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biokonservasi.id: A Development of a Conservation Education Website in the Mount Ciremai National Park as a Learning Resource

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Abstract

The development of science and technology is inevitable, therefore innovation is needed in every aspect of education to keep up with technological advances, as well as conservation education. This research was conducted with the aim of exploring the environmental service potential of Mount Ciremai National Park (TNGC) by developing a TNGC conservation education *website*. The TNGC conservation education *website* to support environmental awareness was developed using the *Research and Development* (R&D) *research* method. Using the *Four-D* model which is carried out until the *disseminate* stage. At the design stage, the *Multimedia Development Life Cycle* (MDLC) method was used because the TNGC conservation education *website* is a multimedia product. Based on the results of the material and media expert test assessment, the TNGC conservation education *website* to support environmental awareness received an average score of 81.89, which means it falls into the feasible category. These results are obtained based on the results of data processing for material aspects of 81.47; and media aspects of 82.31. The development of this *website* media is expected to be one of the alternative learning resources for sustainable conservation education, especially within the Department of Biology and generally for the wider community.

Keywords: Website Development, Conservation Education, Mount Ciremai National Park, Learning Resources, Ecotourism

INTRODUCTION

Education is one of the aspects affected by the rapid use of the internet in the era of the industrial revolution 4.0 (Lase, 2019; Muhaimin *et al*., 2019; Alakrash & Razak, 2022; Meisuri *et al*., 2023; Alshammari, 2024). The development of internet technology ultimately affects the learning system (Prasojo *et* al., 2017; Purwanto *et al*., 2023; Costa *et al*., 2022). *Online, blended* and *hybrid* learning alternatives *in* this era are no longer limited by time and space. Advance in internet technology also play a role in the learning process, while educators as facilitators are encouraged to be able to present media according to the development of the digital era. One of the multimedia that can provide many applications such as images, videos, e-book collections, and discussion forums is a *website. Website* is a program designed as a collection of *web* pages accessed through the *homepage* of a *browser* that is certainly integrated with the internet network (Aprilia *et al.*, 2014). Sadikin *et al*. (2020) emphasized that the development of *website-based* biology interactive multimedia has a high aspect of attractiveness for students.

Conservation education for Biology students at public university in Cirebon is provided through the Conservation Biology course. Conservation education have great potential to be integrated through internet technology with contextual learning resources through the surrounding environment that is close to students. Ecotourism environmental services are the main focus of this research. Environmental services are known as services from natural or artificial ecosystem functions that can provide benefits in the form of maintaining and improving the quality of the environment and social culture of the community through sustainable ecosystem management (Simarmata & Triastuti, 2021; Leksono *et al*., 2020).

The scope of environmental services that have great potential to be developed includes ecotourism. Ecotourism is a model of tourism development carried out in natural areas where its existence contributes to environmental and cultural conservation efforts and improves the welfare of the surrounding community (Ekanara *et* al., 2023; Simarmata & Triastuti, 2021; Henri *et al*., 2021; Arniawati & Anshar, 2017; Damanik & Weber, 2006; Astriani, 2008). Nugroho (2011) states that ecotourism is part of the educational element when managed professionally because it contains the concept of environmental conservation and is able to improve the economy of the local community. In its development, ecotourism has become a representative concept as a conservation strategy to protect ecosystems in natural areas (Henri *et al*., 2017). Ecotourism can be used as a learning resource in sustainable environmental conservation education. However, ecotourism needs to be designed that can be widely accessed through website development to expand the accessibility of learning resources.

Natural tourist attraction is one of the areas that can be used as ecotourism. Based on Law No. 9 of 1990, the definition of natural attractions is the potential of natural resources or cultivation efforts that are able to attract visitors (Republic of Indonesia, 1990b). This potential includes diversity of flora and fauna, natural phenomena, ecosystem uniqueness, local wisdom and cultivation of natural resources. The area that can fulfill these criteria in Cirebon Region III is Mount Ciremai National Park (TNGC). The Mount Ciremai National Park (TNGC) area is located between two districts, namely Kuningan Regency and Majalengka Regency, West Java Province. The TNGC area has an area of 15,383 Ha with various types of unspoiled mountain forest ecosystems scattered in various ecotourism areas.

The existence of the TNGC ecotourism area can be a representative learning resource for Tadris Biology students in biological natural resource conservation education. The potential diversity of biological natural resources, the uniqueness of the ecosystem and the various tourist facilities and products found in the TNGC ecotourism area will be a special attraction to be packaged as a *web-based* learning resource. The need for effective

conservation education is paramount in addressing global biodiversity loss (Sodhi *et al*., 2010). Mount Ciremai National Park (TNGC) in Indonesia boasts rich biodiversity, but faces threats like habitat loss and unsustainable practices (Budiman *et al*., 2022). While existing efforts exist, a dedicated website focusing on conservation education for TNGC is currently lacking. This research aims to develop a website – "biokonservasi.id" – specifically designed to address this gap, serving as a comprehensive learning resource for the public, students, and conservation practitioners.

METHOD

This research was designed by the *research and development* (R&D) method. The design is adjusted to the research objectives which aim to produce a product in the form of a *website* based on the potential utilization of ecotourism environmental services in the TNGC area as a learning resource for sustainable conservation education in the Tadris Biology Study Program. The development method used refers to the development model proposed by Thiagarajan *et al*. (1974) known as the 4D development model. With 4 stages carried out in this study whose flow can be seen in Figure 1.

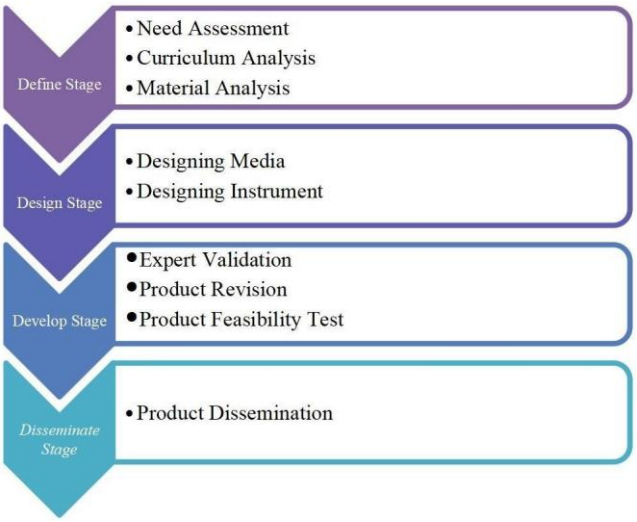

Figure 1. *Research and Development* Flow of Conservation Education Website Development in the Ecotourism Area of Mount Ciremai National Park as a Learning Resource

RESULTS AND DISCUSSION

This research developed a conservation education website which was carried out through the stages of *Define, Design, Develop,* and *Disseminate* which are described in detail as follows.

1. *Define Stages* of Conservation Education *Website*

The define stage was carried out with the aim of gathering information about the conservation education process that has been carried out, conservation problems that occur in TNGC, and how the curriculum and materials are appropriate to be used to develop a TNGC

conservation education *website* for Environmental Awareness. The *define* stage includes needs analysis, curriculum analysis and material analysis.

a. Needs Analysis

The needs analysis was conducted by interviewing several respondents, namely officers at the TNGC ecotourism site and residents around TNGC. The needs analysis aims to find out initial information, existing conservation problems, efforts that have been made and conservation education that exists in the TNGC area and the community around TNGC. Referring to the results of the interviews, several conservation efforts have been carried out in the TNGC area, such as providing education to local communities, making invitation and prohibition posters, and holding area patrols. Some of these prohibitions' posters aim to solve various problems that exist in the TNGC area. Based on the results of interviews conducted, the problems that occur in the TNGC conservation area are TNGC land encroachment, poaching, and illegal logging. This is similar to Wahyono (2005) who states that common problems in conservation areas committed by the community are encroachment, hunting, theft, pollution, and others. Limited sources of information on efforts to preserve the area and the utilization of the TNGC area are the cause of some of the problems that occur. This is because the conservation education that has been conducted has not achieved all aspects of conservation education as according to Setyowati (2014), namely aspects of knowledge, awareness, behavior, skills, and participation.

The aspects of conservation education that have been carried out in TNGC are only in the knowledge and awareness aspects. The knowledge aspect is the aspect that helps individuals, groups and communities to gain various experiences and gain knowledge about what is needed to create and maintain a sustainable environment through the distribution of brochures, posters and counseling to the community. In addition to the knowledge aspect, the aspect that has been carried out is the awareness aspect, which is an aspect that helps social groups and individuals to gain awareness and sensitivity to the environment as a whole along with accompanying issues, questions, and problems related to the environment and development which is applied through the creation and installation of information boards as a form of prohibition and warning. Aspects that have not been applied are aspects of behavior, skills, and participation, causing the community not to have caring behavior towards nature conservation, skills in nature conservation efforts, and a sense of wanting to play an active role in preserving nature.

Karyadi (2011) stated that conservation education has goals that are in line with the goals of environmental education. There are three indicators of concern in environmental

awareness, namely *egoistic* concern (personal interests), *alturistic/humanistic* concern (social/human interests), and *biospheric* concern (ecosystem interests) (Hidayat, 2016). Forest management, along with educational management, is an effective strategy for decreasing environmental deterioration while also improving human well-being (Barak *et al*., 2024). Based on the results of interviews with communities around the TNGC area, the community only has *egoistic* concern (self-interest), namely concern for protecting the environment based on their own impacts and interests. The community does not yet have *alturistic/humanistic* environmental care (social/human interests), which is thinking about nature based on the interests of fellow humans and *biospheric* environmental care (ecosystem interests), which is environmental care thinking about its impact on the ecosystem. The location of villages around the TNGC area, which is far from the outside environment, makes people around the TNGC area think about the impact of what they do independently. People who have *egoistic* environmental awareness only think about the impact of benefits or losses independently (Schultz, 2001).

One of way to optimize conservation education and the achievement of environmental awareness indicators is through the development of the TNGC conservation education *website* for Environmental Awareness. The *website* contains information that can be done by everyone in an effort to utilize and preserve the TNGC environment so as to achieve all aspects of conservation education and environmental awareness indicators.

b. Curriculum Analysis

The TNGC conservation education *website* for Environmental Awareness was created referring to the five aspects or areas that are the objectives of conservation education (knowledge, awareness, behavior, skills, and participation) (Setyowati, 2014) and three indicators of environmental awareness as a curriculum (*egoistic*, *humanistic*, and *biospheric*) (Hidayat, 2016). The development of the TNGC conservation education *website* for environmental awareness that refers to the conservation education curriculum is expected to be able to provide understanding to the wider community on knowledge, awareness, behavior, skills and participation in protecting the environment. In addition, it is expected that the community also has concern for the environment in an *egoistic*, *humanistic*, and *biospheric manner*. *The* curriculum analysis stage is carried out by compiling competencies in each aspect, then derived into several indicators. There are four derivative indicators on the knowledge aspect and two derivative indicators on the aspects of awareness, behavior, skills and participation. Curriculum analysis is carried out to link the aspects or fields of conservation education, competencies, and indicators with the content on the *website* so as to

achieve the objectives of the TNGC conservation education *website* for Environmental Awareness.

The TNGC conservation education *website* has materials on each menu that can provide knowledge and understanding of the environment, especially in TNGC and how to protect it. The materials are provided to achieve the goal of conservation education in the field of knowledge. Through the achievement of the knowledge field, it will be easy to achieve other conservation education goals (Mulyawati *et al.,* 2024). TNGC's conservation education *website* has materials and images that are expected to achieve the conservation education goal of awareness. Examples of materials and images to achieve this goal are found in the photos and flora/fauna sub menus. TNGC's conservation education *website* also contains material about the benefits of the environment and its contents, especially in TNGC. The material aims to achieve the conservation goal in the field of attitude or behavior. On the TNGC conservation education *website,* there are also photos and materials that show ways to protect and preserve the environment, especially TNGC. This aims to achieve the conservation goal in the field of skills. On the TNGC conservation education *website, there is* also a notice on how to come to TNGC and a field guidebook that will guide visitors to go directly to the environment, especially TNGC. This aims to achieve the goal of conservation education in the field of participation (Setyowati, 2014). This is consistent with previous research indicating that incorporating student participation into conservation education might improve its effectiveness (Igei *et al.,* 2024; Kurokawa *et al*., 2023; Agarwal *et al.,* 2017).

c. Material Analysis

Material analysis is carried out by analyzing the relevance between the material demanded through the current situation and the material studied in the developed product. In order for the material studied in the developed product to be relevant to the current situation, the author uses the latest research data. Therefore, the *website* developed in this study used data from the research results of several researchers in TNGC. The previous research results used as secondary data in the development of this research product also refer to the five areas of conservation education objectives. Therefore, the TNGC conservation education *website* using data from research results on the diversity of several flora and in TNGC is expected to be able to make visitors to the TNGC conservation education *website* achieve the five areas of conservation education goals. In addition, the TNGC conservation education *website* is also linked to environmental awareness so that the TNGC conservation education *website* also supports the achievement of environmental awareness of *website* visitors (Hidayat, 2016).

2. *Design Stages of* Mount Ciremai National Park (TNGC) Conservation Education *Website* for Environmental Awareness

The design stage aims to develop a TNGC conservation education *website* product. This product pays attention to material and media aspects in the assessment criteria in order to become a feasible product based on expert testing. The *design* includes media design and assessment instrument design.

a. Media Design

The media design stage is the stage of making the TNGC conservation education *website* until the form of this *website* can be seen and used. The media design stage in the development of the TNGC conservation education *website* uses the *Multimedia Development Life Cycle* (MDLC) method, which has six stages, namely *concept, design, material collecting, assembly, testing* and *distribution*. The six stages do not have to be done sequentially, but the *concept* stage must be done first before doing the other stages (Amali *et al.*, 2024; Saputra *et* al., 2024; Luther, 1994).

1) *Concept*

The most important thing at the concept stage is to determine the purpose of the product as well as the users of the product. TNGC's conservation education *website was* created to be used as a learning resource for conservation education to support environmental awareness in the community at large. Conceptualizing the curriculum and materials is also important. The curriculum and materials have been analyzed at the curriculum and materials analysis stage in the previous stage, namely the *define* stage. The curriculum used is a curriculum that makes reference to the five aspects or areas of conservation education objectives (knowledge, awareness, behavior, skills, participation) (Setyowati, 2014) and indicators of growing environmental awareness (*egoistic*, *humanistic*, and *biospheric*) (Hidayat, 2016). The materials used on the TNGC Conservation Education *Website are* tailored to the purpose of developing this *website* and the conservation education curriculum. The materials used are also the latest materials to be relevant to the current or latest situation in the field.

2) *Design*

In the design stage, a detailed *website* specification is made regarding the architecture, as well as the appearance and needs in a TNGC conservation education *website* design. At this stage, the initial design of the product to be developed is compiled in the form of navigation. Navigation is made to show the workflow of the *website* between one page and another. The main page (*Home*) is the first page encountered when opening the TNGC conservation education *website* as well as the flow to other pages. The field of knowledge and awareness can be found in each menu on the *website*. This is because on the menu visitors can

find information about conservation education. The attitude or behavior field and the skills field can be found on the available menu. Participation can be found on the menu because through the menu visitors have the opportunity to play an active role in conservation activities. This is in accordance with Karyadi (2011) who argues that everything that facilitates maintaining or improving the environment can support the indicators of conservation education goals in the field of participation. The *website* design contains the initial page preparation plan and its description. The initial preparation includes a visualization description of each page of the TNGC conservation education website. The navigation design of the conservation education *website* in the Mount Ciremai National Park Ecotourism Area can be seen in Figure 2.

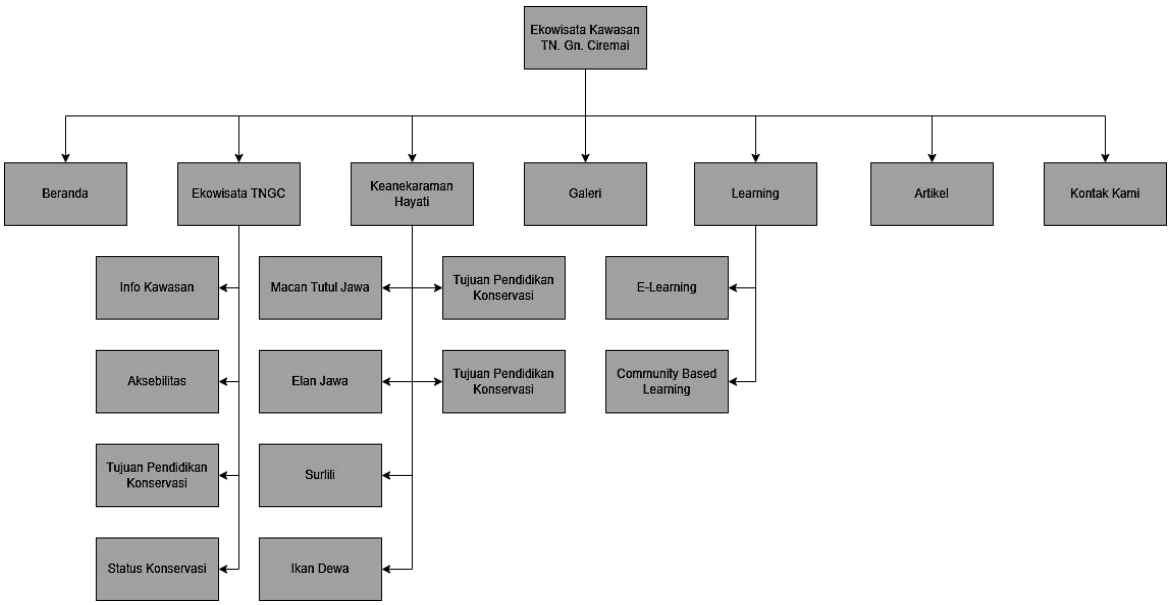

Figure 2. Navigation of the Conservation Education *Website* in the Mount Ciremai National Park Ecotourism Area.

3) *Material Collecting*

The material collection stage is the stage of collecting all the materials needed as mandatory or supporting materials in developing the TNGC Conservation Education *Website*. These materials include images, videos, audio, and various materials that have been obtained from primary sources or materials that need to be modified. This stage is done in parallel with the *assembly* and *distribution* stages. All images and icons that have been collected are used as materials on the TNGC conservation education *website, which* can add value to the attractiveness and make it easier for users to recognize objects and *website* content. The images used are images obtained from personal documentation at TNGC. This is in accordance with the opinion of Beall *et al*., (1996), Zeegen (2012), Male (2017), and Kozak (2020) that illustrations in the form of photography, images, or diagrams, have an important

role in helping readers recognize objects because they have certain meanings. The images used as materials were obtained from personal documentation and previous studies (Leksono & Firdaus, 2017).

All materials used as videos on the TNGC Conservation Education *Website* are obtained from personal documentation such as taking pictures or photos. The video obtained is then edited with audio obtained from *youtube.com* with *copyright-free* status to make a real video material. The video editing process uses *Adobe Premiere CS5* and *AVS Vidio Editor* applications. The actual video material is then uploaded to *youtube.com* which will be used as material on the video page on the *website* menu in Figure 3.

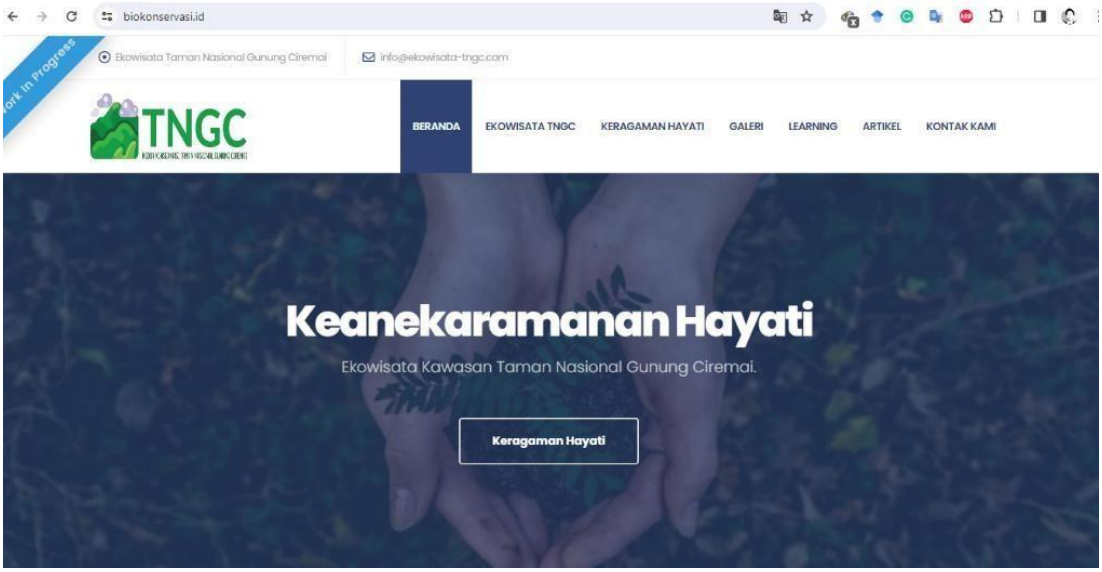

Figure 3. Home Page of TNGC Conservation Education *Website*

The materials used as materials on the TNGC conservation education *website* are materials that are in accordance with the objectives and curriculum used by the TNGC conservation education website. In addition, the materials on this *website* must be sourced from the latest research data to be relevant to the current situation. Therefore, the *website* developed in this research uses the latest research data. The last material needed is the address and contact info of TNGC and the team. This material was used to complete the contact page on the TNGC conservation education *website*. TNGC's address and contact info were obtained from the executive summary of TNGC's profile. This info is needed to support the achievement of conservation education goals in the field of participation. Visitors to the TNGC conservation education *website* can play an active role starting with actively contacting the address and contact information on the contact menu. According to Karyadi (2011), anything that facilitates an active role in maintaining and improving the environment can support the goals of conservation education in the field of participation. Conservation

education plays a vital role in tackling sustainability issues by empowering individuals and communities to actively participate in environmental conservation, establishing harmonious interactions between humans and the environment (Yang & Fang, 2024).

4) *Assembly*

The creation stage is the stage of combining and collaborating various existing TNGC conservation education *website* materials. This stage includes creating a *website* logo, *domain name*, and TNGC conservation education *website*. The creation of the *website* refers to the navigation created at the *design* stage. Through the creation that refers to the design stage, it is expected that the five areas of conservation education objectives on the TNGC conservation education *website will be* achieved. All work in the design stage was done on an HP 14-g008au *Notebook* PC. This device is installed with AMD A8-6410 APU processor with AMP Radeon R5 graphics controller and 2 GB RAM. This device is also supported by Windows 10 Pro as the operating system. The use of devices that have these specifications aims to make the process of making the TNGC conservation education *website* run smoothly. However, these specifications were previously the minimum specifications recommended by researchers. The possibility that will occur if using a device with specifications below those that have been recommended will occur several obstacles and problems. The obstacles and problems that occur are the slow process due to long *loading* times; some supporting *software* cannot be used; and can damage the device itself if forced.

A logo is an important aspect of creating a *website*. The logo is able to symbolize character, identity, and various meanings implied in it. This is in accordance with the opinion of Widiyanto & Febriansyah (2013) and Nabila (2018) which states that a logo becomes an acknowledgment, pride, inspiration of trust, honor, success, loyalty and excellence implied in a form or image. The process of creating a logo for the TNGC conservation education *website* in Figure 4 used a Corel Draw X8 software.

Figure 4. Logo of TNGC Conservation Education *Website*

The next step in the creation stage is the creation of a *domain name*. *Domain name* or commonly referred to as URL (*Uniform Resource Locator*) is a unique address on the internet that is commonly used to identify a *website*. *Domain names are* usually traded on an annual rental system. If the tenant does not pay the following year, the domain name will

automatically become inaccessible (Risdanto, 2014). TNGC's conservation education *website* uses an annual rental system *domain name*. *Domain name* rental is done together with *web hosting* rental. *Domain name* rental and *web hosting are* entrusted to niagahoster.co.id. The *domain name* used as the unique address of TNGC's conservation education *website* on the internet is biokonservasi.id that can be seen in Figure 5. The use of ".id" in the *domain name* extension means that the TNGC conservation education website was developed to be accessed by the general public. The ".id" extension is an extension that signifies the Indonesian region (Risdanto, 2014).

Figure 5. *Website* Name and *Domain* Name

The next step in the manufacturing stage is *website* development. *Website* development is based on *Content Management System* (CMS). The use of CMS in *website development* aims to make it easier for *website* developers, because developers do not need to understand programming languages too deeply to be able to develop a *website* (Junaidi, 2011). The CMS used in the development of this *website* is *Wordpress*. *Wordpress* installation is done on a paid basis which has become a *web hosting* service rental package and *domain name* from https://niagahoster.co.id. *Worpress* that has been installed is then set up so that the *website layout* can be arranged as closely as possible to the planning that has been made at the design stage. *Template* settings can be done on the theme menu on the *wordpress dashboard* page in Figure 6. The template used is *LandingPress Elementor*. The use of *Landingpress Elementor* as a *template is* due to the ease of setting and layout offered by *LandingPress Elementor*.

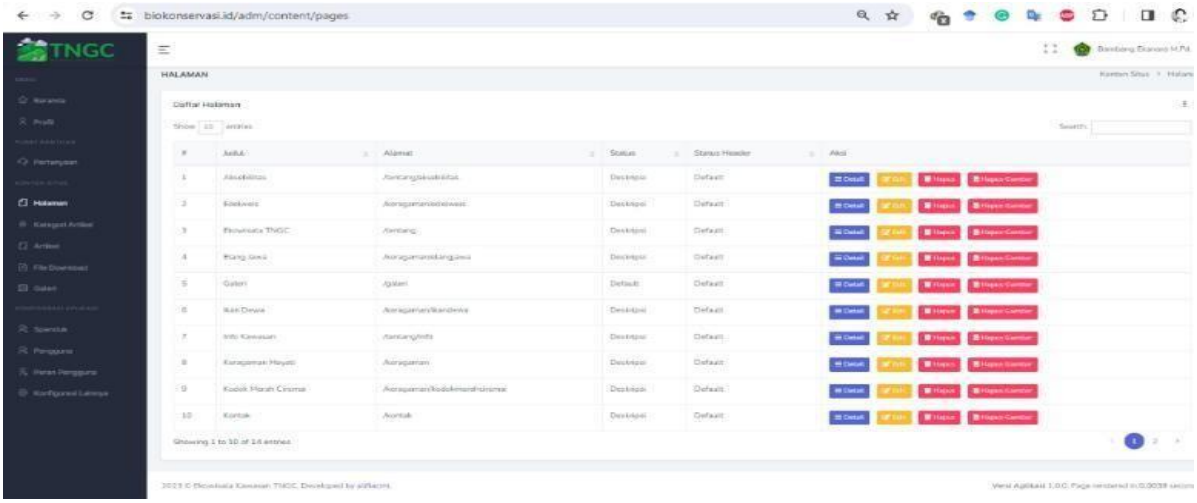

Figure 6. *Website Dashboard* Page

The header is the next part that needs to be created. *Header* is the topmost display part on each page. The *header is* made based on the planning that has been designed. There are two parts to the *header*, the header image and the *header* menu. In the *header* image, there is a TNGC conservation education *website* icon logo placed in the left corner of the *header* image. The website header can be seen in Figuire 7.

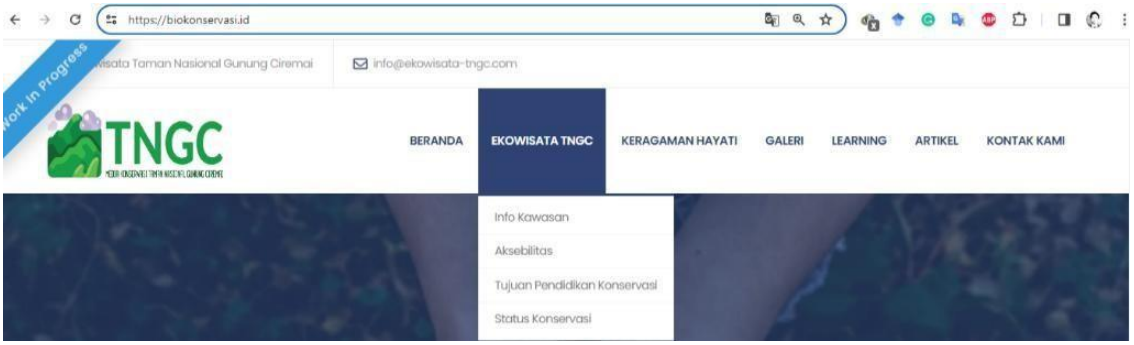

Figure 7. *Website Header*

The home menu is the main page that becomes the first reference when users or *website* visitors access the *domain name* biokonservasi.id. Making a menu or *home* page in accordance with the design. There are several *sections* including *header* and footer. Each *section* except the *header* and *footer* represents a menu on the *website*. These *sections* will take visitors to the menu they represent if they click on the *section* title. This aims to attract visitors to visit all the menus on the *website*. It is necessary for visitors to meet and obtain all aspects of conservation education objectives. Each menu and sub menu on the *website* contains several elements that support the achievement of environmental awareness indicators. There are three indicators of concern as indicators of environmental awareness, namely *egoistic* concern (personal interests), *alturistic/humanistic* concern (social/human interests), and *biospheric* concern (ecosystem interests).

The three indicators of care are listed in the information contained in each paragraph text of each sub menu. *Egoistic* environmental awareness indicators are expressed in sentences that state the benefits that exist for the personal interests of visitors. Indicators of *humanistic* environmental awareness are stated in the sentence of the benefits of each menu that exists for fellow humans on earth. Indicators of *biospheric* environmental awareness are stated in sentences that show the benefits that exist for all inhabitants of nature or ecosystems on earth. This refers to Hidayat (2016) who states that there are three dimensions to environmental awareness, namely: *egoistic* which means being aware of the environment based on self-interest; *humanistic* which means being aware of the environment based on the

interests of fellow humans; and *biospheric* which means being aware of the environment based on the interests of all ecosystems in the environment.

5) *Testing*

The testing stage is the stage of testing the product that has been made. In this research, the testing stage is carried out in parallel with the manufacturing and distribution stages. There are two tests carried out, first *alpha* testing (*alpha test*) testing is carried out by the maker or the maker's own environment. Testing is done by checking the appearance and various displays and features. If there are malfunctions or defects in the product, the product will be repaired. If it has passed the *alpha* test, it is continued in the *beta* test by asking the validator to ensure and examine the product that has been made. The alpha *test is* carried out by checking several aspects, namely *website* usability, *hyperlink* buttons, appearance, responsiveness on various devices, and speed which are carried out randomly. The checks were carried out by the creator or researcher and several research colleagues. All checks that have been carried out repeatedly have not found any errors. To be more convincing the researcher checked with the help of GTmetrix. GTmetrix is a site that provides *website* quality checking services to make it more effective and efficient.

In testing with GTmetrix, the *website* received an A score which means excellent for overall speed and a B score which means good at minimum speed or slow. This shows that the TNGC conservation education *website is* made effectively. This is in accordance with the opinion of Sklar & Farkas (2009), Sklar (2014) and Beaird *et al*., (2020) which states that the faster the *loading* time on the *website, the* more *effective* the *website*. At the *beta test* stage, researchers asked validators to check the quality of the *website*. Some input was given to make the *website* more attractive, easy to use, effective, and efficient. Some input and changes have been discussed at the creation stage such as the addition of sub menus on several menus and changes in the *layout* of several pages. However, there are also inputs and changes that have not been discussed previously.

6) *Distribution*

Distribution is done in parallel with the manufacturing and testing stages. This stage is done in preparation for validation. At this stage, the TNGC conservation education *website is* uploaded on *international networking* so that this product can be used by the wider community. The public can access the TNGC conservation education *website* on various smart devices such as computers, laptops, tabs, and smartphones connected by an internet connection by visiting biokonservasi.id on the *browser*.

b. Assessment Instrument Design

The design of the TNGC conservation education *website* assessment instrument was carried out simultaneously with the design of the TNGC conservation education *website*. The assessment was conducted using a TNGC conservation education *website* assessment questionnaire consisting of two aspects of assessment, namely the feasibility of material content and media quality. The assessment instrument that has been made is then validated by three instrument testers. The assessment instrument received several inputs. The inputs given by the instrument examiners are used as improvements for the assessment instrument that will be used at the expert test stage.

3. *Develop Stages* of Mount Ciremai National Park (TNGC) Conservation Education *Website* for Environmental Awareness

At the *develop* stage, *the* finished product is then validated by experts and revised as an initial product. The product was validated to determine the feasibility of the TNGC conservation education *website* to support environmental awareness. The product was validated on material and media aspects. The expert test on the material aspect validated the product on the material and language components. The expert test on the media aspect validated the product on the components of *usability*, navigation system (structure), visual design, content, compatibility, *loading* time, accessibility, and interactivity. The average score for the material aspect was 81.47, while the media aspect was 82.31 for the TNGC conservation education *website* (Figure 8). Based on the data processing, the TNGC conservation education *website is* categorized as feasible from the material aspect and very feasible from the media aspect. The effectiveness of a conservation education website hinges on its ability to engage, inform, and inspire users. Assessing both the material aspect and media aspect is crucial to ensure that the website achieves these goals.

From material aspect perspective, the website must provide accurate and up-to-date information about TNGC's biodiversity, conservation challenges, and success stories. This ensures that users receive reliable and trustworthy information (Miller *et al*., 2018). The material should be presented in a way that is interesting and engaging, using storytelling techniques, visuals, and interactive elements to capture the attention of users (Barnett *et al*., 2017). The website should offer educational resources, such as fact sheets, quizzes, and lesson plans, to support learning and promote understanding of conservation concepts (Clements *et al*., 2019).

In other hand, media aspect of the website must have interactive visual. High-quality images, videos, and graphics can enhance the website's visual appeal and make the content more engaging (Kemp *et al*., 2016). The website should be designed to be accessible to all users, including those with disabilities. This can be achieved by using appropriate web design

standards and providing alternative text for images (World Wide Web Consortium, 2023). The media aspect should be optimized for a positive user experience, with intuitive navigation, clear layout, and fast loading times (Nielsen, 2010).

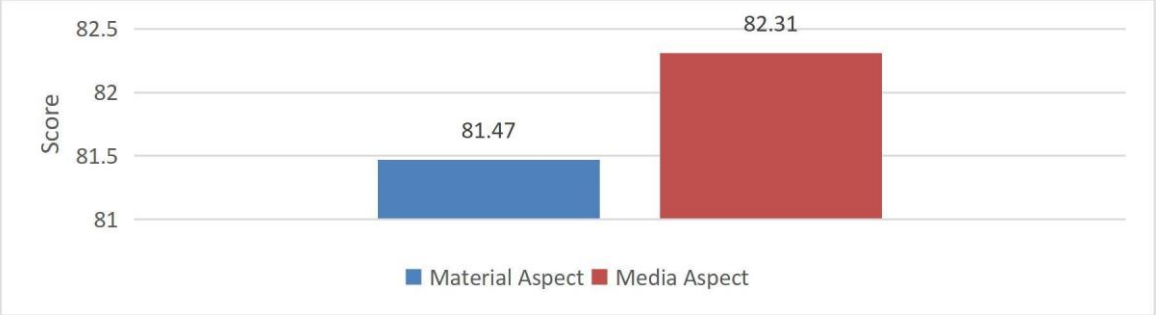

Figure 8. Product Average Score Results of TNGC Conservation Education *Website*

a. Material Expert Test Results

There are two components assessed from the TNGC conservation education *website* product based on material aspects, namely the material component and the language component. The material component received a score of 80.18 which falls into the feasible category. Meanwhile, the language component received a score of 82.8 which falls into the very feasible category (Figure 9). Similar measurements have also been carried out by several previously conducted studies related to "The Role of Validation in Website Revitalization" (Leisthari *et al*., 2024); "Pengembangan Website Bumikita. Life Sebagai Media Psikoedukasi Perilaku Pro-Lingkungan Bagi Masyarakat" (Maulana *et al*., 2020); 'Development of web-based environmental knowledge teaching materials to increase the motivation of IKIP Budi Utomo Malang students' (Irmawati *et al*., 2016); and 'Web-Lembar Kerja Siswa IPA terintegrasi lingkungan untuk meningkatkan literasi lingkungan siswa" (Hekmah *et al*., 2019).

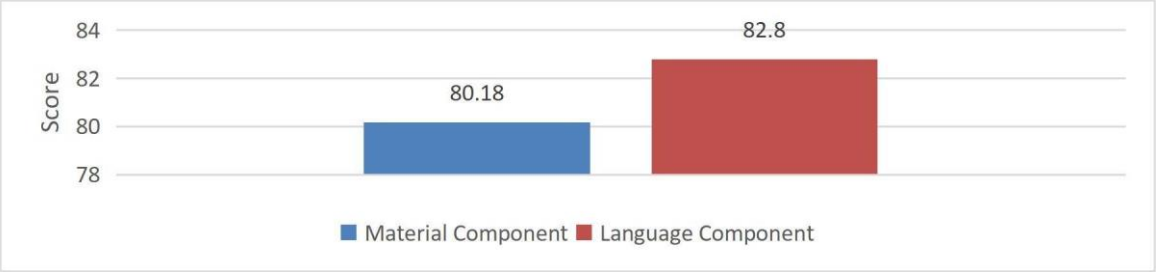

Figure 9. Product Average Score Results of TNGC Conservation Education *Website* of Material and Language Components

1) Material Components

The material component received an average score of 80.18 (see Figure 10), which means that the material on the TNGC conservation education *website* is in the appropriate category. The material assessment on the TNGC conservation education *website* is obtained from six sub-components. The six sub-components are material coverage, material accuracy,

material currency, conservation education insights, dimensions of awareness, and environmental awareness. “Material coverage” was the sub-component that gets the highest score among other sub-components in the material component assessment with a score of 83.66.

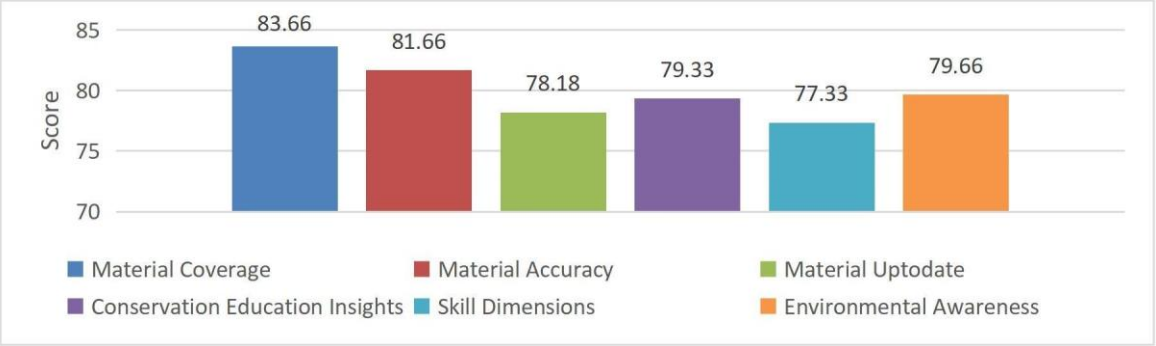

Figure 10. Product Average Score Results of TNGC Conservation Education *Website* Sub-Component Material

Based on Figure 10, the material coverage sub-component received a score of 83.66, including in the very feasible category. Some input given to improve the feasibility of the *website* is that there are some words and sentences that do not match the language that should have been written in the Minister of Environment and Forestry Regulation on Criteria for National Park Management Zones and Management Blocks for Nature Reserves, Wildlife Reserves, Botanical Forest Parks, and Nature Tourism Parks. The next sub-component is material accuracy. The material accuracy sub-component received a score of 81.66, which means that the accuracy of the TNGC conservation education *website* material is in the very feasible category. The material accuracy sub-component is assessed from six indicators. Some suggestions and input were given that the images or photos on the sub menu should be clarified and changed with a simple and comfortable *layout*.

The next sub-component is the recency of the material. The material up to date sub-component received a score of 78.18, which means that the material update of the TNGC Conservation Education *Website is* in the appropriate category. The sub-component of material accuracy was assessed based on three indicators. The input "The quality of photos and videos displayed on each material has presented the biodiversity in the TNGC area". In addition, there is also input to develop a conservation education movement that is not only limited to the TNGC area. This is in accordance with the opinion of Karyadi (2011) that conservation education must invite others widely. Thus, there is a need for developmental research on conservation education.

The next sub-component is the conservation education insight sub-component. The conservation education insights sub-component received a score of 79.33, which means that

TNGC's conservation education *website* is in the appropriate category to provide conservation education insights. This sub-component is assessed based on three indicator items. The feasibility category of the conservation education insight sub-component is not the highest (very feasible). Therefore, suggestions and inputs are needed to increase the feasibility of TNGC's conservation education *website*. The input given is that the *website* needs to add material that can show the potential of the TNGC area for research and education activities. Based on the suggestions given, it is necessary to revise the TNGC conservation education *website*. Improvements are made by giving sentences that show data that TNGC can be used as a place for research and learning. This is in accordance with the Law on Natural Resources and the Environment no.5, year 1990 about National Parks have a purpose as a place for research and development, education, and preservation or cultivation in it (Republic of Indonesia, 1990a).

The next sub-component is the skill dimension sub-component. The skill dimension sub-component received a score of 77.33, which is included in the feasible category. The score obtained by the skill dimension sub-component is the sub-component that gets the lowest score of the other sub-components. Suggestions and inputs are needed so that the feasibility value of the TNGC Conservation Education *Website* can increase. The input obtained was "Add material related to conservation activities that can be carried out by the community". Therefore, revisions were made according to the input from the material expert. The addition of pictures showing examples of conservation activities by the community can be a medium for conservation education (Karyadi, 2011). In addition, there was a suggestion to add a personal assessment of conservation behavior for *website* visitors. However, this input can be realized in the next development research.

The last sub-component in the material component assessment is the environmental awareness sub-component**.** The environmental awareness sub-component received a score of 79.66, which means that the material on the TNGC conservation education *website is* suitable for supporting environmental awareness. Feedback is given in the form of comments that need to be realized so that the environmental awareness value of the TNGC conservation education website can increase. Suggestions for the environmental awareness sub-component are the addition of pictures of environmental damage that occurs in the TNGC area. This is done so that there is a stimulus for visitors to protect the environment (Duroy, 2005).

2) Language Components

The language component scored higher than the material component. The language component received a score of 82.86; included in the appropriate category. The assessment of

the language component is based on six indicator items. In this component there is a suggestion, namely "Less consistent in writing terms". Therefore, improvements were made so that the feasibility value of the language component of the TNGC conservation education *website* could increase. The improvements made are the writing of the sentence "TNGC' which is found in almost every paragraph irregularly changed to only be placed in the initial paragraph then in the next sentence and paragraph simply write "TNGC".

b. Media Expert Test Results

The assessment of the media aspect of the TNGC conservation education *website was* assessed from eight components, namely *usability*, navigation system (structure), visual design, content, compatibility, *loading* time, accessibility, and interactivity. This is in accordance with Suyanto's (2007) opinion that the basic components that need to be considered in developing a *website* are *usability*, navigation system (structure), visual design, content, compatibility, *loading* time, accessibility, and interactivity. The component that gets the highest score is visual design with a score of 86.43 (see Figure 11).

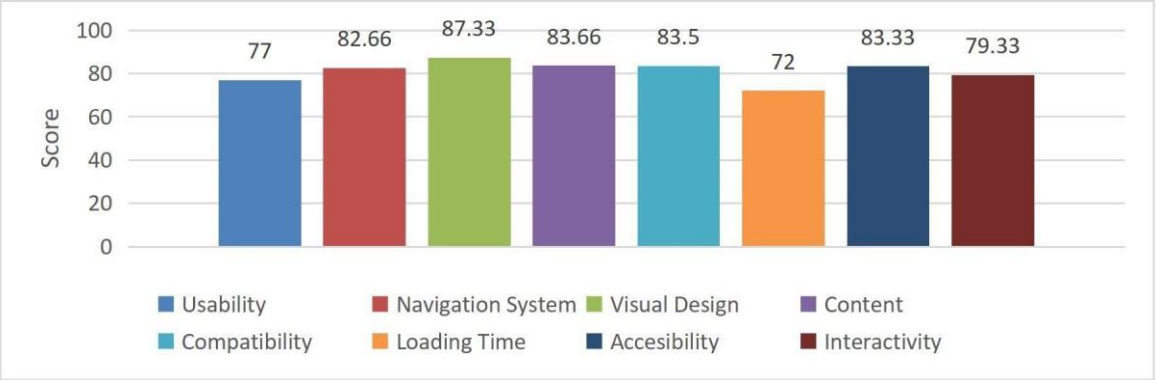

Figure 11. Product Average Score Results of TNGC conservation Education *Website* by Media Experts

1) Usability Components

Based on Figure 11, the usability component received a score of 77, which means that the usability component of the TNGC conservation education *website* is in the feasible category. The usability component is assessed based on five indicator items. There are three comments in the form of suggestions for the TNGC conservation education *website*. First, the use of the *e-commerce plugin should be* maximized. Sarwono & Jusuf (2015) argues that *e-commerce* can be used as a solution in the world of commerce and business, especially on websites. *The* use of the e-commerce *plugin* on the TNGC conservation education *website* aims to fulfill the sales needs of the TNGC Conservation Education Field Guide Book. However, the existing field guide book is not ready to be commercialized. Therefore, the use of this *plugin* cannot be maximized or only limited to preparation. Second, more

consideration should be given to choosing a *hosting* server. The server used by the TNGC conservation education *website is currently* a good server. Third, to build cooperation with the tourism office so that the TNGC conservation education website can be maximized.

2) Navigation System Components

Based on Figure 11, the navigation system component received a score of 82.66, which means that the navigation system on the TNGC conservation education *website* is very feasible. The navigation system component is assessed based on six indicator items. The suggestions given aim to increase the feasibility value of the navigation structure component after the product is revised. The first suggestion is the color of the navigation button that is less clear. In order for the button color to be clear, it is necessary to give a contrasting color to the background color. Silvennoinen (2017) argues that contrasting colors can be an emphasis on a design. The next suggestion is that the *feedback* column which is still one with the testimonial column is less effective. In this improvement, a comments column so that visitors can interact with admin or other visitors. Another suggestion is that there is writing on the button that is not in harmony with the existing menu.

3) Visual Design Components

Based on Figure 11, the visual design component is the component that gets the highest score than other components. The visual design component received a score of 87.33, which means that the visual design of the TNGC conservation education *website* is in the very feasible category. The visual design component assessment is based on seven indicator items.

4) Content Component

Based on Figure 11, the content component received a score of 83.66, which means that the content on the TNGC conservation education *website* is very feasible. The assessment of the content component is based on three indicator items. Several suggestions were given for this component to improve the feasibility value of the TNGC Conservation Education *Website*. The first suggestion is to provide directions for traveling in TNGC in the product. Based on the Law of the Republic of Indonesia No. 5 year 1990 that things that can be done in National Parks are research and development, science, and other activities that support cultivation (Republic of Indonesia, 1990a). Another suggestion for improvement is the need to include data on the flora/fauna in TNGC by comparing it with the same flora/fauna in other areas. The data of the flora/fauna found in TNGC has been listed. However, the data is not compared with flora/fauna data in other areas. Inclusion of comparative data will be a consideration in future development research.

5) Component Compatibility

Based on Figure 11, the compatibility component received a score of 83.5, which means that the compatible component of the TNGC conservation education *website is* classified as very feasible. TNGC conservation education *website* can indeed be used on various devices both software and hardware connected by an *internet* connection, so the value of this component is indeed high. This is indeed supported by the *Content Management System* (CMS) *wordpress* which is used to support the development of the TNGC conservation education website. However, there are shortcomings in the TNGC conservation education website. TNGC conservation education *website is* less compatible when used on *smartphones*. Therefore, the *form* size is reduced so that the TNGC conservation education website can be compatible on *smartphones*.

6) Component *Loading* Time

Based on Figure 11, the loading time component gets the lowest score of the other components. The *loading* time component received a score of 72, which means that the *loading* time of the TNGC conservation education *website is* in the feasible category. Suggestions for this component are related to servers that need to be considered before building a *website*. The suggestion can be considered for the next *website* development because the server affects the *loading* time. *Loading* time is one of the basic components that need to be considered in building a *website* (Munyaradzi *et al*., 2008; Modé, 2014).

7) Accessibility Component

Based on Figure 11, the accessibility component received a score of 83.33, which means that the TNGC conservation education *website* has very feasible accessibility. Based on the score obtained, the TNGC conservation education *website* can be used very feasibly by various groups of people regardless of age, occupation, or level of knowledge about technology. Thus, there are no revisions made to the accessibility component.

8) Component Interactivity

Based on Figure 11, the last component of the TNGC conservation education *website* assessment results is the interactivity component. The interactivity component received a score of 79.33, which means that the TNGC conservation education *website* has decent interactivity. Based on the score obtained, the TNGC conservation education *website* makes it easy for visitors to interact with the admin or fellow visitors to the TNGC conservation education *website*. Revisions need to be made to improve the feasibility of the interactivity component of the TNGC conservation education website. The suggestion given for the interactivity component is "You can add FB fanpage, Instagram, Twitter components to communicate", the suggestion has been accommodated in the *footer of* each page on the

TNGC conservation education *website*. Based on the results of the TNGC conservation education *website* development research, the TNGC conservation education website is very feasible to become a conservation education learning resource. The TNGC conservation education website is also very feasible to support environmental awareness. The TNGC conservation education website is expected to be widely used by the community so that the community can achieve all indicators of conservation education goals (knowledge, awareness, behavior, skills, and participation). People are also expected to achieve the three dimensions of environmental awareness (*egoistic*, *humanistic*, and *biospheric*).

CONCLUSION

The TNGC conservation education *website* supporting environmental awareness was developed using the *research and development* (R&D) *research* method. Using the *Four-D* model which is carried out until the *develop* stage. At the design stage, the *Multimedia Development Life Cycle* (MDLC) method was used because the TNGC conservation education *website* is a multimedia product. Based on the results of the material and media expert test assessment, the TNGC conservation education *website* supporting environmental awareness received an average score of 81,89 which means it falls into the feasible category. These results were obtained based on the results of data processing for material aspects of 81.47; and media aspects of 82.31.

SUGGESTIONS

Once biokonservasi.id has successfully achieved its conservation education goals, it can evolve into a dynamic platform serving multiple purposes. Community Engagement and Empowerment such as Citizen Science Projects: Encourage public participation in research and monitoring activities within Mount Ciremai National Park (TNGC); Community Forums: Create a space for local communities to discuss conservation issues, share knowledge, and collaborate on solutions; and Volunteer Programs: Facilitate volunteer opportunities for visitors and locals to contribute to park conservation efforts. Expanded Educational Resources such as Curriculum Development: Collaborate with schools and universities to develop educational materials aligned with national and local curricula; Teacher Training: Offer workshops and training programs for educators to enhance their knowledge of conservation and facilitate effective teaching; and Online Courses: Develop online courses on various aspects of conservation, biodiversity, and environmental science. Research and Innovation Hub such as Research Partnerships: Foster collaborations with research institutions and scientists to conduct studies on park ecosystems and conservation strategies; Knowledge Sharing: Serve as a platform for disseminating research findings and promoting innovation in

conservation practices; and Policy Advocacy: Advocate for evidence-based policies and regulations to protect Mount Ciremai National Park (TNGC) and its biodiversity. Sustainable Tourism Promotion such as Responsible Tourism Guidelines: Develop guidelines for sustainable tourism practices to minimize environmental impact and benefit local communities; Ecotourism Initiatives: Promote ecotourism activities that support conservation and provide economic opportunities for local residents; and Tourism Data Analysis: Collect and analyze tourism data to inform conservation and management decisions. Biodiversity Monitoring and Conservation such as Species Monitoring: Continue to monitor biodiversity indicators and track changes in species populations; Habitat Restoration: Support habitat restoration projects to enhance biodiversity and ecosystem resilience; and Conservation Action Planning: Develop and implement conservation action plans based on monitoring data and scientific research. By exploring these avenues, biokonservasi.id can expand its reach, deepen its impact, and contribute to the long-term conservation of Mount Ciremai National Park (TNGC) and its surrounding ecosystems.

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