



Effectiveness of e-module based on Google Sites in plant diversity courses on creative thinking skills of biology students

Veren Lativa, Murni Sapta Sari *, Frida Kunti Setiowati

Master Program of Biology Education, Department of Biology, Faculty of Mathematics and Natural Science, Universitas Negeri Malang, Malang, East Java, Indonesia

* Corresponding Author Email: murni.sapta.fmipa@um.ac.id

Article Information	Abstract
<p>Keyword: E-module; Google sites; Biology college students; Creative thinking skills</p> <p>Kata Kunci: E-modul; Google sites; Mahasiswa biologi; Keterampilan berpikir kreatif</p>	<p>One way to empower creative skills in the Plant Diversity course is through the use of e-modules. The low creative thinking skills of students can be improved by developing teaching materials in the form of e-modules. Electronic modules are electronic teaching materials that are arranged systematically and require innovation and utilization of technology in the field of education. The e-module developed is based on Google Sites which can be accessed by students online. This study aims to see the effectiveness of using Google Sites-based e-modules in Plant diversity courses on the creative thinking skills of Biology students. This research is a development research with ADDIE development model. The data analysis technique uses quantitative descriptive data analysis. The subjects in the research were biology students in 2021 with a total of 32 people. The results of the effectiveness of the Google Sites-based e-module were analyzed using the N-Gain calculation with a score obtained of 0.7338 with a high effectiveness category. So that the Google Sites-based e-module developed is effective in improving creative thinking skills. It is hoped that this e-module can help students in the learning process and improve creative thinking competencies in students.</p>
<p>History: Received : 17/10/2023 Accepted : 26/02/2024</p>	<p><i>Abstrak.</i> Salah satu cara memberdayakan keterampilan kreatif dalam mata kuliah Keanekaragaman Tumbuhan adalah melalui pemanfaatan e-modul. Rendahnya keterampilan berpikir kreatif mahasiswa dapat ditingkatkan dengan mengembangkan bahan ajar berupa e-modul. Elektronik modul merupakan bahan ajar elektronik yang disusun secara sistematis dan menuntut inovasi dan pemanfaatan teknologi di bidang pendidikan. E-modul yang dikembangkan berbasis Google Sites yang dapat diakses oleh mahasiswa secara online. Penelitian ini bertujuan untuk melihat efektifitas penggunaan e-modul berbasis Google Sites pada mata kuliah keanekaragaman Tumbuhan terhadap keterampilan berpikir kreatif mahasiswa Biologi. Penelitian ini merupakan penelitian pengembangan dengan model pengembangan ADDIE. Teknik analisis data menggunakan analisis data deskriptif kuantitatif. Subjek dalam penelitian mahasiswa biologi tahun 2021 dengan jumlah 32 orang. Hasil efektifitas e-modul berbasis Google Sites dianalisis dengan menggunakan perhitungan N-Gain dengan skor yang diperoleh sebesar 0,7338 dengan kategori efektifitas tinggi. Sehingga e-modul berbasis Google Sites yang dikembangkan efektif dalam meningkatkan keterampilan berpikir kreatif. Diharapkan dengan adanya e-modul ini bisa membantu mahasiswa dalam proses pembelajaran dan meningkatkan kompetensi berpikir kreatif pada mahasiswa.</p>

A. Introduction

Merdeka Belajar Kampus Merdeka (MBKM) is a program introduced by the government to improve the quality of education in Indonesia (Kamalia & Andriansyah, 2021). The MBKM program prepares students to have the hard and soft skills needed in the world of work (Supriati et al., 2022). The MBKM curriculum prepares students to develop their skills into quality resources (Vhalery et al., 2022) to contribute to national development (Zakiyyah et al., 2021). One of the skills students must develop in learning is creative thinking skills (Nasution et al., 2023; Sukmawati et al., 2017; van Laar et al., 2017). Creative thinking skills are empowered through science learning (Wirayuda et al., 2022), which contributes to the 21st century (Dilekçi & Karatay, 2023). Creative thinking skills involve cognitive processes that will contribute to the emergence of creative ideas or innovative actions (Patrício et al., 2018).

Creative thinking skills can be developed through classroom learning activities (Wannapiroon & Pimdee, 2022). The learning process in the classroom is closely related to learning achievement (Wan & Cheng, 2019). Plant Diversity is one of the semester learning program subjects that can improve students' creative thinking skills. Plant Diversity course discusses taxonomic principles, life cycles, and kinship analysis in plants. Students can develop their potential by utilizing surrounding plants to create valuable products in this Plant Diversity material. Creative thinking skills are needed to develop students' potential in biology learning, especially in plant diversity courses (Yustina et al., 2022). Facts show that students' creative thinking skills are still low. According to the initial analysis of Plant Diversity learning, the creative thinking skills of students in the moderately creative category were 45, while 55 students in the less creative category. It can be concluded that the average value of creative thinking skills acquired by students is still categorized as low. Students' low level of creative thinking skills is due to difficulties understanding the material and bringing new ideas and thoughts into learning.

Overcoming the above problems, efforts are needed to empower creative thinking skills by utilizing modules as teaching materials. According to (Winatha et al., 2018), teaching materials required by students are modules that are easily accessible and contain information in the form of text, images, and video. E-modules are electronic teaching materials systematically organized for self-study needs (Pendit et al., 2022). The development of e-modules also requires innovation and optimal utilization of technology (Budiyono, 2020). In its development, the e-module is formally prepared following a digital format that is self-instructional, self-contained, stand-alone, adaptive, and user-friendly (Putra et al., 2018). Using e-modules as teaching materials is not limited

by time and place to increase learning motivation so that it can adjust to needs and involve students interactively (Hutahaean et al., 2019).

Using e-modules can also clarify and simplify the presentation of messages and be easy to use. The e-module was developed as a website with the Google Sites feature that can be accessed online via cellphones, laptops, tabs, and PCs (Nalasari et al., 2021). The existence of e-modules helps students understand the material well and will increase creativity, motivation, and learning outcomes. The use of teaching materials in the form of e-modules in learning activities will improve students' creative thinking skills (Saryadi & Sulisworo, 2023). The initial analysis results at the State University of Malang show that lecturers have not made optimal use of learning through modules to improve students' creative thinking skills. The teaching materials students use are simple and do not contain technological features. This makes students less motivated to study the material and affects learning outcomes.

The development of the Plant Diversity e-module based on Google Sites is expected to develop creative thinking skills in students and become an innovation in the development of teaching materials in the Plant Diversity course at Universitas Negeri Malang. Based on the above programs, the creative thinking skills of biology students are not optimal in their empowerment, especially in the Plant Diversity lecture material. This article was written to determine the effectiveness of developing a Google Sites-based e-module on students' creative thinking skills in the Plant Diversity course.

B. Material and method

This research type uses the ADDIE development model (Analysis, Design, Development, Implementation and Evaluation). The analysis stage is used to analyze the causes of the gap and the solution needed to overcome it. The analysis stage is used to analyze the teaching materials students need. This analysis stage is also an initial analysis of the lecturer teaching the Plant Diversity course. The next stage is Design; at this stage, the product will be developed to produce problems that have been analyzed. The next stage is Development; at this stage, the idea designed will make a Plant Diversity e-module product and conduct product trials. The results of this trial will have a valid and practical product. The validity test was carried out by distributing questionnaires to media experts, materials and Biology education practitioners. The validity and practicality of e-modules were analyzed descriptively. Criteria for validity and practicality of e-modules can be seen in Table 1. The next stage is implementation; the application of learning is carried out using the product that has been designed, namely the Google

Sites-based plant diversity e-module. The last stage of this development is evaluation, which assesses the quality of e-modules before or after implementation. This stage determines whether the e-module developed is effective for the learning process so that it can achieve the desired goals.

The research was conducted during March-May 2023. Data analysis used descriptive and quantitative techniques. The test subjects were the UM Biology students class 2021, totalling 32 people. Measurement of creative thinking skills indicators from Greenstein, which include: 1) Curiosity, 2) Fluency, 3) Originality, 4) Elaboration, and 5) Flexibility. The instruments used in this research are initial test questions and final tests (pre-test and post-test) by the indicators of creative thinking skills.

The assessment of creative thinking skills uses the creative thinking skills rubric from Greenstein 2012. The following is the creative thinking skills rubric in Table 2. The e-module effectiveness calculation using Formula 1. The N-gain score criteria are: n-gain ≥ 0.7 (high effectiveness), n-gain $0.3 \leq$ n-gain < 0.7 (medium effectiveness), and n-gain ≤ 0.3 (low effectiveness).

$$(g) = \frac{sf - si}{100 - si} \times 100\% \dots \dots \dots \text{Formula 1}$$

Information:
 g = N-gain score
 sf = posttest score
 si = pretest score

Table 1 E-module validity and practicality criteria

Score (%)	Criteria	Information
85.01-100	Very Valid/Very Practical	Can be used without revision
70.01-85.00	Valid/Practical	Usable but needs minor revisions
50.01-70.00	Less Valid/Less Practical	Recommended not to be used as it needs major revision
01,00-50,00	Not Valid/Not Practical	Cannot be used

Table 2 Creative thinking skills score rubric

Criteria	Score
If the answer is correct, be able to write down the idea and be able to convey it in clear detail	4
If the answer is correct, you will be able to find some ideas and be able to convey them well but not in detail	3
If the answer is not correct, it conveys the idea with the help of other people	2
If the answer is wrong, it doesn't convey the idea and it's difficult to convey it well	1
No answer	0

C. Results and discussion

Google Sites-Based E-module Development

The development of the e-module uses the ADDIE model (Branch, 2009), which has five stages: Analysis, design, development, implementation, and evaluation. In the analysis stage, based on the results of the preliminary analysis and observation, there are problems or gaps, including teaching materials that have not been maximized in utilization and have not been integrated with technology and low empowerment of creative thinking skills in students, which causes low motivation and learning outcomes. The Design stage, compiling a list of tasks needed such as (RPS, SAP, e-module, creative thinking skills test, e-module evaluation instrument), collecting research objectives, and developing an assessment strategy, the result of the Google Sites design stage in the form of an initial product in the form of a Plant Diversity e-module in web form. The product of the design stage consists of components such as the front page is a menu button feature that is navigated to the intended page, instructions for use, introduction, sub-CPMK, learning objectives, learning materials, learning activities that are directly connected to Students Worksheets, evaluation (Pretest-Posttest), glossary

and bibliography. The design of the e-module front page can be seen in Figure 1.



Figure 1 Google sites-based e-module front page design (in Indonesian)

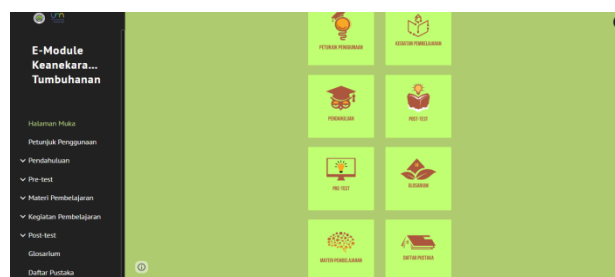


Figure 2 Components of a website-based e-module (in Indonesian)

In the development stage, the e-module is designed using Google Site features. The e-module developed contains components, namely the foreword, CPMK, Sub-CPMK, learning objectives, evaluation in the form of pretest-posttest questions, materials, learning activities, glossary, and bibliography. After loading the e-module components, they then designed the product components that had been described previously (see Figure 2).

Validity and Practicality of Google Sites-Based E-module in Plant Diversity Course

After developing the module, a product validation test was carried out on media and teaching material experts and educational practitioners, and then trials were conducted on biology students. The validity test was carried out to see the feasibility of the products developed according to media and teaching material experts (Herditiya et al., 2023). The results of e-module validation obtained a value of 98% with a very valid category (Table 3). Practicality trials by educational practitioners received a value of 92%

with a very practical category (Table 4). The results of e-module practicality trials by students obtained a value of 88% with a very practical category (Table 5).

Based on Table 2, the average validation of media and teaching materials obtained a value of 98% with a very valid category. The assessment of the module's graphical aspects received a score of 100% with a very valid category. The visual aspect of the e-module content has a flexible display between chapters and other sub-chapters that are navigated to each other. The characteristic aspect of the e-module obtained a score of 95% with a very valid category. This characteristic aspect includes the criteria of module teaching materials that can be used independently or in self-instruction. Self-instruction means that all of the learning is contained in the e-module. Stand-alone can stand alone and adapt or adjust to the times (Sulisetijono et al., 2023). The last aspect obtained a score of 100% with a very valid category. The use of e-modules ensures that the teaching materials are accessible for students to use effectively (Lativa et al., 2021).

Table 3 Average results of validation of media and teaching materials

No	Assessment Indicators	Percentage (%)	Category
1	Feasibility of e-module graphics	100	Very Valid
2	Characteristics of e-module	95	Very Valid
3	Plant diversity material	100	Very Valid
Average Value (%)		98	Very Valid

Table 4 Average validation results from biology education practitioners

No.	Assessment Indicators	Percentage (%)	Category
1	Feasibility of e-module graphics	92	Very Practical
2	Characteristics of e-module	88	Very Practical
3	Plant diversity material	96	Very Practical
Average Value (%)		92	Very Practical

Table 5 Average results of student trials

No.	Assessment Indicators	Percentage (%)	Category
1	Feasibility of e-module graphics	87	Very Practical
2	Characteristics of e-module	92	Very Practical
3	Plant Diversity Material	86	Very Practical
Average Value (%)		88	Very Practical

The average percentage result of the education practitioner test obtained a score of 92% with a very practical category. The first aspect of graphic completeness, which includes the material presented, received a score of 92% with a very valid category. The concept of material that consists of the benefits of local potential can increase student motivation. This is in line with Endah (2020), who stated that teaching materials that include elements of local potential are more readily associated with student life, thus making the material relevant to everyday life. The aspect of e-module characteristics obtained a score of 80% with a practical category. The developed e-module contains self-instructional, self-contained, stand-alone,

adaptive, and user-friendly characteristics (Fajaryati et al., 2016). The last aspect scored 96%, with a very practical category.

The results of the practicality trial on students obtained a score of 88% with a very practical category. The developed e-modules have a unique and attractive appearance. They make it easy to understand the contents and save costs because they do not need to be printed and are easily accessible via cell phones, laptops, and tablets (Dewi et al., 2019). The effectiveness and feasibility of e-modules can increase learning motivation in students. The assessment aspects include the feasibility of e-module graphics, e-module characteristics, and the material

presented in the e-module. The material presented with simple and easy-to-understand language, as well as the selection of letters that are easy to read, facilitates the use of e-modules for students (Putri & Zulyusri, 2022). E-modules are said to be practical if they can be implemented in learning.

The Effectiveness of Google Sites-Based E-module Plant Diversity Subjects on Students' Creative Thinking Skills

The effectiveness test was conducted to see the extent of improvement in creative thinking skills after using the e-module. After implementing the Google Sites-based e-module in learning, student learning outcomes were obtained by comparing the pretest

and posttest. The pretest and posttest scores show increased students' learning outcomes.

The average value of creative thinking skills is known based on the results of the pretest and posttest of creative thinking skills in students. The results of the average value of students' creative thinking skills towards using the e-module can be seen in Table 6. The results of the pretest and posttest scores for creative thinking skills use the Greenstein 2012 creative thinking skills assessment guidelines. Based on the N-gain value category, it is divided into high, medium, and low. N-gain analysis test results get a score of 0.7338, categorized as high effectiveness. The analysis results prove that the pretest score receives a higher score than the posttest score (see Table 7).

Table 6 Results of average students creative thinking skills score

No.	Assessment Indicators	Score	Max value
1	Pretest	39	100
2	Posttest	84	100

Table 7 Results of the effectiveness of Google sites-based e-module

	N	Minimum	Maximum	Mean	Std. Deviation	
N-gain_Score	32	.38	1.00	.7338	.16177	N-gain_Score
N-gain_Percent	32	37.50	100.00	73.3842	16.17742	N-gain_Percent
Valid N (list wise)	32					Valid N (list wise)

Learning requires strategies and media so that the knowledge transfer process can run well and effectively (Sulisetijono et al., 2023). Applying teaching materials in the form of e-modules can improve skills in 21st century learning (Kusumaningtyas & Supaman, 2020). One of the skills developed in the 21st century is creative thinking skills. Creative thinking skills are among the high-level skills that need to be developed in the 21st century. Skills are essential for students in solving problems that arise with logical reasoning and appropriate solutions (Wulansari et al., 2023)

Implementing e-module based on Google Sites, students' thinking skills are good. The analysis values obtained showed a significant increase in pretest and posttest scores. This aligns with research that e-modules can improve creative thinking skills (Wulansari et al., 2023), and student learning outcomes (Laili et al., 2019). Researchers implemented Google Sites-based e-modules to strengthen students' creative thinking skills. Google Sites-based e-modules can also enhance creative thinking skills and make distance learning more accessible for students. This aligns with research by Ratnawati et al. (2023), who found that Google Sites-based e-modules can improve students' creative thinking skills.

E-modules are essential in the learning process in helping lecturers convey the material to be studied (Hakim et al., 2020). The advantage of e-modules compared to printed teaching materials is that they

are interactive and can be accessed via cellphone, tablet, computer, or laptop (Herawati & Muhtadi, 2018). So, e-modules have become an alternative to improve student understanding and learning outcomes (Prabowo et al., 2016). The development of e-modules makes it easy for students to study material independently and solve concrete problems to train creative thinking skills (Simanjuntak et al., 2019) and increase student learning motivation (Riswinarni & Sulisworo, 2016). By improving creative thinking skills, it is hoped that students will come up with new ideas, insights, approaches, perspectives, and ways of understanding various things (Birgili, 2015). With creative thinking, students have many ways and ideas for solving problems from different perspectives.

D. Conclusion

This research shows that learning consists of preparing and teaching materials in delivering learning objectives. The e-module developed effectively improves creative thinking skills with a value of 0.7338. The teaching materials used are effective in enhancing creative thinking skills. The effectiveness of teaching materials can be seen from the results of the post-test and pre-test of students' creative thinking skills.

E. References

Birgili, B. (2015). Creative and critical thinking skills

- in problem-based learning environments. *Journal of Gifted education and creativity*, 2(2), 71-80. DOI: <https://doi.org/10.18200/jgedc.2015214253>
- Budiyono, B. (2020). Inovasi pemanfaatan teknologi sebagai media pembelajaran di era revolusi 4.0. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran*, 6(2), 300–309. DOI: <https://doi.org/10.33394/jk.v6i2.2475>
- Dewi, Y. N., Masril, M., Nafan, E., Hendrik, B., Veri, J., Munawwaroh, K., Silfia, E., & Widyatama, A. (2019). The development of e-module english specific purpose based on computer application for vocational high school students. *Journal of Physics: Conference Series*, 1364(1), 1–9. DOI: <https://doi.org/10.1088/1742-6596/1364/1/012043>
- Dilekçi, A., & Karatay, H. (2023). The effects of the 21st century skills curriculum on the development of students' creative thinking skills. *Thinking Skills and Creativity*, 47, 101229. DOI: <https://doi.org/10.1016/J.TSC.2022.101229>
- Endah, K. (2020). Pemberdayaan masyarakat: Menggali potensi lokal desa. *Moderat: Jurnal Ilmiah Ilmu Pemerintahan*, 6(1), 135–143. Retrieved from <https://jurnal.unigal.ac.id/moderat/article/view/3319/2914>
- Fajaryati, N., Nurkhamid, N., Pranoto, P. W., Muslikhin, M., & Dwi W, A. (2016). E-module development for the subject of measuring instruments and measurement in electronics engineering education. *Jurnal Pendidikan Teknologi dan Kejuruan*, 23(2), 191-199. DOI: <https://doi.org/10.21831/jptk.v23i2.12302>
- Hakim, L. N., Wedi, A., & Praherdhiono, H. (2020). Electronic module (e-module) untuk memfasilitasi siswa belajar materi cahaya dan alat optik di rumah. *Jurnal Kajian Teknologi* 3(3), 239–250. DOI: <https://doi.org/10.17977/um038v3i32020p239>
- Herawati, N. S., & Muhtadi, A. (2018). Pengembangan modul elektronik (e-modul) interaktif pada mata pelajaran kimia kelas XI SMA. *Jurnal Inovasi Teknologi Pendidikan*, 5(2), 180-191. DOI: <https://doi.org/10.21831/jitp.v5i2.15424>
- Herditiya, H., Sari, M., & Koriaty, S. (2023). Development of an e-module based on virtual practicum integrated with local potential in invertebrate material. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, 5(2), 155-163. DOI: <https://doi.org/10.20527/bino.v5i2.15620>
- Hutahaean, L. A., Siswandari, & Harini, H. (2019, November). Pemanfaatan e-module iteraktif sebagai media pembelajaran di era digital. In *Prosiding Seminar Nasional Teknologi Pendidikan Pascasarjana UNIMED*, (Vol. 1, pp. 298-305), Universitas Negeri Medan, Medan. Retrieved from <http://digilib.unimed.ac.id/38744/>
- Nalasari, K. A., Suarni, N. K., & Wibawa, I. M. C. (2021). Pengembangan bahan ajar berbasis web google sites pada tema 9 subtema pemanfaatan kekayaan alam di Indonesia untuk siswa kelas IV sekolah dasar. *Jurnal Teknologi Pembelajaran Indonesia*, 11(2), 135-146. DOI: https://doi.org/10.23887/jurnal_tp.v11i2.658
- Kamalia, P. U., & Andriansyah, E. H. (2021). Independent learning-independent campus (MBKM) in students' perception. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran*, 7(4), 857–867. DOI: <https://doi.org/10.33394/jk.v7i4.4031>
- Kusumaningtyas, S. A., & Supaman, S. (2020). E-module design based mathematics PBL learning model to enhance creative thinking skills. *International Journal of Scientific and Technology Research*, 9(3), 3518–3523.
- Laili, I., Ganefri, G., & Usmeldi, U. (2019). Efektivitas pengembangan e-modul project based learning pada mata pelajaran instalasi motor listrik. *Jurnal Imiah Pendidikan dan Pembelajaran*, 3(3), 303-315. DOI: <https://doi.org/10.23887/jipp.v3i3.21840>
- Lativa, V., Syamsurizal, S., & Fuadiyah, S. (2021). Urgensi pengembangan booklet dilengkapi ensiklopedia tentang materi bakteri untuk kelas X SMA. *Jurnal Penelitian dan Pengembangan Pendidikan*, 5(2), 215-220. DOI: <https://doi.org/10.23887/jppp.v5i2.34668>
- Nasution, N. E. A., Al Muhdhar, M. H. I., Sari, M. S., & Balqis, B. (2023). Relationship between critical and creative thinking skills and learning achievement in biology with reference to educational level and gender. *Journal of Turkish Science Education*, 20(1), 66–83. DOI: <https://doi.org/10.36681/tused.2023.005>
- Patrício, R., Moreira, A. C., & Zurlo, F. (2018). Gamification approaches to the early stage of innovation. *Creativity and Innovation Management*, 27(4), 156–158. DOI: <https://doi.org/10.1111/caim.12284>
- Pendit, S. S. D., Amelia, C., Azizah, A., Pilok, N. A., & Sitepu, M. S. (2022). Pengembangan e-modul discon berbasis android (e-modul disroid) materi bunyi bagi siswa sekolah dasar. *Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme*, 4(3), 175–191. DOI: <https://doi.org/10.37680/scaffolding.v4i3.1941>
- Prabowo, C. A., Ibrohim, I., & Saptasari, M. (2016). Pengembangan modul pembelajaran inkuiri berbasis laboratorium virtual. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, 1(6), 1090-1097. DOI: <http://dx.doi.org/10.17977/jp.v1i6.6422>
- Putra, Z., Kaharudin, A., Rahim, B., & Nabawi, R. (2018, July). The practicality of learning module based on Jigsaw-cooperative learning model in media education course. In *International Conference on Indonesian Technical Vocational Education and Association (APTEKINDO 2018)*, (pp. 48-52),

- Atlantis Press. DOI: <https://doi.org/10.2991/aptekindo-18.2018.11>
- Putri, Y. A., & Zulyusri, Z. (2022). Meta-analisis pengaruh model project based learning terhadap kemampuan berpikir kreatif siswa pada pembelajaran biologi. *Bioeduca: Journal of Biology Education*, 4(2), 1-11. DOI: <https://doi.org/10.21580/bioeduca.v4i2.11891>
- Ratnawati, S., Supeno, S., & Wahyuni, S. (2023). Efektifitas e-modul interaktif berbasis google sites mata pelajaran IPA listrik statis dan dinamis untuk meningkatkan keterampilan berpikir kreatif siswa MTs. *JPE (Jurnal Pendidikan Edutama)*, 10(1), 61–70. DOI: <http://dx.doi.org/10.30734/jpe.v10i1.2997>
- Riswinarni, R., & Sulisworo, D. (2016, November). Pengembangan leaflet sebagai media pembelajaran ilmu pengetahuan alam pada siswa kelas IV sekolah dasar. In *Prosiding Seminar Nasional Reforming Pedagogy*, (pp. 33-39), Universitas Sanata Dharma, Sleman. Retrieved from <https://eprints.uad.ac.id/6545/>
- Saryadi, W., & Sulisworo, D. (2023). Development of e-module based on the discovery learning to improve the student creative thinking skills. *JTAM (Jurnal Teori dan Aplikasi Matematika)*, 7(1), 11–22. DOI: <https://doi.org/10.31764/jtam.v7i1.10185>
- Simanjuntak, E., Hakim, A., & Qadar, R. (2019). Pembelajaran fluida berbasis proyek untuk meningkatkan keterampilan berpikir kreatif siswa SMA. *Vidya Karya*, 34(1), 6-14. DOI: <https://doi.org/10.20527/jvk.v34i1.6336>
- Sukmawati, A. & Sajidan, S. (2017). Higher order thinking skill in 21st century: Creative thinking skill. *International Conference on Science Education (ICoSEd)*, 282–285.
- Sulisetijono, S., Sunarmi, S., & Rochmah, A. N. (2023). The effectiveness of AR e-module of flower structure material on biology students' science literacy. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 9(2), 217–224. DOI: <https://doi.org/10.22219/jpbi.v9i2.25747>
- Supriati, R., Royani Dewi, E., Triyono, Supriyanti, D., & Azizah, N. (2022). Implementation framework for Merdeka Belajar Kampus Merdeka (MBKM) in higher education academic activities. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, 3(2), 150–161. DOI: <https://doi.org/10.34306/itsdi.v3i2.555>
- van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, 72, 257–588. DOI: <https://doi.org/10.1016/j.chb.2017.03.010>
- Vhalery, R., Setyastanto, A. M., & Leksono, A. W. (2022). Kurikulum Merdeka Belajar Kampus Merdeka: Sebuah kajian literatur. *Research and Development Journal of Education*, 8(1), 185-201. DOI: <https://doi.org/10.30998/rdje.v8i1.11718>
- Wan, Z. H., & Cheng, M. H. M. (2019). Classroom learning environment, critical thinking and achievement in an interdisciplinary subject: a study of Hong Kong secondary school graduates. *Educational Studies*, 45(3), 285–304. DOI: <https://doi.org/10.1080/03055698.2018.1446331>
- Wannapiroon, N., & Pimdee, P. (2022). Thai undergraduate science, technology, engineering, arts, and math (STEAM) creative thinking and innovation skill development: a conceptual model using a digital virtual classroom learning environment. *Education and Information Technologies*, 27(4), 5689–5716. DOI: <https://doi.org/10.1007/s10639-021-10849-w>
- Winatha, K., R. Naswan, S., & Agustini, A. (2018). Pengembangan e-modul interaktif berbasis proyek pada mata pelajaran simulasi digital kelas X di SMK TI Bali Global Singaraja. *Jurnal Teknologi Pembelajaran Indonesia*, 8(1), 13-25. DOI: <https://doi.org/10.23887/jtpi.v8i1.2238>
- Wirayuda, R. P., Darmaji, & Kurniawan, D. A. (2022). Identification of science process skills and students' creative thinking ability in science lessons. *Attractive: Innovative Education Journal*, 4(1), 129–132. DOI: <http://dx.doi.org/10.51278/aj.v4i1.335>
- Wulansari, K., Irdawati, Razak, A., Chatri, M., & Fajrina, S. (2023). Development of e-module with STEM nuances to improve students' creative thinking skills. *Jurnal Penelitian Pendidikan IPA*, 9(7), 5540–5546. DOI: <https://doi.org/10.29303/jppipa.v9i7.4417>
- Yustina, Y., Mahadi, I., Ariska, D., Arnentis, & 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. *International Journal of Instruction*, 15(2), 654–656. DOI: <https://doi.org/10.29333/iji.2022.15219a>
- Zakiyyah, Z., Cahyani, M. D., & Fatnah, N. (2021). Readiness of the science education study program in the implementation of the 'Merdeka Belajar - Kampus Merdeka' (MBKM) curriculum. *Scientiae Educatia*, 10(2), 160–168. DOI: <https://doi.org/10.24235/sc.educatia.v10i2.9243>