Development of educational multimedia to improve the understanding of nature conservation: A study of Gunung Gede Pangrango National Park's conservation volunteers

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ABSTRACT

The purpose of this research is to develop a multimedia conservation of education application, and to determine its effectiveness in understanding the nature conservation of conservation cadres or volunteers in the national park area. This research used the *Research and Development* method of the model *Borg & Gall* which was modified into five stages, were *Research and Information Collecting, Planning, Developing Preliminary of Product, Preliminary Field Testing and Main Product Revision.* While the application development stage used the SDLC (*System Development Life Cycle*) method which consisted of planning, analysis, design, implementation and testing stages. Data obtained from the validation of material experts and multimedia experts. The effectiveness test used the analysis of the N-Gain value of each indicator of the *pretest* and *posttest questions.* To develop educational multimedia applications need to analysis, preparing the designs and materials, developing the application, validating applications by experts, assessing the quality of application systems, small and large scaling field trials and evaluation. The purpose research product is the digital information entitled E-Info of Nature Conservation Media which can be accessed free of charge via the link (*ika.gedepangrango.org*). According to data analysis we concluded that the development of educational multimedia applications can increase understanding of nature conservation for conservation volunteers in the national park area. The Scores *pretest* and *posttest* obtained an average N-Gain score of 0.73 and a percentage score of 73.33% with the criteria ``High" and the criteria "Quite Effective", which means E-Info Application The media developed is suitable to be applied and quite effective in increasing respondents' understanding of conservation.

ABSTRAK

Tujuan dari penelitian ini adalah untuk mengembangkan aplikasi multimedia edukasi konservasi dan untuk mengetahui tingkat efektivitasnya terhadap pemahaman konservasi alam para kader konservasi di wilayah taman nasional. Penelitian ini menggunakan metode *Research and Development* model *Borg & Gall* yang dimodifikasi menjadi lima tahapan yaitu *Research and Information Collecting, Planning, Develop Preliminary of Product, Preliminary Field Testing dan Main Product Revision*. Sedangkan tahapan pengembangan aplikasinya menggunakan metode SDLC (*System Development Life Cycle*) yang terdiri dari tahapan perencanaan, analisis, desain, implementasi dan tesing. Data diperoleh dari hasil validasi dua ahli yaitu ahli materi dan ahli multimedia. Uji keefektifan menggunakan analisis nilai N-Gain dari setiap indikator soal *pretest* dan *posttest*. Langkah-langkah untuk mengembangkan aplikasi multimedia edukasi yaitu analisis kebutuhan, penyusunan desain dan materi, pengembangan aplikasi, memvalidasi aplikasi oleh para ahli, penilaian kualitas sistem aplikasi, uji coba lapangan skala kecil dan skala luas serta evaluasi. Produk yang dihasilkan adalah informasi digital berjudul E-Info Media Konservasi Alam yang dapat diakses secara gratis melalui link (*ika.gedepangrango.org*). Berdasarkan analisis data disimpulkan bahwa pengembangan aplikasi multimedia edukasi dapat meningkatkan pemahaman konservasi alam bagi para kader konservasi di wilayah taman nasional. Skor *pretest* dan *posttest* diperoleh rata-rata skor N-Gain yaitu 0,73 dan skor prosentase 73,33% dengan kriteria "Tinggi" dan kriteria "Cukup Efektif" yang artinya Aplikasi E-Info Media yang dikembangkan layak untuk digunakan dan cukup efektif dalam meningkatkan pemahaman konservasi responden.

Keywords: *Education, multimedia application, nature conservation, Gunung Gede Pangrango National Park, Indonesia*

INTRODUCTION

Natural resources are all those that come from the earth, the biosphere, and the atmosphere, whose existence depends on human activities. All parts of our natural environment (grains, trees, soil, water, air, sun, rivers) are natural resources (Hunker, 1964). Living natural resources and their ecosystems collectively have functions and benefits as the constituent elements of the living environment which are interdependent and mutually influencing so that their presence cannot be replaced. This shows that living natural resources and their ecosystems have an important position and role for human life, so community involvement in conservation efforts is also very important. Community participation in conservation in Portugal is 43% ineffective. In contrast to Fiji which uses an approach

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bottom up with community involvement of 88%, and it shows that conservation is going well (Thaman, et.al. 2016).

In developing community participation, the government seeks to encourage community independent participation in conservation through various programs, including by providing conservation education materials to increase community knowledge and understanding of conservation. One of the mechanisms applied in developing countries in Asia, Africa and Latin America for successful conservation is by providing control to communities over resources, as well as supplements in the form of conservation education (Nilson, et.al. 2016).

Currently, the use of digital technology is increasingly massive and developing, therefore it is necessary to have a technology-based conservation education strategy so that it can provide the same understanding between the two parties, including through public literacy. Public literacy requires the right medium or way so that the message conveyed can be well received and understood by people with different levels of knowledge, experience and levels of technological literacy (Wiratno, 2020).

Technology-based literacy is known as digital literacy. This term was first put forward by Gilster (1997) as the ability to understand and use information from various digital sources (Gilster, 1997). Digital literacy innovation for the benefit of conservation education can be carried out through the development of a nature conservation education multimedia application. This innovation provides many advantages, including relatively cheap technology costs, reducing the digital divide, portable facilities because learning can be done anywhere and anytime and makes the learning process fun. According to Sudjana (2002), learning media is one of the important elements in learning and learning that can enhance the learning process, so that in the end it is expected to enhance learning outcomes (Sudjana & Rivai, 2002). The same thing was explained by Muhammad (2002) who emphasized the importance of media as a tool to stimulate the learning process (Muhammad, 2002). The use of instructional media in the teaching and learning process can generate new desires and interests, generate motivation and stimulation of learning activities and even bring psychological influences on participants. The use of instructional media will greatly help the effectiveness of the learning process as well as the delivery of messages and lesson content so that it can help participants increase understanding because it presents information in an attractive and reliable manner. In addition, learning media can also facilitate data interpretation and condense information. This allows the achievement of learning objectives, which in turn can improve learning processes and outcomes (Hamalik, et.al. 2002).

Multimedia can accommodate different learning styles and has the potential to create an environment *multisensory* that supports certain learning styles (Phillips, 1997). Multimedia can help participants achieve a wide variety of goals and participants benefit from multimedia which includes text, graphics, images, audio and video (Agnew, et.al. 1996).

METHODS

The development of a multimedia application for nature conservation education was carried out by modifying the model development procedure Borg & Gall into five stages, namely:

1. ***Research and Information Collecting stage***, by conducting field studies and literature studies. Field studies are carried out by analyzing the conditions of the *existing* nature conservation materials, analyzing ways to convey information on nature conservation and analyzing needs. Meanwhile, literature study is carried out by examining books and sources that are relevant to the research to be carried out.
2. ***Planning stage***, begins with material mapping through an assessment of the concept of nature conservation followed by determining themes and objectives and collecting materials from various sources, followed by designing educational multimedia applications and determining the content of the parts of the material to be developed.
3. ***Develop Preliminary of Product stage***, compiling and designing parts that have been planned into an initial product draft for consultation with experts and correcting if there is a mismatch in the material or approach used so that the product formulated can be used to increase understanding of nature conservation. At this stage an evaluation instrument is also prepared to assess the quality of the product being developed.
4. ***Preliminary Field Testing Stage***, after the product is declared valid and feasible to be tested, then the product can then be tested on selected conservation volunteers. Small-scale field trials were carried out on conservation volunteers around Gunung Gede Pangrango National Park Center with 9 subjects, while large-scale trials were carried out on 18 respondents in Cianjur, Sukabumi, Bandung and Pandeglang districts. The results of this field trial will be obtained in the form of the results of the assessment of conservation volunteers on multimedia educational applications and the results of tests on understanding of nature conservation.

5. ***Main Product Revision (Revision of Field Trial Results) stage***, after the educational multimedia application product is tested, then revision of the field trial results is carried out. The revision is based on data obtained from the results of field trials and the assessment of conservation volunteers on the product and is a stage of product refinement.

Research Design

The software used in application development is *Flip PDF Professional* version 2.4.9.31. The preparation of the design is by compiling a framework consisting of a cover, foreword, a table of contents and material content that combines narration, photos, videos, website links and youtube links according to the theme discussed.

The material developed is in the form of digital literacy media about nature conservation which includes information on forests and forestry, conservation areas, national parks, management models of Gunung Gede Pangrango National Park and nature conservation which contains conservation education programs. In terms of *content*, the material presented is adjusted to the characteristics and needs of people who want information that is more dynamic, interactive and has more curiosity.

RESULTS

Analysis of the information material used in implementing conservation education currently consists of projection media in the form of presentation materials presented using an *infocus* and printed media in the form of nature conservation education modules and information books on the potential of national parks. The advantages of in-projection media *focus* are that the same material can be conveyed to the audience simultaneously, but the drawbacks require a little room for light, and must always *update* the material and not be interactive, in this case *the skills* facilitators play an important role in presenting the material attractively. Meanwhile, the use of print media in the current digital era is considered less effective and efficient because it is less attractive than audio-visual media, it is difficult to *update* material, is not interactive, printing costs are more expensive when displaying colorful illustrations or photos, it is difficult to display motion on the page. printed media, the media printing process often takes several days or even months depending on the printing equipment and the complexity of the information on the printed page and it is difficult to repair. The material that the national park wants to convey is mostly information on the potential of the area that must be presented by collaborating the narrative with photos/images as well as a combination of audio-visuals so that it can attract audiences to learn about and participate in conservation efforts. This cannot be conveyed properly if you rely on projection media and print media only. In addition, the use of projection media and print media in the industrial era 4.0 is deemed ineffective for the millennial generation who always take advantage of technological sophistication in carrying out various activities. Millennials also cannot be separated from their gadgets in finding the information they need.

Analysis of the implementation of nature conservation information delivery shows that so far they still rely on the ability of officers as facilitators, even though not all officers have the *skills* to communicate so that the dissemination of conservation information to the community experiences obstacles both in quality and quantity. Based on the results of the interview, the implementation of environmental conservation education is carried out about 9 times a year and spread across three districts, namely Cianjur, Sukabumi and Bogor. Based on the results of the identification of the potential of natural resources and the economy of the buffer villages in the scope of the Mount Gede Pangrango National Park in 2017, there were 60 buffer villages spread across three districts and were the main target of the love development program.

From the two facts in the field, a needs analysis was carried out for the development of a multimedia application for nature conservation education. By relying on the print media and the ability of officers as facilitators of the love of nature program in the form of conservation, the education cannot run optimally, so that efforts are needed to develop materials that are more effective and efficient and fulfill elements of informative, attractive, interactive, broad reach and suitable to the characteristics of society in the digital era currently. The referred development of the material through the development of nature conservation education multimedia applications. Multimedia applications have attractiveness so that they can motivate participants to learn more material and make models that the audience will emulate. Multimedia applications can also prepare interesting variations so that they can encourage the level of speed of learning about a subject or problem and the breadth of the audience is not limited by time and distance. According to several studies, it is known that multimedia-based educational media has a positive influence on users in forming interest and motivation to learn as well as increasing user knowledge and understanding.

Development

Initially, the development of digital information development used the application *FlipBookPDF.Net* online which was published in Html form. After testing and validation stage one by material experts and media experts, there are several weaknesses in the early stage application development using the online FlipBook, namely:

Revision of Material Expert	Revision of Media Expert
1. The content of the material presented is not a stage / guide for conservation volunteers, so the title **E-Book Ready to Become Conservation Volunteer** must be replaced, so that it is more relevant and in accordance with the content of the material. 2. The content of the material is a combination of several information, you should make a title that describes the information and it is better not to use the word E-Book. 3. Improvements to sentences in the foreword need to be revised to make them more attractive to readers. 4. Material enrichment on each subject while still paying attention to the aesthetic elements in designing the layout between text, images, videos and links to keep it interesting. 5. Videos and links cannot be connected yet, need to be cross-checked again. 6. It is necessary to pay attention to the presentation of website links or youtube links, it must refer to the information material to be delivered and according to the needs, because there are several titles on the link but after checking the contents are not relevant. 7. Additional material on the use of national parks as alternative tourist attractions that can support economic empowerment.	1. Videos and website links or youtube links are not connected and cannot be opened, so it is necessary to revise the application if you want to display videos and website links and youtube links. 2. FlippingBook can be tried to use based on templates and published using the template owner's server. 3. Another alternative is to use the *Flip PDF Professional* software version 2.4.9.31. application-based *full version* and can be published on a server with a domain that has been previously created.

Based on the results of validation and input from experts, improvements were made to the digital information developed. Revisions to the material were made in accordance with the direction of material experts and changed the title of the E-Book Ready to Become a Conservation Volunteer changed to E-Info Media Conservation Nature. The next application development stage uses the SDLC (methodology*System Development Life Cycle*) or in Indonesian it is called the system development life cycle. SDLC is used to develop a faster system, maintain and use an information system so that it can run according to what is expected, with the following stages: a) the planning stage, by identifying the needs needed in the application; b) the analysis stage, by analyzing data or information from the needs obtained from the planning stage, in order to determine dynamic or static data in the application; c) the design stage, by making a *prototyping* of the E-Info Media application both from its graphic design, color and *layout* . This is to facilitate the creation of program code; d) the implementation stage, by writing a program from the analysis and design that has been made so that it can determine a suitable programming language for the application. The programming language used by *Javascript* and HTML is the Language *Hypertext Markup*. Furthermore, the *hardware* and *software resources* for the *web server are selected*. *Software* used in application development, namely *software Flip PDF Professional* version 2.4.9.31. After making the program, the application is uploaded to the server with the domain that was previously created and e) the testing stage, testing the application to find out whether there are *bugs* or *errors*.

Not only developers, the target of application users is also testing applications that have been made through the SUMI method (*software usability measurement inventory*), namely by distributing questionnaires to 11 respondents with various educational and occupational backgrounds via *google form* to assess aspects of *efficiency, affect, helpfulness, control* and *learnability*. The SUMI questionnaire consists of 50 statements, in which statements that lead to a more positive direction to the system are given a score of 4, 2, 0 for responses to agree, do not know and disagree. The results of the SUMI questionnaire show that in all categories *usability* and *global score* there are still scores below the average score of 50, namely in the category *control* which only reaches a score of 43 and *learnability* reaches a score of 48. While for the average score in the category *Efficiency* is 80, *Affect* is at score of 50 and *HelpfullnessSUMI* at a score of 69. The measure of the level of user satisfaction based on the method is taken from the average value, if it is more than the average value, it is included in the criteria of being quite satisfied or satisfied, while below average is the criterion of less satisfied. From the results of the SUMI questionnaire conducted, of the 5 aspects assessed, 3 aspects scored above average (50 up) while 2 aspects scored below average. However, it can be said that users are quite satisfied in accessing and operating the E-Info Media application.

In general, the development steps for the *Flip PDF Professional* version 2.4.9.31 application are the same as for the application *FlipBookPDF.NET* Online. The results of the improvement by paying attention to the opinions of experts, a multimedia educational application that was successfully developed was entitled E-Info Media for Nature Conservation and published on the website of the Mount Gede Pangrango National Park with the link address *http://Ika.gedepangrango.org.*

Trials

Small-scale field trials were carried out on conservation volunteers around the Cianjur Region I

National Park Management Division in the Cipanas, Pacet and Cugenang Districts with 9 conservation volunteers as the subject. The results of small-scale field trials show that the response of conservation volunteers in assessing the application developed by E-Info Media is very positive and reaches a percentage value of 91.11% with the criteria "Very Good" meaning that the E-Info Media application developed is suitable for use. The assessment on each aspect also shows the criteria of "Very Good" where the aspects of the presentation of the material, the benefits of application and application can motivate to get a high percentage of value, namely 94.44% and aspects of content suitability score 88.89%, while aspects of conformity with the needs of conservation volunteers obtained a value of 83.33%.

In small-scale field trials, the respondent also measured the level of understanding of nature conservation by giving multiple choice test questions that were carried out through the *pretest* and *posttest*. The results of the T test analysis showed that t count -9.38876 and t table -1.7459. Based on the criteria t count is not between the t table, then reject H0 and accept H1. This means that the use of the E-Info Media application affects the understanding of nature conservation because there are differences in the scores before and after, with the difference in the average score of 32.78.

At this stage, the researcher also measures the effectiveness of the product being developed to increase understanding of nature conservation through the calculation of N-Gain. From the pretest and posttest scores, the average N-Gain score was 0.68. Based on Melzer's criteria, if the mean N-Gain score is between 0.3 and 0.7, it is considered moderate. Based on criteria of Hake (1999), measurements were made on the percentage of the N-Gain score, and if the N-Gain percentage score was between 56-75, it was considered quite effective. From the calculation results in the table above, it is known that the N-Gain mean value is 0.68, which means that the feasibility level of the E-Info Media application developed is included in the "Medium" criteria and the N-Gain percentage score shows the number 68.36 which means the E-Application. The Info Media developed meets the criteria "Effective Enough" to be used and has an effect on increasing the respondents' understanding of conservation.

Large-scale field trials were carried out by redistributing pretest questions, then spreading the E-Info Media application link that had been developed, then spreading the posttest questions back to a wider range of respondents, namely to 18 respondents from Cianjur, Bandung, Sukabumi and Pandeglang . The results of the t test analysis showed that t count -8,85924 and t table -1,6909. Based on the criteria t count is not between the t table, then reject H_0 and accept H_1. This means that the use of the E-Info Media application affects the understanding of nature conservation because there are differences in the scores before and after, with a difference in the average score of 29.78. Meanwhile, the pretest and posttest scores obtained an average N-Gain score of 0.73. Based on Melzer's criteria, if the mean N-Gain score is more than 0.7, it is considered a “high” criterion. Based on criteria of Hake (1999), measurements were made on the percentage of the N-Gain score, and if the N-Gain percentage score was between 56-75, it was categorized as "Effective Enough". From the calculation results in the table above, it is known that the mean value of N-Gain is 0.73, which means that the feasibility level of the E-Info Media application developed is included in the "High" criteria and the N-Gain percentage score shows the number 73.33, which means the E-Application The Info Media developed meets the criteria "Effective Enough" to be used and has an effect on increasing the respondents' understanding of conservation.

Revision of Trial Results

From the results of field trials 75% of respondents stated that the E-Info Media application was good because the information presented was not monotonous and attractive by collaborating articles, images, videos and website links and youtube links so that it was in accordance with the characteristics of current users who always use gadgets to explore cyberspace. However, through the disseminated conservation volunteer response instrument, some input and suggestions were obtained from respondents regarding the E-Info Media application being developed, namely that they must continue to update the information presented, further increasing the element of attractiveness that can be accepted by all groups, holding meetings for deepen the material or evaluate the material that has been presented on the E-Info Media application and complete the application with instructions for use. Most of the inputs and suggestions from respondents are to maintain the sustainable use of the E-Info Media application so that it does not affect the improvement of the E-Info Media application that has been developed.

DISCUSSION

In product development, many changes have been made to the information material in the E-Info Media application based on input and suggestions from material experts. Increasing and improving information material on the *website* is one way to influence visitors' websites to remember the key information submitted (Desra, 2020) so that improvements to the information material presented are expected to make it easier for information to be more quickly embedded in the minds of visitors.

Validation was also carried out by media experts, where in stage 2 a percentage of 89.58% was obtained with the criteria "No Need for Revision", meaning that the digital information made was suitable for use. The results of this study are in line with the opinion of O'Brien (2004) which states that there are three dimensions of information quality, namely the information (*time dimension time dimension*), the information (*content dimension content dimension*) and the information (*form dimension from dimension*). Regarding the time dimension, information is said to be of quality if it meets the criteria, *up to date* namely information that is submitted on time, quickly presented and available at any time (not limited by time), this will satisfy users. Regarding the content dimension, that the information provided is accurate and in accordance with user needs. Meanwhile, regarding the shape dimension, it is stated that the effective media used to convey information to users can provide satisfaction to users. In this case, the E-Info Media application is built based on the internet and can be accessed *online* and has no time limit considered very effective in conveying nature conservation information to the public because the media used is in accordance with the characteristics of millennials so that it can provide satisfaction to its users.

The results of the attractiveness test show that the user response in assessing the E-Info Media application is very positive and reaches a percentage value of 91.11% with the criteria "Very Good". According to Widiyanto & Prasilowati (2015), adesign is said to be attractive if its content and appearance are able to attract internet users to visit the website and the attractiveness of the design *website* has a positive and significant impact on user perceptions. Thus, it can be said that the E-Info Media application developed is considered attractive and worthy of use.

Based on the results of the SUMI questionnaire, there are 3 aspects that score above average (50 up), so it can be said that users are "quite satisfied" in accessing and operating the E-Info Media application because it is easy to use and can add new knowledge. This is in accordance with the opinion of Barnes & Vidgen (2003) which states that the quality of use (*usability*) includes the ease of learning the website, the ease of understanding, the ease of browsing, the ease of use, the attractiveness of the website, a pleasant interface, good competence and providing new fun experience. The opinion of Davis (1993) states that all factors, namely ease of use, perceived benefits and attitudes affect decisions in using technology. So it can be concluded that the ease of use of the E-Info Media application is one of the attractions for users to access the application.

The results of small-scale and large-scale field trials showed a change in the assessment of the feasibility level based on the Meltzer (2002) criteria, where in small-scale trials the criteria were "Medium" but on scale trials they reached the "High" criteria. Meanwhile, based on Hake (1999), the evaluation of the E-Info Media application meets the criteria "Effective Enough" to be used and has an effect on increasing the user's understanding of conservation. Maflikhah (2010) provides several dimensions regarding the benefits of information technology. The benefit with an estimate of two factors is divided into two categories, namely benefit and effectiveness. The dimension of benefit has the function of a) making work easier, b) useful and 3) increasing productivity. While effectiveness functions a) enhance effectiveness and b) develop employee performance. Maflikhah's opinion clarifies that using digital technology to obtain information can contribute positively to users, so that the results of this study can strengthen the conclusion that the benefits of digital information made in the form of E-Info Media have a positive effect on users and can increase users' understanding of the information presented.

From the results of field trials 75% of respondents stated that the E-Info Media application was good because the information presented was not monotonous and attractive by collaborating articles, images, videos and website links and YouTube links so that they were in accordance with the characteristics of current millennial users, so that researchers did not Many revisions to the product being developed, only add instructions for using the application on the first page after the cover.

The advantages of the E-Info Media product being developed are: 1) E-Info Media provides information on nature conservation that is broader than just a printed book, because it provides a *website* and a *linkYouTube link* that can be accessed by users and allows users to get more information from these links ; 2) E-Info Media can be accessed by all groups regardless of distance and time limit; 3) collaborative information presented provides a special attraction for the user so that it is not boring; 4) E-Info Media can be accessed via laptop, PC or *smartphone* ; 5) E-Info Media also assists the national park program in disseminating conservation information to the wider community; 6) it is possible to add the required information; 7) the presentation of information with audio visual features in the E-Info Media application can accommodate users with various learning styles, where according to Bobby De Potter a person's learning style is divided into 3 types, namely 1) visual learning styles that focus on vision and appropriate learning methods for this type through pictures or videos; 2) auditory learning styles that rely on hearing to receive information and knowledge; 3) kinesthetic learning style that involves movement even though it is simple by clicking fingers, the whole learning style is possible through the E-Info Media educational application. While the drawbacks

are 1) E-Info Media can only be accessed *online*; 2) need *frequent maintenance* / maintenance for additional information.

CONCLUSION

1. The product of the E-Info Media application developed can be applied by all groups regardless of distance and time limits through the link ika.gedepangrango.org. This was supported by the results of large-scale trials that followed by participants who taken part in the pretest and posttest understanding of conservation. They had educational background from Junior High School to graduate school and have work backgrounds as students, students, farmers, private employees, entrepreneurs, teachers and lecturers.
2. Users can access this application for free and very easily by using a computer, laptop or smartphone.
3. The presentation of information with audio visual features in the E-Info Media application can accommodate users with various learning styles, both visual learning styles (which focus on vision),
4. The E-Info Media application that completed by auditory learning styles (which rely on hearing) and kinesthetic learning styles (which involve simple movements), so it have a positive effect on user knowledge and understanding.
5. The E-Info Media application was built using the gedepangrango.org domain, so that it can assist the national park program in disseminating conservation information to the public. Therefore, we recommend to the Gunung Gede Pangrango National Park management to maintain the E-Info Media application, up date the information, and use it as a reference or material guide in implementing the formation and fostering of conservation volunteers or volunteers.

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