

The Development of Digital Module for Natural Sciences to Improve Islamic Elementary School Students' Learning Outcomes

Wina Mariana Parinduri*

STKIP Al Maksum Langkat, Indonesia

Email: winamarianaparinduri@gmail.com

Titin Rahmayanti Rambe

STKIP Al Maksum Langkat, Indonesia

Email: titinrahmayanti@stkipalmaksum.ac.id

Diah Kesumawati

STKIP Al Maksum Langkat, Indonesia

Email: diahk.hartanto@gmail.com

Togue Nana Dipanda Franklin

University of Bamenda, Cameroon

Email: toguenanadipandafranklin@yahoo.com

*Corresponding Author

Copyright © 2022 Wina Mariana Parinduri, Titin Rahmayanti Rambe, Diah Kesumawati, Togue Nana Dipanda Franklin



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

Abstract

This study aims to develop a digital module in science learning to improve student learning outcomes. To this end, the research and development using the ADDIE model were applied. This research was conducted at Madrasah Ibtidaiyah Negeri 12 Langkat during the even semester of the 2021/2022 academic year. The study participants were fifth-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat. The object of this research was the

development of digital-based modules. Data were collected through observation, interviews, and documentation. The developed product was validated by three validators: a linguist, a media expert, and a material expert. Students' responses were also garnered. The developed digital module was proven to improve students' learning outcomes 77.27% of students said they were happy with the subject matter and 86.36% of students were happy with the module components. Meanwhile, 72.73% of students were happy with the classroom learning atmosphere, and 86.36% of students were happy with the teacher's teaching method. The results of the assessment of the digital module showed that the product was deemed feasible. Students' responses to the digital module were very good. The digital science learning module developed in this study was proven to be able to improve the learning outcomes of fifth-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat. This study contributes to the development of e-learning media in elementary education.

Keywords: module, digital, science, learning outcomes

INTRODUCTION

Education is an important factor for the nation's generation because it can improve human resource quality. Education is expected to improve the quality of a nation's future generations. Education is also inseparable from technology, as it plays an important role in the education sector.

Today's technological development surely affects the education process. It supports the learning process, helping students achieve the expected results (Carstens et al., 2021; Lestari, 2018; Pinto & Leite, 2020; Niiranen, 2021). To keep up with technological development, teachers are demanded to continuously improve their potential. Educators are required to deliver an innovative learning process (Herliandry et al., 2020), which could be done through the development of teaching materials.

One of the forms of teaching materials is a module. It is an important teaching material in learning activities (Priantini & Widiastuti, 2021; Rahmawati et al., 2019; Tania & Susilowibowo, 2017). The module is a collection of learning materials designed and used to assist students in learning to support optimal learning achievement (Ferenčíková, 2017; Ramadhani & Fitria, 2021). In terms of format, there are two types of modules: printed and digital modules (Gatus & Vargas, 2022; Irwandani et al., 2017). The latter is defined as a computer-based module that contains fragments of questions in each section to help users understand the material (Rahayu & Sukardi, 2021; Sugihartini & Jayanta, 2017). The digital module is helpful teaching material for students to measure and control their learning abilities and intensity. It is usually not time- and place-bound, meaning that students could access it, depending on their ability. A digital module developed can be used anytime and anywhere using a smartphone, a device almost all students own in this technological era. As such, teachers' limited explanation of the materials may be complemented by the module, allowing students to gain a better understanding before the practicum session as they have already understood what will be done (Astuti et al., 2019; Laili et al., 2019; Marjanah et al., 2021; Said et al., 2021).

The digital module offers several advantages over the printed ones, including a) better attractiveness as it is supported by pictures, videos, and other features, b) better interactiveness as it allows students to engage in the independent evaluation, c) paperless format d) multi-platform, as it could be used through computers, laptops and mobile phones (Nisa et al., 2020). In the same vein, Apriliyah & Wahjudi (2014) and Novia et al. (2022) stated

that the digital module has a better performance in displaying some materials more interactively.

Science learning in elementary schools emphasizes the implementation of direct experience through the development of scientific processes and attitudes. Scientific concepts and principles are applied to everyday life to help students understand the concepts and their applications (Safira et al., 2021). Science is one of the elementary school subjects that can provide students with meaningful roles and experiences, allowing them to engage in experiences of researching truth and organizing concepts (Sekaringtyas, 2017). Scientific learning in elementary schools may provide students with a new experience, which is usually done during the practicum and outdoor learning sessions.

In the science learning process, educators should realize appropriate learning activities for knowledge, attitudes, and skills development. Teachers need to pay attention to learning that focuses on student interactions and learning objects to provide students with direct observation experiences. As such, students may develop their competence and be engaged in an inventive process (Fitria, 2017).

Students could only obtain optimal outcomes when they understand the teaching material, which is a learning aspect that should be thoroughly considered to ensure optimal outcomes. Properly developed teaching materials would be helpful in ensuring a smooth learning system. In every learning process, an evaluation was conducted to examine the students' achievement. Evaluations are conducted to see to what extent the teaching

materials achieve the expected learning goals (Gratitude et al., 2021; Sewagegn, 2020) .

Our interviews with the fifth-grade teacher in Madrasah Ibtidaiyah Negeri 12 Langkat revealed that students are less interested in the science learning books they are currently using because they are dominated by words, among other causes. In addition, teachers only have the same handbook as students. The interview concluded that science learning was suboptimal mainly due to a lack of teaching materials.

To address this problem, we attempted to develop a digital science learning module to improve the learning outcomes of fifth-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat.

METHODS

This study applied research and development with ADDIE model. The ADDIE model is typically used to develop new, innovative products based on needs analysis. The product's effectiveness is also tested to determine its function (Nisa et al., 2020). This model involves several stages: analysis, design, development, implementation, and evaluation.

This research was conducted at Madrasah Ibtidaiyah Negeri 12 Langkat during the even semester of the 2021/2022 academic year. The study participants were twenty fifth-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat. The object of this research was the development of digital-based modules. Data were collected through observation, interviews, and documentation. The developed product was validated by three validators: a linguist, a media expert, and a material expert. Student

responses were also garnered. The following sections present the data analysis technique.

A criterion was also developed. The Likert scale criteria are presented in Table 1.

Table 1. Criteria

No.	Criteria	Score
1	Highly feasible	4
2	Feasible	3
3	Less feasible	2
4	Not feasible	1

(Sudaryono in Tania & Susilowati., 2017)

An interpretation criterion was developed as a reference to interpret the product feasibility score. The criteria for the interpretation of the validation questionnaire are presented in Table 2 below:

Table 2. Interpretation Criteria

No.	Mean score	Category
1	81% - 100%	Highly Feasible
2	61% - 80%	Feasible
3	41% - 60%	Less feasible
4	21% - 40%	Not feasible
5	0% - 20%	Not feasible at all

(Sudaryono in Tania & Susilowati., 2017)

The mean score was calculated to analyze the validation result. The following formula was used:

$$P = \frac{\sum x}{\sum xi} \times 100\% \quad (\text{Azizah \& Alnasr, 2022})$$

description:

P: feasibility

x: number of assessment answers

xi: highest number of answers

The criteria for the interpretation of the validation questionnaire are presented in Table 3 below:

Table 3. Criteria for Interpretation of Student Response Questionnaires

No.	Mean score	Category
1	81% - 100%	Very happy
2	61% - 80%	Happy
3	41% - 60%	Quite Happy
4	21% - 40%	Not happy
5	0% - 20%	Not feasible at all

(Riduwan in Tania & Susilowati., 2017)

RESULTS AND DISCUSSION

This section presents the result of the development of the digital science learning module in terms of its development process, product feasibility, and students' responses. The digital module was developed following stages in the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. However, this study is conducted only until the implementation stage. The results of the assessment of the digital module showed that the product was deemed feasible, as displayed in Tables 4, 5, and 6 below.

Table 4 shows that the material experts consider the product as very feasible. It was deemed very feasible to be used for fifth-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat, indicated by Material experts' suggestions and feedbacks. Thus, the product was revised according to the material experts' suggestions and inputs.

Table 4. Material Experts' Validation Result

Evaluation Aspect	Rating Indicator	Rating Points	Validator Score		Total Score	Criteria
			I	II		
Content Eligibility	Quality of Learning Materials	1. Clarity of learning objectives	4	4	8	Highly Feasible
		2. Accuracy of material coverage	4	4	8	Highly Feasible
	Learning Delivery System	3. Conceptual truth	3	3	6	Feasible
		4. Compliance with curriculum	4	4	8	Highly Feasible
		5. Conformity with a Realistic Approach	4	4	8	Highly Feasible
		6. The accuracy of the order of learning materials	4	4	8	Highly Feasible
		7. Depth of learning material	3	3	6	Highly feasible
Presentation	Quality of Learning Strategies	8. Quality Introduction	4	4	8	Highly Feasible
		9. Student involvement and role in learning activities	4	4	8	Highly Feasible
		10. Encourage students to answer in their way	4	4	8	Highly Feasible
		11. Quality feedback	3	3	6	Feasible
		12. Serving time	4	4	8	Highly Feasible
		13. Quality of practice questions	4	4	8	Highly Feasible
language	Quality of Learning Materials	14. Digestibility of topics and logical presentation	4	4	8	Highly Feasible
		15. Ease of understanding the language	4	3	7	Highly Feasible
Image Selection	Students' worksheet display quality	16. Display	4	4	8	Highly Feasible
		17. Illustration	4	4	8	Highly Feasible

Table 5. Language Experts' Validation Result

Evaluation Aspect	Rating Indicator	Validator Score	Score Percentage	Criteria
Language Usage	1. Sentence structure accuracy	3	75%	Feasible
	2. Sentence effectiveness	3	75%	Feasible
	3. Clarity of language in the material	4	100%	Highly Feasible
	4. Sentence clarity	4	100%	Highly Feasible
	5. The attractiveness of language style	3	75%	Feasible
	6. Using good and correct Indonesian rules	3	75%	Feasible
Language Accuracy	8. Font clarity	4	100%	Highly feasible
	9. Symbols used	4	100%	Highly feasible
	10. Instruction clarity	4	100%	Highly feasible
	11. The language used is simple, straightforward, and easy to understand	3	75%	Feasible
	12. Compliance with the Indonesian Spelling System	3	75%	Feasible
Student Development Suitability	13. Language is adjusted to developmental stage of students	4	100%	Highly Feasible
	14. Language can stimulate students' imagination	4	100%	Highly Feasible
	15. Language is easy for students to understand	3	75%	Feasible

Table 5 above shows that the language of the developed product is deemed feasible. It was deemed suitable for fifth-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat, indicated by the language expert's suggestions and feedback. The product was then revised according to the language expert's suggestion and feedback.

Table 6. Media Expert Validation Result

Evaluation Aspect	Rating Indicator	Validator Score	Score (%)	Criteria
Learning	1. Title Clarity	4	100%	Highly Feasible
	2. Clarity instruction presentation	3	75%	Feasible
	3. Consistent presentation of the material	3	75%	Feasible
	4. Ease of understanding the material	3	75%	Feasible
	5. The material is repeatable to improve memory	4	100%	Highly Feasible
	6. Test questions are provided	4	100%	Highly Feasible
	7. Quality Introduction	4	100%	Highly Feasible
	8. The suitability of the material to the needs of students	3	75%	Feasible
Theory	9. The usefulness of learning materials	4	100%	Highly Feasible
	10. Factual content	3	75%	Feasible
	11. The suitability of the picture in clarifying the material	4	100%	Highly Feasible
	12. Ease of use of the module	3	75%	Feasible
	13. Ease of choosing material to study	3	75%	Feasible
	14. Selection of font type and size	4	100%	Highly Feasible
	15. Limitations of text and writing	3	75%	Feasible
	16. Clarity of color selection	4	100%	Highly Feasible
Module Display Quality	17. Display quality	4	100%	Highly Feasible
	18. Animated Serving	4	100%	Highly Feasible
	19. Interesting image display	4	100%	Highly Feasible
	20. Matching color portion	4	100%	Highly Feasible

Table 6 above shows that the media of the developed product is deemed feasible. It was deemed suitable for fifth-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat, indicated by the language expert's suggestions

and feedback. Thus, the product was revised according to the media expert's suggestion and feedback.

Table 7. Student Responses to the digital modules

Aspect	Frequency		Percentage (%)	
	Happy	Not happy	Happy	Not happy
Are you happy with the following learning components?				
a. Subject matter	17	5	77.27	22.73
b. Student Worksheet (Module)	19	3	86.36	13.64
c. Classroom learning atmosphere	16	6	72.73	27.27
d. Teachers' teaching method	19	3	86.36	13.64

Table 7 shows that 77.27% of students said they were happy with the subject matter and 86.36% of students were happy with the module components. Meanwhile, 72.73% of students were happy with the classroom learning atmosphere and 86.36% of students were happy with the teacher's teaching method. These responses indicate that the learning objectives have been achieved. In other words, the digital module was very feasible to be used for fifth-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat.

The product developed in this study was proven to (a) help students understand the learning materials more easily, (b) be more interesting for students, and (c) allow students to learn independently.

The developed digital module could also improve the teacher's ability to develop learning materials, as reported in previous studies on different subject teachers. The development of a digital dance module for

teachers could effectively improve the professional competence of cultural arts teachers (Purnomo & Nugraheni, 2019). Digital module for Islamic education subject was also found to be feasible and valid (Assyauqi, 2020). In another study, the digital STEM-based mathematic module for lower-grade elementary school students was valid with a score of (85.65.) In other words, it is feasible for use (Hendri et al., 2021). The digital flipbook-based e-module exhibit a score of 0.91, indicating that the digital flipbook-based E-module is valid and theoretically feasible. The readability test is at level 10, which means that it corresponds to class 10 and the average results of student responses are 82% in positive statements and 39% in negative statements, including the very empirically feasible category (Sa'diyah, 2021). The digital mathematics module developed using an open-ended approach could improve students' mathematical creative thinking skills, indicated by the gain test score of 0.55 (moderate improvement) (Auliah et al., 2020). the digital module for biology for the 11th-grade science students developed in the (Khasanah & Nurmawati, 2021) study was also reported to be valid.

In the (Putro & Huda, 2022)'s study, the information report text digital module was reported to be a highly feasible media (mean score of 125.00 of max. 132.00). The flipbook-based digital science learning module product developed is suitable for use (Hadiyanti, 2021). Using digital modules to complement the learning process would likely improve students' learning motivation and interest, and ease of learning. In (Hemilia et al., 2022), The product feasibility test result from media and material experts, and students showed positive and good responses. The product validation result concludes that the interactive digital module based on

Articulate Studio '13 in mathematics subjects was categorized as "very feasible." The material and media expert gave a score of 88.3% and 86.1%, respectively, indicating that the interactive digital module based on Articulate Studio'13 in mathematics subjects with set material can be used as a learning module (Ammy, 2021).

The Covid-19 pandemic hit Indonesia and significantly affected various life sectors, including education. These changes have changed the perspective and learning practices of today's world of education. The development of digital education allows students to be able to gain abundant knowledge quickly and easily. The digital era is an era where all aspects of life, including the learning process, begin to shift to digital media. Changes in education in the digital era require teachers to have the ability to integrate information and communication technology into the learning process (Ramadhani & Zuleha, 2020). Changes in the education sector due to the COVID-19 pandemic caused the learning process to shift to a distance learning system or an online learning system, a system that Demands students' learning independence to ensure an optimal outcome.

As science learning at the elementary school level is also affected by this change, Teachers' attention is necessary to cope with this new condition. Science learning is a means for students to learn about themselves and the environment and can be further developed to be applied in everyday life (Andriana et al., 2020). Science learning could also develop students' critical thinking, environmental sensitivity, and problem-solving skills in everyday life (Iskandar & Kusmayanti, 2018). Students' science concept mastery should also be taken into account during the

learning process, as good mastery of science concepts may help students solve problems and apply the concept in real-life settings more easily. In the same vein, (Rahmah et al., 2017) stated that mastery of concepts can help students solve real-life problems. Students with sufficient mastery of concepts will be able to think at a higher level and achieve the minimum completeness criteria (Azhari & Yuliati, 2017). Therefore, to be able to achieve these goals, teachers need to facilitate students to learn optimally in the learning process.

Teachers play a central role in regulating the environment to create teaching and learning interactions between students, teachers, and other learning resources to achieve learning objectives. Learning resources are all sources, both in the form of data, people, and objects that can be used to provide facilities or ease of learning for students. Learning resources are related to the teaching and learning components, including teaching materials. Teaching materials are one of the main components because learning activities cannot be held without teaching materials (Prastowo, 2018). For teachers, teaching materials serve as a reference for delivering the learning process, while for students, it is used as a learning resource to be mastered.

Several studies have shown that science learning often does not run as expected, which is affected by various factors, including inadequate teaching materials. (Melasevix et al, 2017) stated that elementary school often suffers from monotonous, non-interesting teaching materials. The need analysis, which we conducted through interviews with three fourth-grade elementary school teachers, revealed that teachers need teaching

materials in the form of learning modules that contain complete and comprehensive materials students can use in the online learning process during the pandemic. Students' responses to the questionnaire also showed that they need easily accessible and interesting learning modules.

Teaching materials take various forms, from printed (books and worksheets) to electronic ones. The latter is currently more accessible due to the presence of information technology network devices. Technology also allows teachers to use learning materials more easily (Kuncahyono, 2018). The module is one of the learning materials that could be used by students. It is typically developed in a structured manner and contains a series of learning activities that are tailored to the competencies students need to achieve. The module is a set of teaching materials that are presented systematically so that students can learn without a teacher, arranged systematically and interestingly that includes material content, methods, and evaluations that can be used independently (Suryani, 2022). According to (Nurbaeti & Sunarsih, 2020), the module is a teaching material that is systematically arranged in language that is easily understood by students according to their level of knowledge and age to support can learn independently with minimal assistance or guidance from the teacher. This is by the current educational paradigm where learning is more student-centered and the teacher acts as a learning facilitator. As science and technology develop, modules begin to transform into digital forms, which can be accessed via laptops, computers, and other devices. A digital module usually contains texts, images, video, and audio to support independent learning activities and is suitable for distance learning systems.

Compared to e-books, the digital module offers more advantages as it can be opened sheet by sheet, supported by animations, videos, texts, and images relevant to the learning context (Khasanah & Nurmawati, 2021). The advantages of this application are (1) being able to provide a flip effect module or flipping pages; (2) module creation with this application is very easy; (3) the display of the module is not only in the form of text and images but audio and video forms can also be combined in presenting the material; (4) the resulting product can be published in SWF (Shock Wave Flash), HTML (Hyper Text Markup Language) format if you want to be published through the website (Anandari et al., 2019).

Given the important role of teaching materials and the need to develop digital science teaching materials to accommodate online learning during the pandemic, we developed a digital science learning module for online learning for 5th-grade elementary school students.

The fifth-grade students' responses were collected as a product users. Their responses indicate that students liked the product. The product was also found to increase students' learning motivation and process. The digital science learning module developed in this study was proven to be able to improve the learning outcomes of 5th-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat.

CONCLUSION

The product developed in this study was a digital module in science learning for the 5th-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat during the even semester of the 2021/2022 academic year. The

product was developed following the ADDIE model and validated by three experts: language, media, and material experts. The validation result showed that the product was suitable for the 5th-grade students at Madrasah Ibtidaiyah Negeri 12 Langkat. Students reported that they were happy with the product. The digital module was proven to improve students' learning outcomes. 77.27% of students said they were happy with the subject matter and 86.36% of students were happy with the module components. Meanwhile, 72.73% of students were happy with the classroom learning atmosphere and 86.36% of students were happy with the teacher's teaching method. The digital science learning module developed in this study was proven to be able to improve the learning outcomes of fifth-grade students in Madrasah Ibtidaiyah Negeri 12 Langkat. This study contributes to the development of e-learning media in elementary education.

REFERENCES

- Ammy, P. M. (2021). Pengembangan Modul Digital Interaktif Berbasis Articulate Studio ' 13 Dalam Pembelajaran Matematika Materi Himpunan. *SiNTESa CERED, Seminar Nasional Teknologi Edukasi Dan Humaniora 2021, Ke-1, 14*, 641-648.
- Anandari, Q. S., Kurniawati, E. F., Marlina, Piyana, S. O., Melinda, L. G., Meidiawati, R., & Fajar, M. R. (2019). Development of Electronic Module: Student Learning Motivation Using the Application of Ethnoconstructivism-Based Flipbook Kvisoft. *Jurnal Pedagogik, 06(02)*, 416-436.
- Andriana, E., Ramadayanti, S., & Noviyanti, T. E. (2020). Pembelajaran IPA di SD pada Masa Covid 19. *Seminar Nasional Pendidikan FKIP, 3(1)*, 409-413.
- Aprilliyah, & Wahjudi, E. (2014). Pengembangan Media Pembelajaran Modul Interaktif pada Materi Jurnal Khusus Kelas X Akutansi di SMK Negeri Mojoagung. *Jurnal UNESA, 7*, 1-7.

- Astuti, I. A. D., Putra, I. Y., & Bhakti, Y. B. (2019). Developing Practicum Module of Particle Dynamics Based on Scientific Methods to Improve Students' Science Process Skills. *Scientiae Educatia*, 7(2), 183. <https://doi.org/10.24235/sc.educatia.v7i2.2513>
- Auliah, L., Syaiful, S., & Syamsurizal, S. (2020). Pengembangan Modul Digital Pembelajaran Matematika Berbasis Pendekatan Open Ended Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis. *Jurnal Pendidikan Matematika*, 11(1), 13. <https://doi.org/10.36709/jpm.v11i1.9885>
- Azizah, L., & Alnashr, M. S. (2022). Pengembangan Bahan Ajar Tematik Berbasis Kearifan Lokal Guna Meningkatkan Hasil Belajar Kognitif Siswa. *Dawuh Guru: Jurnal Pendidikan MI/SD*, 2(1), 1-12. <https://doi.org/10.35878/guru.v2i1.340>
- Carstens, K. J., Mallon, J. M., Bataineh, M., & Al-Bataineh, A. (2021). Effects of Web 2.0 technology on student learning in science. *TOJET: The Turkish Online Journal of Educational Technology*, 20(1), 105-113.
- Ferenčíková, P. (2017). E-learning module for traffic police to develop the English language. *Public Security and Public Order*, 2035(June), 238-253.
- Fitria, Y. (2017). Efektivitas Capaian Kompetensi Belajar Siswa Dalam Pembelajaran Sains Di Sekolah Dasar. *Jurnal Inovasi Pendidikan Dan Pembelajaran Sekolah Dasar*, 1(2). <https://doi.org/10.24036/jippsd.v1i2.8605>
- Gatus, L. C., & Vargas, D. S. (2022). *Teachers ' And Students ' Experiences In Using Printed Modules In Distance Learning Under The New Normal : A Documentation Study*. 6(10), 2594-2601.
- Hadiyanti, A. H. D. (2021). Pengembangan Modul Pembelajaran IPA Digital Berbasis Flipbook Untuk Pembelajaran Daring di Sekolah Dasar. *Jurnal Elementaria Edukasia*, 4(2), 284-291. <https://doi.org/10.31949/jee.v4i2.3344>
- Hemilia, F., Wedi, A., & Praherdhiono, H. (2022). Pengembangan Modul Digital Menggunakan Pendekatan Collaborative Learning Pada Mata Kuliah Pengembangan Bahan Belajar. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 05(03), 223-231. <https://doi.org/10.17977/um038v5i32022p223>
- Hendri, S., Handika, R., Kenedi, A. K., & Ramadhani, D. (2021). Pengembangan Modul Digital Pembelajaran Matematika Berbasis

- Science, Technology, Engineering, Mathematic untuk Calon Guru Sekolah Dasar. *Jurnal Basicedu*, 5(4), 2395-2403.
- Herliandry, L. D., Nurhasanah, N., Suban, M. E., & Kuswanto, H. (2020). Pembelajaran Pada Masa Pandemi Covid-19. *JTP - Jurnal Teknologi Pendidikan*, 22(1), 65-70. <https://doi.org/10.21009/jtp.v22i1.15286>
- Irwandani, I., Latifah, S., Asyhari, A., Muzannur, M., & Widayanti, W. (2017). Modul Digital Interaktif Berbasis Articulate Studio'13: Pengembangan pada Materi Gerak Melingkar Kelas X. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, 6(2), 221-231. <https://doi.org/10.24042/jipfalbiruni.v6i2.1862>
- Iskandar, R., & Kusmayanti, I. (2018). Pendekatan Science Technology Society. *Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 2(2), 200-215.
- Khasanah, I., & Nurmawati, I. (2021). Pengembangan Modul Digital sebagai Bahan Ajar Biologi untuk Siswa Kelas XI IPA. *Indonesian Journal of Mathematics and Natural Science Education*, 2(1), 34-44. <https://doi.org/10.35719/mass.v2i1.57>
- Kuncahyono. (2018). Pengembangan E-Modul (Modul Digital) Dalam Pembelajaran Tematik di Sekolah Dasar. *JMIE: Journal of Madrasah Ibtidaiyah Education*, 2(2), 219-231.
- Laili, I., Ganefri, & Usmeldi. (2019). Efektivitas Pengembangan E-Modul Project Based Learning Pada Mata Pelajaran Instalasi. *Jurnal Ilmiah Pendidikan Dan Pembelajaran*, 3(3), 306-315.
- Lestari, S. (2018). Peran Teknologi dalam Pendidikan di Era Globalisasi. *Edureligia; Jurnal Pendidikan Agama Islam*, 2(2), 94-100. <https://doi.org/10.33650/edureligia.v2i2.459>
- Marjanah, Pandia, E. S., & Nursamsu. (2021). Development of Practicum Instruction Module Based on Project Based Learning (PjBL) Integrated with Science Process Skills and Scientific Literacy. *Jurnal Penelitian Pendidikan IPA*, 7(SpecialIssue), 104-111. <https://doi.org/10.29303/jppipa.v7ispecialissue.874>
- Muh Zulqutbi Azhari, L., & Yuliati, L. (2017). Penguasaan Konsep IPA Siswa Kelas V SD pada Materi Rangka Tubuh. *Pros. Seminar Pend. IPA Pascasarjana UM*, 2, 978-602.
- Niiranen, S. (2021). Supporting the development of students' technological understanding in craft and technology education via the learning-by-doing approach. *International Journal of Technology and Design Education*,

- 31(1), 81–93. <https://doi.org/10.1007/s10798-019-09546-0>
- Nisa, A. H., Mujib, M., & Putra, R. W. Y. (2020). Efektivitas E-Modul dengan Flip Pdf Professional Berbasis Gamifikasi Terhadap Siswa SMP. *Jurnal Pendidikan Matematika Raflesia*, 05(02), 14–25.
- Novia, Y., Zaim, M., & Rozimela, Y. (2022). Interactive Learning Using E-Learning Module in Learning English for Senior High School: A Review of Related Articles. *Journal of Education, Language Innovation, and Applied Linguistics*, 1(2), 2828–2930. <https://doi.org/10.37058/jelita.v1i2.5306>
- Nurbaeti, R. U. (2020). Pengembangan Modul Praktikum Ipa Berbasis Kurikulum 2013 Untuk Mahasiswa Pendidikan Guru Sekolah Dasar. *Jurnal Elementaria Edukasia*, 3(1), 109–116. <https://doi.org/10.31949/jee.v3i1.2115>
- Pinto, M., & Leite, C. (2020). Digital technologies in support of students learning in higher education: A literature review. *Digital Education Review*, 37, 343–360. <https://doi.org/10.1344/DER.2020.37.343-360>
- Priantini, D. A. M. M. O., & Widiastuti, N. L. G. K. (2021). How Effective is Learning Style Material with E-modules During The COVID-19 Pandemic? *Jurnal Ilmiah Sekolah Dasar*, 5(2), 307–314.
- Purnomo, E., & Nugraheni, T. (2019). Pengembangan Modul Tari Berbasis Digital untuk Meningkatkan Kompetensi Guru Sekolah Menengah Tari. *Gondang: Jurnal Seni Dan Budaya*, 3(2), 119. <https://doi.org/10.24114/gondang.v3i2.14157>
- Putro, H. Y. S., & Huda, S. Al. (2022). Pengembangan Modul Digital Information Report Text Berbasis Assure Sekolah Menengah Pertama. *Edukatif: Jurnal Ilmu Pendidikan*, 4(3), 3310–3318. <https://doi.org/10.31004/edukatif.v4i3.2611>
- Rahayu, I., & Sukardi, S. (2021). The Development Of E-Modules Project Based Learning for Students of Computer and Basic Networks at Vocational Schools. *Journal of Education Technology*, 4(4), 398. <https://doi.org/10.23887/jet.v4i4.29230>
- Rahmah, S., Yulianti, L., & Irawan, E. B. (2017). Penguasaan Konsep Ipa Pada Siswa Sekolah Dasar. *Prosiding Seminar Nasional PS2DMP ULM*, 3(1), 35–40.
- Rahmawati, R., Lestari, F., & Umam, R. (2019). Analysis of the Effectiveness of Learning in the Use of Learning Modules Against Student Learning

- Outcomes. *Desimal: Jurnal Matematika*, 2(3), 233-240.
<https://doi.org/10.24042/djm.v2i3.4557>
- Ramadhani, S. P., & MS, Z. (2020). Profesional Pedagogy Guru Terhadap Perubahan Pembelajaran di Era Digital. *Jurnal Elementaria Edukasia*, 3(2). <https://doi.org/10.31949/jee.v3i2.2538>
- Ramadhani, W., & Fitria, Y. (2021). Capaian Kemandirian Belajar Siswa dalam Pembelajaran Sains Tematik menggunakan Modul Digital. *Jurnal Basicedu*, 5(5), 4101-4108.
<https://doi.org/10.31004/basicedu.v5i5.1391>
- Sa'diyah, K. (2021). Pengembangan E-Modul Berbasis Digital Flipbook Untuk Mempermudah Pembelajaran Jarak Jauh di SMA. *Edukatif: Jurnal Ilmu Pendidikan*, 3(4), 1298-1308.
- Safira, A. D., Sarifah, I., & Sekaringtyas, T. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Web Articulate Storyline Pada Pembelajaran Ipa Di Kelas V Sekolah Dasar. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 2(2), 237-253.
<https://doi.org/10.37478/jpm.v2i2.1109>
- Said, M. A., Arsyad, M., & Tawil, M. (2021). The Development of Electronic Practicum Modules at Electronic Course for Physics Education Program. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 7(2), 99-106. <https://doi.org/10.21009/1.07201>
- Sari, R. S. P. (2018). Pengembangan Bahan Ajar Matematika Pada Materi Bangun Ruang Sisi Datar. *Jurnal Pendidikan Matematika UIN Raden Intan Lampung*, 1, 830-838.
- Sekaringtyas, T. (2017). Pengaruh Motivasi Berprestasi dan Kemampuan Berpikir Kritis terhadap Hasil Belajar Ilmu Pengetahuan Alam Siswa SD Sukatani IV. *Jurnal Pendidikan Dasar*, 8(2), 159-171.
- Sewagegn, A. A. (2020). Learning objective and assessment linkage: Its contribution to meaningful student learning. *Universal Journal of Educational Research*, 8(11), 5044-5052.
<https://doi.org/10.13189/ujer.2020.081104>
- Sugihartini, N., & Jayanta, N. L. (2017). Pengembangan E-Modul Mata Kuliah Strategi Pembelajaran. *Jurnal Pendidikan Teknologi Dan Kejuruan*, 14(2), 221-230. <https://doi.org/10.23887/jptk-undiksha.v14i2.11830>
- Syukur, S. K., Fitria, Y., & F, F. (2021). Pengembangan Bahan Ajar IPA Tema 8 Menggunakan Model Project Based Learning Di Sekolah

Dasar. *PENDIPA Journal of Science Education*, 6(1), 120-127.
<https://doi.org/10.33369/pendipa.6.1.120-127>

Tania, L. (2017). Pengembangan Bahan Ajar E-Modul Sebagai Pendukung Pembelajaran Kurikulum 2013 Pada Materi Ayat Jurnal Penyesuaian Perusahaan Jasa Siswa Kelas X Akuntansi SMK Negeri 1 Surabaya. *Jurnal Pendidikan Akuntansi (JPAK)*, 2(6), 1-9.