Journal Corner of Education, Linguistics, and Literature
Vol. 4 No. 4 (May, 2025), pp. 474-486
https://doi.org/10.54012/jcell.v4i4.482

Development of Interactive Map Media for Teaching the Distribution of Indonesian Flora and Fauna in Senior High School Geography

Ni Kadek Indrena Gupta Narasrestha[1]✉, I Putu Sriartha[2], Made Dwipayana[3]
[1] *Department Geography Education, Universitas Pendidikan Gaensha, Bali, Indonesia*
[2] *Department Geography Education, Universitas Pendidikan Gaensha, Bali, Indonesia*
[3] *Department Geography Education, Universitas Pendidikan Gaensha, Bali, Indonesia*
✉ email: rena.narasrestha@gmail.com

Received:
May 17, 2025
Revised:
May 20, 2025
Accepted:
May 27, 2025
Published:
May 29, 2025

ABSTRACT

Geography learning requires appropriate media to concretize abstract concepts, such as the distribution of flora and fauna in Indonesia, which varies significantly across the archipelago. Conventional maps commonly used in schools often lack the flexibility and interactivity needed to present geospatial information effectively and dynamically. Therefore, this study aims to develop an interactive map-based learning media to enhance students' understanding of the distribution of Indonesian flora and fauna in Senior High School geography subjects. The study applies a Research and Development (R&D) method using the ADDIE model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. The interactive map was designed using base maps derived from thematic data, combined with digital or satellite imagery, to produce a more comprehensive and engaging geospatial visualization. Features of the media include layers of flora and fauna distribution, geographic characteristics, interactive videos, quizzes, learning materials, and lesson plans. The media is also supported by clear icons, appropriate cartographic symbols, and color gradations based on cartographic principles to improve readability and spatial interpretation. The developed media was tested on students at SMAN 1 Penebel, Tabanan Regency, Bali. Validation results from content, language, and media experts indicated a very high level of validity. In addition, practicality assessments by teachers and students showed that the media is easy to use and effective in classroom settings. Pre-test and post-test comparisons revealed a significant improvement in student learning outcomes, with an average post-test score increase of 28.75 points. These results suggest that interactive map media can significantly enhance the effectiveness of geography learning.

Keywords: *Flora; Fauna; Interactive; Learning Media; SMAN 1 Penebel.*

INTRODUCTION

Geography education at the Senior High School (SMA) level plays a critical role in introducing students to concepts that connect geospatial elements with natural phenomena on Earth. In this context, effective geography instruction relies not only on theoretical frameworks but also on the utilization of learning media that assist students in concretizing abstract concepts, making them easier to understand (Kurniawan et al.,

2020). One topic that often presents a challenge is the distribution of flora and fauna in Indonesia. This topic encompasses the vast diversity of species spread across the archipelago and demands a comprehensive understanding of Indonesia's rich biodiversity. Students must be able to depict and relate the locations of flora and fauna to specific regions in Indonesia, necessitating the use of dynamic and interactive maps to facilitate deeper comprehension. Nevertheless, while conventional maps are still widely used in education, their application in geography instruction often encounters limitations. Static maps commonly used in schools lack the flexibility to present up-to-date information and do not allow students to directly interact with the geographic data being studied (Mentari et al., 2022). In several schools, including SMA Negeri 1 Penebel in Tabanan Regency, Bali, conventional maps remain the primary tool for delivering geographic content. Surveys conducted in these schools indicate that both teachers and students find static maps less engaging and that they hinder students' ability to grasp broader content, such as the distribution of flora and fauna in Indonesia (Wijayanti et al., 2019). These findings reveal a significant gap in the delivery of geographic material that needs to be addressed promptly.

With the rapid advancement of technology, interactive map-based learning media offer a more flexible and engaging solution. These tools enable students to participate more actively in the learning process and gain a deeper understanding of geospatial concepts (Annisa et al., 2018). The use of interactive maps in studying flora and fauna is particularly essential, as they can dynamically and attractively visualize distribution data. Abstract concepts such as regional distribution and biodiversity become more concrete, thereby improving student comprehension. The interactive nature of these media fosters active participation, increases student interest, and enhances the development of spatial and analytical thinking skills, which are crucial in geography education (Sari & Miaz, 2019). In this context, the use of interactive maps not only heightens students' interest in learning but also strengthens their engagement in the educational process.

As part of efforts to address these challenges, this study developed an interactive map media designed to teach the topic of flora and fauna distribution in Indonesia within the geography curriculum at the high school level. The research was conducted at SMA Negeri 1 Penebel, Tabanan Regency, Bali, where the interactive map media was tested in classroom settings as part of the instructional process. The development of this media adopted the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), a systematic approach for creating technology-based learning products. The study also evaluated the validity and practicality of the media in supporting a more interactive, dynamic, and effective geography learning experience. Through this research, it is expected that evidence will confirm that the developed interactive map media provides a practical solution to the challenges encountered in geography education at the high school level. By utilizing interactive maps, students can become more actively involved in learning about the distribution of flora and fauna in Indonesia and achieve a deeper understanding of the subject matter. This study

makes a significant contribution to the creation of more innovative learning media that align with the needs of students in today's increasingly digital era.

METHOD

Research Approach

This study employed a Research and Development (R&D) approach to develop an interactive map as a learning medium for geography, specifically focusing on the distribution of flora and fauna in Indonesia. The ADDIE model was selected for its efficiency in instructional product development. The model comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. To this study, the ADDIE model was modified into four stages: analysis, design, development, and a combined implementation and evaluation phase. The initial stage involved conducting observations and interviews with teachers and students to identify the need for interactive maps in geography education. The analysis revealed that conventional maps were insufficient in supporting students' comprehension, particularly in spatially oriented subjects such as flora and fauna distribution. Hence, the development of an interactive map-based medium was deemed crucial for enhancing student understanding. To further inform the analysis phase, unstructured interviews were conducted to gather in-depth data regarding instructional needs, which formed the basis for the development of the interactive map. Observations were carried out to monitor students' learning outcomes during lessons on flora and fauna distribution. A questionnaire was used to collect data during expert reviews, limited field trials, and extended field tests. In addition, pre-tests and post-tests were conducted to assess students' knowledge before and after the implementation of the interactive media. The tests consisted of essay-type questions administered before (pre-test) and after (post-test) the treatment, using identical items to measure students' mastery of the content using the interactive map.

Research Design

During the design stage, the interactive map media was developed by collecting relevant raster and vector data on the distribution of flora and fauna. A storyboard was created to visualize the media interface and navigation structure. Research instruments included questionnaires used for validation by subject-matter experts, teachers, and students. A content validity test was then conducted to assess whether the measurements or items in the instrument accurately reflected the intended concepts or variables (Slamet & Wahyuningsih, 2022). The formula employed to determine content validity in this study was Gregory's formula, as shown below.

$$V = \frac{D}{A+B+C+D}$$

Description:

V = Content Validity
A = Number of items judged irrelevant by both experts
B = Number of items rated as relevant by Expert 1 but irrelevant by Expert 2
C = Number of items rated as irrelevant by Expert 1 but relevant by Expert 2
D = Number of items rated as relevant by both experts

The next step was conducting a reliability test, which serves as a tool to measure whether an instrument has consistent indicators for a given variable or construct. This study employed Cronbach's Alpha method to assess the reliability of the instrument, using the following formula:

$$r_i = \frac{k}{(k-1)}\left\{1 - \frac{\sum s_i^2}{s_t^2}\right\}$$

Description :
K = Mean square between subjectsk
$\sum s_i^2$ = Mean square error
s_t^2 = Total variance

The next stage was the development phase, in which the interactive map product was created and tested on a small scale (limited field trial) involving teachers and students. Based on feedback from the initial trial, revisions were made to the product, which was then re-tested on a larger scale to obtain more representative data. The implementation stage began with the use of the interactive map in teaching, followed by an effectiveness test using the One Group Pre-Test – Post-Test Design method. Students were given a pre-test before using the media and a post-test after its use to measure their improvement in understanding. The gain score was calculated to assess the effectiveness of the media, defined as the difference between the post-test and pre-test scores.

Population and Sample

The population in this study consisted of geography teachers and 12th-grade students at SMA Negeri 1 Penebel. The students were divided into three classes: XII-1, XII-2, and XII-3. There was one geography teacher at the school who taught grades X, XI, and XII.

Table 1. Research Population

Grade Level	Class Name	Students	Teacher
XII	XII 1	32	1
	XII 2	32	
	XII 3	31	
Total		**95**	**1**

Meanwhile, the research sample was selected using random sampling after conducting a class equivalence test. A T-test was performed to ensure the equivalence among the classes involved in the study. The T-test results indicated that all class pairings showed no significant differences, which confirms that the classes were equivalent.

Table 2. Random Sampling Conducting A Class Equivalence Test

Class Pairing	t Score	Sig.t	Description
XII IPS 1 – XII IPS 2	0,257	0,798	Equivalent
XII IPS 1 – XII IPS 3	0,662	0,510	Equivalent
XII IPS 2 – XII IPS 3	0,453	0,652	Equivalent

After confirming group equivalence, the experimental group was determined using random sampling as follows:

Table 3. The experimental group

Experimental Group	Description
XII IPS 1	Limited Field Trial
XII IPS 2	One Group Pre-test – Post-Test
XII IPS 3	Wider Field Trial

Data Analysis

The data analysis in this study was carried out to systematically organize, structure, and interpret the collected data in order to draw valid and meaningful conclusions. The analysis process consisted of four main stages. The first stage involved identifying the need for media through interviews, observations, and documentation to explore the urgency of using interactive maps in geography learning. The findings were analyzed descriptively and narratively to understand the preferences and needs of both students and teachers. The second stage focused on analyzing the media development process. This included designing a development workflow, creating an initial prototype, and identifying potential obstacles. Various techniques such as flowcharts, SWOT analysis, and prototyping were used to guide the development strategy of the interactive map. The third stage was the analysis of the media's validity and practicality. These aspects were assessed using Likert scale-based evaluation instruments, which were filled out by media experts, subject matter experts, and users both teachers and students. The results were interpreted quantitatively to determine whether the developed media was appropriate and feasible for use in the classroom. The final stage was the analysis of the media's effectiveness, which was conducted using a One Group Pre-test – Post-test design. Students were given a pre-test before using the interactive map and a post-test afterward. The difference in scores was analyzed to determine the extent to which students' understanding improved after engaging with the interactive learning tool.

.

FINDINGS AND DISCUSSION

Concept of Developing a Web-Based Interactive Map for the Distribution of Flora and Fauna

In the current digital era, the teaching of geography requires a more contextual, visual, and interactive approach to help students understand the relationships between space, place, and natural phenomena in a tangible way. One of the essential topics in geography is the distribution of flora and fauna, which is often challenging for students to grasp when only presented through conventional media such as textbooks and printed maps. As a solution to this challenge, an innovative learning tool using a web-based interactive map has been developed. This web-based interactive map is a digital medium that enables students to dynamically explore maps, zoom in and out of regions, display thematic information, and directly interact with the spatial data presented. Through this platform, students can view the distribution of plant and animal species by region, climate, and ecological characteristics in real time and with more context (Amelia et al., 2023). The map can also be enhanced with images, videos, species descriptions, and reference links, enriching the learning experience. This innovation not only facilitates understanding of biogeography concepts but also encourages active student engagement in learning. For instance, students can be assigned tasks to create digital maps of the distribution of endemic flora in Indonesia or to compare the habitats of certain fauna across regions. This process cultivates geospatial literacy skills, critical thinking abilities, and environmental awareness. By leveraging technologies such as Leaflet, Google Maps API, or ArcGIS Online, teachers can design more engaging, adaptive, and project-based learning experiences. This innovation also addresses the needs of 21st-century education, which emphasizes integrative, data-driven learning and the holistic development of students' digital skills (Husain et al., 2023).

In the context of modern geography education, students' understanding of the concept of flora and fauna distribution cannot be adequately achieved through static text-based or printed media alone. This material requires an approach that can effectively illustrate spatial interrelationships, particularly given Indonesia's status as an archipelagic nation with exceptionally high biodiversity and complex distribution patterns (Nuha et al., 2024). To meet this need, a technology-based learning innovation has been developed namely, the use of a web-based interactive map as the primary medium for delivering content on the distribution of flora and fauna in Indonesia. This interactive map is designed to provide a dynamic learning experience by offering distribution menus that allow students to explore the specific locations of various plant and animal species directly on a digital map. Each distribution point is represented by icons or symbols depicting the species present in that region. For example, the Komodo icon appears on Komodo Island, the bird-of-paradise icon in Papua, and the Rafflesia icon in Sumatra. This presentation offers a strong visual impact and helps students connect geographic locations with the endemic species that inhabit them. This

feature transforms the map into not just a visual aid, but an authentic source of spatial information rich with contextual data.

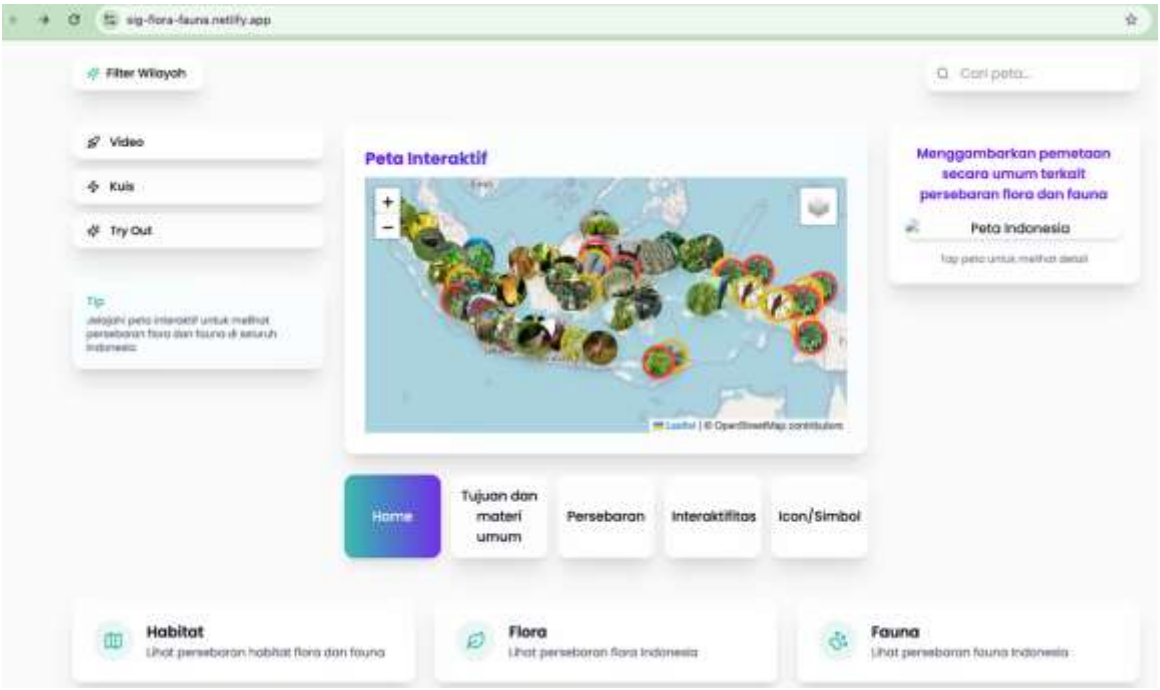

Figure 1. Web-Based Interactive Map for the Distribution of Flora and Fauna
Source: Data Analysis 2025 (author's design)

Furthermore, this map is not merely static in presenting location data, but also interactive, as it is equipped with analytical menus to examine geographical characteristics, such as natural habitats, topographic conditions, and climatic zones. Students can choose to display the distribution of flora and fauna based on habitat types, such as tropical rainforests, wetlands, savannas, or highlands, as well as by climatic parameters such as rainfall and temperature. Thus, students are encouraged not merely to memorize the location of a species but to analyze the ecological relationships between the Earth's physical factors and the presence of living organisms. For example, when students select a map layer based on topography, they can observe that certain species appear exclusively in highland or mountainous areas, while others are more prevalent in humid lowland regions. This interactivity fosters a reasoning-based and evidence-driven learning experience, which aligns with the principles of inquiry-based learning (Pakaya et al., 2023).

The aspect of symbolization is also a crucial part of this innovation. The application features an icon menu displaying distinctive symbols for each flora and fauna. These icons are not merely representative images but function as informational windows that can be clicked to access comprehensive data about the species, including original photographs, scientific explanations, documentary videos, and micro-scale local distribution maps. This symbolic approach assists students in establishing strong visual associations and facilitates their understanding of biodiversity across various

regions. Moreover, the use of symbols enhances interface navigation, making the map a user-friendly learning tool for both students and teachers (Putri et al., 2023).

Figure 2. Interactive Map of Geographic Characteristics of Flora and Fauna
Source: Data Analysis 2025, (author's design)

As a complement to its core features, the application also offers various supporting tools to strengthen the learning process inside and outside the classroom. One such feature is access to structured lesson plans aligned with the curriculum, encompassing indicators, learning objectives, and step-by-step activities that teachers can readily implement. Additionally, there is a wealth of enrichment materials such as popular scientific articles, infographics, and instructional videos relevant to the topic of Indonesian flora and fauna. These features enable teachers to utilize the application not only as a supplementary medium but as a primary source for designing comprehensive and integrative thematic learning experiences. For students, the availability of multimedia learning materials empowers them to access information independently and caters to diverse learning styles, whether visual, auditory, or kinesthetic. Furthermore, the application enables deeper exploration through regional filter features, allowing students to narrow down the spatial scope of their analysis to focus on specific administrative areas, such as provinces, districts, or even designated national parks. This filter functionality enables students to investigate particular flora and fauna within those areas and analyze local environmental factors that influence their distribution. This capability is invaluable for developing students' local analytical skills and for strengthening the connection between geography content and the actual conditions in their home regions.

By integrating all these features from spatial visualization and ecological interactivity to iconic symbolization, educational materials, and regional analysis tools this web-based interactive map transforms into a comprehensive and contextual digital learning ecosystem. It not only bridges the limitations of conventional media but also creates opportunities for more participatory, analytical, and data-driven learning experiences. Therefore, incorporating interactive maps into geography education about Indonesia's flora and fauna represents a concrete step towards integrating technology with pedagogy. It introduces not only a media innovation but also a new paradigm in learning that emphasizes the interconnectedness of space, environment, and biodiversity. Ultimately, this innovation fosters active, critical, and environmentally conscious learners who are better equipped to address current global and local challenges.

Analysis of the Use of Web-Based Interactive Maps in Senior High School Geography Education

The development of the interactive map follows the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), which provides a systematic and structured approach to designing educational media. In the analysis phase, it was identified that students often struggle to understand spatial content, such as the distribution of flora and fauna in Indonesia. Consequently, the interactive map was designed to provide clearer understanding by incorporating features such as zoom functions, informational pop-ups, and interactivity that enable students to directly explore the data. Research by Widodo et al. (2017) indicates that interactive media, including digital maps, can enhance students' comprehension of geospatial content. Following the media development stage, we conducted measurements of students' understanding through analysis of pre-test and post-test scores after using the interactive map. The following section presents the results of this analysis:

Table 4. Pre Test and Post Test Result

Test Type	Average	Score Increase	Description
Pre-test	62.19		Before using the media
Post-test	90.94	+28.75	After using the media
Peningkatan		+28.75	Significant improvement

The results of the pre-test and post-test showed a significant increase in students' understanding after using the interactive map media. The average pre-test score before using the media was 62.19, while the average post-test score after using the media increased to 90.94, with an average improvement of 28.75 points. This demonstrates that the use of interactive maps is effective in enhancing students' comprehension of the distribution of flora and fauna in Indonesia. Research by Sari & Miaz (2019) also found that the use of interactive media in learning increased students' motivation and understanding, which aligns with the findings of this study. Further analysis using the gain score revealed that the gain score for all students was above 0.7, indicating that this media successfully and significantly improved students' understanding. This

finding is supported by Wahyudi (2018), who noted that technology-based learning media can significantly improve student learning outcomes.

Table 5. Practicality Test by Expert

Aspect	Main Indicator	Average	Description
Kelayakan Isi	Suitability of material with basic competencies	4	Very Good
	Depth of material for cognitive development	3.5	Good
	Concept accuracy of flora and fauna	4	Very Good
Kebahasaan	Language suitability with EYD	4	Very Good
	Effectiveness of language in delivering information	3.5	B Good
Penyajian	Clarity of material objectives and indicators	4	Very Good
	Completeness of flora and fauna information	4	Very Good
	Logical and systematic presentation of material	4	Very Good
Total Score		**96,87**	**Very Good**

Subsequently, a practicality test was conducted with teachers regarding the interactive map learning media to assess the substance of the material content and its alignment with the learning curriculum. Meanwhile, the students' practicality assessment aimed to evaluate the effectiveness of the media in the learning process (Saifudin et al., 2024).

Table 6. Practicality Test by Teacher

Aspect	Main Indicator	Average	Description
Alignment	Material aligns with the curriculum	4	Very Good
Presentation	Material is presented clearly and comprehensively	4	Very Good
Usefulness	Media supports the learning process	4	Very Good
Ease of Use	Media is easy for students to use	4	Very Good
Interactivity	Media allows students to interact with the material	4	Very Good
Total Score		**100**	**Very Good**

The practicality test involving teachers and students showed that the interactive map media was easy to use and effective in supporting the learning process. The average practicality score given by both teachers and students reached 100%, indicating that this media is highly practical and beneficial in the classroom context. This aligns with the findings of Nugroho et al. (2020), who stated that technology-based learning media, such as interactive maps, are often well-received by both teachers and students due to their ease of use.

Table 7. Practicality Test by Student

Aspect	Main Indicator	Average	Description
Clarity of Material	Material is delivered clearly	4	Very Good
Material Comprehension	Helps students understand the material	4	Very Good
Visualization	Visualization supports comprehension	4	Very Good
Time Efficiency	Saves students' learning time	4	Very Good
Ease of Access	Media is easily accessible to students	4	Very Good
Total		**100**	**Very Good**

The results of the effectiveness test demonstrated an improvement in students' understanding after using the interactive map media. A comparison between pre-test and post-test scores showed a statistically significant increase ($p < 0.05$), with the average post-test score rising by 28.75 points. These findings indicate that the use of interactive maps is effective in enhancing students' comprehension of geographical material.

Table 8. Effectiveness Test of the Interactive Map Learning Media

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ngainscore	32	,25	1,00	,7625	,23222
ngainpersen	32	25,00	100,00	76,2492	23,22169
Valid N (listwise)	32				

The findings of this study are consistent with previous research indicating that interactive media, such as digital maps, can assist students in understanding geographical concepts that are otherwise difficult to grasp using conventional media (Widodo et al., 2017). The use of interactive media in learning also enhances student engagement, which in turn improves learning outcomes (Sari & Miaz, 2019). Overall, the use of interactive map media in geography education has proven effective in improving students' understanding of the distribution of flora and fauna in Indonesia. This media is not only valid and practical but also easily accessible to students, providing significant improvements in their learning outcomes. Therefore, the use of interactive map media is highly recommended for implementation in other schools as a more engaging and effective learning tool (Widarto et al., 2023)

CONCLUSION

This study aims to develop an interactive map media for teaching geography, specifically regarding the distribution of flora and fauna in Indonesia at the high school level. The interactive map is designed to address the limitations of conventional maps, which do not provide the flexibility and interactivity required to present spatially-oriented material. Using the Research and Development (R&D) method with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), this research demonstrates that the developed interactive map media has high validity and practicality, as evidenced by the validity tests conducted by experts in the fields of

subject matter, language, and media. Furthermore, the results from the trials conducted with students show a significant improvement in understanding, with the average post-test score increasing by 28.75 points compared to the pre-test. These findings confirm that the interactive map media is effective in enhancing students' comprehension of geographic material, particularly the distribution of flora and fauna in Indonesia. Therefore, the use of this interactive map media is highly recommended for implementation in other schools as an alternative learning tool that is more innovative, interactive, and aligned with current developments in educational technology.

ACKNOWLEDGMENTS

I would like to express my gratitude to Universitas Pendidikan Ganesha, for providing financial support for this research project. I also appreciate the guidance and feedback from my supervisor, Prof. Dr. I Putu Sriartha. M. S., and Made Dwipayana, S.Pd.,M.Sc, whose insights were invaluable in shaping this study.

REFERENCES

Amelia, D. P., Oktafianti, M., & Rustini, T. (2023). Pengaruh penggunaan media Google Earth terhadap pembelajaran peta di sekolah dasar. Journal on Education, 5(2), 2369–2375. https://doi.org/10.31004/joe.v5i2.893

Annisa, S., Priyadi, A., & Ramdhani, D. (2018). Peningkatan pemahaman geospasial melalui peta interaktif pada siswa SMA. Jurnal Teknologi Pendidikan, 11(4), 43-52.

Husain, S., Eraku, S., & Koem, S. (2024). Pengembangan modul digital berbasis Story Map pada pokok bahasan flora dan fauna. Jurnal Swarnabhumi: Jurnal Geografi dan Pembelajaran Geografi, 9(1), 1–10. https://doi.org/10.31851/swarnabhumi.v9i1.9631

Kurniawan, H., Suryani, D., & Wijayanti, R. (2020). Pemanfaatan media interaktif dalam pembelajaran geografi untuk meningkatkan pemahaman konsep geospasial siswa di sekolah menengah. Jurnal Pendidikan Geografi, 10(2), 15-25.

Mentari, F., Susanto, A., & Pramudito, H. (2022). Evaluasi penggunaan peta konvensional dalam pembelajaran geografi: Sebuah studi di SMA Negeri di Jakarta. Jurnal Ilmu Pendidikan, 12(1), 34-47.

Nuha, W. D., & Prasetya, S. P. (2024). Pengembangan media pembelajaran Story Maps pada materi flora dan fauna di Indonesia di SMA Kemala Bhayangkari 1 Surabaya. Swara Bhumi, 2(1), 50–60. https://doi.org/10.15294/swara.v2i1.46453

Nugraha, H. A., Khairunnisa, U. Z., & Mukti, H. (2024). Inovasi pembelajaran persebaran flora dan fauna endemik berbasis Geographical Location menggunakan ArcGIS StoryMaps: Studi kasus SMAN 07 Surakarta. Edu Geography, 12(1), 1–19. https://doi.org/10.15294/y7pt6t63

Nugroho, S., Widodo, S., & Yuliana, R. (2020). Evaluasi kepraktisan penggunaan media peta digital dalam pembelajaran geografi di SMA. Jurnal Teknologi dan Pendidikan, 15(3), 89-97.

Pakaya, H., Maryati, S., & Pambudi, M. R. (2023). Desain media pembelajaran berbasis digital flipbook pada mata pelajaran geografi materi keanekaragaman hayati. Jurnal Riset dan Pengabdian Interdisipliner, 2(1), 45–55. https://doi.org/10.34312/jrpi.v2i1.29889

Putri, N. E., & Ana, R. F. R. (2024). Pengembangan media pembelajaran infografis berbasis Canva pada siswa kelas V materi persebaran flora dan fauna di Indonesia. Jurnal Simki Postgraduate, 3(2), 177–185. https://doi.org/10.29407/jspg.v3i2.815

Saifudin, M. Z., Kurniawati, R., Murni, A. W., Wardono, M. S., Yasin, F. N., & Jannah, N. L. (2024). Pengembangan media pembelajaran Panasia (Peta Flora Fauna di Indonesia) pada materi IPS kelas V SD. Ed-Humanistics: Jurnal Ilmu Pendidikan, 9(1), 11–15. https://doi.org/10.33752/ed-humanistics.v9i01.6091

Sari, R., & Miaz, M. (2019). Pengaruh media pembelajaran berbasis peta digital terhadap hasil belajar siswa di sekolah menengah. Jurnal Pendidikan Geografi, 14(1), 60-70.

Setiawan, D., & Haryanto, P. (2019). Validitas dan reliabilitas media pembelajaran digital di sekolah menengah. Jurnal Penelitian Pendidikan, 13(2), 42-53.

Wahyudi, R. (2018). Implementasi media interaktif dalam pembelajaran geografi di sekolah menengah. Jurnal Pendidikan dan Teknologi Pembelajaran, 9(2), 28-37.

Widarto, M. N., Soelistijo, D., & Insani, N. (2023). Pengembangan media pembelajaran komik digital geografi pada materi persebaran flora dan fauna di Indonesia. Jurnal Integrasi dan Harmoni Inovatif Ilmu-Ilmu Sosial, 2(12), 1214–1223. https://doi.org/10.17977/um063v2i12p1214-1223

Widodo, S., Purnama, H., & Nabila, R. (2017). Pemanfaatan peta interaktif dalam pembelajaran geografi untuk meningkatkan pemahaman siswa terhadap konsep geospasial. Jurnal Pendidikan Geografi, 13(3), 12-22.

Wijayanti, N., Purnama, A., & Salim, M. (2019). Peran peta statis dalam pengajaran geografi di SMA. Jurnal Pendidikan dan Teknologi, 8(3), 50-58.