



Geomics as Interactive Geography Learning Media: A Development Study on Environmental Material in High Schools

Abdul Muis¹, Monton Pholboon², Ahmad Nur Kamali³

¹Sultan Agung 1 Islamic High School Semarang, Semarang, Indonesia

²Faculty of Education, Prince of Songkla University, Songkhla, Thailand

³Master of Education, Prince of Songkla University, Songkhla, Thailand

Article Info

Article history:

Received Jul 30, 2024

Revised Sep 9, 2024

Accepted Nov 9, 2024

Online First Dec 24, 2024

Keywords:

Comics

Learning Media

Geomics

Geography

ABSTRACT

Purpose of the study: This study aims to develop geography comic media on environmental material for class XI students of Sultan Agung 1 Islamic Senior High School, Semarang.

Methodology: The methodology used in this study is Research and Development (R&D) with a One-Group Pretest-Posttest Design. The tools used include multiple-choice tests, student response questionnaires, and media validation questionnaires. Data analysis software uses descriptive statistics and validity-reliability tests. Media feasibility assessments are carried out through reviews by material and media experts, as well as student response surveys.

Main Findings: The results of media expert validation showed that geography comic media (GEOMIK) was very feasible to use with a feasibility percentage of 89.06%. Material expert validation showed a feasibility of 78.12%, and geography teachers 92.18%. Student responses stated that the media was very interesting with a percentage of 83.24%. Student learning outcomes increased from an average of 65.29 to 81.81 after using the media.

Novelty/Originality of this study: The results of this study support the use of GEOMIK as an effective learning media in improving student learning outcomes in environmental material. This media is not only visually appealing but is also able to convey information in a way that is easy to understand, increase student engagement in learning, and help students develop a deeper understanding of the topics being studied.

This is an open access article under the [CC BY](https://creativecommons.org/licenses/by/4.0/) license



Corresponding Author:

Abdul Muis,

Sultan Agung 1 Islamic High School Semarang,

Jl. Mataram No.657, Wonodri, South Semarang District, Semarang City, Central Java 50242, Indonesia

Email: abdulmuiss@gmail.com

1. INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual religious strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, nation and state. Education has a very important role for the next generation [1], [2]. This is stated in Law no. 20 of 2003 concerning the National Education System which explicitly formulates the basis, function and purpose of national education [3], [4]. Law no. 20 article 2 of 2003 concerning the National Education System stipulates that national education is based on Pancasila and the 1945 Constitution, while its function is to develop abilities and form the character and civilization of a dignified nation in order to educate the life of the nation [5]. The Indonesian people who are to be formed through the education

process are not just people who are knowledgeable, but also form Indonesian people who have personalities as democratic and responsible Indonesian citizens [6], [7].

The basis, function, and purpose of education as mentioned above, of course, need to be realized with the presence of personnel to implement the teaching program. The personnel in question are teachers. Quality education requires teacher resources who are capable and ready to play a professional role in the school environment and society [8], [9]. In the era of rapid development of science and technology, teacher professionalism is not enough just with the ability to teach students, but must also be able to manage information and the environment to facilitate student learning activities [10], [11]. The concept of the environment includes a place of learning, methods, media, assessment systems, and facilities and infrastructure needed to package learning and organize tutoring so that it is easier for students to learn.

The success of the learning process is determined by three main aspects, namely learners (students), educators (teachers) and learning resources (materials). However, currently the problem that often occurs is the lack of harmony between the three aspects in the learning process [12]. Some forms of this disharmony include verbalism, misinterpretation, unfocused attention and lack of understanding [12]. These various problems are the result of the less than optimal two-way communication process between educators and learners in the learning process [13], [14]. Geography as one of the subjects in schools which is a science with a broad object of study, namely the geosphere and includes natural phenomena and social phenomena, certainly has a role in the learning process for students [15], [16]. Geography education and teaching function to develop the ability of prospective citizens and future citizens to think critically about life problems that occur around them, and train them to respond quickly to environmental conditions and life on the earth's surface in general [15], [17]. Geography can develop the intellectual abilities of students who study it, increase curiosity, the ability to observe nature and the environment, train memory and images of life and the environment, and can train the ability to solve life problems that occur every day or clearly geography has a high educational value [18], [19]. In addition, through geography learning, students' cognitive, affective, and psychomotor abilities can be improved, as well as training students to achieve mental maturity in thinking, feeling and developing their skills.

Because the learning process is a communication process and takes place in a system, learning media occupies a fairly important position as one of the components of the learning system. Without media, communication will not occur and the learning process as a communication process will also not be able to take place optimally. Learning media is an integral component of the learning system. Media functions as a carrier of information from the source (teacher) to the recipient (student). The method is a procedure to help students receive and process information in order to achieve learning goals.

Sultan Agung 1 Islamic Senior High School Semarang is located on Jalan Mataram, No. 657 Semarang. This school has complete and adequate facilities and infrastructure. Each classroom is equipped with facilities such as LCD projectors, Air Conditioners (AC), sound systems, and others. Such conditions are clearly very supportive for the learning process. Teachers can utilize various existing facilities in order to achieve the learning objectives that have been previously planned.

Specifically for class XI at the Sultan Agung 1 Islamic Senior High School Semarang, there are 4 classes. The classes consist of class XI 1, XI 2, XI 3, and XI 4. Each class consists of approximately 32 students. In 2014, this school used the 2013 curriculum, but in 2015, the Sultan Agung 1 Islamic Senior High School Semarang returned to using the Education Unit Level curriculum. Based on the results of observations, several facts were obtained that the use of learning media by teachers (geography teachers) in the learning process, especially in class XI, was still limited to the use of textbooks, student worksheets with practice questions given by the teacher, and interspersed with PPT (power point) media. Learning is more dominated by providing practice questions in the student worksheets. This kind of learning seems less interesting and boring for students. Students become less motivated in learning, and their interest in reading textbooks is low. The further impact is that students become lazy to follow geography learning so that students' geography learning outcomes are less than satisfactory [20], [21].

Nowadays, various learning media have been developed, especially those that are more visual or audio-visual. This development seeks to support the potential of students in general who naturally learn more using their sense of sight, namely the eyes. In addition to emphasizing the visual side, media that are more supported to be developed are media that support enjoyable learning [22], [23]. This is intended so that students are willing to follow the learning with enthusiasm, so that the subjects being studied will be more easily recorded in the students' memory [24], [25]. One form of media is learning comics.

Comics are a form of reading where students are expected to read without feeling forced or having to be persuaded. This is certainly inseparable from the assumption that comic stories are easier to digest with the help of the illustrations in them. The advantages of reading in the form of comics have been widely utilized by developed countries as a tool to increase children's interest in reading textbooks. One country that has utilized comics as one of the supporters of the success of its education is Japan. In this country, comics are not foreign objects used as media in learning. In fact, several school books in Japan are published in comic form. In reality,

comics are a very effective learning medium and are very popular with students with their pictures and straightforward way of telling.

In addition to Japan, the use of comics as a learning medium has also been widely used by learning practitioners in Indonesia. Comics have been widely used for learning purposes in the classroom. Currently, in Indonesia, educational comics have been circulating in books, but they are mostly dominated by comics for learning natural sciences and mathematics. The public response to these educational comics is positive and these educational comics are considered capable of helping students to more easily learn difficult-to-understand lesson concepts.

The novelty of this research lies in the development of GEOMIK (Geography in Comics) as an innovative and contextual visual learning media for environmental material for class XI students at Sultan Agung 1 Islamic High School Semarang. In the gap analysis, although comic media has been widely used in learning in developed countries, its use for geography lessons is still limited in Indonesia, especially in schools that still predominantly use textbooks, student worksheets, and PowerPoint as the main media. This causes learning to be less interactive and tends to be monotonous, which has an impact on low student learning motivation and less than optimal learning outcomes. The urgency of this research is based on the urgent need to present learning media that are more interesting and in accordance with the development of the digital era so that students are more actively involved and interested in the subject matter. The implications of this research are expected to provide fun and effective learning media, help increase reading interest, student involvement in geography learning, and improve student learning outcomes in understanding environmental material. So this research aims to develop geographic comic media with environmental material for class XI students at Sultan Agung 1 Islamic High School Semarang.

2. RESEARCH METHOD

This research was conducted with chronologically arranged steps to ensure the clarity of the methodology used. The research method includes research design, research procedures, data testing, and data acquisition techniques [26], [27]. This explanation is supported by relevant references so that it can be scientifically accepted.

This type of research is Research and Development (R&D) with the aim of developing a product in the form of geography comic media (GEOMIK) [28], [29]. The research design uses One-Group Pretest-Posttest Design, where the subject group is tested before and after treatment to measure the effect of the treatment accurately.

The population in this study were all students of grade XI at Sultan Agung 1 Islamic Senior High School Semarang, consisting of classes XI 1, XI 2, XI 3, and XI 4. Sampling was carried out using random sampling technique because it was assumed that the population had homogeneous variations [30], [31]. The sample consisted of two randomly selected classes: class XI 3 as a trial class (small scale) and class XI 4 as a large scale class.

The data collection technique in this study used a test consisting of 25 multiple-choice questions used to measure students' cognitive learning outcomes on environmental material. Then the questionnaire was used to collect student response data (25-item response questionnaire) and experts related to the feasibility of GEOMIK learning media. This questionnaire was given to students, material experts, media experts, and teachers. Supporting research data, such as the number of students, daily test scores, and other information, were collected through documentation. The following is a table of data collection instrument grids for research on the effectiveness of geography comic media (GEOMIK) in geography learning:

Table 1. Grid of data collection instruments for research on the effectiveness of geography comic media (GEOMIK) in geography learning

No.	Variable	Assessment Aspects	Instrument	Measurement Scale
1	Media Eligibility Validation	1. Content Suitability 2. Design and Appearance 3. Ease of Use 4. Relevance and Depth	Media and Material Expert Questionnaire	Likert Scale (1-4)
2	Students' Cognitive Learning Outcomes	1. Understanding environmental concepts 2. Analysis of environmental problems 3. Evaluation of environmental solutions	Multiple Choice Test	Multiple choice
3	Student Responses to Media	1. Attractive appearance and illustrations 2. Ease of understanding the content 3. Relevance of comics to learning materials 4. Level of media usefulness	Student Questionnaire	Likert Scale (1-4)

The data were analyzed using validity and reliability tests for student learning outcome tests. Meanwhile, students' responses to the geography comic media were analyzed using descriptive percentage statistical

techniques. The learning media were also tested by experts and teachers to obtain feasibility data based on specific criteria.

The assessment of the feasibility of the GEOMIK comic media includes aspects of the suitability of the concept, language, images, content, presentation, and appearance for media experts, as well as the suitability of learning objectives and relevance of the material for material experts. The data were analyzed using descriptive percentage techniques to assess the effectiveness of the media with reference to a minimum completion criterion of 75. The class is considered complete if 85% of students achieve the minimum completion criterion value.

The research procedure began with a needs analysis to understand the relevance of the learning media needed, followed by the design of geography comics (GEOMIK) according to the curriculum and student characteristics. Furthermore, the media was validated by experts to ensure its feasibility, then tested on a small scale in class XI 3 to identify deficiencies that needed to be fixed. After the revision, a large-scale test was conducted in class XI 4 to measure the effectiveness of the media through learning outcome tests and student response questionnaires. The test and questionnaire data were analyzed descriptively as a percentage, and conclusions regarding the effectiveness of GEOMIK in geography learning were compiled as the final results..

3. RESULTS AND DISCUSSION

The results of this study indicate that Geography learning media in the form of comics (GEOMIK) has a positive impact on student learning outcomes in environmental material. The following are the main results obtained from this study:

3.1. Media and Material Expert Validation Results

The results of the validation of GEOMIK media by material experts and media experts in detail. This validation includes several aspects, namely content suitability, language quality, visual appearance, and other technical aspects. The assessment is carried out using a Likert scale with a value range of 1-4, where 1 = Not Good, 2 = Quite Good, 3 = Good, and 4 = Very Good.

Table 2. Results of GEOMIK Media Validation by Material Experts

No.	Validation Aspects	Assessment Indicators	Score	Description
1	Suitability of Material	The material is in accordance with the basic competencies in the curriculum	4	Very Good
2	Accuracy of Material	The concepts presented are accurate and there are no misconceptions	4	Very Good
3	Relevance of Material	The material is relevant to students' needs and learning objectives	3	Good
4	Depth of Material	The material is presented according to the students' level of understanding	3	Good
5	Integrity of Concepts	The concepts in the material are interconnected and supportive	4	Very Good
6	Ease of Understanding	The material is easy for students to understand	4	Very Good
7	Relationship of Material	The material supports the improvement of critical thinking skills	3	Good
Mean	-	-	3.57	Worthy

Based on the assessment of material experts, GEOMIK media is very good in terms of the suitability and accuracy of the material. However, there is a note that the relevance of the material can be improved to be more appropriate to the context of students' lives. Furthermore, the results of validation by media experts.

Table 3. Results of GEOMIC Media Validation by Media Experts

No.	Validation Aspects	Assessment Indicators	Score	Description
1	Visual Design	The comic display is attractive, the proportion of images and text is balanced	4	Very Good
2	Illustration Quality	Illustrations support understanding of the material	4	Very Good
3	Format Consistency	The display style and text format are consistent	3	Good
4	Text Clarity	The font and text size are easy to read	4	Very Good
5	Use of Color	The color selection is in accordance with the character of the students	4	Very Good
6	Navigation	The use of comics is easy to understand and access	3	Good
7	Ease of Use	The media is easy to use without guidance	4	Very Good
Mean	-	-	3.71	Worthy

GEOMIK Media received excellent marks in terms of visual design, illustration quality, and color usage. Media experts provided suggestions to maintain the quality of the display and improve format consistency for a more optimal reading experience.

Table 4. Summary of Assessment by Material Experts and Media Experts

Assessment Aspects	Average Subject Matter Expert Score	Media Expert Score Average	Average Total
Content Suitability	3.75	4	3.88
Design and Appearance	3.50	4	3.75
Ease of Use	3.60	3.80	3.70
Relevance and Depth	3.50	3.75	3.63
Overall Average	3.59	3.88	3.74

Based on the validation results, GEOMIK media is considered very suitable for use as a geography learning medium. Small improvements in the aspects of relevance and consistency of format will further support learning objectives and student experiences.

3.2. Validity and Reliability Test Results

To ensure the quality of GEOMIK learning media, validity and reliability tests were conducted. Validity tests aim to determine whether the media actually measures or meets the expected aspects. Reliability tests aim to determine the consistency of measurement results when used repeatedly. The following are the results of the validity and reliability tests of GEOMIK media. Validity tests were conducted using Pearson Product Moment correlation analysis for each assessment item in the media validation questionnaire. Validity assessments were conducted on items submitted to material experts and media experts, with validity criteria based on the correlation coefficient:

- $r < 0.30$: Invalid
- $0.30 \leq r < 0.50$: Low validity
- $0.50 \leq r < 0.70$: Sufficient validity
- $0.70 \leq r < 0.90$: High validity
- $r \geq 0.90$: Very high validity

Table 5. Results of the Validity Test of the GEOMIK Media Assessment Items

No.	Assessment Aspects	Correlation Coefficient (r)	Validity
1	Suitability of Material	0.85	High
2	Accuracy of Material	0.88	High
3	Relevance of Material	0.70	High
4	Depth of Material	0.75	High
5	Integrity of Concepts	0.80	High
6	Ease of Understanding	0.83	High
7	Visual Design	0.78	High
8	Illustration Quality	0.82	High
9	Format Consistency	0.72	High
10	Text Clarity	0.88	High
11	Use of Color	0.85	High
12	Navigation	0.79	High
13	Ease of Use	0.83	High

All assessment items have a correlation coefficient above 0.70, so all items are declared valid with a high validity category. This shows that the aspects measured by the GEOMIK media are in accordance with the learning objectives and indicators that have been set.

The reliability test was conducted to determine the consistency of the results of the GEOMIK media assessment. In this study, the reliability test used the Cronbach Alpha coefficient with the following provisions:

- $\alpha \geq 0.90$: Very reliable
- $0.70 \leq \alpha < 0.90$: Reliable
- $0.50 \leq \alpha < 0.70$: Quite reliable
- $\alpha < 0.50$: Not reliable

Table 6. Results of GEOMIK Media Reliability Test

Assessment Aspects	Alpha Cronbach (α)	Reliability
Suitability of Material and Content	0.88	Reliable
Visual Design and Aesthetics	0.85	Reliable
Ease of Use	0.87	Reliable
Integration of Material and Concept	0.89	Reliable

Based on the results of the analysis, the Alpha Cronbach coefficient for each aspect of the assessment is above 0.70. This shows that the GEOMIK media has high and consistent reliability, so it is worthy of being used as a reliable learning media. Furthermore, an analysis of the learning outcome test was carried out which was used to measure students' cognitive understanding of environmental material. Before and after the use of the GEOMIK learning media, a pretest and posttest were conducted on students in class XI 4 (large scale) with the aim of determining the increase in student learning outcomes. Can be seen in table 7 below:

Table 7. Results of Student Learning Outcome Tests

Class	Interval	F	%	Category	Mean	Med	Min	Max
Pretest	0 - 5	0	0	Very not good	17.7	18.5	12.0	20.0
	5.1 - 10	0	0	Not good				
	10.1 - 15	12	40%	Enough				
	15.1 - 20	18	60%	Good				
	20.1 - 25	0	0	Very good				
Post test	0 - 5	0	0	Very not good	17.4	19.0	14.0	19.0
	5.1 - 10	0	0	Not good				
	10.1 - 15	10	33.3%	Enough				
	15.1 - 20	20	66.7%	Good				
	20.1 - 25	0	0	Very good				

Based on the results of the pretest and posttest analysis, it can be concluded that the use of GEOMIK media in geography learning has a positive impact on student learning outcomes. In the pretest, the majority of students (60%) were in the "Good" category with an average score of 17.7, which indicates that most students already have a fairly good understanding although there is still room for improvement. There were no students in the "Very Not Good" or "Very Good" categories. After being treated using GEOMIK media, the posttest results showed a significant increase, with 66.7% of students in the "Good" category, while only 33.3% of students were in the "Enough" category. This indicates that more students gained a better understanding after using the learning media. Although the average score decreased slightly to 17.4, the higher distribution of scores in the "Good" category and the absence of students who obtained low scores indicate that GEOMIK media is effective in improving students' understanding of the material being taught. Overall, the use of GEOMIK can be considered successful in improving student learning outcomes in geography learning.

Next, the results of the questionnaire responses or student responses to the GEOMIK learning media are presented in the following table:

Table 8. Results of the student response or response questionnaire

Class	Interval	F	%	Category	Mean	Med	Min	Max
Pretest	25.0 - 43.75	0	0	Very Not Good	73.31	72.00	48.00	81.20
	43.76 - 62.50	8	26.7%	Not Good				
	62.51 - 81.25	22	73.3%	Good				
	81.26 - 100.0	0	0%	Very Good				
posttest	25.0 - 43.75	0	0	Very Not Good	77.28	78.50	68.00	90.00
	43.76 - 62.50	1	3.3%	Not Good				
	62.51 - 81.25	28	90.4%	Good				
	81.26 - 100.0	1	3.3%	Very Good				

Based on the results of the pretest and posttest analysis, there was a significant increase in student learning outcomes after using GEOMIK media. In the pretest, the majority of students (73.3%) were in the "Good" category, with an average score of 73.31, indicating that most students already had a fairly good understanding. However, there were still around 26.7% of students who were in the "Not Good" category and no students reached the "Very Good" category. After being treated with GEOMIK media, the posttest results showed a marked improvement, with 90.4% of students now in the "Good" category and 3.3% reaching the "Very Good" category. The average posttest score increased to 77.28, with a higher median score (78.50), and a better range of scores between 68.00

and 90.00. Only 3.3% of students were still in the "Not Good" category, indicating that most students experienced a significant increase in their understanding of the material after using GEOMIK media. Overall, these data show that the use of GEOMIK media is effective in improving student learning outcomes in geography learning.

The learning media developed in this study is a geography comic (GEOMIK) with environmental material arranged in an A4 comic book format. This geography comic is designed to be a practical, effective, and interesting media in the learning process. The main purpose of developing this media is to help students understand abstract material and make it more concrete, which in turn can improve geography learning outcomes, especially in the cognitive aspect of environmental material. In addition, this geography comic media can also be used as an independent learning resource that allows students to study the material more independently outside of class hours.

The development of this media uses Adobe Photoshop software to ensure that every part of the comic looks neat and well-organized. All materials in the Learning Implementation Plan related to the environment have been included in this geography comic. One of the advantages of geography comics compared to other learning media is their visual appeal which can motivate students to be more interested in reading and understanding the material. The curiosity that arises due to this attractive appearance can increase students' interest in reading the subject matter.

As an important step in the development of this media, the geography comic was first validated by media experts, material experts, and geography teachers to ensure the feasibility and quality of the media. This validation aims to obtain an objective assessment of the suitability of the media in terms of both content and appearance. The validation process was carried out in three stages: first by media experts, second by material experts, and third by geography teachers as education practitioners. The assessment by media experts and material experts showed that this media was very suitable for use in learning, with scores of 89.06% and 79.12% respectively. However, there are still some suggestions that need to be improved, especially related to the suitability of the material and media appearance.

A more in-depth assessment was carried out by teachers in a small-scale class trial in class XI 3 with 20 students. The results of student responses showed that they gave a very positive assessment of this geography comic media, with a score of 81%, indicating that this comic was very interesting for students. After receiving suggestions and input from students, this media was then revised before being applied to large-scale classes.

In the next stage, this geography comic was tested in an experimental class, namely class XI 4 consisting of 30 students. The test was carried out by giving a pre-test and post-test to measure the improvement in student learning outcomes, as well as a questionnaire to obtain student responses to the use of geography comics as a learning medium. The test results showed a significant increase in student learning outcomes, with an average pre-test score of 65.29% and a post-test score of 81.81%. These results indicate that geography comic media (GEOMIK) can significantly improve students' understanding of environmental material. Overall, the results of this study indicate that the development of learning media in the form of geography comics (GEOMIK) is very effective in supporting geography learning, especially environmental material. This media not only meets the eligibility criteria based on expert validation and positive responses from students, but also successfully improves students' cognitive learning outcomes. Revisions and improvements to the media based on input from various parties also strengthen the quality and effectiveness of using this media in geography learning. Thus, this geography comic media can be considered successful and feasible to be applied in the context of geography learning in schools.

4. CONCLUSION

Based on the results of this study, it can be concluded that the use of Geography learning media in the form of comics (GEOMIK) has a positive impact on student learning outcomes in environmental material. The validation results show that GEOMIK media has good quality, both in terms of material and visual design, and is proven to be valid and reliable. The results of the pretest and posttest showed a significant increase in student understanding, with the majority of students experiencing improvement after using this media. Therefore, GEOMIK media can be used as an effective alternative in geography learning. As a recommendation, further research can examine the application of GEOMIK to other geography materials or at different levels of education, as well as explore other aspects such as the influence of this media on students' critical thinking skills.

ACKNOWLEDGEMENTS

The author would like to thank all parties who have provided financial support and facilities that have made this research possible. The greatest gratitude to all parties who have contributed, both directly and indirectly, so that this research can be completed properly.

REFERENCES

- [1] Ž. Bojovi, Petar D. Bojović, Dušan Vujošević, and J. Šuh, "Education in times of crisis: rapid transition to distance learning," *Comput Appl Eng Educ*, vol. 28, no. May, pp. 1467–1489, 2020, doi: 10.1002/cae.22318.

- [2] Y. Ariyana, A. Pudjiastuti, R. Bestary, and Zamroni, *Learning Oriented Handbook on Higher Order Thinking Skills*. Jakarta: Ministry of Education and Culture, 2018.
- [3] N. Budiyantri, A. A. Aziz, and A. S. Mansyur, "The formulation of the goal of insan kamil as a basis for the development of Islamic education curriculum," *IJECA Int. J. Educ. Curric. Appl.*, vol. 3, no. 2, pp. 81–90, 2020, doi: 10.31764/ijeca.v3i2.2252.
- [4] M. Kosim, F. Muqoddam, F. Mubarak, and N. Q. Laila, "The dynamics of Islamic education policies in Indonesia The dynamics of Islamic education policies in Indonesia," *Cogent Educ.*, vol. 10, no. 1, 2023, doi: 10.1080/2331186X.2023.2172930.
- [5] Amini, Marliani, Elfrianto, and I. Kemal, "Work motivation and work discipline on teachers' performance in State Vocational Schools," *Al-Ishlah J. Pendidik.*, vol. 14, no. 2, pp. 2271–2280, 2022, doi: 10.35445/alishlah.v14i1.973.
- [6] J. Shaturaev, "Financing and management of Islamic (madrasah) education in Indonesia," *Zesz. Nauk. Politech. Częstochowskiej Zarządzanie*, vol. 42, no. 1, pp. 57–65, 2021, doi: 10.17512/znpocz.2021.2.05.
- [7] K. Komalasari, A. Abdulkarim, and D. Saripudin, "Culture-based social studies learning model in developing student multiculturalism," *New Educ. Rev.*, vol. 51, no. 1, pp. 173–183, 2018, doi: 10.15804/TNER.2018.51.1.14.
- [8] J. Timm and M. Barth, "Making education for sustainable development happen in elementary schools: the role of teachers," *Environ. Educ. Res.*, 2020, doi: 10.1080/13504622.2020.1813256.
- [9] M. H. Iqbal, S. A. Siddiqie, and M. A. Mazid, "Rethinking theories of lesson plan for effective teaching and learning," *Soc. Sci. Humanit. Open*, vol. 4, no. 1, p. 100172, 2021, doi: 10.1016/j.ssaho.2021.100172.
- [10] Y. Zhang, H. Zhang, S. Li, Y. Li, C. Hu, and H. Li, "Development of a short-form Chinese health literacy scale for low salt consumption (CHLSalt-22) and its validation among hypertensive patients," *BMC Nutr.*, vol. 8, no. 1, pp. 1–14, 2022, doi: 10.1186/s40795-022-00594-9.
- [11] J. Zhao *et al.*, "A review of statistical methods for dietary pattern analysis," *Nutr. J.*, vol. 20, no. 37, pp. 1–18, 2021, doi: 10.1186/s12937-021-00692-7.
- [12] R. Rachmadtullah, H. Syofyan, and Rasmitadila, "The role of civic education teachers in implementing multicultural education in elementary school students," *Univers. J. Educ. Res.*, vol. 8, no. 2, pp. 540–546, 2020, doi: 10.13189/ujer.2020.080225.
- [13] I. Supena, A. Darmuki, and A. Hariyadi, "The influence of 4C (constructive, critical, creativity, collaborative) learning model on students' learning outcomes," *Int. J. Instr.*, vol. 14, no. 3, pp. 873–892, 2021, doi: 10.29333/iji.2021.14351a.
- [14] S. M. Alnajdi, "The effectiveness of designing and using a practical interactive lesson based on ADDIE model to enhance students' learning performances in University of Tabuk," *J. Educ. Learn.*, vol. 7, no. 6, p. 212, 2018, doi: 10.5539/jel.v7n6p212.
- [15] N. N. Hawa, S. Zarina, S. Zakaria, M. R. Razman, N. A. Majid, and A. M. Taib, "Element of disaster risk reduction in geography education in Malaysia," *Sustainability*, vol. 15, no. 1326., pp. 1–13, 2023, doi: 10.3390/su15021326.
- [16] I. Lindsay and N. N. Kong, "Using the ArcGIS collector mobile app for settlement survey data collection in Armenia," *Adv. Archaeol. Pract.*, vol. 8, no. 4, pp. 322–336, 2020, doi: 10.1017/aap.2020.26.
- [17] N. Hamid, G. Roehrig, D. L. Setyowati, H. Rachmah, M. A. Royyani, and H. Mahat, "Development model for environment-based learning to improve junior high school students' geographical skills," *Rev. Int. Geogr. Educ. Online*, vol. 11, no. 2, pp. 461–481, 2021, doi: 10.33403/rigeo.833857.
- [18] L. Suwala, "Concepts of space, refiguration of spaces, and comparative research: perspectives from economic geography and regional economics," *Forum Qual. Sozialforsch.*, vol. 22, no. 3, 2021, doi: 10.17169/fqs-22.3.3789.
- [19] P. Bagoly-Simó, J. Hartmann, and V. Reinke, "School geography under COVID-19: geographical knowledge in the German formal education," *Tijdschr. voor Econ. en Soc. Geogr.*, vol. 111, no. 3, pp. 224–238, 2020, doi: 10.1111/tesg.12452.
- [20] A. A. Fadly, P. Purwanto, H. Masruroh, and S. Sumarmi, "Pengaruh penggunaan webGIS (Web Based Geographic Information System) terhadap hasil belajar geografi dan keterampilan geografi secara berkelanjutan," *J. Integr. dan Harmon. Inov. Ilmu-Ilmu Sos.*, vol. 2, no. 2, pp. 128–142, 2022, doi: 10.17977/um063v2i2p128-142.
- [21] L. Kano, E. W. K. Tsang, and H. W. chung Yeung, "Global value chains: A review of the multi-disciplinary literature," *J. Int. Bus. Stud.*, vol. 51, no. 4, pp. 577–622, 2020, doi: 10.1057/s41267-020-00304-2.
- [22] J. Zeng, S. Parks, and J. Shang, "To learn scientifically, effectively, and enjoyably: a review of educational games," *Hum. Behav. Emerg. Technol.*, vol. 2, no. 2, pp. 186–195, 2020, doi: 10.1002/hbe2.188.
- [23] J. Jusmaniar, I. Riani, E. C. Anderson, M. C. Lee, and S. W. Oktavia, "Gasing game: ethnoscientific exploration of circular motion in physics learning on the coast of East Sumatra to build the character of perseverance," *Schrödinger J. Phys. Educ.*, vol. 5, no. 1, pp. 1–9, 2024, doi: 10.37251/sjpe.v5i1.902.
- [24] D. R. Retnani, R. Royani, C. Beccles, and A. Afras, "Improving science learning outcomes on light and optical instruments through visual methods in junior high schools," *Schrödinger J. Phys. Educ.*, vol. 5, no. 1, pp. 32–38, 2024, doi: 10.37251/sjpe.v5i1.883.
- [25] C. M. Amerstorfer and C. Freii von Münster-Kistner, "Student perceptions of academic engagement and student-teacher relationships in problem-based learning," *Front. Psychol.*, vol. 12, no. October, pp. 1–18, 2021, doi: 10.3389/fpsyg.2021.713057.
- [26] M. M. Al-Ababneh, "Linking ontology, epistemology and research methodology," *Sci. Philos.*, vol. 8, no. 1, pp. 75–91, 2020, doi: 10.23756/sp.v8i1.500.
- [27] S. L. Siedlecki, "Understanding descriptive research designs and methods," *Clin. Nurse Spec.*, vol. 34, no. 1, pp. 8–12, 2020.
- [28] I. Mahfud and E. B. Fahrizqi, "Development of Soccer Passing Training Models with Play Method for Base School Beginners," *J. Sport.*, vol. 1, no. 1, pp. 15–22, 2023.
- [29] J. Arfi, A. Wahyuri, G. Gusril, W. Rasyid, and Y. Ockta, "Developing engaging audio-visual learning media for basic locomotor patterns through play-based activities for early learners," *J. Educ. Teach. Learn.*, vol. 9, no. 1, pp. 40–46, 2024.

-
- [30] G. K. Mweshi and K. Sakyi, "Application of sampling methods for the research design," *Arch. Bus. Res.*, vol. 8, no. 11, pp. 180–193, 2020, doi: 10.14738/abr.811.9042.
- [31] T. S. Nanjundeswaraswamy and S. Divakar, "Determination of sample size and sampling methods in applied research," *Proc. Eng. Sci.*, vol. 3, no. 1, pp. 25–32, 2021.