Web-Based Science Learning Media at High School Level

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ABSTRACT

Digitalization is one of the fields that affect the 5.0 revolution civilization towards world mobility. In fact, there are many conversions of learning media from manual forms to digital variations, in the learning process. Learning media as a tool that helps the learning process in presenting material in an interesting way so that the learning situation becomes effective, efficient, active and easily understood by students. This study aims to determine: validity by experts, feasibility by teachers and response by students to the design of web-based science learning media at the high school level. The method used in this research is R&D using the ADDIE development procedure, where this model consists of 5 stages, namely analysis, design, development, implementation, and evaluation, but this research is limited to the development stage. The instrument in this study is a validation questionnaire, feasibility and response. The results of this study are (1) obtained validity test results from media experts as a whole average percentage of 91.1% in the "very valid" category, and material experts of 93.7% in the "very valid" category. (2) the teacher feasibility test amounted to 88.4% so that it was concluded that the category "very feasible" and "feasible". (3) the average percentage of student responses obtained was 84.3%, it can be concluded that each school is in the "interesting" category. The results of this study indicate that the learning media is interesting.

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Keywords: ADDIE, Learning media, and web

1. INTRODUCTION

Learning Natural Sciences (IPA) is a process of finding out about nature systematically to master a collection of knowledge in the form of facts, concepts, principles, discovery processes and have a scientific attitude. [1]–[3]. Science learning can foster students' thinking skills that are useful for solving problems in everyday life phenomena. [4]. So that science learning requires teachers and students to be able to keep up with technological developments.

Technology has become one of the main reasons for changes in various sectors of life. The development of technology has gone digital where all human activities can be fulfilled by technology. [5][6]. Previously, we have known the Era of Industrial Revolution 4.0 which is a comprehensive transformation of all aspects of production in an industry by utilizing digital technology and the internet.. [7] states that the industrial revolution is one of the major changes in technology that has resulted in changes in other fields, especially in education and social fields.

Advances in science and technology are developing at a rapid pace, triggering a digital transformation that is often referred to as the digital age. [8]. This rapid technological development continues to create new patterns in learning and encourages rapid adaptation. The use and utilization of technology in the learning process has become a necessity and demand in the global/digital era. [9].

Living in the digital era requires all people to always be technologically literate in their lives. Not only is it useful for communication, but it also provides many benefits in the world of education, especially in the field of learning media utilization. [10].

Learning media is used as a tool in presenting learning materials in an interesting way, making learning situations active, and easily understood by students, with the aim of improving the quality of learning

effectively and efficiently. [11]. Through the use of media, teachers can convey messages and information to students more effectively in the learning process. Learning media has an important role in improving the quality of learning, providing a means for teachers to deliver learning materials with an innovative, creative, and comprehensive approach. [12]. In addition, learning media can also create an interesting and enthusiastic learning atmosphere for students, both in the classroom and outside the room. [13]. Student-centered learning is a process in which students are invited to be actively involved in solving any problems given by the teacher, students are encouraged to be the subject of learning, so as to develop a deeper understanding and relevant problem solving skills. [14].

Web-based learning media can help teachers in combining online and face-to-face learning. It also provides a new experience in learning for students so that the learning process can be more varied, interactive, and innovative which can improve student achievement. [15].

Generally, students already have smartphones in the current digital era, but there is a lack of media that accompanies students in learning. Based on this, researchers want to make web-based learning innovations. [16][17]. Using this web learning will provide students with new interesting additional media and assist students in learning because students in this era cannot be forced to learn so this media becomes a companion for students, and this web learning is needed to facilitate teachers in developing innovative media. [18] and become versatile, especially in lesson planning and media creation as well as storage of existing learning media. [19].

The observation results obtained information that in the school the teacher has used digital media but it is not structured and there are still many shortcomings in its implementation, and the school is currently only implementing an independent curriculum [20] then the needs of books in schools are not all available. Based on this, researchers were inspired to create a WEB-based learning media as a companion media for students and teachers in the science learning process.

2. METHOD

This study used the research and development method. This research adopted the ADDIE model which consists of five stages, namely analysis, design, development, implementation, and evaluation. In this study, researchers have implemented 3 stages of the ADDIE model development, namely analysis, design, and development.
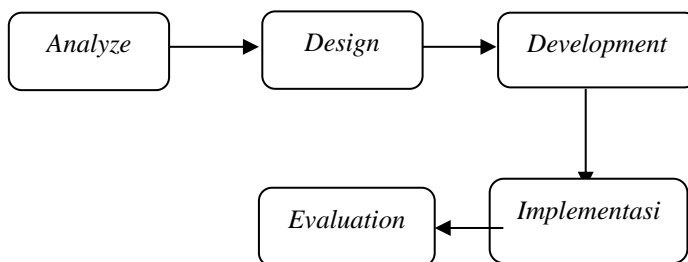
Picture 1 Stages of the ADDIE Model

The description of the stages of the ADDIE development model is as follows::
a)   Analysis Stage
Needs analysis is the process of defining what students will learn and how about the performance or use of a web innovation that has been made. Developers make observations by interviewing science teachers related to student needs in the use of web-based learning innovations for the learning process in class and at home.

b)   Design Stage
Planning models have similarities to teaching and learning activities. The process starts from determining learning objectives, designing feature procedures prepared for the materials and evaluation media. The stages of design activities include. Prepare learning objectives that have been prepared in terms of material and make visualization planning in terms of design, features and some additional media for the needs of web-based learning innovations designed..

c)   Development Stage
This development stage was carried out as follows:
i)   Web-based learning innovation creation stage
ii)   Validation Stage
iii)   Revision Stage
iv)   Test Phase (Student and teacher responses)

The subjects in this study were teachers of students of class XI SMAN Dewantara, 2 media experts and 2 material experts and as the object in this study were web-based interactive media. This study used a validation questionnaire instrument as well as a teacher and student response questionnaire.

The research data was processed using descriptive analysis by paying attention to aspects related to the design of interactive multimedia based on Web Laerning which was reviewed from several aspects. According to [21] The assessment criteria for the feasibility of interactive multimedia based on Web Laerning are expressed in percentages which are calculated using the following equation:

$$Persentase = \frac{Jumlah\ skor\ hasil\ pengumpulan\ data}{Jumlah\ skor\ maksimal}\ x\ 100\%$$

3. RESULT AND DISCUSSION

The research that has been done is the ADDIE method. The development procedures carried out are analysis, design, development. The following is a description of the data on the results of research conducted based on ADDIE including the following:

A. *Analyze*

Analysis aims to establish the basic research problem. The analysis began by conducting observations and interviews with the Xth grade science subject teacher at the school in SMA Negeri Dewantara. Through this stage, the researcher obtained information from the teacher that at school the teacher has used digital media but it has not been structured and there are still many shortcomings in its implementation, and the existing media still does not have a place to store. In class X at this time because it has just implemented the independent curriculum [20] Therefore, the need for books from schools is still not widely available and information from students in the current era, the average student has used a smartphone outside the school environment or occasionally for class learning. Therefore, researchers developed innovative web-based learning media on class X science material that can be used in science learning for teachers and for students as a companion media in learning because the material is in accordance with the independent curriculum book and web-based advantages have fast and practical access that can be used anytime using an adequate internet network. [22]–[25]

B. *Design*

This stage is carried out, namely making a web-based learning media design using steps including:

a) Initial preparation stage of materials and practice questions

At this stage, the preparation for filling the web starts in terms of material from the independent curriculum book and prepares an evaluation page using the quizizz application to be validated as web content.

b) Main Menu Page Display

The main menu page contains the title and shows several buttons and features provided for the initial introduction of the media.

c) Learning material page display

Display the learning material page in accordance with the chapter to be studied and contains a short narrative in each sub chapter on science material.

d) Teaching module page display

On this display contains a display of images in accordance with the sub-material that has been compiled based on the curriculum at school. Can be used to assist teachers in saving existing media in accordance with the sub material.

e) Evaluation page view

On this display contains a display and a button that is clicked directly connected to the quizizz page as media in the evaluation.

f) Display of the instructions for use page

In this view, there are simple user instructions for using the web.

C. *Development*

This stage is an extension of the design stage. At the development stage, the interactive media-assisted module is packaged in such a way based on the points at the design stage which will become draft 1. The stages in this section include: (a) review of Web-based learning media. The results of the review of Web-based learning media in the form of suggestions and input. Suggestions and input from these are used to revise Web-based learning media to make it more perfect. The results of the expert review can be seen in Figure 2.
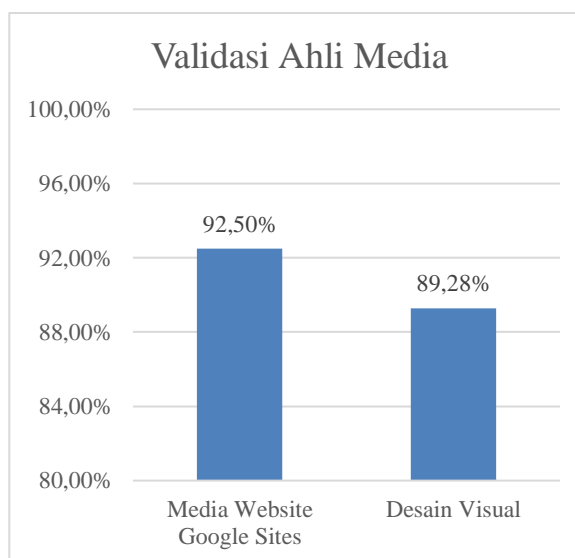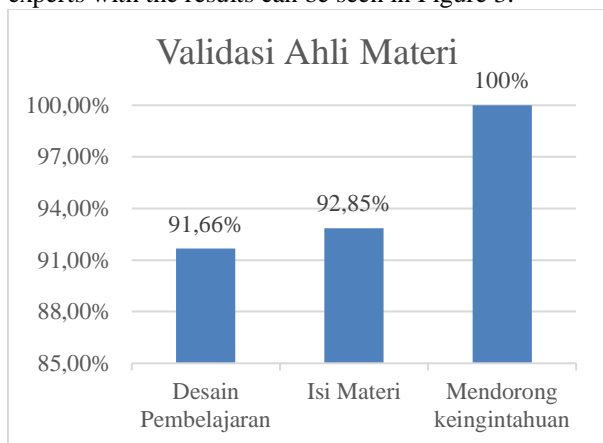

Gambar 2 Hasil Ahli Validasi Media

Based on the picture above, it shows that the media innovation developed is included in the very valid category. This category can be seen from the average score on the google sites website aspect of 37 out of a maximum score of 40 with a percentage of 92.50% with a very valid category, such as the presence of menu bars and illustrations that respond well, the average score on the visual design aspect of 25 out of a maximum score of 28 with a percentage of 89.28% with a very valid category, Based on the assessment by media expert validation shows for the whole with a percentage of 91.17% that the media innovation developed can be declared very valid. [26], but still needs improvement with the following notes:

1. Profiles in the media are completed in detail, such as the developer's address and home university address.
2. Supporting pages may be able to add interesting

information and content in accordance with the material discussed in the media.

3. Complete quiz questions for evaluation

Furthermore, the media was reviewed by material experts with the results can be seen in Figure 3.

Gambar 3. Hasil Ahli Validasi Materi

Based on the picture above, the results of the validity of the material experts show that the learning media developed are included in the very valid category. This category can be seen from the average score on the learning design aspect of 11 out of a maximum score of 12 with a percentage of 91.66% with a very valid category, the aspect of clarity of learning objectives on the breadth of material still requires revision in the presentation on the web, the average score on the material content aspect of 26 out of a maximum score of 28 with a percentage of 92.85% with a very valid category and on the aspect of encouraging curiosity of 8 out of a maximum score of 8 with a percentage of 100% with a very valid category[27]. Based on the assessment by the material expert validation as a whole, the percentage of 93.75% indicates that the Web learning media developed can be declared very valid to be tested with several revisions.

Some of the results of the review of Web-based learning media can be seen in Table 1

Table 1 Web-based learning media review results

Before revision	After revision
No evaluation page yet	There is already Evaluation page
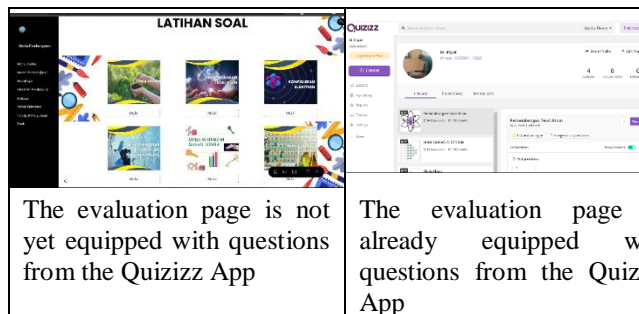
| The evaluation page is not yet equipped with questions from the Quizizz App | The evaluation page already equipped with questions from the Quizizz App |

After the product was declared valid and after completing several additions and improvements, the researchers tested the feasibility conducted by 1 chemistry teacher in class X at SMA Negeri 1 Dewantara with the results can be seen in Figure 4..
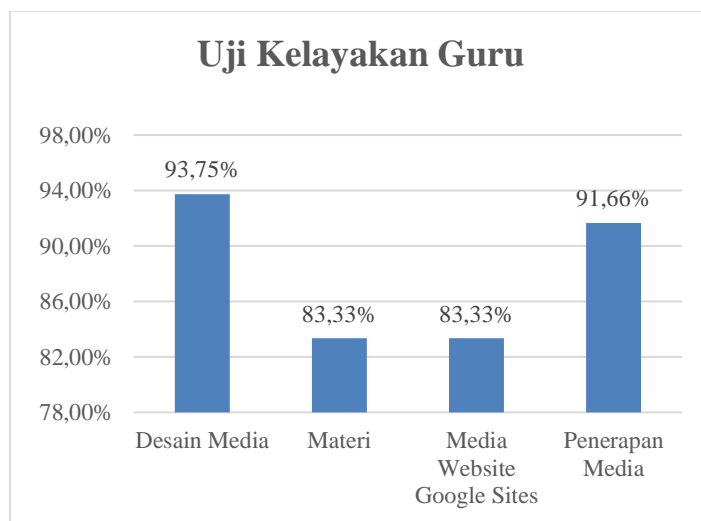

Figure 4. Teacher Feasibility Test

Based on Figure 4, the results of the teacher assessment at SMA N 1 Dewantara on the media design aspect are included in the very valid category, obtaining an average score of 15 out of a maximum score of 16 with a percentage of 93.75% with a very feasible category, showing an attractive media design starting from the appearance and good color collaboration, this greatly encourages teachers in providing science learning. The material aspect obtained an average score of 10 out of a maximum score of 12 with a percentage of 83.33% feasible because the material comes from official books from the Ministry of Education. The media aspect of the google sites website obtained an average score of 10 out of a maximum score of 12 with a percentage of 83.33% with a decent category. This indicator shows that this web media is suitable for use in learning. The aspect of media application obtained an average score of 11 out of a maximum score of 12 with a percentage of 91.66% with a very feasible category. Based on the results of the study, it shows that media innovation is very feasible to use and usually helps in the learning process both in class and at home.

This was followed by student response. This student response test was conducted at SMA N 1 Dewantara in class X IPA. The results of the student response trial to media innovation show that the media developed is included in the category of interesting to use. This category can be seen from the results of the average score assessment on the media aspect of the google sites website of 23.66 out of a maximum score of 28 with a percentage of 84.50% in the interesting category. This indicator shows that the web media is very easy to use and understand by students. The average score on the material and language aspects is 20.13 out of a maximum score of 24 with a percentage of 83.87% with an interesting category because the material and language displayed on the web media are easy to read and neatly structured. So it can be concluded that students are interested in the learning innovations that have been developed. [28].

After giving an assessment of media innovation, students are also directed to be able to join the whtasapp group provided on the web which can later communicate there along with classmates at school. The percentage assessment of media trials through student responses can be seen in Figure 5.
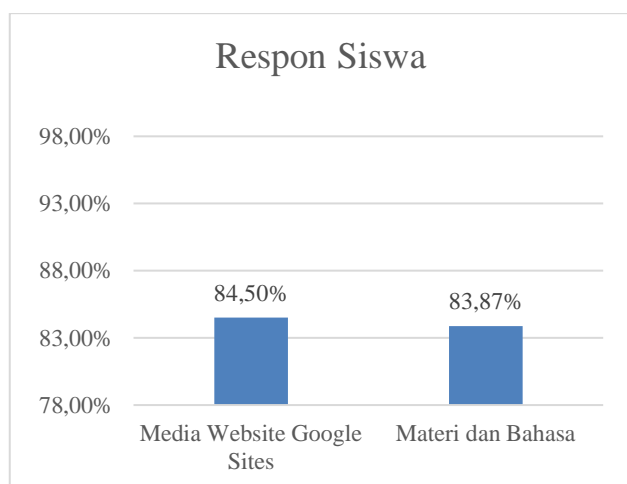
Figure 5. Student Response Test

AUTHORS' CONTRIBUTIONS

Web-based Science Learning Media that has been designed and validated by experts, feasible by teachers and responded to by students in categories (valid, feasible and interesting) is one of the author's contributions to the achievement of theoretical and practical science learning. The target beneficiaries are the author's team, teachers, students and all parties who use the science teaching and learning process.

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