

Development of *EXBOOK – M2J* on Human Excretory System Materials to Improve Students' Collaboration Skills

Novinda Vira Fardiana¹, Firda Awalia Putri², Safwatun Nida^{3*}

¹Teacher Professional Education Postgraduate School at State University of Malang, Indonesia.

²State Junior High School 2 Malang, Indonesia.

³*Department of Science at Faculty of Mathematics and Natural Sciences State University of Malang, Indonesia.

E-mail: novinda.vira.2431299@students.um.ac.id

*Corresponding Author



<https://doi.org/10.31004/jerkin.v5i1.3178>

ARTICLE INFO

Article history:

Received: 06 Jul 2026

Revised: 12 Jul 2026

Accepted: 18 Jul 2026

Kata Kunci:

Buklet, Penuh
Perhatian, Bermakna,
Penuh Sukacita,
Kolaborasi.

Keywords:

Booklet, Mindful,
Meaningful, Joyful,
Collaboration.

ABSTRACT

Penelitian ini bertujuan untuk mengembangkan dan menguji validitas dan kepraktisan media pembelajaran *EXBOOK-M2J* (Buku Panduan Ekskresi - Pembelajaran yang Penuh Perhatian, Bermakna & Menyenangkan) yang dirancang untuk meningkatkan keterampilan kolaborasi siswa pada materi sistem ekskresi manusia. Penelitian ini menggunakan metode R&D model ADDIE dengan pendekatan kuantitatif dan kualitatif, dengan desain penelitian pretest-posttest satu kelompok. Uji validitas dilakukan oleh seorang ahli materi dan media, sedangkan keterbacaan diuji pada siswa kelas VIII SMP Negeri 2 Malang. Hasil validasi menunjukkan bahwa produk ini sangat valid dan layak. Implementasi dilakukan melalui model pembelajaran berbasis proyek, yang menghasilkan peningkatan keterampilan kolaborasi siswa berdasarkan perbandingan kuesioner awal dan akhir. Hasil ini menunjukkan bahwa *EXBOOK-M2J* efektif sebagai media pembelajaran berbasis proyek untuk mengembangkan keterampilan abad ke-21, khususnya kolaborasi.

This study aims to develop and test the validity and practicality of EXBOOK-M2J (Excretory Booklet - Mindful, Meaningful & Joyful Learning) learning media designed to improve students' collaboration skills on human excretory system material. This study used the ADDIE model R&D method with quantitative and qualitative approaches, with a one-group pretest-posttest research design. The validity test was carried out by a material and media expert, while readability was tested on VIII-grade students of SMP Negeri 2 Malang. The validation results show that this product is very valid and feasible. Implementation was carried out through a project-based learning model, which resulted in an increase in students' collaboration skills based on the comparison of the initial and final questionnaires. These results show that EXBOOK-M2J is effective as a project-based learning medium to develop 21st-century skills, especially collaboration.



This is an open access article under the CC-BY-SA license.

How to Cite: Novinda Vira Fardiana, et al. (2026), Development of *EXBOOK – M2J* on Human Excretory System Materials to Improve Students' Collaboration Skills, 5(1). <https://doi.org/10.31004/jerkin.v5i1.3178>

INTRODUCTION

In the midst of rapid globalization and technological advancement, students need to master various skills in a comprehensive and integrated manner in order to be able to answer future challenges. One of the important skills that must be possessed is the ability to work together effectively. Collaboration refers to the ability to collaborate with other individuals to realize common goals optimally. This value is in line with the character of Indonesian culture that prioritizes the spirit of mutual cooperation and cooperation in social life (Rafdi, W. F. M., et al., 2024). When learners have completed their education, they will engage in teamwork and not live individually, so the exchange of ideas is indispensable to achieve optimal outcomes. If learners do not have collaboration skills, they have the potential to become less comprehensible individuals or find it difficult to adapt in a social environment.

The learning approach chosen by the teacher plays a crucial role in achieving learning objectives effectively. As the main instrument in the educational process, the learning approach determines how the material is delivered, received, and understood by students (Solissa et al., 2024). Teachers need to consider the characteristics of the students, the learning context, and the final goals they want to achieve. In the modern era of education, interactive and student-centered learning methods, such as deeper learning, are increasingly important to prepare students for global challenges. Deep learning has become a strategic approach in improving the quality of education in the digital era. Research Results Lentzen et al., 2024 & M. Elbashbishy, 2024 show that deeper learning prepares students for college and careers by equipping them with critical thinking skills and adaptability. This gives rise to a deeper understanding of content, leading to increased retention and application of knowledge in various situations (M. Elbashbishy, 2024). The principles deep learning consist of being mindful, meaningful, and joyful. Deep learning not only aims to improve academic abilities, but also builds character, creativity, and empathy, so that students grow into complete individuals and are in harmony with global demands (Suyanto, et al. 2025).

Booklets are one of the print media that present important information in a concise, clear, and easy-to-understand manner. The existence of illustrations can add to the attractiveness, while its practical size makes it easy to carry and supports the learning process of students (Pralisaputri, 2016). According to Sitepu (in Rukmana, 2018) the components in the preparation of the booklet include several parts, namely, (1) the cover of the book which contains illustrations of interesting images and describes the contents of the booklet, (2) the front of the book includes the title page, blank pages, table of contents and introduction, (3) the text part includes the subject matter, chapter titles, and subchapters, (4) the back part includes the bibliography, Glossary, and index. The preparation of the booklet content is developed according to the needs of the researcher. So, based on the explanation above, the *booklet* is composed of the cover and contents of the book. There are two covers, namely the front cover and the back cover. The content of the book includes an introduction, table of contents, instructions for use, learning outcomes, learning objectives, concept maps, subject matter consisting of 2 sub-chapters, namely the organs of the human excretory system and diseases of the human excretory system as well as efforts to maintain the health of the excretory system, games, evaluation questions, glossary, and bibliography. In addition, this booklet is prepared using a scientific approach to support students' activeness in learning.

The material chosen for the application of learning media this time is the human excretion system. The selection of this material is due to the many terms and processes that exist in the human excretion system that students must understand. The excretory system is a material that contains organs and their functions in removing residual substances from the human body's metabolism (Setyoningtyas, et al., 2022). The excretory system is an abstract topic (At, et al., 2021) because it studies about organs and processes to remove metabolic waste products that occur in the body (Fatirani, 2022). In line with the results of interviews conducted with science teachers, the material on the human excretory system is abstract material and requires media that can facilitate students' visuals. This is the background for the researcher to choose the material in the development of learning media, where the material is closely related to daily life. This research was conducted to develop an *EXBOOK-M2J* for valid and feasible human excretion system material with the aim of improving students' collaboration skills. By taking the initial steps to improve the educational process, this development can also assist educators in improving students' learning collaboration skills.

In line with previous research conducted by Rahmawati (2024) entitled "Development of QR Code Integrated Booklet Learning Media to Increase Students' Learning Interest in Human Excretion System Materials". The research has been proven to be able to increase students' interest in learning through the use of interactive QR Code-based booklets. However, the research still focuses on the aspect of learning interest in learning based on the 2013 Curriculum, while improving students' collaboration skills has not been the main concern. Therefore, this study developed a similar medium by adding a focus on collaboration skills to expand the benefits of booklet-based learning in supporting students to the material concepts of the human excretory system.

METHOD

This research uses the Research and Development (R&D) method. This approach is used to create a product while assessing the extent to which the product is effective when used. Thus, the R&D method

aims not only to design and develop a particular product, but also to test the level of validity and effectiveness of the product in the process of its application (Okpatrioka, 2023). This study uses quantitative and qualitative research approaches with a *One Group Pretest-Posttest research design*. The quantitative data of the research was obtained from the results of validation, questionnaires and student responses. Meanwhile, the qualitative data of the research was obtained based on suggestions and comments given by teachers and students as well as descriptive analysis of the data obtained. The data collection techniques used were observation, interviews, validation questionnaire assessments, literature studies, and documentation. The research model used follows the ADDIE development pattern which is composed of five stages, which will be described in the following diagram.

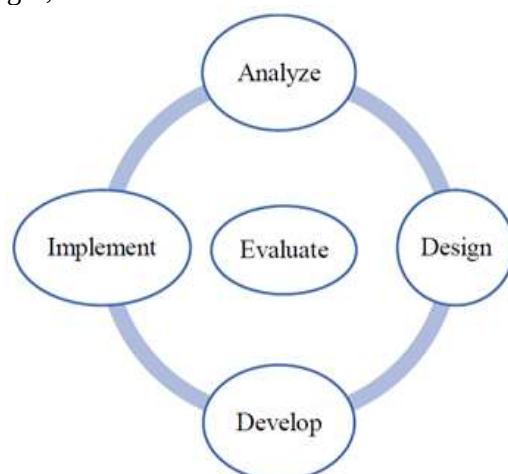


Figure 1. ADDIE Research Diagram

Source: (Maydiantoro, 2021)

The first stage is analysis , where this stage is analyzed the needs of learning media through interviews with science teachers. The subjects in this study are science teachers of SMP Negeri 2 Malang and students of grade VIII. In addition, a literature study was carried out to determine the learning media that needed to be developed. The second stage is design which includes the design of a product, starting from the selection of materials, the formulation of learning objectives, the selection of appropriate layouts, making instruments for the validation of materials, media, and student readability. In addition, this stage also includes the collection of references that will be used in the development of the booklet on the Human Excretion System material.

The third stage is development, in this stage the booklet development activities take place in accordance with the previous design. In addition, instruments are also prepared that will be used to test the validity and feasibility of the product. Validation tests include material validation, concept truth, and media validation. The feasibility test includes student readability. Then revisions are made to the suggestions and comments obtained to make the product valid and feasible. In the fourth stage, namely implementation, a trial was carried out in the field. Product trials are carried out on teachers and students to determine the validity and practicality of the product. Then in the last stage, namely evaluation, product improvements are made from all comments or validator suggestions to produce a decent and practical product so that it can be used in the learning process.

The product developed is *EXBOOK-M2J (Excretory Booklet – Mindful, Meaningful & Joyful Learning)* on the Human Excretory System material for grade VIII junior high school students. This research was conducted at SMP Negeri 2 Malang in April 2025. The subjects of this study were 32 students in class VIII D and 1 teacher to find out the results of product feasibility. The instruments used consisted of science teacher interview sheets, material expert validation questionnaires, media expert validation questionnaires, and student response questionnaires. Qualitative data were obtained from literature studies, interviews with science teachers, comments and suggestions from validators (science teachers) and student response questionnaires. Meanwhile, quantitative data was obtained from the results of material and media feasibility tests as well as the practicality of student responses.

The data used were scores obtained from the material and media validation questionnaire and the practicality of the *booklet*. The scores obtained from the feasibility and practicality questionnaire of the *booklet* used a *likert* scale consisting of four categories presented in the following table.

Table 1. Likert Scale Criteria

Criterion	Value
Disagree	1
Disagree	2
Agree	3
Strongly agree	4

Source: (Sugiyono, 2016)

To test the validity of the concept truth, use *the Guttman scale* as shown in the following table.

Table 2. Guttman Scale Criteria

Criterion	Value
True	1
Wrong	0

Source: (Sugiyono, 2016)

Furthermore, the data obtained based on validation from material experts and media experts is calculated using an assessment system with the following formula:

$$P = \frac{f}{N} \times 100\%$$

P = Percentage of the score sought

f = Total score obtained

N = Maximum number of scores

Source: (Arikunto, 2021)

The percentage results obtained are then adjusted in the following categories:

Table 3. Criteria for Validity and Eligibility

Eligibility Percentage	Validity Criteria	Value
0% - 39%	Invalid	Not Eligible
40% - 55%	Less Valid	Less Worthy
56% - 65%	Quite Valid	Quite Decent
66% - 79%	Valid	Proper
80% - 100%	Highly Valid	Highly Worth It

Source: (Mijaya, et al., 2021)

Then, for indicators that demonstrate collaboration skills to assess the collaborative process, it can be reviewed as follows.

Table 4. Collaboration Skills Indicators

Indicators	Value
Actively contribute	Always express ideas, suggestions, or solutions in discussions.
Work productively	Ideas, suggestions or solutions that are expressed are useful in the discussion Use time efficiently by staying focused on his task without being dictated and producing the work needed.
Responsible	Knowing how to plan, organize, fulfill the tasks that have been given by the teacher and hold their respective duties. Consistently attend group meetings on time. Follow the orders that have become his duty. Not relying on others to complete his task.
Demonstrates flexibility	Accept the decision together. Receive awards, criticism and suggestions. Understanding, negotiating, and taking into account differences to achieve problem-solving, especially in a multicultural environment. Flexible in working together.
Appreciate others	Always compromise with the team to solve problems. Respond with an open mind to differences of opinion and appreciate the new ideas of others. Show a polite and kind attitude to friends. Discuss ideas.

Source: Rahmawati, et al. 2019

RESULT AND DISCUSSION

This research produced a *booklet* with *mindful*, *meaningful*, and *joyful learning*. The resulting product is in line with the principles of Deep Learning according to Suyanto, et al. (2025) because it is designed to present an excretory system learning that is aware, meaningful, and at the same time exciting. The *mindful aspect* is reflected in the preparation of material that is consistent and accompanied by reflective activities, so that students are invited to understand the function of the excretory organs consciously and deeply. The *meaningful aspect* can be seen from the context of questions and activities that are relevant to daily life, such as the habit of maintaining healthy kidneys, skin, liver, and lungs. Meanwhile, the *joyful aspect* is shown through attractive booklet design, communicative language, and collaborative activities that are fun and encourage interaction between students.

The material chosen in this study is science material class VIII, namely the human excretion system. Booklets as a print media product play a role in conveying important information in a straightforward and easy-to-understand manner. Equipped with pictures and small in size, booklets are an interesting and practical learning aid for students to use in learning activities (Pralisaputri, et al., 2016). The media developed by the researcher is a printed *booklet* with *mindful*, *meaningful*, and *joyful learning* on the material of the human excretory system in grade VIII junior high school. The *booklet* used in learning has an A5 size and is printed using *Art Paper* size 210 gsm on the cover and 150 gsm on the *booklet*.

This *booklet* consists of a preface, table of contents, concept map, introduction containing CP (Learning Outcomes) and TP (Learning Objectives), description of the *contents of the booklet*, instructions for use, *chapter 1* contains material on the organs that make up the excretory system, *chapter 2* contains disorders in the excretory system and efforts to handle it, evaluation quizzes, glossary, bibliography, and author profile. The booklet view can be seen in the following image:



Figure 2. Multiple Parts of the *Booklet Display*
Source: Personal Documents

EXBOOK-M2J uses 2 sub-chapters of material presented in 2 *chapters*, namely Organs That Constitute the Excretory System and Disorders of the Excretory System and Efforts to Maintain the Health of the Excretory System. In *chapter 1*, learning materials are presented equipped with a QR Code learning video to increase students' knowledge about learning materials that are difficult to understand and not listed in the *booklet*. At the beginning of the material, "Let's Observe" and "Let's Think", where students are asked to observe an image and are stimulated to think about what is in the picture and relate it to the learning material. After that, there is a "Let's Read" which contains learning materials and learning videos that can increase students' knowledge. In *chapter 1*, which is a sub-chapter of the Organs that make up the Excretory System, there are 4 organs, namely the kidneys, lungs, skin, and liver which are discussed one by one in *this chapter*. In *this chapter* there is also "Let's Do". There is a section in the booklet that contains group practicum in the form of Practicum Model of Blood Filtration in the Kidney and Practicum of Lung Excreted Metabolic Residues. In addition, there is a "Let's Find Out" section, where students fill in a blank table related to the process of blood filtration in the kidneys. In chapter 2 of the sub-chapter Disorders of the Excretory System and Efforts to Maintain the Health of the Excretory System, there are learning materials and "Let's Do" contains practicum on Sugar and Protein

Content Tests in Urine. At the end of chapter 2, it contains evaluation questions of 10 questions on the QR Code which are directly linked to the Quizizz application/website.

Booklet Validity Test

This research produced a learning media product in the form of *EXBOOK-M2J (Excretory Booklet – Mindful, Meaningful & Joyful Learning)* on the Human Excretory System material for grade VIII junior high school students that is feasible and practical. In this study, a feasibility test was carried out by material experts and media experts by Mrs. Firda Awalia Putri, S.Pd. so that the product can be suitable for use. The instrument of qualification of subject matter and media experts uses *the Likert and Guttman scales* in its testing. The feasibility test of subject matter experts is assessed based on the categories of feasibility of material content, feasibility of presentation, as well as language and readability which can be seen in Table 4.

Table 5. Material Validation Test Results

No.	Assessment Aspects	Percentage (%)	Criterion
1.	Eligibility of Content	96,9%	Highly Valid
2.	Language and Readability	95,8%	Highly Valid
3.	Compatibility with Aspects of Collaboration Skills	85%	Highly Valid
4.	Compatibility with Deep Learning Aspects	100%	Highly Valid
5.	Concept Truth Aspects	100%	Highly Valid
Average		95,5%	Highly Valid

Based on Table 5 presented, the assessment related to the validation test of the expert of the criteria material is very valid. This is in accordance with the theory presented by Mijaya, et al. (2021). The material concept has no revision and is suitable for use in learning. The suggestions and inputs provided by material experts, namely the material in the *booklet* have been well arranged, in accordance with the learning outcomes and objectives, and are expected to support science learning.

Table 6. Media Validation Test Results

No.	Assessment Aspects	Percentage (%)	Criterion
1.	Media Presentation Eligibility	97,2%	Highly Valid
2.	Media Usage	100%	Highly Valid
Average		98,6%	Highly Valid

Based on Table 6 presented, an assessment related to the validation test of the material expert criteria is very valid. This is in accordance with the theory conveyed by Mijaya, et al. (2021). The material concept has no revision and is suitable for use in learning. The suggestions and inputs provided by the material experts, namely *the booklet* media developed are very practical to use in learning and presented with interesting illustrations and videos.

Booklet Effectiveness Test

The implementation activities carried out began with learning at the first meeting with students filling out questionnaires related to Collaboration Skills that were felt at the beginning before learning. This is done to measure perception perception before the use of learning media. Then continued to start working on Student Worksheets (Individual, documents attached) with assistance using *EXBOOK-M2J (Excretory Booklet – Mindful, Meaningful & Joyful Learning)*. Then students start planning to make projects from the results of the discussion and start making them in groups. Learning is carried out using a project-based learning model (PjBL). The activities that have been carried out can be seen in the following table.

Table 7. Syntax of PjBL in Learning

PjBL Syntax	Activities	Constraints
Defining fundamental questions	The teacher conveyed the learning objectives and triggered initial questions about human excretory organs and the importance of maintaining the health of these organs.	Students do not understand the urgency of the topic very well, so they are less enthusiastic in the early stages.
Design project planning	The teacher explained the flow of the activity: filling out the initial questionnaire for collaboration skills,	Planning time outside of class hours can be difficult to adjust to the busyness of each student.

Prepare an implementation schedule	working on individual LK and group projects, and making educational videos in groups. Teachers and students agree on a time for working on the LK, project, video collection, and project presentation schedule.	Difficulty synchronizing time between group members.
Monitor project progress	Teachers monitor the work of individual LK and group discussion activities while creating projects. Teachers provide assistance and facilitation of discussions accompanied by the use of <i>EXBOOK-M2J</i> .	Not all participants are active in the group; It requires intensive monitoring from teachers and the use of supporting media in student collaboration activities.
Testing results	Students present the results of the project in front of the class and display educational videos, then give each other feedback.	Technical obstacles in video playback and difficulty in public speaking for some students.

Through this series of activities, there was an increase in students' collaboration skills, as shown by the comparison of the results of the initial and final questionnaires. There is a student readability questionnaire that needs to be filled out to find out the response to the use of *EXBOOK-M2J* learning media. The average comparison results obtained on students' collaboration skills before and after learning can be seen in the following graph.

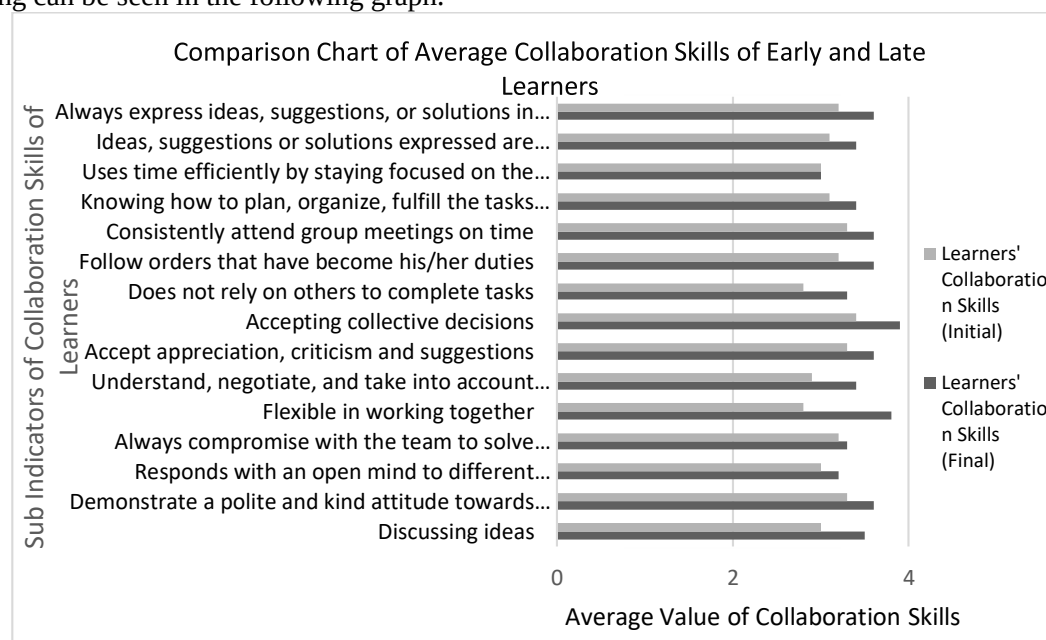


Figure 2. Multiple Parts of the *Booklet Display*

Source: Personal Documents

Based on the graph above, the data shows that the majority of students have improved their collaboration skills in conducting learning after being given treatment. This improvement reflects that booklets with mindful, meaningful, and joyful learning are not only effective as learning media, but also support the implementation of PjBL which directly fosters students' collaborative skills.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that *the EXBOOK-M2J (Excretory Booklet – Mindful, Meaningful & Joyful Learning)* learning media on the human excretory system material is proven to be valid, practical, and effective for use in learning. The validity of the media is supported by the results of the test of material and media experts who show that

the category is very valid. The readability test of students also showed that the media is very suitable for use. In addition, the implementation of EXBOOK-M2J in *Project-Based Learning* was able to improve students' collaboration skills, which was shown by the increase in questionnaire scores before and after learning. Thus, EXBOOK-M2J is not only able to deliver material effectively and engagingly, but also contributes to the development of 21st century skills, in particular collaboration skills.

ACKNOWLEDGE

We would like to express our deepest gratitude to the Teacher Professional Education (PPG) Program of the Graduate School, Universitas Negeri Malang, for the financial support provided for this activity. This initiative would not have been possible without the funding and academic encouragement from the PPG program, which has played a crucial role in facilitating our professional growth and research implementation in the field. The support given reflects the institution's strong commitment to empowering future educators and enhancing the quality of education through meaningful practice and inquiry.

REFERENCE

- Annisa, A. R., Putra, A. P., & Dharmono, D. (2020). Practicality of Learning Media for Antibacterial Power of Savoy Fruit Extract Based on Macromedia Flash. *Quantum: Journal of Science Education Innovation*, 11(1), 76. <https://doi.org/10.20527/quantum.v11i1.8204>
- Fatirani, H. (2022). Application of Jigsaw-Type Cooperative Model to Improve the Learning Activities of Junior High School Students on the Human Excretory System Concept. *SCIENCE: Journal of Innovation in Mathematics and Science Education*, 2(2), 133–143. <https://doi.org/10.51878/science.v2i2.1235>
- M. Elbashbishy, E. (2024). Deep Learning in Education. *Sustainability Education Globe*, 2(1), 15–21. <https://doi.org/10.21608/seg.2024.269380.1000>
- Mijaya, N. P. A. P., Sudiarmika, A. A. I. A. R., & Suardana, I. N. (2021). Development of E-Module for Science Learning for Junior High School Class VII Based on the Levels of Inquiry Learning Model to Improve Students' Science Literacy. *Quantum: Journal of Science Education Innovation*, 12(2).
- Okpatrioka. (2023). Research and Development (R&D) Innovative Research in Education. *Dharma Acariya Nusantara: Journal of Education, Language and Culture*, 1(1), 86-100.
- At, K., Bare, Y., & Putra, S. H. J. (2021). Development of Biology Student Worksheets (LKPD) Based on the Scientific Approach of Excretory System Materials in Humans Class VIII SMP Negeri 2 Maumere. *Scientific Journal of Educational Vehicles*, 7(8), 337–349. <https://doi.org/10.5281/zenodo.5769603>
- Pralisaputri, K. R., et al. (2016), DEVELOPMENT OF SET-BASED BOOKLET MEDIA ON THE SUBJECT MATTER OF NATURAL DISASTER MITIGATION AND ADAPTATION FOR CLASS X HIGH SCHOOL (Experiment on Class X Students of SMA Negeri 8 Surakarta Academic Year 2014/2015). *GeoEco*, vol. 2, no. 2, pp. 147–154.
- Rafdi, W. F. M., Jamaludin, U., and Hakim, Z. R. (2024). The Role of Teachers in Developing Collaboration Skills in Students Through Problem-Based Learning. *Pendas: Scientific Journal of Basic Education*, 09(02), 6841-6853.
- Rahmawati, L. (2024). *Development of QR Code Integrated Booklet Learning Media to Increase Students' Learning Interest in Human Excretion System Materials*. (Thesis (Undergraduate)-- State University of Malang. 2024). : State University of Malang. Natural Sciences Study Program.
- Rahmawati, A., Fadiawati, N., and Diawati, C. (2019). Analysis of High School Students' Collaborative Skills in Learning Used Cooking Oil Recycling Project. *Journal of Chemical Learning Education*, 8(2), 430-443.
- Rukmana, H. I., et al. (2018). ELIGIBILITY OF THE BIODIVERSITY SUBMATERIAL BOOKLET MEDIA FOR CLASS X HIGH SCHOOL. *Journal of Equatorial Education and Learning (JPPK)*, vol. 7, no. 2, <https://doi.org/10.26418/jppk.v7i2.23908>
- Setyoningtyas, N. M., Astriani, D., & Qosyim, A. (2022). The effectiveness of e-modules based on a deductive approach on human excretion system material on improving student learning outcomes. *PENSA: E-Journal of Science Education*, 10(1), 135–141.

- Solissa, E. M., Rakhmawati, E., Maulinda, R., Syamsuri, S., & Putri, I. D. A. (2024). Analysis of the Implementation of Project-Based Learning Methods in Improving Learning Achievement in Elementary School. *Al-Madrasah Journal of Education Madrasah Ibtidaiyah*, 8(2), 558. <https://doi.org/10.35931/am.v8i2.3284>
- Sugiyono. (2016). *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta.
- Suyanto, et al. (2025). *An Academic Manuscript of Deep Learning Towards Quality Education for All*. Ministry of Education of the Republic of Indonesia.