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PULBIN PEDIA: an Interactive dynamic web as a bioconservation learning resource for preservice science teacher



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The International Journal of Mathematics and Sciences Education

Editor-in-Chief: Prof. Ebenezer Bonyah



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To cite this article:

Natadiwijaya, I.F., Yuliana, E, Sugianto, Rachman, D.F., Subkhi, N, Luzyawati, L. (2024). PULBIN PEDIA: An interactive dynamic web as a Bioconservation learning resource for preservice science teachers. *The International Journal of Mathematics and Sciences Education*, 2(1), 10-17.

To link to this article:

<https://nakiscience.com/index.php/IJMSEd>

Published by:

Nasir Al-Kutub Indonesia

PULBIN PEDIA: An interactive dynamic web as a Bioconservation learning resource for preservice science teacher**Ismail Fikri Natadiwijaya^{a*}, Eva Yuliana^b, Sugianto^c, Dwi Fauzi Rachman^d, Nur Subkhi^e, Lesy Luzyawati^f**^{a*}Department of Science Education, Universitas Negeri Yogyakarta, Indonesia, fikrinatadiwijaya@uny.ac.id^bDepartment of Biology Education, Universitas Wiralodra, Indonesia, evayuliana@unwir.ac.id^cDepartment of Biology Education, Universitas Wiralodra, Indonesia, sugianto@unwir.ac.id^dDepartment of Biology Education, Universitas Wiralodra, Indonesia, nursubkhi@unwir.ac.id^eDepartment of Biology Education, Universitas Wiralodra, Indonesia, fauzirachman@unwir.ac.id^fDepartment of Biology Education, Universitas Wiralodra, Indonesia, lesy.luzyawati@unwir.ac.id***Corresponding Author:** fikrinatadiwijaya@uny.ac.id**Abstract**

Bioconservation is an interdisciplinary science whose purpose is to encourage the development of theory and application in conservation areas. Biawak Island is one of the leading conservation areas in the Indramayu district, therefore Bioconservation learning should be done directly on Biawak Island. In practice, studying Bioconservation directly on Biawak Island is difficult because of the long distance and expensive access to this place. Based on these problems, an interactive dynamic web in the form of a digital encyclopedia is a solution for the problem. Digital encyclopedia named "PULBIN PEDIA". That was implemented in one of the private universities in West Java. The design used is Descriptive Qualitative. A qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. This research was conducted on 24 students who were taking the course of Bioconservation in the academic years of 2023/2024. The results of the analysis from observations found that PULBIN PEDIA is an interactive and dynamic media and can be implemented as an integrated learning resource in Bioconservation lectures because it contains complete and accurate information regarding the location, origin of the name, management, conservation activities, conservation actors and biodiversity on Biawak Island. PULBIN PEDIA also can be implemented as a learning resource in lectures that apply problem-based learning strategies where students can find 3 (three) conservation problems, investigate components that have been conserved, and formulate solutions on how to preserve Biawak Island.

Article History

Received:

23 January 2024

Revised:

02 April 2024

Accepted:

28 May 2024

Published Online:

01 June 2024

Keywords:

Bioconservation;

Digital encyclopedia;

Interactive dynamic web

1. Introduction

Bioconservation is a science that examines the management and design of a nature reserve to maintain the diversity of habitats and species and minimize this diversity from human, agricultural, industrial and recreational disturbances (Dubynin, 2021). Indonesia has many conservation areas, one of which is Biawak Island. Biawak Island is one of the leading conservation areas with coral reefs and water lizards (*Varanus salvator*) as the main attractions. Therefore, based on these facts, Lizard Island

is a suitable place to learn about bioconservation (Solihudin et al., 2020; Hanjar et al., 2016; Salsabiela et al., 2014).

Biawak Island is located off the coast of the Java Sea and 50 km north of the coast of Indramayu (Rahmadeni et al., 2017). Even though it is an ideal place for studying bioconservation. Biawak Island is difficult to reach because of the long distance and expensive access to this place. Transportation and accessibility to Biawak Island is quite complicated due to the lack of crossing facilities and the travel time is more than 4 hours (Nurlaela & Warlina, 2018). Based on these problems, a solution is needed so that students can still study bioconservation on Biawak Island without having to travel there.

One alternative learning resource that can be used for learning Bioconservation is a digital encyclopedia. A digital encyclopedia is an Interactive Dynamic Web with structured and in-depth information (Sari et al., 2019). Digital encyclopedias are different from other learning resources because they provide images or illustrations that accompany Bioconservation information according to the topics discussed. Readers will find it easy to find information because it is arranged alphabetically (Audriansyah et al., 2022). According to Aulia et al. (2021), encyclopedias can be used as a learning resource with accurate and up-to-date information and can broaden readers' horizons.

Based on these problems, a digital encyclopedia of conservation on Biawak Island is needed to solve the problem of needing media that can become a medium for studying conservation in this hard-to-reach area. Therefore, this research focuses on describing the characteristics of the digital encyclopedia that was developed, describing the implementation of products in teaching and learning activities. Therefore, this research focuses on the implementation of products in learning which are described in qualitative descriptions of learning activities that occur among students during bioconservation lectures who use digital encyclopedias as learning resources and student responses to the digital encyclopedias they use.

2. Method

This research is an implementation of the development of a digital encyclopedia named "PULBIN PEDIA". The design used is Descriptive Qualitative. A qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. Qualitative descriptive research is aimed at describing and illustrating existing phenomena, both natural and human-engineered, which pays more attention to characteristics, quality, and interrelationships between activities. This qualitative approach aims to obtain complete information about the "implementation of the PULBIN PEDIA digital encyclopedia in Bioconservation learning". The participants in this research were 24 students who took a Bioconservation course at a university in Indramayu Regency in the 2023/2024 academic year.

In this study, researchers used data collection techniques using observation, documentation, interviews, and field notes. Observation techniques are carried out by direct observation of the learning activity of the Bioconservation lecture. In addition, researchers used in-depth interview techniques in the form of semi-structured interviews to obtain more accurate data regarding the use of digital encyclopedias by preservice science teachers. Before conducting in-depth interviews, the researcher explained the research topic briefly and clearly. In this study, the Data Analysis technique used qualitative data analysis from Miles and Huberman (Emzir, 2016), which consisted of three stages: (1) data reduction; (2) data presentation; and (3) drawing/verifying conclusions. Qualitative data analysis is inductive, after analysis of the data is carried out, certain relationship patterns are then developed so that conclusions are obtained.

3. Results and Discussion

Results

a. PULBIN PEDIA

The digital encyclopedia can be freely accessed at the link <https://publinpedia.vilabio.my.id/go/doku.php?id=start>. The programming language used to create digital encyclopedias is PHP (Hypertext Preprocessor). PHP is an open-source programming language generally used to build interactive and dynamic web applications. Interactive means that the encyclopedia contains many elements (text, visuals, audiovisuals) equipped with control devices (click or arrow buttons) that allow users to choose the following process actively. Dynamic means that the content in the encyclopedia can be updated regularly. To update the data, the administrator just clicks the log in button (fill in the username and password) then edit or add the desired data. The digital encyclopedia is called PULBIN PEDIA which is an abbreviation of Pulau Biawak Indramayu Ensiklopedia. This name was chosen because it can represent the name of the place (Biawak Island), the name of the district (Indramayu), and the name of the media being created (encyclopedia). The content contained in PULBIN PEDIA is a profile of Biawak Island and conservation on Biawak Island accompanied by details of sub-content and multimedia elements. PULBIN PEDIA has a control device that allows users to explore its contents independently. The layout of the digital encyclopedia is shown in the following image.

Figure 1

The layout of Biawak Island Digital Encyclopedia

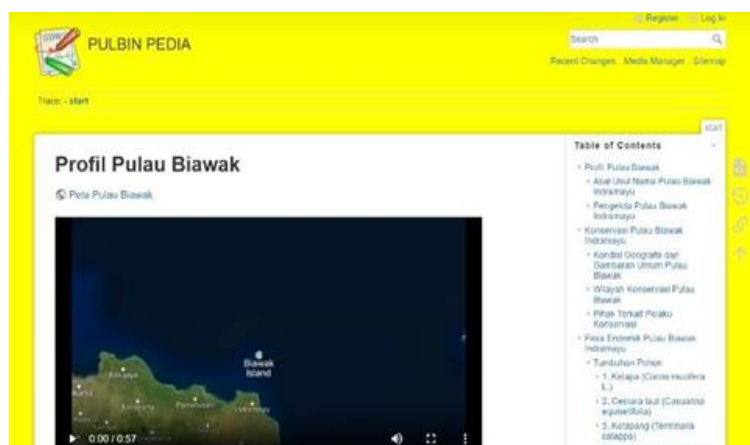
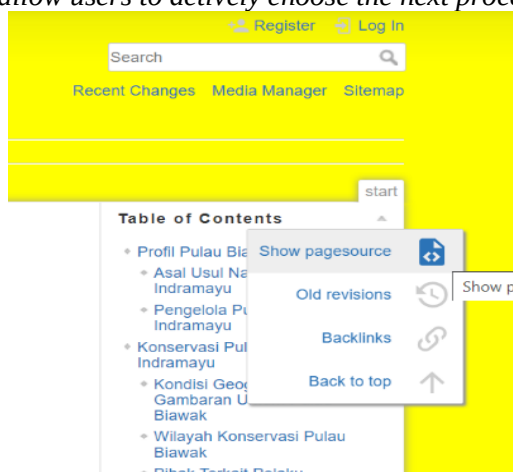


Figure 2.

View of Control devices that allow users to actively choose the next process



Learning that uses PULBIN PEDIA as a learning resource is carried out using problem-based learning strategies. During the lesson, data was collected through observation, documentation, interviews, and field notes with the following results.

Problem Orientation

Students are oriented to the problem of "Biawak Island conservation and the challenges of its conservation". Students are oriented to the problem "Please open the PULBIN PEDIA website, Biawak Island is a conservation area in Indramayu district, you write down 3 (three) conservation problems that you find based on information from PULBIN PEDIA". Students open the PULBIN PEDIA website and study the information available in it in the form of photos and videos about the location of Biawak Island and a narrative about the origin of the name Biawak Island.

Organizing to learn

Students are divided into 5 groups and given instructions to sit in a circle and open e-learning prepared by the lecturer. Each group was given the same series of questions and the students answered these questions directly on the e-learning platform. The use of e-learning is to make it easier for lecturers to carry out assessments.

Guiding the investigation

Students discuss in groups and look for answers to the question "3 (three) conservation problems" by searching for information available in PULBIN PEDIA in the form of photos, videos, and narratives about the management of Biawak Island, the conservation of Biawak Island and the conservationists of Biawak Island. Students continued their investigation regarding "Which of the biodiversity on Biawak Island has been conserved (fulfilling the aspects of protection, preservation, sustainable use), and which of its existence is threatened and requires further efforts to save it?". The following is an example of a student's answer.

Figure 3

Student's answer to question "3 (three) conservation problems"

• Kesulitan dalam menjaga serta memelihara hewan adalah tidak terdapatnya fasilitas dalam menangkap ikan salah satunya tidak adanya jala untuk menangkap ikan yang merupakan makanan utama hewan biawak tersebut. • Pengelolaan hutan atau flora yang ada dipulau biawak terdapat kendala karena tidak ada utusan dalam pengelolaan mangrove dipulau rakit atau biawak tersebut karena hutan mangrove tersebut bukan tanggung jawab dari Dishub. • Kesulitan dalam menjaga kelestarian hewan biawak ini adalah kesulitan mencari ikan karena kendala fasilitas jaring atau jala dalam menangkap ikan yang merupakan makanan utama bagi hewan biawak tersebut.	1. The difficulty in looking after and caring for animals is that there are no facilities for catching fish, one of which is the absence of nets to catch fish, which is the main food for these monitor lizards. 2. There are obstacles in managing the forests and flora on Biawak Island because there are no delegates in managing the mangroves on Rakit or Biawak Island because the mangrove forests are not the responsibility of the Department of Transportation. 3. The difficulty in preserving these monitor lizards is the difficulty of finding fish due to obstacles in netting facilities for catching fish which is the main food for these monitor lizards.
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Develop and present the result

Students develop the results of the investigation into a solution "How to preserve the biodiversity of Biawak Island". The results of the solution are then presented through a presentation. Each group presents the solutions they have made to other groups and the activities are guided by the lecturer. The following is an example of a student's answer.

Figure 4

Student's answer of the question "How to preserve the biodiversity of Biawak Island"

Berikut adalah beberapa solusi untuk melestarikan keanekaragaman hayati pulau biawak : 1. Mengembangkan ekowisata, hal ini dapat dilakukan dengan mengidentifikasi potensi dan masalah dipulau tersebut serta mengembangkan kegiatan ekowisata yang sesuai dengan tujuan konservasi pulau biawak 2. Melindungi dan melestarikan keanekaragaman hayati pulau, hal ini dapat dilakukan dengan cara restorasi habitat, reboisasi dan pembentukan kawasan lindung 3. Meningkatkan kesadaran, hal ini dapat dilakukan melalui program pendidikan dan sosialisasi serta melibatkan masyarakat setempat dalam upaya konservasi 4. Perlindungan kolaboratif, hal ini dapat melibatkan kerja sama dengan masyarakat setempat, LSM dan pemangku kepentingan lainnya untuk mengembangkan dan melaksanakan strategi konservasi yang disesuaikan dengan kebutuhan pulau	Here are some solutions to preserve the biodiversity of Lizard Island 1. Developing ecotourism, this can be done by identifying the potential and problems on the island and developing ecotourism activities that are in accordance with the conservation objectives of Biawak Island. 2. Protecting and preserving island biodiversity, this can be done by means of habitat restoration, reforestation and the establishment of protected areas 3. Increasing awareness, this can be done through education and outreach programs as well as involving local communities in conservation efforts 4. Collaborative protection, this can involve working with local communities, non-governmental organizations and other stakeholders to develop and implement conservation strategies tailored to the needs of the island
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Analyze and evaluate problem-solving

Students analyze and evaluate problem solutions presented by each group of presenters and then respond to each other through class discussions. After the class discussion session has finished, the results of the solutions and reflections are refined by the lecturer.

Discussion

At the stage of problem orientation and organizing to learn the results the entire group can formulate 3 (three) conservation problems by searching for information on PULBIN PEDIA through reviewing information and observing available images and videos. Based on the analysis, information was obtained that almost all the answers made by students were in PULBIN PEDIA. Observation results also show that few students open other sites to find answers. This shows that PULBIN PEDIA can be said to be integrated in terms of media because it has provided information regarding the conservation of Biawak Island in a complete, structured, and systematic manner. According to Ikhwanudin (2018), the characteristics of integrated media are combining various subjects/disciplines by determining the main points to find concepts, skills, and attitudes in various disciplines. Integrated learning can be packaged with the theme or topic of a discourse that discusses various aspects of the field of study that is easy to understand learners (Murfiah, 2017).

At the stage of guiding the investigation give the results that the whole group can investigate the answer to the question of which components have been conserved, and which are endangered. Based on observations, it can be seen that the learning activities that occur are students reading and identifying one by one the names of plant and animal species on Biawak Island on the PULBIN PEDIA website. This can be happened because information about endemic animals and plants on Biawak Island is fully available on PULBIN PEDIA, where the information is presented in the form of narratives, photos and videos. The narrative includes taxonomic data, morphological descriptions and practical benefits of the animal or plant.

This learning activity related to the cognitive schema that has been formed because allows students to know the names of animals and plants on Biawak Island so they can apply this knowledge to the question "which species are conserved and which are endangered". The cognitive schemes that have been formed in the previous stage are the reason why students can answer questions that are about the application of knowledge. According to Aleksandrov & Levitskaya (2018), the application of integrated media education technology in the educational process provides a link between theoretical and practical components of education. Cognitive schemata formed in the course of reflexive and analytical activities based on media texts can be extrapolated to life and professional practices, and enrich students' behavior repertoire (Aleksandrov & Levitskaya, 2018).

At the stage of development and present give the results that the whole group can put the solutions to preserve the biodiversity of Biawak Island. Based on observations, it was found that the learning activities that occurred involved students discussing with their groups, exchanging ideas regarding solutions to preserving Biawak Island, and then obtaining mutually agreed answers. The formulated solution is very diverse, where the answers given by one group are different from those of another group. This means that the resulting solution does not come from PULBIN PEDIA, but is purely the result of student thinking. PULBIN PEDIA in this case only plays a role in providing comprehensive, real, and up-to-date information for the formulation of these solutions. Technology-enhanced the demand for innovative and creative teachers in the media that will be used in the learning process (Bukhori & Setyawati, 2015). Learning media is very necessary to prepare teachers to support the delivery of learning materials. It means teachers need media aid to effectively communicate with students in the learning process (Pratiwi, et.al, 2014).

Digital learning media such as digital encyclopedias has various advantages because of its dynamic and interactive characteristics. Frey & Sutton (2010) said that multimedia learning in the classroom is not a new phenomenon, but advances in computer technology enable multimedia to be developed to present learning material interactively. PULBIN PEDIA is a dynamic interactive web that is a learning resource for bioconservation lectures. Dynamic because conservation activities and biodiversity in a particular area will usually always change over time (Nahdi, 2008; Irni et al., 2017; Tefarani et al., 2019). Interactive because contains information in the form of text narratives combined with visual (photo) and audiovisual (video) multimedia (Tuma, 2021). Another advantage of PULBIN

PEDIA is that it is easy to use because of its dynamic and interactive character. Tatroe & MacIntyre (2020) said that the advantage of dynamic and interactive digital learning media is that it is easy to use.

4. Conclusion

First, PULBIN PEDIA is an interactive and dynamic media and can be implemented as an integrated learning resource in Bioconservation lectures because it contains complete and accurate information regarding the location, origin of the name, management, conservation activities, conservation actors, and biodiversity (plant and animal) on Biawak Island. This information is presented in the form of narrative and multimedia such as photos and videos. Second, PULBIN PEDIA can be implemented as a learning resource in lectures that apply problem-based learning strategies. Through the information presented, students can find 3 (three) conservation problems, investigate answers to three conservation problems, investigate components that have been conserved, as well as components whose existence is threatened, and formulate solutions on how to preserve Biawak Island.

Limitations

The scope of this research is limited to the implementation of PULBIN PEDIA as a learning resource in Bioconservation lectures, specifically focusing on the conservation of Biawak Island. The content includes information about the island's location, name origin, management, conservation activities, conservation actors, and biodiversity, presented through narrative, photos, and videos. The research applies PULBIN PEDIA within a problem-based learning (PBL) approach, where students identify and investigate three specific conservation issues related to the island. This study does not explore other learning strategies or conservation areas beyond Biawak Island, and the outcomes are constrained to the effectiveness of PULBIN PEDIA within this particular educational context.

Acknowledgments

We would like to express our deepest gratitude to Universitas Negeri Yogyakarta and Universitas Wiralodra for their invaluable support throughout this project. Special thanks go to all the contributors who helped make the development of PULBIN PEDIA: An Interactive Dynamic Web as a Bioconservation Learning Resource for Preservice Science Teachers possible. We are particularly grateful to our colleagues in the Department of Science Education and the Department of Biology Education for their dedication and collaboration. Lastly, we extend our appreciation to the preservice science teachers who participated in this study, whose feedback greatly contributed to the refinement of PULBIN PEDIA. This project would not have been possible without the continuous encouragement and efforts from everyone involved.

Author Contribution

Ismail Fikri Natadiwijaya: Conceptualization, Writing - Original Draft

Eva Yuliana: Editing, Visualization

Sugianto: Review & Editing

Dwi Fauzi Rachman: Formal Analysis

Nur Subkhi: Methodology

Lesy Luzyawati: Validation and Supervision.

Funding Statement

This research was supported by funding Universitas Wiralodra. The author would like to acknowledge the financial assistance provided, which was instrumental in facilitating the research activities and the publication of this work.

Conflict of Interest

The authors declare no conflict of interest.

Additional Information:

Additional information is available for this paper.

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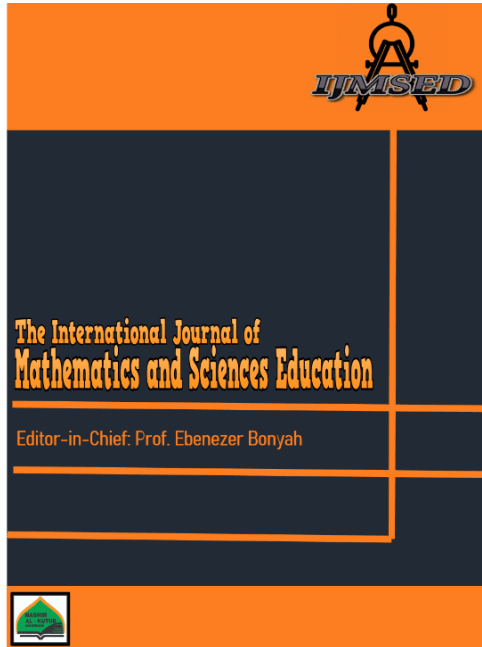
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The International Journal of Mathematics and Sciences Education

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<https://nakiscience.com/index.php/IJMSEd>

3



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To cite this article:

Natadiwijaya, I.F., Yuliana, E, Sugianto, Rachman, D.F., Subkhi, N, Luzyawati, L. (2024). PULBIN PEDIA: An interactive dynamic web as a Bioconservation learning resource for preservice science teachers. *The International Journal of Mathematics and Sciences Education*, 2(1), 10-17.

To link to this article:

<https://nakiscience.com/index.php/IJMSEd>

Published by:

Nasir Al-Kutub Indonesia

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Abstract

Bioconservation is an interdisciplinary science whose purpose is to encourage the development of theory and application in conservation areas. Biawak Island is one of the leading conservation areas in the Indramayu district, therefore Bioconservation learning should be done directly on Biawak Island. In practice, studying Bioconservation directly on Biawak Island is difficult because of the long distance and expensive access to this place. Based on these problems, an interactive dynamic web in the form of a digital encyclopedia is a solution for the problem. Digital encyclopedia named "PULBIN PEDIA". That was implemented in one of the private universities in West Java. The design used is Descriptive Qualitative. A qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. This research was conducted on 24 students who were taking the course of Bioconservation in the academic years of 2023/2024. The results of the analysis from observations found that PULBIN PEDIA is an interactive and dynamic media and can be implemented as an integrated learning resource in Bioconservation lectures because it contains complete and accurate information regarding the location, origin of the name, management, conservation activities, conservation actors and biodiversity on Biawak Island. PULBIN PEDIA also can be implemented as a learning resource in lectures that apply problem-based learning strategies where students can find 3 (three) conservation problems, investigate components that have been conserved, and formulate solutions on how to preserve Biawak Island.

Article History

Received:

23 January 2024

Revised:

02 April 2024

Accepted:

28 May 2024

Published Online:

01 June 2024

Keywords:

Bioconservation;

Digital encyclopedia;

Interactive dynamic web

1. Introduction

Bioconservation is a science that examines the management and design of a nature reserve to maintain the diversity of habitats and species and minimize this diversity from human, agricultural, industrial and recreational disturbances (Dubynin, 2021). Indonesia has many conservation areas, one of which is Biawak Island. Biawak Island is one of the leading conservation areas with coral reefs and water lizards (*Varanus salvator*) as the main attractions. Therefore, based on these facts, Lizard Island

is a suitable place to learn about bioconservation (Solihudin et al., 2020; Hanjar et al., 2016; Salsabiela et al., 2014).

Biawak Island is located off the coast of the Java Sea and 50 km north of the coast of Indramayu (Rahmadeni et al., 2017). Even though it is an ideal place for studying bioconservation. Biawak Island is difficult to reach because of the long distance and expensive access to this place. Transportation and accessibility to Biawak Island is quite complicated due to the lack of crossing facilities and the travel time is more than 4 hours (Nurlaela & Warlina, 2018). Based on these problems, a solution is needed so that students can still study bioconservation on Biawak Island without having to travel there.

One alternative learning resource that can be used for learning Bioconservation is a digital encyclopedia. A digital encyclopedia is an Interactive Dynamic Web with structured and in-depth information (Sari et al., 2019). Digital encyclopedias are different from other learning resources because they provide images or illustrations that accompany Bioconservation information according to the topics discussed. Readers will find it easy to find information because it is arranged alphabetically (Audriansyah et al., 2022). According to Aulia et al. (2021), encyclopedias can be used as a learning resource with accurate and up-to-date information and can broaden readers' horizons.

Based on these problems, a digital encyclopedia of conservation on Biawak Island is needed to solve the problem of needing media that can become a medium for studying conservation in this hard-to-reach area. Therefore, this research focuses on describing the characteristics of the digital encyclopedia that was developed, describing the implementation of products in teaching and learning activities. Therefore, this research focuses on the implementation of products in learning which are described in qualitative descriptions of learning activities that occur among students during bioconservation lectures who use digital encyclopedias as learning resources and student responses to the digital encyclopedias they use.

2. Method

This research is an implementation of the development of a digital encyclopedia named "PULBIN PEDIA". The design used is Descriptive Qualitative. A qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. Qualitative descriptive research is aimed at describing and illustrating existing phenomena, both natural and human-engineered, which pays more attention to characteristics, quality, and interrelationships between activities. This qualitative approach aims to obtain complete information about the "implementation of the PULBIN PEDIA digital encyclopedia in Bioconservation learning". The participants in this research were 24 students who took a Bioconservation course at a university in Indramayu Regency in the 2023/2024 academic year.

In this study, researchers used data collection techniques using observation, documentation, interviews, and field notes. Observation techniques are carried out by direct observation of the learning activity of the Bioconservation lecture. In addition, researchers used in-depth interview techniques in the form of semi-structured interviews to obtain more accurate data regarding the use of digital encyclopedias by preservice science teachers. Before conducting in-depth interviews, the researcher explained the research topic briefly and clearly. In this study, the Data Analysis technique used qualitative data analysis from Miles and Huberman (Emzir, 2016), which consisted of three stages: (1) data reduction; (2) data presentation; and (3) drawing/verifying conclusions. Qualitative data analysis is inductive, after analysis of the data is carried out, certain relationship patterns are then developed so that conclusions are obtained.



3. Results and Discussion

Results

a. PULBIN PEDIA

The digital encyclopedia can be freely accessed at the link <https://publinpedia.vilabio.my.id/go/doku.php?id=start>. The programming language used to create digital encyclopedias is PHP (Hypertext Preprocessor). PHP is an open-source programming language generally used to build interactive and dynamic web applications. Interactive means that the encyclopedia contains many elements (text, visuals, audiovisuals) equipped with control devices (click or arrow buttons) that allow users to choose the following process actively. Dynamic means that the content in the encyclopedia can be updated regularly. To update the data, the administrator just clicks the log in button (fill in the username and password) then edit or add the desired data. The digital encyclopedia is called PULBIN PEDIA which is an abbreviation of Pulau Biawak Indramayu Ensiklopedia. This name was chosen because it can represent the name of the place (Biawak Island), the name of the district (Indramayu), and the name of the media being created (encyclopedia). The content contained in PULBIN PEDIA is a profile of Biawak Island and conservation on Biawak Island accompanied by details of sub-content and multimedia elements. PULBIN PEDIA has a control device that allows users to explore its contents independently. The layout of the digital encyclopedia is shown in the following image.

Figure 1

The layout of Biawak Island Digital Encyclopedia

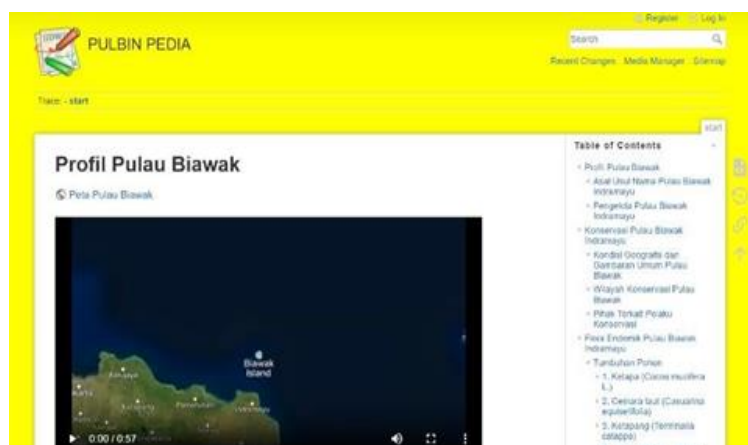
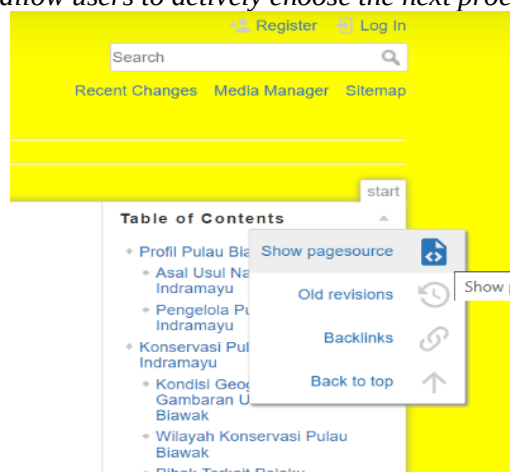


Figure 2.

View of Control devices that allow users to actively choose the next process





Learning that uses PULBIN PEDIA as a learning resource is carried out using problem-based learning strategies. During the lesson, data was collected through observation, documentation, interviews, and field notes with the following results.

Problem Orientation

Students are oriented to the problem of "Biawak Island conservation and the challenges of its conservation". Students are oriented to the problem "Please open the PULBIN PEDIA website, Biawak Island is a conservation area in Indramayu district, you write down 3 (three) conservation problems that you find based on information from PULBIN PEDIA". Students open the PULBIN PEDIA website and study the information available in it in the form of photos and videos about the location of Biawak Island and a narrative about the origin of the name Biawak Island.

Organizing to learn

Students are divided into 5 groups and given instructions to sit in a circle and open e-learning prepared by the lecturer. Each group was given the same series of questions and the students answered these questions directly on the e-learning platform. The use of e-learning is to make it easier for lecturers to carry out assessments.

Guiding the investigation

Students discuss in groups and look for answers to the question "3 (three) conservation problems" by searching for information available in PULBIN PEDIA in the form of photos, videos, and narratives about the management of Biawak Island, the conservation of Biawak Island and the conservationists of Biawak Island. Students continued their investigation regarding "Which of the biodiversity on Biawak Island has been conserved (fulfilling the aspects of protection, preservation, sustainable use), and which of its existence is threatened and requires further efforts to save it?". The following is an example of a student's answer.

Figure 3

Student's answer to question "3 (three) conservation problems"

• Kesulitan dalam menjaga serta memelihara hewan adalah tidak terdapatnya fasilitas dalam menangkap ikan salah satunya tidak adanya jala untuk menangkap ikan yang merupakan makanan utama hewan biawak tersebut. • Pengelolaan hutan atau flora yang ada dipulau biawak terdapat kendala karena tidak ada utusan dalam pengelolaan mangrove dipulau rakit atau biawak tersebut karena hutan mangrove tersebut bukan tanggung jawab dari Dishub. • Kesulitan dalam menjaga kelestarian hewan biawak ini adalah kesulitan mencari ikan karena kendala fasilitas jaring atau jala dalam menangkap ikan yang merupakan makanan utama bagi hewan biawak tersebut.	1. The difficulty in looking after and caring for animals is that there are no facilities for catching fish, one of which is the absence of nets to catch fish, which is the main food for these monitor lizards. 2. There are obstacles in managing the forests and flora on Biawak Island because there are no delegates in managing the mangroves on Rakit or Biawak Island because the mangrove forests are not the responsibility of the Department of Transportation. 3. The difficulty in preserving these monitor lizards is the difficulty of finding fish due to obstacles in netting facilities for catching fish which is the main food for these monitor lizards.
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Develop and present the result

Students develop the results of the investigation into a solution "How to preserve the biodiversity of Biawak Island". The results of the solution are then presented through a presentation. Each group presents the solutions they have made to other groups and the activities are guided by the lecturer. The following is an example of a student's answer.

Figure 4

Student's answer of the question "How to preserve the biodiversity of Biawak Island"

Berikut adalah beberapa solusi untuk melestarikan keanekaragaman hayati pulau biawak : 1. Mengembangkan ekowisata, hal ini dapat dilakukan dengan mengidentifikasi potensi dan masalah dipulau tersebut serta mengembangkan kegiatan ekowisata yang sesuai dengan tujuan konservasi pulau biawak 2. Melindungi dan melestarikan keanekaragaman hayati pulau, hal ini dapat dilakukan dengan cara restorasi habitat, reboisasi dan pembentukan kawasan lindung 3. Meningkatkan kesadaran, hal ini dapat dilakukan melalui program pendidikan dan sosialisasi serta melibatkan masyarakat setempat dalam upaya konservasi 4. Perlindungan kolaboratif, hal ini dapat melibatkan kerja sama dengan masyarakat setempat, LSM dan pemangku kepentingan lainnya untuk mengembangkan dan melaksanakan strategi konservasi yang disesuaikan dengan kebutuhan pulau	Here are some solutions to preserve the biodiversity of Lizard Island 1. Developing ecotourism, this can be done by identifying the potential and problems on the island and developing ecotourism activities that are in accordance with the conservation objectives of Biawak Island. 2. Protecting and preserving island biodiversity, this can be done by means of habitat restoration, reforestation and the establishment of protected areas 3. Increasing awareness, this can be done through education and outreach programs as well as involving local communities in conservation efforts 4. Collaborative protection, this can involve working with local communities, non-governmental organizations and other stakeholders to develop and implement conservation strategies tailored to the needs of the island
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Analyze and evaluate problem-solving

Students analyze and evaluate problem solutions presented by each group of presenters and then respond to each other through class discussions. After the class discussion session has finished, the results of the solutions and reflections are refined by the lecturer.

Discussion

At the stage of problem orientation and organizing to learn the results the entire group can formulate 3 (three) conservation problems by searching for information on PULBIN PEDIA through reviewing information and observing available images and videos. Based on the analysis, information was obtained that almost all the answers made by students were in PULBIN PEDIA. Observation results also show that few students open other sites to find answers. This shows that PULBIN PEDIA can be said to be integrated in terms of media because it has provided information regarding the conservation of Biawak Island in a complete, structured, and systematic manner. According to Ikhwanudin (2018), the characteristics of integrated media are combining various subjects/disciplines by determining the main points to find concepts, skills, and attitudes in various disciplines. Integrated learning can be packaged with the theme or topic of a discourse that discusses various aspects of the field of study that is easy to understand learners (Murfiah, 2017).

At the stage of guiding the investigation give the results that the whole group can investigate the answer to the question of which components have been conserved, and which are endangered. Based on observations, it can be seen that the learning activities that occur are students reading and identifying one by one the names of plant and animal species on Biawak Island on the PULBIN PEDIA website. This can be happened because information about endemic animals and plants on Biawak Island is fully available on PULBIN PEDIA, where the information is presented in the form of narratives, photos and videos. The narrative includes taxonomic data, morphological descriptions and practical benefits of the animal or plant.

This learning activity related to the cognitive schema that has been formed because allows students to know the names of animals and plants on Biawak Island so they can apply this knowledge to the question "which species are conserved and which are endangered". The cognitive schemes that have been formed in the previous stage are the reason why students can answer questions that are about the application of knowledge. According to Aleksandrov & Levitskaya (2018), the application of integrated media education technology in the educational process provides a link between theoretical and practical components of education. Cognitive schemata formed in the course of reflexive and analytical activities based on media texts can be extrapolated to life and professional practices, and enrich students' behavior repertoire (Aleksandrov & Levitskaya, 2018).

At the stage of development and present give the results that the whole group can put the solutions to preserve the biodiversity of Biawak Island. Based on observations, it was found that the learning activities that occurred involved students discussing with their groups, exchanging ideas regarding solutions to preserving Biawak Island, and then obtaining mutually agreed answers. The formulated solution is very diverse, where the answers given by one group are different from those of another group. This means that the resulting solution does not come from PULBIN PEDIA, but is purely the result of student thinking. PULBIN PEDIA in this case only plays a role in providing comprehensive, real, and up-to-date information for the formulation of these solutions. Technology-enhanced the demand for innovative and creative teachers in the media that will be used in the learning process (Bukhori & Setyawati, 2015). Learning media is very necessary to prepare teachers to support the delivery of learning materials. It means teachers need media aid to effectively communicate with students in the learning process (Pratiwi, et.al, 2014).

Digital learning media such as digital encyclopedias has various advantages because of its dynamic and interactive characteristics. Frey & Sutton (2010) said that multimedia learning in the classroom is not a new phenomenon, but advances in computer technology enable multimedia to be developed to present learning material interactively. PULBIN PEDIA is a dynamic interactive web that is a learning resource for bioconservation lectures. Dynamic because conservation activities and biodiversity in a particular area will usually always change over time (Nahdi, 2008; Irni et al., 2017; Tefarani et al., 2019). Interactive because contains information in the form of text narratives combined with visual (photo) and audiovisual (video) multimedia (Tuma, 2021). Another advantage of PULBIN

PEDIA is that it is easy to use because of its dynamic and interactive character. Tatroe & MacIntyre (2020) said that the advantage of dynamic and interactive digital learning media is that it is easy to use.

4. Conclusion

First, PULBIN PEDIA is an interactive and dynamic media and can be implemented as an integrated learning resource in Bioconservation lectures because it contains complete and accurate information regarding the location, origin of the name, management, conservation activities, conservation actors, and biodiversity (plant and animal) on Biawak Island. This information is presented in the form of narrative and multimedia such as photos and videos. Second, PULBIN PEDIA can be implemented as a learning resource in lectures that apply problem-based learning strategies. Through the information presented, students can find 3 (three) conservation problems, investigate answers to three conservation problems, investigate components that have been conserved, as well as components whose existence is threatened, and formulate solutions on how to preserve Biawak Island.

Limitations

The scope of this research is limited to the implementation of PULBIN PEDIA as a learning resource in Bioconservation lectures, specifically focusing on the conservation of Biawak Island. The content includes information about the island's location, name origin, management, conservation activities, conservation actors, and biodiversity, presented through narrative, photos, and videos. The research applies PULBIN PEDIA within a problem-based learning (PBL) approach, where students identify and investigate three specific conservation issues related to the island. This study does not explore other learning strategies or conservation areas beyond Biawak Island, and the outcomes are constrained to the effectiveness of PULBIN PEDIA within this particular educational context.

Acknowledgments

We would like to express our deepest gratitude to Universitas Negeri Yogyakarta and Universitas Wiralodra for their invaluable support throughout this project. Special thanks go to all the contributors who helped make the development of PULBIN PEDIA: An Interactive Dynamic Web as a Bioconservation Learning Resource for Preservice Science Teachers possible. We are particularly grateful to our colleagues in the Department of Science Education and the Department of Biology Education for their dedication and collaboration. Lastly, we extend our appreciation to the preservice science teachers who participated in this study, whose feedback greatly contributed to the refinement of PULBIN PEDIA. This project would not have been possible without the continuous encouragement and efforts from everyone involved.

Author Contribution

Ismail Fikri Natadiwijaya: Conceptualization, Writing - Original Draft

Eva Yuliana: Editing, Visualization

Sugianto: Review & Editing

Dwi Fauzi Rachman: Formal Analysis

Nur Subkhi: Methodology

Lesy Luzyawati: Validation and Supervision.

Funding Statement

This research was supported by funding Universitas Wiralodra. The author would like to acknowledge the financial assistance provided, which was instrumental in facilitating the research activities and the publication of this work.

Conflict of Interest

The authors declare no conflict of interest.

Additional Information:

Additional information is available for this paper.

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