinn & Malhotra, 2002)	The open inquiry laboratory model effectively supports the formation of scientific independence and creativity because students are directly involved in the investigation process like real scientists.
2.	(Munandar et al., 2019)	Inquiry learning through practicum based on lesson study is effective in improving mastery of the concept of respiration system and student activity during the learning process.
3.	(Kadir et al., 2017)	The using of Open-Inquiry Laboratory approach effectively improves students' mathematical creative thinking skills.
4.	**(Destino & Cunningham, 2020)**	The inquiry-laboratory model is effective in making students more creative in the process of problem solving and critical thinking.
5.	(Rattanakit, 2021)	The inquiry-laboratory model effectively helps develop their abilities in critical and creative thinking, problem solving, and laboratory skills.

OPPEMEI Model

Table 4. Article Review Data on the Effectiveness of the OPPEMEI Model

No.	Article Identity	Result
1.	(Tri Agustiana et al., 2020)	This model is effective in improving students' creative thinking skills.
2.	(Bahri, 2017)	Mathematics learning using the Predict-Observe-Explain learning model has a significant effect on students' KBKM.

Table 5. Article Review Data on the Effectiveness of the Interactive Media and Virtual Laboratory

No.	Identitas Artikel	Hasil yang Diperoleh
1.	(Liu et al., 2024)	Virtual laboratory technology is effective in providing a moderate positive impact on enhancing student creativity, with a combined effect size of 0.596.
2.	(Tawil & Sukarna, 2024)	The using of computer simulation software in science practicum during the COVID-19 pandemic significantly increased student creativity.
3.	(Widiarini et al., 2024)	The results showed that the use of Tinkercad virtual laboratory based on project assessment was effective in increasing student creativity.
4.	(Sugiharini et al., 2019)	The results showed that learning based on practical methods and interactive video observation methods was effective in improving student learning outcomes and creativity.

Based on the results of the above review, the practicum learning process with various models used provides varying effectiveness in increasing students' scientific creativity. There are several learning models that can be identified, namely project-based learning (PjBL), Discovery Learning, Open-Inquiry Laboratory, OPPEMEI, and Interactive Media/Virtual Laboratory. The project-based learning model provides assistance to students to improve their creative thinking skills. Project-based learning model is also effective to be used in improving students' scientific creativity.

The implementation of the discovery learning model provides a gradual increase in demanding students' ability to be more creative. The discovery learning model associated with the scientific approach will provide a good effectiveness for increasing students' scientific creativity. The similar thing also occurs when using the open-inquiry laboratory model, where this model is quite effective in developing students' ability to think critically and creatively. Inquiry learning through lesson study-based practicum is also very effective in increasing student activity.

Similarly, the other two models can have a positive impact on increasing students' scientific creativity.

CONCLUSION

Practicum models such as PjBL, discovery learning, open inquirylaboratory, OPPEMEI and interactive media/virtual laboratory have proven effective in increasing students' scientific creativity. The effectiveness of the model is influenced by the implementation context, infrastructure support, and educator readiness. The combination of project-based approach and digital technology is highly recommended for the integration of 21st century higher education curriculum.

The implications of the results of this study indicate the need for:

1. Educators design practicum activities based on exploration and real problem solving.
2. Higher education institutions provide digital facilities support and innovative pedagogy training.
3. Researchers conduct further studies with a mixed approach to evaluate the effectiveness of the practicum model in more depth.

REFERENCES

Haris, A. (2023). Keefektifan Problem-Based Learning dan Discoveri Learning Ditinjau dari Kemampuan Berfikir Kreaktif Matematis dan Minat. *Jurnal Pendidikan Mipa*, *13*(2), 505–513. https://doi.org/10.37630/jpm.v13i2.1071

Rahman, N. A., Tan Kofli, N., Takriff, M. S., & Sheikh Abdullah, S. R. (2011). Comparative study between open ended laboratory and traditional laboratory. *2011 IEEE Global Engineering Education Conference, EDUCON 2011*, *3*(4), 40–44. https://doi.org/10.1109/EDUCON.2011.5773110

Abrahamson, D., & Kapur, M. (2018). Reinventing discovery learning: a field-wide research program. *Instructional Science*, *46*(1), 1–10.

Aini, A. N., Suharno, S., & Azizah, U. (2020). Improving students' scientific creativity through guided inquiry laboratory activities. *Journal of Physics: Conference Series*, *1490*(1), 012030.

Ardianto, A., Mulyono, D., & Handayani, S. (2019). Pengaruh Model Discovery Learning Terhadap Hasil Belajar Matematika Siswa Kelas VII SMP. *Jurnal Inovasi Matematika*, *1*(1), 31–37. https://doi.org/10.35438/inomatika.v1i1.136

Asy'ari, A., & Hamami, T. (2020). Strategi pengembangan kurikulum menghadapi tuntutan kompetensi abad 21 IQ (ilmu al-qur'an). *Jurnal Pendidikan Islam*, *3*(1), 19–34.

Bahri, S. (2017). *Model Pembelajaran Predict-Observe-Explain (POE) Terhadap Kemampuan Berpikir Kreatif Matematis Mahasiswa [Skripsi]*. UIN Syarif Hidayatullah Jakarta.

Bahtiar, R. A., Ahmad, I. R., & Latifah, A. N. (2022). Peningkatan kemampuan berpikir kreatif mahasiswa melalui discovery learning. *Urnal Pendidikan IPA Indonesia*, *11*(2), 167–174.

Chinn, C. A., & Malhotra, B. A. (2002). Epistemologically Authentic Inquiry in Schools: A Theoretical Framework for Evaluating Inquiry Tasks. *Science Education*, *86*(2), 175–218. https://doi.org/10.1002/sce.10001

Destino, J. F., & Cunningham, K. (2020). At-Home colorimetric and absorbance-based analyses: an opportunity for inquiry-based, laboratory-style learning. *Journal of Chemical Education*, *97*(9), 2960–2966. https://doi.org/10.1021/acs.jchemed.0c00604

Ekaputra, F. (2023). Efektivitas Penerapan Model Pembelajaran Praktikum Dengan Model Discovery Learning Dalam Meningkatkan Kemampuan Kolaborasi Dan Kreativitas Mahasiswa. *Paedagoria : Jurnal Kajian, Penelitian Dan Pengembangan Kependidikan*, *14*(3), 238–242. http://journal.ummat.ac.id/index.php/paedagoria

Ekaputra, F. (2024). *Effectiveness of Practicum Learning With Discovery Learning Model in Improving 4C Skills of Students*. *4*(3), 3–8.

Hidayati, F., Solida, A., & Wisudariani, E. (2024). Pengaruh Pembelajaran Problem Based Learning Dalam Meningkatkan Kreativitas Dan Kemampuan Berfikir Kritis Mahasiswa and Critical Thinking Ability) Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 16 Tahun 2007 Tentang Standar Pane & Fadilah. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, *10*, 46–53.

Fitriani, M, W., D, D., & Lasiani. (2024). Efektivitas Berbagai Model Pembelajaran dalam Meningkatkan Keterampilan Proses Sains Siswa. *SINAPMASAGI (Seminar Nasional Pembelajaran Matematika, Sains, Dan Teknologi)*, *4*(1), 43–54.

Gunawan, Sahidu, H., Harjono, A., & Suranti, N. M. Y. (2017). The effect of project based learning with virtual media assistance on students creative in physics. *Cakrawala Pendidikan*, *36*(2), 167–179.

Hermansyah, H., Gunawan, G., & Harjono, A. (2017). Pengaruh Penggunaan Laboratoium Virtual Dalam Pembelajaran Inkuiri Terbimbing Terhadap Penguasaan Konsep Kalor Peserta Didik. *Jurnal Pendidikan Fisika Dan Teknologi*, *3*(2), 249–256. https://doi.org/10.29303/jpft.v3i2.420

Hu, W., & Adey, P. (2002). A scientific creativity test for secondary school students. *International Journal of Science Education*, *24*(4), 389–403. https://doi.org/10.1080/09500690110098912

Istiqomah, A. N., & Suparman. (2020). Design of e-student worksheet for linier equation based on discovery learning to improve creative thinking. *International Journal of Scientific and Technology Research*, *9*(4), 2579–2584.

Jana, P., & Fahmawati, A. A. N. (2020). Penelitian ini bertujuan untuk meningkatkan kemampuan pemecahan masalah matematis siswa pada materi pokok kubus dan balok dengan model. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(1), 213–220.

Jauziati, B., Nuraini, N., Sabahanudin, S., Muis, M. A., Jalaluddin, J., Mariani, S. S., & Nurulloh, M. Z. (2024). Implementing Discovery Learning Model to Improve Students' Creative Thinking Skills. *IJE : Interdisciplinary Journal of Education*, *2*(1), 58–69. https://doi.org/10.61277/ije.v2i1.74

Sirait, J. V., Amnie, E., & Falah, H. S. (2023). Analisis Kreativitas Mahasiswa dengan Menggunakan Model Project Based Learning. *Jurnal Pendidikan Mipa*, *13*(4), 970–977. https://doi.org/10.37630/jpm.v13i4.1245

Juniarso, T. (2020). Model Discovery Learning Terhadap Kemampuan Berpikir Kreatif Mahasiswa. *ELSE (Elementary School Education Journal) : Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, *4*(1), 36. https://doi.org/10.30651/else.v4i1.4197

Kadir, Lucyana, & Satriawati, G. (2017). The implementation of open-inquiry approach to improve students' learning activities, responses, and mathematical creative thinking skills. *Journal on Mathematics Education*, *8*(1), 103–114. https://doi.org/10.22342/jme.8.1.3406.103-114

Latifah, L., & Ritonga, I. (2020). Systematic Literature Review (SLR): Kompetensi Sumber Daya Insani Bagi Perkembangan Perbankan Syariah Di Indonesia. *Al Maal: Journal of Islamic Economics and Banking*, *2*(1), 63. https://doi.org/10.31000/almaal.v2i1.2763

Lesmana, I., Mulianti, Primawati, & Kassymova, G. K. (2023). Implementation of project-based learning (PjBL) model to increase students creativity and critical thinking skill in vocational creative product subjects. *Jurnal Pendidikan Teknologi Kejuruan*, *6*(3), 202–215. https://doi.org/10.24036/jptk.v6i3.34023

Liu, W., Wang, Y., Yu, X., Li, B., & Wang, Q. (2024). The impact of virtual technology on students' creativity: a meta-analysis. *Computers & Education*, *215*, 105044.

Mukarramah, M., Gani, A., & Winarni, S. (2021). Analisis Kesesuaian Perangkat Pelaksanaan Pembelajaran dengan Tuntutan Pembelajaran Abad 21. *Jurnal IPA & Pembelajaran IPA*, *5*(3), 233–241. https://doi.org/10.24815/jipi.v5i3.21934

Mulbar, U., Alimuddin, Rahmadani, Adnan, & Hasanah, R. (2021). The Influence of Discovery Learning with Scientific Approach on Students' Creative Thinking Ability. *Journal of Physics: Conference Series*, *1899*(1). https://doi.org/10.1088/1742-6596/1899/1/012134

Munandar, R. R., Sutjiati, S., & Irpan, A. M. (2019). Prediction of respiration rate of barangan banana using arrhenius model. *Pedagonal : Jurnal Ilmiah Pendidikan*, *3*(2), 10–17.

OECD. (2018). *The Future of Education and Skills: Education 2030*. OECD Publishing.

Pan, A.-J., Lai, C.-F., & Kuo, H.-C. (2023). Investigating the impact of a possibility-thinking integrated project-based learning history course on high school students' creativity, learning motivation, and history knowlende. *Thinking Skills and Creativity*, *47*(3), 101214.

Putri, F. E., & Handayani. (2024). Peningkatan Kreativitas dan hasil belajar mahasiswa melalui model pembelajaran project-based learning. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, *10*(2), 91–101.

Rattanakit, P. (2021). Open Inquiry-Based Laboratory Project on Plant-Mediated Green Synthesis of Metal Nanoparticles and Their Potential Applications. *Journal of Chemical Education*, *98*(12), 3984–3991. https://doi.org/10.1021/acs.jchemed.1c00300

Rawung, W. H., Katuuk, D. A., Rotty, V. N. J., & Lengkong, J. S. J. (2021). Kurikulum dan Tantangannya pada Abad 21. *Jurnal Bahana Manajemen Pendidikan*, *10*(1), 29–34.

Saad, N. S. M., & Zainudin, Z. N. (2022). Effect of project-based learning on students' creativity: A meta-analysis. *Education and Information Technologies*, *27*, 5445–5468.

Sari, R. T., & Angreni, S. (2018). Penerapan Model Pembelajaran Project Based Learning (PjBL) Upaya Peningkatan Kreativitas Mahasiswa. *Jurnal VARIDIKA*, *30*(1), 79–83. https://doi.org/10.23917/varidika.v30i1.6548

Setyarini, T. A., Mustaji, & Jannah, M. (2020). The effect of project-based learning assisted PANGTUS on creative thinking ability in higher education. *International Journal of Emerging Technologies in Learning*, *15*(11), 245–251. https://doi.org/10.3991/IJET.V15I11.12717

Shalihah, N. H., Dafik, & Prastiti, T. D. (2020). The analysis of the application of learning materials based on project-based learning to improve the elementary school students' creative thinking skills in solving contextual division problems. *Journal of Physics: Conference Series*, *1563*(1). https://doi.org/10.1088/1742-6596/1563/1/012044

Simamora, E. R., & Hutagalung, R. (2021). Scientific creativity of students in online biology practical during pandemic. *Journal of Education and Learning (EduLearn)*, *15*(1), 103–110.

Sugiharini, S., Ridlo, S., & Priyono, B. (2019). The Difference of Students' Learning Activities and Output Due to Problem Based Teaching Model by Using Practicum Method With Video Observation Method. *Journal of Biology Education*, *8*(3), 295–300. https://doi.org/10.15294/jbe.v8i3.27242

Tawil, M., & Sukarna, S. (2024). Investigasi kreativitas mahasiswa melalui software simulasi komputer. *EDUKATIF: Jurnal Ilmu Pendidikan*, *4*(2), 61–65.

Tri Agustiana, I. G. A., Agustini, R., Ibrahim, M., & Tika, I. N. (2020). Efektivitas Model OPPEMEI untuk Meningkatkan Kemampuan Berpikir Kreatif Mahasiswa. *Journal of Education Technology*, *4*(2), 150. https://doi.org/10.23887/jet.v4i2.25343

Triandini, E., Jayanatha, S., Indrawan, A., Werla Putra, G., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems*, *1*(2), 63. https://doi.org/10.24002/ijis.v1i2.1916

Umam, H. I., & Jiddiyyah, S. H. (2021). Jurnal basicedu. Jurnal Basicedu,. *Jurnal Basicedu*, *5*(1), 350–356. https://journal.uii.ac.id/ajie/article/view/971

Wahyuningsih, S., Qohar, A., Satyananda, D., & Atan, N. A. (2021). The Effect of Online Project-Based Learning Application on Mathematics Students' Visual Thinking Continuum in Covid-19 Pandemic. *International Journal of Interactive Mobile Technologies*, *15*(8), 4–17. https://doi.org/10.3991/ijim.v15i08.21565

Wicaksana, E. J., & Sanjaya, M. E. (2022). Model PjBL pada Era Merdeka Belajar untuk Meningkatkan Sikap Ilmiah dan Kreativitas Mahasiswa Mata Kuliah Belajar dan Pembelajaran. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *6*(1), 193. https://doi.org/10.23887/jipp.v6i1.41181

Widiarini, P., Rapi, N. K., & Suma, K. (2024). Efektivitas pengunaan laboratorium virtual tinkercad berbasis penilaian proyek terhadap kreativitasmahasiswa pada matakuliah elektronika digital. *Jurnal Inovasi Pendidikan Matematika Dan IPA*, *4*(3), 277–286.

Yuliana, N. (2018). Penggunaan Model Pembelajaran Discovery Learning dalam Meningkatan Hasil Belajar Siswa Sekolah Dasar. *Jurnal Ilmiah Pendidikan Dan Pembelajaran*, *2*(1), 21–28. https://doi.org/10.52217/pedagogia.v4i1.732

Zainudin, M. (2016). Efektivitas Pembelajaran Laboratorium Berbasis Proyek (Plbp) Terhadap Kreativitas Mahasiswa. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, *5*(1), 33. https://doi.org/10.25273/jipm.v5i1.853

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