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Enhancing Fourth Grade IPAS Concept Comprehension through Scientific Reading-Based E-Modules Developed with Exe-Learning

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ABSTRACT

The integration of technology in 21st-century learning is essential, particularly in science education, where interactive tools can enhance students' understanding of complex concepts. Exe-learning, a platform that supports the creation of interactive educational content, offers features such as quizzes, practice questions, and simulations that aid in concept comprehension. This study employed a Research and Development (R&D) approach with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) to create an interactive electronic module for the IPAS lesson on "Energy Transformation." A nonequivalent control group design was used to assess the e-module's effectiveness. Data were collected using pretest-posttest assessments to evaluate module feasibility and effectiveness, complemented by interviews and observations. Data analysis included N-Gain and Cohen's tests to measure improvement in conceptual understanding. The validation of the e-module showed high feasibility scores: 66% for content, 94% for language, and 86% for media. The N-Gain analysis indicated significant improvement in students' understanding, confirming the module's effectiveness as a learning tool. The findings suggest that the scientifically structured, reading-based e-module promotes critical thinking and actively engages students, leading to improved comprehension of IPAS concepts. The exe-learning-based electronic module demonstrates potential as an effective educational medium, enhancing students' engagement and understanding in the study of energy transformation in elementary science.

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1. INTRODUCTION

The demands of 21st-century learning must be student-centered, with ease of access to learning media to expand student's knowledge (Mardiyah et al., 2021). Utilizing appropriate learning media helps teachers and students achieve successful learning outcomes (Farihah et al., 2023; Nurjumiati et al., 2024; Syachruroji et al., 2024). Using digital technology through e-modules can transform the learning process into something more fun, practical, and motivating for students (Komikesari et al., 2020; Zain, 2024).

Electronic modules are digital teaching materials that present dynamic learning content by combining various media elements such as images, animation, audio, and video (Setyaningtyas et al., 2024; Surtini et al., 2023). To create these interactive learning tools, educators can utilize software like Exe-learning. This open-source application enables the creation of web-based interactive learning materials independently, without needing to understand HTML, XML, or other web programming languages.

However, despite the potential of electronic modules, there are notable gaps in their current implementation. As highlighted by Estuhono & Efendi (2024), while the creation of digital teaching materials with e-modules can significantly improve student learning outcome, the available resources often fall short. Many existing e-modules and digital learning resources are often generic and do not sufficiently incorporate interactive elements or project-based learning approaches, which are critical for fostering deeper understanding and critical thinking in students. Therefore, it is crucial to carefully consider the concerns raised regarding creating an interactive e-module to effectively enhance fourth-grade students' comprehension in the IPAS curriculum.

In addition to using learning media, teachers can use various learning models to encourage students to participate actively (Indrapangastuti et al., 2024). Learning models encompass comprehensive strategies for material presentation that serve as guidelines in the learning process to facilitate the achievement of students' learning goals. Choosing a learning model aligned with the students' characteristics is crucial for optimizing the effectiveness and efficiency of the educational process (Khawani & Rahmadana, 2023).

In addressing this need, it is essential to explore learning models that integrate there interactive and project-based elements. Joyce's learning model framework, consist of five main components: (1) syntax, (2) social system, (3) principles of reaction, (4) support system, and (5) instructional effect (Suastika, 2021). These components are integrated into a conceptual framework that guides the planning and implementation of specific learning models to encourage optimal achievement of student learning outcomes. One such innovative model is the Scientific Reading Based Project (SRBP) learning model, which combines scientific literacy with project-based learning to create a more engaging and effective educational experience for students.

Scientific reading or literacy, integrates scientific knowledge and skills to understand the world around us, solve problems, and make responsible decisions (Irsan, 2021; Pratiwi et al., 2019). Meanwhile, the project-based learning model on the other hand, involves students in creating projects, allowing them to plan learning activities, work collaboratively, and produce products (Anggraini & Wulandari, 2020; Azzahra et al., 2023). The SRBP model combines these approaches by integrating scientific literacy activities with project-based learning (Suryandari et al., 2020). This learning model necessitates project and research activities grounded in scientific reading (Suryandari et al., 2019). The scientific reading-based project model is implemented through the following syntax: (1) orientation, (2) scientific reading, (3) design and create, (4) progress of a project, (5) analysis, (6) discussion and communication (Suryandari et al., 2019).

The scientific reading-based project model, implemented through exe-learning software, is designed to specifically address these shortcomings. In this model, students actively seek information through scientific articles, books, or other relevant to develop their understanding of a topic, which is then realized through a project (Suryandari et al., 2021). This approach allows students to actively engage with scientific concepts through reading, analysis, and the creation of projects that reinforce their understanding with an interactive and engaging learning experience (Suryandari & Sajidan, 2019). This integration of scientific reading and project activities within a digital framework is a novel contribution to elementary science education, filling a critical gap in the current literature and practice.

Observations at SDN 1 Kalibagor revealed several issues regarding teachers' use of teaching materials and learning media. Most teachers were found to be underutilizing technology in preparing teaching materials and learning media. This lack of technology use hinders the potential for more interactive and dynamic learning. Additionally, no digital teaching materials are specifically designed to facilitate independent student learning. In the context of project-based learning, there is a notable gap

at the initial stage, where scientific reading activities are absent before implementing the learning project. Whereas, these activities are critical for building students' comprehensions, particularly in IPAS material.

To address the issues, there is a need for teaching materials in the form of electronic modules that can facilitate students' independent learning, making the learning process more interesting, meaningful, effective, and enjoyable. This study aims to develop and evaluate the effectiveness of an interactive electronic module based on the Scientific Reading-Based Project (SRBP) model to enhance fourth-grade students' comprehension of energy transformation concepts in the IPAS curriculum.

2. METHODS

This research is a study on the development of electronic module media. The instructional system design model used is the ADDIE model. The ADDIE model consists of five stages: (1) analyze, (2) design, (3) development, (4) implementation, and (5) evaluation, developed by Dick and Carey (Ula & Fadila, 2018). Table 1 provides a thorough analysis of the development stages.

Table 1. Development Stage

Development Stage	Actions
A (Analyze)	Curriculum analysis, student characteristics and needs, and material analysis
D (Design)	The process of designing the product concept that will be developed has been completed.
D (Develop)	The product development process is to be developed
I (Implement)	Product trial
E (Evaluate)	Assessment of the feasibility and effectiveness of the product to be developed

This research employs a quasi-experimental design with a pretest-posttest control group design. This research employs a quasi-experimental design with a pretest-posttest control group design. This design is chosen because it allows for the examination of the effect of the intervention (learning using the electronic module) while considering practical constraints such as the inability to randomly assign participants to groups. In real-world educational settings, random assignment is often impractical due to logistical, ethical, and administrative reasons (Joni & Suratno, 2023). In the initial stage, both groups are given a pretest. The experimental group is then given treatment through learning using the electronic module, while the control group does not receive any treatment. Both groups then undergo a posttest to measure the effect of the treatment. By including a pretest, this design helps to control for pre-existing differences between the groups. Any differences observed in the posttest results can be more confidently attributed to the treatment rather than to initial disparities (Olivares & Millsap, 2009). Although the equivalence of the characteristics of the two groups cannot be fully guaranteed due to the lack of random assignment, the pretest-posttest design helps to mitigate this limitation by providing a baseline for comparison.

The research data consists of quantitative and qualitative data. Data collection methods include test, questionnaires, observation, and interviews. The instruments used consist of validation questionnaires for the e-module (content, media, and language experts), teacher and student response questionnaires, and IPAS learning outcome tests. The interview data and the feedback and suggestions from the validators are processed using qualitative descriptive analysis. Meanwhile, the quantitative descriptive analysis of this electronic module includes expert validity tests (content, media, and language experts) and effectiveness tests.

The validity test evaluates the feasibility of developing an interactive electronic module tailored to the learning material. The answer categories in the expert validation questionnaire are measured using a Likert scale consisting of 5 answer categories, as follows:

Table 2. Answer Categories in the Likert Scale

Description	Score
Very good	5
Good	4
Simply	3
Less	2
Very less	1

The validation test of the learning media expert questionnaire as an interactive electronic module can be done by comparing the number of respondents' answer scores (∑) with the ideal number of scores (N). In determining the percentage, researchers will use the following formula.

$$P = \frac{\sum R}{N} x100\%$$

Description:
P = Percentage score (rounded)
∑R = The number of respondents' answer scores
N = Total score of each item

The applied descriptive data analysis technique highlights the validity and efficacy of the e-module being built. The following table presents the validation criteria for media validation.

Table 3. Validation Criteria Used in Media Validation

Percentage (%)	Interpretation
81% - 100%	Very valid
61% - 80%	Valid
41% - 60%	Quite valid
21% - 40%	Less valid
0% - 20%	Invalid

Based on these criteria, the development product is declared complete if the assessment results meet the eligibility criteria for electronic module learning media in the "very valid" or "valid" category regarding material suitability, media, and technical quality. Exam data on student learning outcomes can be analyzed to evaluate the e-module efficacy. The following table presents the effectiveness and magnitude of the module's effect.

Table 4. N-Gain Calculation Categories

Normalized N-Gain Value	Interpretation
-1,00 < g ≤ 0,00	There was a decrease
g = 0,00	There is no decrease
0,70 < g ≤ 1,00	High
0,30 < g ≤ 0,70	Medium
0,00 < g ≤ 0,30	Low

Table 5. Effect Size Calculation Categories

Score	Interpretation
0 – 0,20	Very weak effect
0,21 – 0,50	Weak effect
0,51 – 1,00	Moderate effect
>1,00	Strong effect

3. FINDINGS AND DISCUSSIONS

3.1 Electronic Module Development Steps

The development of this interactive electronic module based on a scientific reading-based project model is structured with the ADDIE model learning design.

3.1.1 Analyze

At the analysis stage, the curriculum used at SDN 1 Kalibagor, called the independent curriculum, was examined. This curriculum is designed to be interactive and relevant, partly by having students do projects. In IPAS learning at SDN 1 Kalibagor, teachers have used methods like individual learning, group activities, making projects together, and discussions to build communication and cooperation skills. But, students have not been fully active in these projects.

An analysis of the students' characteristics and needs was also done. The fourth-grade students at SDN 1 Kalibagor are from the same area, are ethnically and religiously similar, are of the same age range, and most have gadgets. Thus, they can use e-modules for their learning. However, the IPAS projects did not start with scientific reading, so students did not understand the material well. This is because teachers need more knowledge about science literacy, and students have different learning styles. The teaching materials used were government books. Therefore, learning media should be innovative and adaptive by using technology. By developing interactive e-modules, students can have varied and interesting learning experiences, with images, videos, animations, projects, and interactive quizzes to help them understand energy concepts.

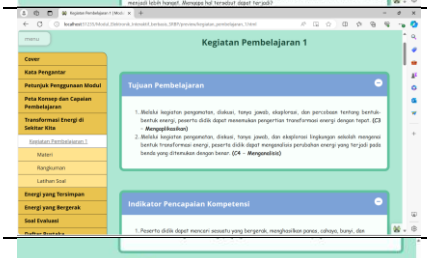
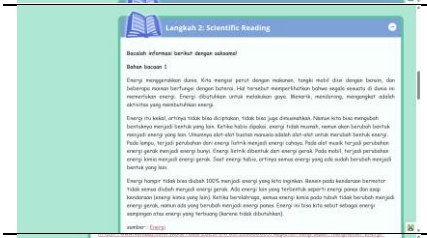
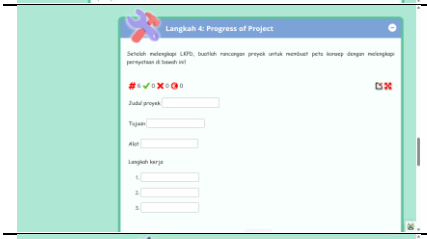
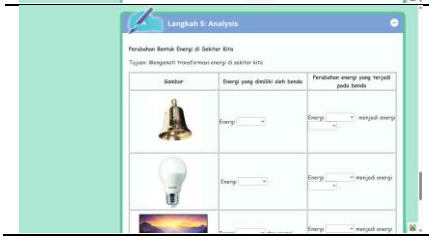
3.1.2 Design

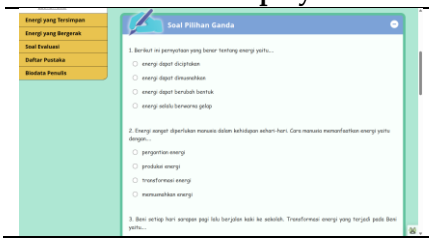
The second stage is planning the product designs, which includes preparing learning scenarios, storyboards, and product prototypes. These needs include enhancing students' engagement, facilitating comprehension of complex concepts, and providing interactive learning experiences. To meet these needs, the design process involves preparing learning scenarios and storyboards that align with the students' learning objectives and cognitive levels. These scenarios and storyboards serve as blueprints for the e-module, ensuring that the content is structured in a way that is both engaging and educational. This e-module based on a scientific reading-based project is developed using exe-learning software, and tools like Microsoft Word, Canva, Google Drive, and Drive to Web, is tailored to provide a seamless user experience. The product can be accessed through a website link on an internet-connected device, ensures that students can easily engage with the material, regardless of their location or the device they are using. This accessibility addresses the need for flexible learning environments, enabling students to learn at their own pace and convenience.

3.1.3 Develop

In the third stage, the development of the e-module involves a conscientious process of gathering and incorporating feedback from various validation experts, including those specializing in material content, language, and media design. This stage is crucial for ensuring that the e-module meets high educational standards and is effective in facilitating learning. The material experts reviewed the content of the e-module to ensure it was accurate, relevant, and aligned with the curriculum objectives. Language experts evaluated the readability and linguistic appropriateness of the e-module. Media experts assessed the usability and visual appeal of the e-module, focusing on the layout, design elements, and the integration of multimedia components. Following these expert reviews, the e-module underwent a series of revisions. Each aspect of the feedback was carefully considered and incorporated into the product to ensure that the final e-module was both educationally effective and engaging for students. The revisions were essential in refining the e-module to meet the desired educational outcomes, resulting in a product that is validated by experts and ready for use in the classroom. The result of e-module development is shown in Table 6.

Table 6. Development of Interactive E-Module based on Scientific Reading-Based Project Model with Exe-Learning Software

Visual Display	Interactive E-Module Section
	**Material apperception,** connects new information with prior knowledge.
	**Learning goals,** include basic and advanced thinking skills
	**SRBP Step 1: Orientation,** involves observing and asking questions about the material
	**SRBP Step 2: Scientific reading,** includes studying scientific activities from different sources
	**SRBP Step 3: Design and create,** involves planning the project, deciding how to work, and listing tools and materials needed
	**SRBP Step 4: Progress of the project,** involves collecting data and writing a project report
	**SRBP Step 5: Analysis,** involves analyzing and interpreting data

Visual Display	Interactive E-Module Section
	**Practice with advanced thinking questions**, to enhance students' critical thinking skills, enabling them to apply concepts to real-world scenarios and solve complex problems effectively.

3.1.4 Implement

In the fourth stage of implementation, a quasi-experimental method was employed with a non-equivalent control group design. Prior to introducing the learning media, both experimental and control groups underwent a pretest. Each group completed a posttest after four learning sessions to see how effective the created e-module was. To determine the effectiveness of the product, the students pre- and post-test score were compared.

3.1.5 Evaluate

The evaluation phase represents the final step in the ADDIE model design. This phase involves analyzing data gathered from various research component, including needs analysis, design preparation, expert validation of the media, responses from teacher and students via questionnaires, and the media's effectiveness in learning. The culmination of this evaluation demonstrates that the e-module created by the researchers falls within the valid and effective category for learning purposes. The quality of the developed e-module must meet the eligibility standards based on assessments form validation experts as well as feedback from teacher and students (Violadini & Mustika, 2021).

3.2 Validity of Electronic Module based on Scientific Reading-Based Project Model

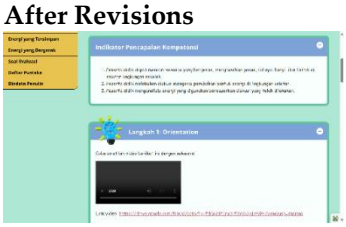
The learning media developed is then tested by a validation team of material experts, linguists, media experts, teacher, and students to determine the validity of the product used in the learning process. Table 7 below recapitulates expert validation results.

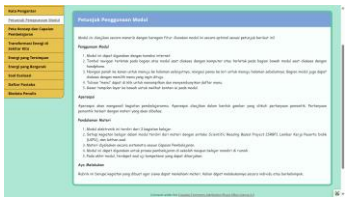
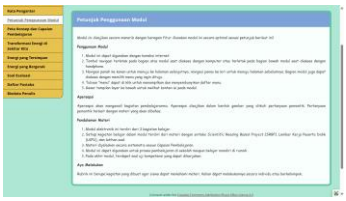
Table 7. Recapitulation of Validation Data

Validator	Percentage	Interpretation
Material	66%	Valid
Language	94%	Very valid
Media	86%	Very valid

Based on Table 7, the assessment from experts gave eligibility criteria for electronic module learning media in the "very valid" or "valid" category regarding material suitability, media, and, technical quality. Therefore, the e-module structured around a scientific reading-based project model holds validity. Table 8 displays suggestions and revisions provided by experts.

Table 8. The Suggestions and Revisions Given by Experts

Aspect	Suggestions	Revisions	
		Before revisions	**After Revisions**
Materials	Added a video link address to orientation activities to anticipate if it cannot be opened directly in the module.		

Aspect	Suggestions	Revisions	
Materials	Added project instructions to make it clear.	**Before revisions** 	**After Revisions** 
	Added feedback for correct answers to evaluation questions.	**Before revisions** 	**After revisions** 
Language	Use EYD by adding punctuation.	**Before revisions** 	**After revisions** 

The next stage, product assessment, was carried out by filling in the electronic module media assessment sheet for the teacher and fourth-grade students of SDN 1 Kalibagor. The results of the recapitulation of the assessment of electronic module media by teachers and students are presented in Table 9.

Table 9. Recapitulation of Media Assessment Results by Teacher and Students

No	Appraiser	Percentage	Interpretation
1.	Teacher	87%	Very valid
2.	Students	91%	Very valid
Average		89%	Very valid

Based on Table 9, the average response was 89%, so the e-module based on a scientific reading-based project is very valid. This means the e-module can be used in IPAS learning, efficiently, and useful.

3.3 Effectiveness of Electronic Module Based on Scientific Reading-Based Project Model

Based on the research results, Table 10 below presents the pretest and posttest scores for the effectiveness of using electronic modules in learning.

Table 10. Description of Learning Outcome Data

Group	Number of students	Pretest			Posttest			s
		Mean	Min	Max	Mean	Min	Max	
Control	19	46,05	25	60	78,68	70	95	7,22
Experiment	19	54,73	25	70	87,37	75	100	8,17

The normality of the data must be tested before hypothesis testing can be carried out. Furthermore, to evaluate the efficacy of interactive e-module based on scientific reading-based project model in IPAS learning, an effectiveness test was conducted. Details of the calculation results are presented in Table 11 below.

Table 11. Analysis of Test Outcome

Tests	Test Types	Result	Decision	Conclusion
Normality	Shapiro-Walk	Control class (Sig. 0.79) Experimental class (Sig. 0.55)	H0 is accepted	Data is normally distributed
Homogenity	Levene's Statistic	Sig. 0.544	H0 is accepted	Homogeneous data
Difference test	N-Gain Score	Control class (0.597) Experimental class (0.722)	H0 is accepted	Differences
The effect size test	Cohen's	D = 1.13		High category

Table 11 shows that the necessary test is satisfied due to the normally and homogeneous distributed data. Based on the N-Gain test calculation results, the electronic module product test result in the control group which did not receive treatment in the form of an electronic module, achieved an N-Gain score of 0.597, classified as medium. In contrast, the experimental group, which used the electronic module, achieved a higher N-Gain score of 0.722, classified as high. The significant difference suggests that the electronic module had a substantial impact on student' understanding.

Furthermore, the Cohen's effect size test, used to measure the magnitude of the correlation of a research variable, produced a strong effect size (d = 1.13). The large effect size combined with the high N-Gain score, underscores the effectiveness of the interactive e-module in enhancing students' comprehension of energy transformation concepts compared to traditional teaching methods. These results highlight the potential of well-designed multimedia resources to significantly improve educational outcomes.

Discussion

The findings from this study straighten with previous research demonstrating that the incorporation of multimedia, such as images, instructional videos, project activities, and interactive tests, can significantly enhance students' enthusiasm for learning (Hadiyanti et al., 2021; Triwahyuningtyas et al., 2020). The positive responses collected from both teachers and students through questionnaires further support the effectiveness of the e-modules. Students informed that the diverse and exciting learning experiences provided by the e-modules allowed them to better visualize abstract concepts, such as energy transformation, through images, videos, animations, projects, and interactive quizzes.

When comparing these findings with existing studies, it becomes evident that the use of multimedia in educational tools, especially those based on scientific reading and project-based learning, is not only effective but also critical in bridging the gap between theoretical knowledge and practical application. For instance, Eriyanti et al. (2023); Maulidinah & Ekasari (2023) have shown that e-modules designed with similar multimedia elements significantly contribute to improving students' digital competencies and independent learning skills. Misbah et al. (2021) further corroborate this by highlighting the role of interactive e-modules in enhancing student engagement and comprehension.

What sets this study apart is the specific focus on the IPAS learning material "Energy Transformation," a concept that is inherently concrete and closely tied to everyday experiences. The ability of students to directly connect their learning activities to real-life energy usage, facilitated by the interactive e-module, underscores the unique value of this approach. Unlike traditional teaching methods, which may struggle to convey abstract material effectively, this e-module transforms such content into a concrete learning tool, making it more accessible and understandable for students (Sriyanti et al., 2021; Triwahyuningtyas et al., 2020; Wati & Nugrahani, 2023).

These findings have significant implications for future teaching practices and the development of educational tools. By integrating multimedia into learning materials, teachers can better address diverse learning styles, making lessons more engaging and accessible. Moreover, the results highlight the critical need for ongoing professional development for educators. Teachers must be equipped with the

necessary skills and knowledge to effectively incorporate multimedia into their teaching practices, ensuring that they can fully leverage these tools to enhance student learning outcomes. So, the positive impact of multimedia-rich e-modules on student learning is well-documented. This study adds to the growing body of evidence by focusing on the specific context of IPAS education. The high N-Gain scores and strong effect sizes observed here underscore the transformative potential of these tools in improving student comprehension and enthusiasm for learning, particularly in subjects that are otherwise challenging to teach through traditional methods.

4. CONCLUSION

The interactive electronic module based on a scientific reading project using exe-learning software has proven to be a valid, feasible, and effective tool for enhancing fourth-grade students' understanding of energy transformation at SDN 1 Kalibagor. Developed using the ADDIE model, the module received validation scores of 66% from material experts, 84% from language experts, and 86% from media experts, with teacher and student satisfaction ratings at 87% and 91%, respectively. Practicality was rated as medium, showing an N-Gain value of 0.722 and a strong learning effect of 1.13 in the experimental class. The findings imply that such interactive, project-based e-modules can foster independent, active, and engaging learning experiences both at home and in school, while also supporting teachers in facilitating effective instruction. However, limitations in this study include a focus on a single topic within a specific educational setting, which may restrict the generalizability of the results. Future research could explore the application of similar modules across various subjects and educational contexts to further validate the effectiveness of project-based e-learning approaches in promoting conceptual understanding and student independence in diverse learning environments.

REFERENCES

Anggraini, P. D., & Wulandari, S. S. (2020). Analisis Penggunaan Model Pembelajaran Project Based Learning Dalam Peningkatan Keaktifan Siswa. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, *9*(2), 292–299. https://doi.org/10.26740/jpap.v9n2.p292-299

Azzahra, U., Arsih, F., & Alberida, H. (2023). Pengaruh Model Pembelajaran Project-Based Learning (Pjbl) terhadap Keterampilan Berpikir Kreatif Peserta Didik Pada Pembelajaran Biologi : Literature Review. *BIOCHEPHY: Journal of Science Education*, *3*(1), 49–60.

Eriyanti, I. L., Jumadi, J., Yanarti, Y., & Rosiningtias, W. (2023). Develeopment e-modules based android in Newton's law topic for senior high school. *Jurnal Inovasi Pendidikan IPA*, *9*(1), 62–72. https://doi.org/10.21831/jipi.v9i1.50313

Estuhono, E., & Efendi, R. (2024). Development of Research-Based Learning IPAS E-Module Using the Book Creator Application in the Merdeka Curriculum. *AL-ISHLAH: Jurnal Pendidikan*, *16*(1), 592–604. https://doi.org/10.35445/alishlah.v16i1.4643

Farihah, T. S., Ampera, D., Sitompul, H., & Jahidin, I. (2023). Development of 3D-based Learning Modules for University Students. *International Journal of Education in Mathematics, Science and Technology*, *11*(1), 56–73. https://doi.org/10.46328/ijemst.2715

Hadiyanti, N. F. D., Hobri, P. A. C., Susanto, M. R. P., Khasanah, N., & Maharani, P. (2021). Development of mathematics e-module with STEM-collaborative project based learning to improve mathematical literacy ability of vocational high school students. *Journal of Physics: Conference Series*, *1839*(1). https://doi.org/10.1088/1742-6596/1839/1/012031

Indrapangastuti, D., Wahyudi, W., & Rokhmaniyah, R. (2024). Enhancing Critical Thinking Skills of Prospective Elementary School Teachers: A Study on Problem-Based Learning Approach. *AL-ISHLAH: Jurnal Pendidikan*, *16*(1), 306–316. https://doi.org/10.35445/alishlah.v16i1.4476

Irsan, I. (2021). Implemensi Literasi Sains dalam Pembelajaran IPA di Sekolah Dasar. *Jurnal Basicedu*, *5*(6), 5631–5639. https://doi.org/10.31004/basicedu.v5i6.1682

Joni & Suratno, S. (2023). *Pengaruh Metode Inkuiri terhadap Hasil Belajar Siswa (Studi Kuasi Eksperimen pada*

Mata Pelajaran Matematika Kelas IV di Sekolah Dasar Negeri Indrapuri Kecamatan Tapung Kabupaten Kampar). *1*(1), 1–8.

Khawani, A., & Rahmadana, J. (2023). Penerapan Model Pembelajaran Inovatif Abad 21 pada Pembelajaran Tematik untuk Menumbuhkan Kreatifitas Peserta Didik di Sekolah Dasar. *Jurnal Basicedu*, *7*(1), 231–240. https://doi.org/10.31004/basicedu.v7i1.4280

Komikesari, H., Mutoharoh, M., Dewi, P. S., Utami, G. N., Anggraini, W., & Himmah, E. F. (2020). Development of e-module using flip pdf professional on temperature and heat material. *Journal of Physics: Conference Series*, *1572*(1). https://doi.org/10.1088/1742-6596/1572/1/012017

Mardiyah, R. H., Aldriani, S. . N. F., Chitta, F., & Zulfikar, M. R. (2021). *Pentingnya Keterampilan Belajar di Abad 21 sebagai Tuntutan dalam Pengembangan Sumber Daya Manusia*. *71*(1), 63–71.

Maulidinah, M., & Ekasari, A. (2023). Application of E-Module to Identify Students' Science Process Skills in the Practicum of Refraction on Prisms. *Schrödinger: Journal of Physics Education*, *4*(2), 30–35. https://doi.org/10.37251/sjpe.v4i2.502

Maydeu-Olivares, A., & Millsap, R. E. (2009). *The SAGE Handbook of Quantitative Methods in Psychology*. Sage. http://digital.casalini.it/9781446206676

Misbah, M., Sasmita, F. D., Dinata, P. A. C., Deta, U. A., & Muhammad, N. (2021). The validity of introduction to nuclear physics e-module as a teaching material during covid-19 pandemic. *IOP Conference Series: Earth and Environmental Science*, *1796*(1). https://doi.org/10.1088/1742-6596/1796/1/012070

Nurjumiati, N., Sumardi, L., Sawaludin, S., & Herianto, E. (2024). Penggunaan Media Pembelajaran Video Animasi Pada Pembelajaran PPKn dan Dampaknya Terhadap Hasil Belajar Siswa. *Jurnal Ilmiah Profesi Pendidikan*, *9*(1), 361–366. https://doi.org/10.29303/jipp.v9i1.2001

Pratiwi, S. N., Cari, C., & Aminah, N. S. (2019). Pembelajaran IPA Abad 21 dengan Literasi Sains Siswa. *Jurnal Materi dan Pembelajaran*, *9*, 34–42. https://jurnal.uns.ac.id/jmpf/article/view/31612%0Ahttps://jurnal.uns.ac.id/jmpf/article/download/31612/21184

Setyaningtyas, T., Hadi, W. P., Rosidi, I., Bagus, D., & Astid, R. (2024). Pengembangan Modul Elektronik IPA Berbasis SETS pada Materi Pencemaran Lingkungan. *Jurnal National Science Educational Reseacrh*, *7*(1), 86–93.

Sriyanti, I., Almafie, M. R., Marlina, L., & Jauhari, J. (2021). The effect of Using Flipbook-Based E-modules on Student Learning Outcomes. *Kasuari: Physics Education Journal (KPEJ)*, *3*(2), 69–75. https://doi.org/10.37891/kpej.v3i2.156

Suastika, K. (2021). Mathematics Learning Model of Open Problem Solving to Develop Students' Creativity. *International Electronic Journal of Mathematics Education*, *12*(3), 569–577. https://doi.org/10.29333/iejme/633

Surtini, S., Junedi, B., & Tabrani, M. B. (2023). Pengembangan Modul Elektronik Kontekstual Berbasis Flipbooks terhadap Pemahaman Konsep Matematis Siswa Kelas XI MA. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(1), 332. https://doi.org/10.24127/ajpm.v12i1.6045

Suryandari, K. C., Rohkmaniyah, & Chamdani, M. (2019). Analysis of student responses for scientific reading based project (SRBP) model: Using Rasch modeling. *AIP Conference Proceedings*, *2194*. https://doi.org/10.1063/1.5139852

Suryandari, K. C., Rokhmaniyah, & Joharman. (2020). *Development of Subject Specific Pedagogy (SSP) Based on the Scientific Reading Based Project (SRBP) Model Empowering Critical and Creative Thinking Skills*. *491*(Ijcah), 468–474. https://doi.org/10.2991/assehr.k.201201.084

Suryandari, K. C., Rokhmaniyah, R., & Wahyudi, W. (2021). The Effect of Scientific Reading Based Project Model in Empowering Creative Thinking Skills of Preservice Teacher in Elementary School. *European Journal of Educational Research*, *10*(3), 1199–1213. https://www.researchgate.net/profile/Ebru-Eren/publication/348382981_Education_Policies_in_the_Context_of_Political_Communication_in_Turkey/links/5ffc2aeba6fdccdcb846cc03/Education-Policies-in-the-Context-of-Political-Communication-in-Turkey.pdf

Suryandari, K. C., & Sajidan, S. (2019). Memberdayakan High Order Thinking Skill (HOTS) Melalui Model Scientific Reading Based Project (SRBP) Pada Pembelajaran IPA Bagi Calon Guru Di Era Revolusi Industri 4.0. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *3*(2), 183. https://doi.org/10.20961/jdc.v3i2.35059

Syachruroji, A., Mahtuh, N. A., Andriani, N., Raya, J. C., Serang, K., Serang, K., Samuan, J., Lopang, B., Serang, K., & Serang, K. (2024). *Pengaruh penggunaan media pembelajaran wordwall terhadap minat belajar peserta didik kelas 3 muatan pelajaran IPA di SDN Kebaharan 2*. *2*(1), 13–21.

Triwahyuningtyas, D., Ningtyas, A. S., & Rahayu, S. (2020). The problem-based learning e-module of planes using Kvisoft Flipbook Maker for elementary school students. *Jurnal Prima Edukasia*, *8*(2), 199–208. https://doi.org/10.21831/jpe.v8i2.34446

Ula, I. R., & Fadila, A. (2018). Pengembangan E-Modul Berbasis Learning Content Development System Pokok Bahasan Pola Bilangan SMP. *Desimal: Jurnal Matematika*, *1*(2), 201. https://doi.org/10.24042/djm.v1i2.2563

Violadini, R., & Mustika, D. (2021). Pengembangan e-modul berbasis metode inkuiri pada pembelajaran tematik di sekolah dasar. *Jurnal Basicedu*, *5*(3), 1210–1222. https://doi.org/10.31004/basicedu.v5i3.899

Wati, E. S., & Nugrahani, A. (2023). Analysis E-Modul Using Kondular Application on Poetry Writing Material at SDN Tasikmadu 1 Malang. *Journey: Journal of English Language and Pedagogy*, *6*(3), 618–625. https://doi.org/10.33503/journey.v6i3.3673

Zain, A. K. (2024). *Interactive Digital Modul Physics (Idmp) Berbasis Inquiry Pada Konsep Energi Alternatif*. *XII*, 189–198. https://doi.org/10.21009/03.1201.pf27