International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 4, Number 3, December, *Page. 1697 – 1710*
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Development of Hydrosphere Geography Learning Media to Improve Higher Order Thinking Skills (HOTS)

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Abstract

This research aims to: (1) develop geography learning media on hydrosphere material to improve higher-order thinking skills (HOTS) and (2) Know the effectiveness of Web-based application media development products to improve the ability of Higher Order Thinking skills (HOTS). This research is Research and Development (R&D) using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The subjects of the small-scale trial were 36 students, the large scale was 72 students, and the effectiveness test subjects were 108 students. The effectiveness test used a one-group pre-test post-test design experiment. Data analysis used a paired sample t-test with a significance level of 0.05. The results demonstrated that: (1) based on Gregory's validation the material experts' validation was very high with a construct validity value of 0.81, and the media experts' validation was very high with a construct validity value of 1. Practicality validation conducted by teachers in small and large fields shows a construct validity value of 1. (2) The web-based application media improved higher-order thinking Skills (HOTS), with effectiveness demonstrated by the results of a paired sample t-test analysis showing a significance value of 12.83, which is greater than the critical value of 2.045. The Web-based application media positively impacted the ability of higher-order thinking Skills (HOTS) in geography learning

Keywords: Hydrosphere Media Developmen; Improving HOTS Skills; Web- based Application Media.

INTRODUCTION

Education plays a crucial role in improving the quality of human resources that are beneficial to individuals (Sudarsana, 2015),society, and the state, as regulated in Law of the Republic of Indonesia Number 20 of 2003 concerning the national education system. In order to provide religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential (Azhar, Rama, & Mahmud, 2023).

The purpose of geography learning is to increase students' understanding of places, communities, spatial structures, and the environment (Wijayanti, Anwar, Khairani, & Sukhaimi, 2022). At the high school level, Geography helps students to: 1) Understand spatial distribution patterns, environmental dynamics, and various processes related to both: 2) master basic skills in acquiring, communicating, and applying data and knowledge of Geography: 3) show concern for utilizing nature and real resources in a wise way, and appreciate cultural differences (Permendiknas No. 22 of 2003). In accordance with the level of education, it is required to prepare a learning method in accordance with Article 40 Paragraph 2 of Law of the Republic of Indonesia No. 20 of 2003 concerning the National Education System which contains meaning, encouraging, biological, innovative, and flexible. Therefore, using appropriate learning materials is very important when teaching geography. In order to understand geographical phenomena and processes effectively, various media such as plans, tables, diagrams, illustrations, data sets, and visualizations in the form of static visuals, as well as dynamic visuals, are needed. By utilizing it as such, geography material can be arrived at effectively and increase the ease of students in understanding the material being taught.

Education can be interpreted as a system that includes a variety of elements that are

connected and communicate with each other or are interrelated in order to realize educational goals (Iswahyudi et al., 2023). The classroom teaching and learning process is one of the elements of this system, where various components, such as students, teachers, subject matter, learning objectives, learning strategies, learning media, and evaluation, play an important role in the success of the process. But in reality, there are still many instructors who do not have an optimal compilation of learning media in teaching plans and teaching modules. As a result, the use of learning media is often inadequate, which negatively impacts student success in the learning process (Ikhsan & Humaisi, 2021). Thus, the use of effective educational facilities is very important to support the success of student learning.

The fact that there are still many teachers who use dry and practical learning materials has an impact on student disinterest and lack of academic progress. For many educators, textbooks only serve as a learning aid (Jalmur, 2016). In line with advances in education and technology, it is hoped that using a wider variety of more powerful learning resources will improve student learning outcomes.

The use of learning aids such as prototypes or replicas is increasingly popular among teachers and students because they can display shapes that are close to the original object. This kind of media attracts students' interest, especially because students tend to get bored with monotonous objects. Therefore, it is important for teachers to present variations in the learning process to maintain student interest.

A teacher organizes the learning environment deliberately to help his students' learning process. Educational interaction between teachers and students is very important, with teaching materials as the intermediary.

A supportive learning environment can foster a supportive learning environment. According to Hamalik (2003:48), penyampaian materi oleh guru dan proses pembelajaran termasuk dalam proses This communication can be done through various learning media that have been prepared.

Teachers play an important role in developing a pleasant learning atmosphere and guiding students to achieve maximum learning outcomes. Teachers need to strive to create a learning environment that allows students to get the maximum learning experience, both as a learning resource and by using the right teaching strategies. Teachers must also plan steps to build a learning environment that supports the success of learning targets. The use of web-based media can help overcome the limitations of verbal communication from teachers and visualize abstract materials (Biassari & Putri, 2021). Learners can use the learning platform to help them understand topok more easily in this way.

Each subject has a different level of complexity. In the field of geography, some materials require deep imagination, such as in studying historical events. Therefore, students must have the ability to think abstractly.

However, not all materials require complex imagination, so learning media can be an important tool. Sudjana (2007:6) this media provides the resources needed by students to study alone or in groups. Therefore, the media makes it very easy for teachers to carry out the teaching process.

By using specialized equipment, the media functions as a tool or system to communicate messages or information. This thinking is based on the idea that the use of media in the classroom can improve students' learning outcomes in the long run. Thus, the learning process and outcomes of students tend to be better if they use media than without using media.

When discussing hydrospheres, geographers, geography teachers, and geography observers cannot be separated from the context of geography studies. geographers in Indonesia, as stated by Sandy (1983), emphasized that "geography is synonymous with maps". This statement emphasizes how important maps are in the study of geography, both in academic contexts and as learning materials in schools. Geography is a special science because

geographical concepts developed along with the progress of human civilization.

As humans naturally began to try to defend themselves and develop their lives on the earth's surface, they had already begun to think geographically.

In order to obtain learning objectives effectively and efficiently, the development of learning technology needs to be adapted to related fields. In the realm of learning technology, the process involves converting design standards into real objects. These areas of progress consist of: (1) Technology in the field of printing and visual display; (2) Technology that combines audio and visual; (3) Computer-based technology; (4) Technology that integrates various media (Abdulhak & Darmawan, 2013. Learning media is one of the components in the learning process. Learning media is one of the tools that can help teachers to convey learning materials so that students can have interest and interest in the learning materials presented (Wulandari, Salsabila, Cahyani, Nurazizah, & Ulfiah, 2023)

This shows that interest in technological devices is not limited to kindergarten, junior high, high school and so on. The results of the survey confirm that technology is not considered something that must be avoided, not only to the extent that technology is effectively and useful to be used in daily routines and within the scope of education, but also to the extent to which its use is effectively integrated.

Technological media provides a specific set of information skills, such as assessing or searching for information (Fitriani, 2021). Through the use of digital technology today, individuals can be involved in the process of being creative, productive, and interacting, both in the context of work, social, and education. The development of technology and media that must develop has changed the paradigm of communication, learning, and work, both individually, in groups, and on a societal scale (Anwar et al., 2022)

An understanding of media technology becomes relevant because it not only emphasizes expertise in computer technology, but also includes understanding, skills, and emotional aspects in the use of means and devices, including internet access (Switri, 2022). Furthermore, the understanding of not only refers to students' activities in using digital media, but also includes the contribution of the internet to various aspects of student development.

This problem has sparked a lot of debate among academics about the impact of the use of digital media on adolescent students, both positive and negative, but it is usually prevented when given understanding to the public. The use of learning media technology is an important support in the learning process, so that the technology is expected to facilitate and optimize the potential of individual student development. Mendia learning includes a variety of things used to convey information. In other words, learning media facilitates the work of instructors by helping students gain new concepts, abilities, and competencies.

Students may become disinterested quickly when the teacher gives an explanation that is difficult for them to understand. Skilled educators realize that ambiguous explanations often make students bored. Therefore, if a teacher finds it difficult to explain the material well, using a web application-based platform as an additional instrument in teaching can be an effective solution. This media can help achieve learning outcomes that have been predetermined before the teaching process.

Actually, using media as a source or instrument for learning is still often not applied. This is due to various obstacles faced by teachers in making media accessible in the classroom and limited facilities to help the educational process. As a result, many teachers are unable to make the most of the media due to these various constraints. The use of media is actually quite important, especially when it comes to content that needs to be conveyed through intermediary instruments.

Studying geography involves analyzing several types of maps, including political, demographic, economic, and other forms of maps (Lestari, 2020). For some products, the maps serve as tools and even as learning resources. In accordance with. The use of media in learning

activities can produce higher learning outcomes compared to learning activities that do not use media, in accordance with quantitative research methodologies. Therefore, the use of map media is expected to improve the quality of the learning process so that it can improve the quality of student learning outcomes.

Four assessment components were included in the 2013 curriculum: behavior, attitudes, skills, and knowledge. The 2013 curriculum includes new elements as well as several simplified subjects in the learning material.

The following levels of competence are anticipated in geography education at the high school/MA level: (1) Capacity to understand processes related to region, environment, and spatial patterns. (2) Capacity to communicate and use geographical knowledge, as well as basic skills in data collection and analysis. (3) Tolerance of cultural diversity, wise use of natural resources, and caring attitude towards the environment.

Developing higher-order thinking skills, or HOTS, is seen as a top goal for all educators and anyone involved in the education sector. At every level of education, various efforts are made to achieve this goal. According to Bereiter and Scardamalia, as referenced by (Yousef Abosalem, 2016), critical thinking practices and problem-solving techniques can improve higher-order thinking skills (Sucipto, 2017). One of the features of HOTS is that it measures high-level thinking skills and does not place too much emphasis on memory or basic information. Another feature is that the test is focused on contextual issues, uses interesting stimuli, and involves non-routine tasks.

A variety of different learning theories, such as behaviorist, cognitive, and constructivist theories, each with its own set of assumptions, explain how learning occurs. According to the theory of behaviorism, learning is a linear and gradual change in behavior. Complex skills are divided into simpler components that can be learned and achieved independently according to cognitive theory, learning occurs when information is generated organically and individualized through mental processing and storage. On the other hand, Constructivist Theory carries a different approach by emphasizing that learning takes place through active involvement, participation, and the formation of new information derived from existing knowledge. In this method, lecturers act as facilitators, assisting students in creating their own knowledge.

In this study, the researcher provides intervention to students and students in the form of video media based on *Web* applications and the researcher observes how students respond to the video media provided about the watershed.

The findings from learning observations conducted by teachers from January 5-7, 2023, obtained information that the ability to recognize media development to improve one of the problems faced by students when learning in the classroom is the ability to think at a higher level. The development of Web-based application media for geography learning is still low and learning motivation is still lacking. The causative factor is the low ability of students to understand learning due to the unsuitability of learning media to be used.

Furthermore, based on the results of interviews with teachers on January 11-12, 2023, it was concluded that the use of technology-based media is needed as one of the educational resources that can offer solutions, because it can attract students' curiosity. Therefore, this research will initiate a new work, namely the development of Web-based application media for the improvement of high-level thinking in geography learning in hydrosphere materials that use Web application media or use the links used. The development of learning media is the process of designing, developing, and compiling various types or media tools used in learning to improve learning outcomes and students' understanding.

Web-based application development refers to the process of creating a money software application designed to be accessed and used through a Web browser. The application runs on a *Web* server and is delivered to the user online. *Web* applications can provide a wide range of functions and services, from *simple web* pages to complex interactive platforms.

Therefore, the development of Web-based applications is very important in this digital era because of the widespread use of the internet and the increasing dependence on online services. Here are some of the reasons why Web application development is so important because with an internet connection, Web-based applications can be accessed from any location around the world. This global accessibility allows businesses to reach a wider audience and users to access services without geographical restrictions and is easier to learn for students to understand, learning is less boring and more manerative for learners as they learn in the classroom.

The researcher also made initial observations to schools in Bantul and after making observations, the researcher obtained observation results, namely the low cognitive ability of students during classroom learning.

Looking at the context above, the application of media in the geography learning process is an interesting topic for researchers. Therefore, the researcher conducted a study titled. "Development of Hydrosphere Geography Learning Media to Improve *Higher Order Thinking Skills* (HOTS)".

RESEARCH METHODS

This research was carried out with a qualitative descriptive approach, which is designed to explore innovative solutions to the problem of low students' ability to think at a higher level (Higher Order Thinking Skills or HOTS) in geography learning, especially hydrosphere materials. This research aims to develop and evaluate web-based learning media, which is able to improve HOTS capabilities through visualization and interactivity. This research was conducted in various schools in Bantul Regency, with high school students as the research population.

The research was carried out at SMA N 1 Banguntapan, Bantul, during the period from January to June 2024. This location was chosen based on the results of initial observations that showed that the cognitive ability of students in this school was still low in geography learning. This condition underlies the importance of developing media that are able to facilitate the understanding of abstract concepts such as the hydrosphere cycle.

The population of this study is all students in class X at the school. From this population, a sample of 108 students was selected using a simple random sampling technique. The sample was divided into two groups: the trial group (72 students) and the control group (36 students). The trial group used developed web-based learning media, while the control group used conventional media.

The instruments used in this study include tests to measure HOTS ability, observation sheets, and questionnaires. The HOTS test is structured based on the aspects of critical, creative, analytical, and evaluative thinking. Observation sheets were used to assess students' interactions with learning media, while questionnaires were used to collect data on teachers' and students' perceptions of the media developed.

This research goes through several stages, namely:

1. Needs Analysis

This stage involves initial observation in schools to identify problems in geography learning, especially hydrosphere material. Based on the observation results, it was found that students had difficulty understanding the concept of hydrological cycles and river flows because the learning media used was not interesting and interactive. In addition, interviews with teachers also show low digital literacy which has an impact on the lack of use of technology in the learning process.

2. Learning Media Design

After the needs analysis, the next step is to design web-based learning media. The media is designed to be interactive, with features such as animated videos of the hydrological cycle, interactive maps, and evaluative quizzes. This media is also designed to be accessible via mobile devices, so students can learn outside the classroom. This design refers to the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, which starts from the analysis stage to the evaluation.

3. Media Development

Media development is carried out using web technologies based on HTML5, CSS, and JavaScript. The media is equipped with interactive modules that include simulations of hydrological cycles and the impact of inland waters on human life. Development also involves collaboration with geography material experts and learning media experts to ensure the feasibility of the content and display of the media developed.

4. Product Trial

Product trials are carried out in two stages: small-scale and large-scale. The small-scale trial involved 36 students to test the feasibility of the media in terms of ease of use, appeal, and content. After going through improvements based on feedback from the small-scale trial, a large-scale trial was carried out involving 72 students. At this stage, the effectiveness of the media is tested by comparing the learning outcomes of the trial group and the control group using the HOTS test.

5. Evaluation and Improvement

Evaluation was carried out through paired sample t-test testing to see significant differences between the trial group and the control group. In addition, a qualitative evaluation was also carried out based on the results of observations and questionnaires to determine students' perception of the media. After the evaluation, the media is further developed for improvement based on the results of the evaluation.

To ensure the validity of the instrument, validation is carried out by material experts and media experts. Material experts assess the suitability of the geographic content in the media, while media experts assess the display and interactivity of the media. The validation results showed that the media met the criteria of high validity, with a construct validation value of 0.81 for material experts and 1 for media experts.

The reliability of the instrument was tested using the split-half reliability technique. The test results show that the instrument used has a high level of reliability, with a reliability coefficient of 0.85, which indicates that the instrument is reliable for measuring students' HOTS ability.

Quantitative data from the HOTS test were analyzed using the t-test to see the significant difference between the pre-test and post-test results in the trial group and the control group. The results showed that there was a significant improvement in the HOTS ability of students who used web-based learning media compared to the control group that used conventional media.

Qualitative data from observations and questionnaires were analyzed descriptively. The results of the analysis showed that students responded positively to the use of web-based media, especially in the aspects of visualization and interactivity which were considered helpful in understanding abstract hydrospherical material.

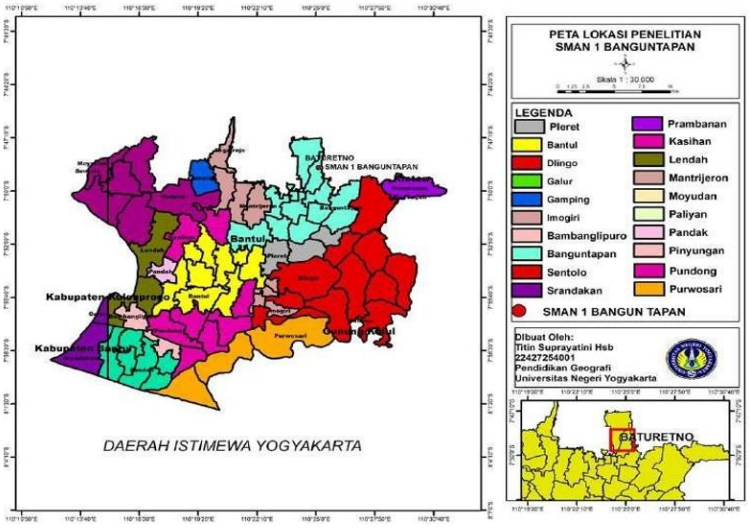
RESULT AND DISCUSSION

Overview of SMA 1 Banguntapan

1. Research Location

A research location plan is an image that shows the location or location of certain rooms and places in the school. There is a legend or description on the edge of the map that shows the

sub-district in Bantul Regency. The research loci with a green picture is in Banguntapan sub-district right at the location of the school in the northern part.



2. Plan of SMAN 1 Banguntapan

This plan provides a clear overview of the structure or layout of the research area, including the location of the observed objects, facilities, tools, and other scopes. SMA Negeri 1 Banguntapan is located in Ngentak Village, Baturetno, Banguntapan, Bantul, Yogyakarta, precisely in the postal code 55197. The school began operating in the first year of new student admissions, 1985-1986 which consisted of 160 students placed in four classes. In the time when it was first established, the afternoon was a time for teaching and learning, utilizing facilities previously used by SMA Negeri 2 Babarsari. This is due to the use of school facilities in the morning at SMA Negeri 1 Depok. SMA Negeri 1 Banguntapan is declared valid and meets the requirements to be classified as a public high school in accordance with the Decree of the Minister of Education and Culture of the Republic of Indonesia No. 06601/O/1985 concerning the Opening, Merger, and Expansion of Senior High Schools. Initially, SMA Negeri 1 Banguntapan was led by Mr. Sudiyono as the principal and was a branch school of SMA Negeri 1 Depok, Sleman, Derah Istimewa Yogyakarta. This school began to accept new students in the

1985-1986 school year, at that time the overall number of students reached 160 people, divided into four classes and using the building of SMA Negeri 2 Babarsari. Because SMA Negeri 1 Depok uses the facilities in the morning during the initial period, the teaching and learning process takes place in the afternoon.

Entering the 1986/1987 school year, SMA Negeri 1 Banguntapan moved to a new building located on land owned by the Baturetno Village Government, precisely in Ngentak Hamlet, Baturetno, Banguntapan, Bantul, with a land area of 1.6 hectares. In the school year, SMA Negeri 1 Banguntapan has eight classes, consisting of four classes for level one and four classes for level two. Along with moving to a new location, the handover of the position of Principal from Mr. Sudiyono to Mrs. Dra. Tumiraharjo occurred on May 15, 1987. In the 1987-1988 school year.

Improving the development of infrastructure and facilities of SMA Negeri 1 Banguntapan has been the main goal so far. The construction of places of worship, basketball and tennis facilities, library rooms, and laboratory rooms are some of the initiatives carried out. In addition, the construction of additional classrooms (RKB) and tree planting to shade the school yard have also been completed. There were a total of 12 classes at SMA Negeri 1 Banguntapan at the end of the 1992-1993 school year.

In the 1992/1993 school year, there was a handover of the position of Principal from Mrs. Dra. Tumiraharjo to Mr. R. Sugito, BA. Along with this leadership transition, together with BP3, the school made various efforts to improve administration, creating initiatives that would enhance learning success and foster piety and religion. New buildings were also built, such as computer labs, facilities for science labs, student parking lots, and school canteens.

The position of Principal was handed over on January 3, 1995, from Mr. R. Sugito, BA to Drs. Ngadimin. Schools, in addition to building classrooms. It began in the 1998/1999 school year. SMA Negeri 1Bnaguntapan has 15 classrooms, which are divided into five parallel classes for each level I, II, and III. The position of Principal was handed over from Mr. Drs. Ngadimin to Mr. Drs. Ismudari on July 12, 1999. SMA Negeri 1 Banguntapan established management practices to improve students' academic achievement during the 1999-2000 school year. This includes forming an Achievement Development Team and starting a number of extracurricular programs.

Physical improvements to the school's infrastructure and facilities include the construction of eighteen new classrooms, multimedia rooms, school canteens, and upgrades to computer rooms and hallways. On November 23, 2002, Mrs. Dra. Kusriyantinah took over the position of school coconut from Mr. Dra. Ismudari. In the 2002/2003 school year, the school continued the programs that had been running, such as optimizing intra and extracurricular activities, activating the School Health Unit (UKS) by adding medical equipment, improving the laboratory, adding library books, maximizing the function of Counseling Guidance, and building a computer laboratory.

Mr. Drs. H. Sumitono began to serve as the principal on August 9, 2005, replacing Mrs. Dra. Hj. Kusritantinah. SMA Negeri 1 Banguntapan released extracurricular activities, strengthened material enrichment for students in grades XI and XII, formed a disciplinary enforcement team, and renovated buildings damaged by the May 27, 2006 earthquake in the 2005-2006 school year. In addition, the vice principal's room was built, the BK, SI, and UKS rooms were built, the teacher's room was renovated and enlarged, the school management was strengthened, and the teacher's competence was improved, starting from various educational seminars, specifically for computers and English, as well as fostering harmony in the learning environment.

The role of the Principal was transferred from Drs. H. Sumiyono and Sugita on February 4, 2009. Innovative projects that were previously carried out under the direction of Drs. Sugita, emphasized on improving quality. Drs. Sukarja, M.Pd. was appointed as the Acting Principal by

the Bantul Regency Secondary and Non-Formal Education Office on December 1, 2010, and Dr. Titi Pratiwi Sariningsih, M.Pd. took over the position of Principal on November 13, 2010.

Under the leadership of Mrs. Titi Pratiwi Sriningsih, M.Pd., SMA Negeri 1 Banguntapan became an Adiwiyata School. A number of modifications were made to support the program, including installing LCD projectors in each classroom, increasing the number of classrooms to 21 classrooms, installing ceramics in each classroom, building greenhouses, creating green corridors, building prayer rooms, and building representative and integrated canteens.

In addition, the program of cultivating Smiles, Greetings, Greetings (3S), revitalizing school identity, and improving student order is also carried out. In the field of school management, improvements are carried out in administrative and financial management, as well as as a step to improve the quality of human resources through optimizing the working hours of Civil Servants (PNS). In the academic field, the Academic Quality Improvement Program (PMA) is implemented for grade XII students, as well as personal and clinical guidance.

Edison Ahmad Jamil officially replaced Mrs. Titi Pratiwi Sriningsih, M.Pd. as the Principal on July 28, 2012. The policies that have been set previously are still carried out under the direction of Mr. Edison Ahmad Jamli. One of the remarkable achievements is that in 2013, SMA Negeri 1 Banguntapan represented Yogyakarta in the Healthy School Competition (LSS) at the provincial level of Derah Istimewa Yogyakarta (DIY). In addition, the Yogyakarta Iatimewa Regional Environment Agency designated this school as Adawiyata School in 2014.

The improvement of student services is implemented through a number of programs, such as strengthening guidance for the National Science Olympiad (OSN) and providing support and clinical guidance, especially for grade XII students ahead of the National Examination (UN). In addition, the administration of learning and social and religious activities is improved by holding recitations and worship activities involving students, teachers, employees, and families. In terms of physical infrastructure, renovations were carried out on the hall building and the addition of the second floor to the mosque. Dr. J. Joko Kustanta served as the Principal on September 30, 2014, replacing Drs. Edison Ahmad Jamli.

Drs. Ir. H. Joko Kustanta, M.Pd, and other leaders, the policies that have been implemented previously continue to be continued. The most important achievement is that SMA Negeri 1 Banguntapan succeeded in making DIY proud at the local level in the Healthy School Competition (LSS) and the Champion of the Healthy School Competition (LSS) at the national level in the province of the Special Region of Yogyakarta (DIY). Tadarus Al-Qur'an every morning, followed by classroom literacy before the lesson starts, tutoring for grade XII students, who will face the National Exam (UN), optimization of guidance for the National Science Olympiad (OSN), and student coaches are just a few of the programs to improve services to students.

Efforts to improve disciplined education and socio-religious involvement continue to be carried out by holding recitations and other religious activities. In terms of physical infrastructure development, the project includes the rehabilitation of the biology laboratory, the addition of two new classrooms, a multimedia room, and a computer laboratory located on the upper floor of the teacher's room. In addition, the lobby, the Administration room, and the Principal's room has also undergone renovation. SMA Negeri 1 Banguntapan was crowned the first winner for the Best Achievement category in the National Level Healthy School Competition on August 17, 2017. On November 5, 2018, this school also received the title of Independent Adawiyata School. On July 23, 2019, there was a transfer of the position of Principal from Dra. H. Joko Kustanta, M.Pd. to Mr. Tri Giharto, S.Pd., M.Pd.

The ongoing activities have been carried out under the direction of Mr. Tri Giharto, S.Pd., with a focus on improving student services. This includes daily Qur'an tadarus activities, which are followed by literacy teaching in the classroom, optimizing the National Science Olympiad (OSN) mentoring program, and clinical support for grade XII students in preparation for the

National Exam (UN). Through recitation and other religious activities, the administration of learning and socio-religious activities also continues to be developed. In addition, on August 19, 2019, the second phase of the rehabilitation of the second floor of the library began.

Product Testing Results and Product Revisions

The implementation stage of small field trials and large field trials are the two phases of trials used for the product. The purpose of this trial is to collect feedback from educators and learners on the products that have been developed.

1. Small-Scale Trial

Thirty-six students from class X6 Social Sciences and one instructor participated in a small field trial at SMA Negeri 1 Banguntapan. This procedure is carried out by providing instructions on the use of media to teachers by the researcher before the trial process begins. Furthermore, teachers are asked to respond to the use of Web-based application media in the context of learning activities.

The purpose of the response made by teachers is to understand their views on the effectiveness of the media developed in supporting the learning process. The results of the teachers' responses were then analyzed and interpreted on a scale of 4 to gain a more detailed understanding of their assessment of the web-based application media that had been created in this way:

Table 1. Results of the Practicality of Large-Scale Web-Based Application Media

		Teacher 2	
		Less relevant score 1-2	**Highly relevant score 3-4**
Teacher 1	Less relevant score 1-2	0	0
	Highly relevant score 3-4	0	12

If entered into Gregory's formula, the result is as follows:

$$Vi = = \frac{12}{0+0+0+12} = 1$$

In the table, it can be explained that teachers one and two expressed the same opinion as many as 12. Based on the table, it can be seen that the product value result is 1 with a very high value. This shows that Web-based application media is practical to use in the field. To find out the interest of students in using Web-based application media, a test was conducted on 36 students. The results of the participant's field data can be considered as follows:

Table 2. Data on Students' Attraction to Web-Based Application Media in the Field

Respondent's Answer	**Frequency**	**Percentage**
Very disliked	0	0
Dislike	0	0
Like	9	22,5
Really like	31	77,5

The table above shows that respondents who expressed their likes were 9 people (22.5%), 0 people disliked it very much (0%), 0 people disliked it very much (0%), and 0 people disliked it very much (0%). (22.5%), somewhat like 9 (22.5%), somewhat dislike 0 (0%), and very dislike 0 (0%). 31 (77,5%). The data explains that there are many who really like the Web-based application media.

2. Large-Scale Trial

Large-scale trials of Web-based application media products are conducted after the product is tested on a small scale. This large field experiment was carried out at SMA N 1 Banguntapan Yogyakarta., involving the participation of geography teachers and 72 students

from classes X6 and X7. In this smaller field trial stage, teachers are given directions regarding the use of media by researchers. Subsequently, the responses given by teachers related to Web-based application media are revealed.

The purpose of teachers' response to Web-based application media is to explore their perspective on the use of Web-based application media in the context of the learning process. The measurement of teachers' responses to the implemented media was carried out through the use of teacher response questionnaires, which then the results were adjusted to a scale of 4.

Media validation was carried out by a practitioner, namely a teacher of SMA N 1 Banguntapan Yogyakarta. The results of the assessment from experts on the meters compiled are as follows:

Table 3. Results of the Practicality of Web-Based Application Media in Large Fields

		Teacher 2	
		Less relevant score 1-2	**Highly relevant score 3-4**
Teacher 1	Less relevant score 1 2	0	0
	Highly relevant score 3-4	0	12

Then it is formulated into Gregory's formula as follows: Vi = 12 / 0+0+0+12 = 1

In the table, it can be explained that teachers one and two stated that the data collection was the same, a total of 12 were successful. Based on the table, it can be seen that the product value result is 1 in the very class. This shows how useful Web-based application media can be in the field.

There are still weaknesses identified in the development of Web-based application media. The comments and suggestions from the class teacher include:

a. Conditioning of students before the activity is carried out.
b. Clarified how to use Web-based application media.
c. Rewards are given to students in the form of praise after completing learning tasks in class.

Then to find out the students in using the web application media, 72 students in class X6 and class X7 IPS SMA N 1 Banguntapan Yogyakarta were given assessments. The results of the students' field data can be seen as follows.

Table 4. Data on Students' Interest in Web Application Media in Large Fields

Respondent's answer	**Frequency**	**Percentage**
Very disliked	0	0
Dislike	0	0
Like	10	16.7
Really like	50	83,3

The table above shows that those who say they strongly like 50 (83.3%), read very much 0 (0%), like 10 (16.7%), and hate 0 (%). The data explains that there are many who really like the Web application media.

Final Product Review

1. Evaluation (Evaluasi)

The evaluation of Web-based application media is carried out by being assessed by students, along with the scores obtained by students:

Table 5. Tabulation of Pretest and Posttest Data

Class	**Pretest report**	**Posttest report**
Mean	66,25	80,69
Standard deviation	15.34	14.99
Minimum value	10	20

Maximum value	75	100

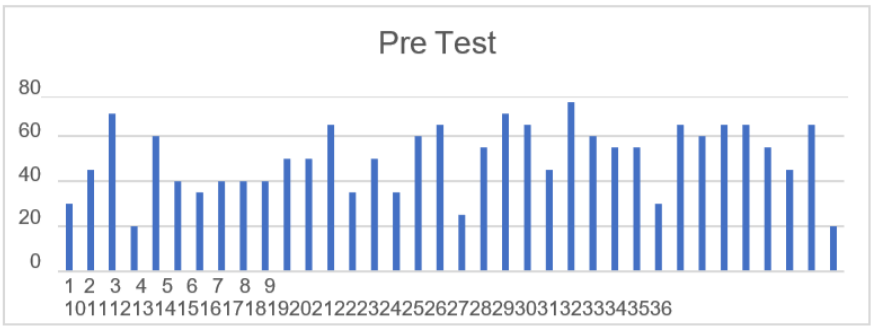
In the table, it can be seen that the control class shows an average pretest of 66.25, while the average score of the posttest is 80.69. The minimum score range for the pretest is 10 and for the posttest is 20, while the maximum score for the pretest is 75 and for the posttest is 100. Based on this explanation, it can be concluded that there was a significant increase in the average score after the treatment.

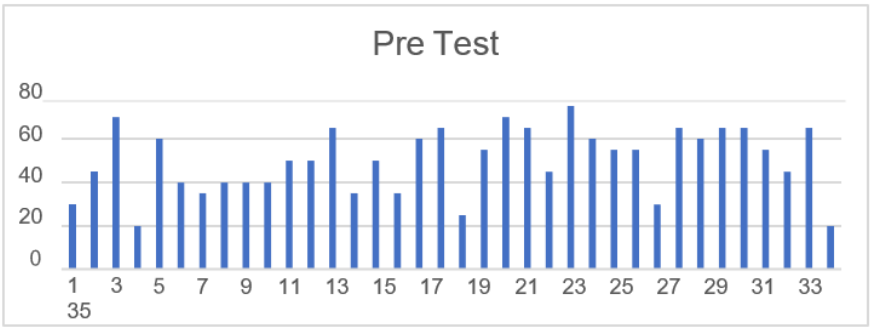
Further analysis of the descriptive test results is available in the appendix. Data analysis was used to evaluate the level of influence and effectiveness of Web application media on students' ability to understand hydrosphere concept material in geography learning. Paired sample tests are used as part of the hypothesis testing process. A priori, the normality test is carried out as a requirement.

Then to find out the students in using Web-based application media, 72 students in grades X6 and X7 IPS SMA N 1 Banguntapan Yogyakarta were given assessments. The results of the field data of the participants can be seen as follows:

Table 6. Data on Students' Interest in Web Application Media in the Effectiveness Test

Conclusion	
Parameter	**Average**
pre test	50.13
post tes	80.69
post – pre	30.55
score ideal	49.86
N gain score	0.6
N gain score Persentase (%)	60.78





2. Normality Test

Assessing whether the distribution of the data being analyzed can be considered normal or not is the purpose of the data normality check. This assessment is carried out through the use of statistical software, such as SPSS, by applying the Shapiro-Wilk method. The evaluation criteria applied is that when the significance level is less than 0.05, then the dataset is assumed to follow an abnormal distribution. Conversely, if the significance value exceeds 0.05, then the

dataset is assumed to follow the normal distribution. The following table contains information about the results of the normality test.

Table 7. Normality Test

Web-based application media	Shapiro-Wilk		
	Statistic	Df	sig
Pretest	.123	20	.65
Posttest	.143	20	.100

From the previous table, it is clear that the pretest data is normally distributed because the significance of the pretest is 0.065 > 0.05. Posttest data can be considered normally distributed because the posttest significance is 0.100 > 0.05.

3. Test Paired Sample Test

Table 8. Test Paired Sample Test

Class	Pretest report	Posttest report
Mean	66,25	80,69
Standard deviation	15.34	14.99
Minimum value	10	20
Maximum value	75	100

The table shows that the significance value of 0.001 is lower than 0.05, which indicates that the significance is lower than 0.05. The results of the paired sample test are attached.

4. Uji Hipotesis

With a t-value of 12.837, it can be concluded that web-based application media has a positive impact on the ability and understanding of hydrosphere material for students.

CONCLUSION

This research aims to develop web-based learning media to improve students' Higher Order Thinking Skills (HOTS) in learning geography, especially hydrosphere materials. The main findings of this study show that the use of web-based media significantly improves students' HOTS ability compared to conventional learning methods. This medium facilitates students' understanding of abstract concepts by providing interactive visualizations and evaluative quizzes that encourage students to think critically and creatively. An important contribution of this research is the development of technology-based media that students can access independently, thus allowing a more flexible and effective learning approach in improving higher-order thinking skills. This media also provides a solution to the challenge of geography learning which has been using conventional methods that tend to be boring and less effective in improving students' analytical skills. However, this study has several limitations, including uneven access to internet technology and infrastructure in schools, which can limit the implementation of this web-based media. In addition, this study was only conducted in one location with a limited number of samples, so the generalization of results needs to be done carefully. For further research, it is recommended that this media be piloted in various schools with different geographical conditions and technological facilities, so that wider and more comprehensive results can be obtained. In addition, it is necessary to develop additional features in learning media that are more adaptive and responsive to the needs of students at various levels of ability.

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