



# Website-Based Learning Media in High School Biology Learning on Genetic Substance Material

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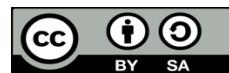
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## ABSTRAK

Materi substansi genetika memerlukan media pembelajaran dalam penyampaiannya karena tidak dapat dilihat secara langsung sehingga sulit dipahami oleh peserta didik. Penelitian ini bertujuan untuk menciptakan media pembelajaran berbasis website yang layak digunakan dalam pembelajaran biologi SMA pada materi substansi genetika. Metode penelitian yang digunakan adalah penelitian dan pengembangan (R&D) dengan model ADDIE. Subjek penelitian terdiri dari ahli materi dan media, guru, dan 13 peserta didik kelas XII SMA. Pengumpulan data dilakukan menggunakan metode wawancara, observasi, dan angket. Teknik analisis data menggunakan analisis kualitatif dan kuantitatif. Hasil penelitian menunjukkan validasi ahli materi memperoleh skor 100% (sangat layak), ahli media memperoleh skor 87,50% (sangat layak), uji coba perorangan memperoleh skor 100% (sangat layak), dan uji coba terbatas memperoleh skor 85,79% (sangat layak). Diperoleh kesimpulan bahwa media pembelajaran berbasis website layak untuk diterapkan dalam pembelajaran biologi pada materi substansi genetika. Implikasi penelitian ini yaitu memberikan motivasi kepada guru untuk menggunakan media dalam proses pembelajaran di sekolah.

## ABSTRACT

Genetic substance material requires learning media in its delivery because it cannot be seen directly, making it difficult for students to understand. This study aims to create a website-based learning media suitable for high school biology learning on genetic substance material. The research method used is research and development (R&D) with the ADDIE model. The study subjects included material and media experts, teachers, and 13 grade XII high school students. Data collection was carried out using interview, observation, and questionnaire methods. Data analysis techniques used qualitative and quantitative analysis. The results of the study showed that the validation of material experts obtained a score of 100% (very feasible), media experts obtained a score of 87.50% (very possible), individual trials obtained a score of 100% (very possible), and limited trials obtained a score of 85.79% (very feasible). It was concluded that website-based learning media is suitable for application in biology learning on genetic substance material. The implications of this study are to motivate teachers to use media in the learning process at school.

## 1. INTRODUCTION

The industrial revolution 4.0 is marked by the presence of a digital revolution in all aspects of life, including the world of education. Education in the era of the digital revolution demands the use of information technology as a tool to support the development of individual skills (Dhevi et al., 2024). The main concept in digital revolution education is that the teaching and learning process is carried out with the support of technology, because it can be accessed anytime and anywhere, both in and outside the classroom (Fathurohman, 2021; Lawrence & Tar, 2018; Sabaruddin, 2022). Technological advances have changed the perspectives, learning patterns, and interactions of students (Syed et al., 2021; Theobald, 2021; DAW Wardani & Budiadnyana, 2023). Digital technology has become an inseparable part of students' daily lives (Azairok & Fathurohman, 2023). This requires teachers to use and develop interesting, creative and innovative learning media by utilizing digital technology in the learning process (Azairok & Fathurohman,

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2023; Salsabila & Aslam, 2022). One of the important elements in the learning process that must follow the flow of technological developments is learning media (Salsabila & Aslam, 2022).

Learning media as a connecting tool to convey messages or information from educators to students (Susanti & Suripah, 2021). Learning media can improve the quality of learning for educators by providing innovative, creative, comprehensive learning materials, involving students, and creating enjoyable learning situations (Primananda & Hamid, 2021; Suryandaru & Setyaningtyas, 2021). Presenting interesting material can support the learning process so that it is easy to understand and make students more active in order to improve the quality of learning and achieve learning goals effectively and efficiently (Atmaja & Widodo, 2022; Audia et al., 2021; Puspitarini & Hanif, 2019). Effective and efficient learning quality and objectives certainly require support from the use of appropriate methods, strategies, techniques and media (Harisnur & Suriana, 2022). This also applies to biology learning. Biology is a branch of science that studies living things (Babutta, 2020; Wulandari & Nisrina, 2020). The objects studied must be rational and the material taught in biology learning has a high level of understanding, one of which is genetic substance. This material cannot be seen directly so it requires media in its delivery (Gerda et al., 2021; Mardhiah, 2023).

However, the fact is that in the field not all teachers in the learning process use learning media. This is due to the limitations of teachers in developing learning media. In general, learning is still centered on the teacher (Dhevi et al., 2024). Some learning processes still use conventional media such as textbooks and PowerPoint (Rahmawati & Hidayati, 2022). Based on the results of the observation also showed the same thing, namely the delivery of material still uses powerpoint, images, and textbooks while technology-based media has not been utilized optimally. In addition, during the learning process, teachers experience time constraints in delivering the material. This makes the material explained not conveyed in its entirety so that students have difficulty in understanding the material. One of the materials that is difficult for students to understand is genetic substances. Therefore, it is necessary to develop effective, efficient, and interesting learning media to help teachers in delivering material to students so that they can understand the material well.

One of the media that can be used is website-based learning media. Websites are effective media in delivering material (Safi & Singh, 2023; Susanti & Suripah, 2021; Tambunan & Siagian, 2022; Utami et al., 2020). Website has a simple design, but is more varied by containing new information to help students understand the material, increase their insight, and find solutions (Azaly & Fitrihidajati, 2022; Munawaroh & Indah, 2022; Wahyuni & Rahayu, 2021). A simple website design, arranged systematically and completely with simple language makes it easier for students to understand the material (Arsyaf et al., 2022; S. Suwanti et al., 2020). The website has a good and attractive balance of image, color and text combinations (Coach & Son, 2021). The integration of text, images, animations, and videos attracts the attention of students so that it can improve understanding, make it easier to absorb information, and improve student learning outcomes (Hafidz et al., 2019; Jannah & Atmojo, 2022; Kuncoro & Hidayati, 2021; Nurlatifah et al., 2022; Pramana et al., 2020; SK Wardani et al., 2019). The advantage of using a website is that it can be accessed easily, quickly, anytime and anywhere without reducing the meaning and purpose of the learning delivered (Astuti et al., 2020; Suripah & Susanti, 2022).

In addition, the website also provides new experiences and atmosphere, making the learning process more diverse, interactive and innovative, and improving student achievement (Rahman et al., 2020; Rijal & Jaya, 2020). Previous findings state that the use of websites in learning can create an innovative environment, increase the effectiveness of the learning process, and help students understand learning materials (Arsyaf et al., 2022; Hursen, 2021). Although there are many opportunities presented by website-based learning media, there are still few teachers who apply it in learning, especially in Biology learning on genetic substance material. The great benefits obtained from the use of website-based learning media will make it easier for students to understand the material so that it will improve student learning outcomes. The purpose of this research is to produce products in the form of website-based learning media that are suitable for use in high school biology learning on genetic substance material.

## 2. METHOD

The research method applied is research and development. Research and development is a method used to produce a product. The product produced in this study is a website-based learning media in high school biology learning on genetic substance material. The procedure for compiling learning media was developed using the ADDIE development model. The ADDIE model consists of five stages including analysis, design, development, implementation, and evaluation (Tegeh & Sudatha, 2019). The product trial design of this research is expert validation test and product trial. Product trial consists of individual trial and limited trial. The subject of expert validation test is one material expert who has a background in Biotechnology, and a media expert who has a background in Genetics. The subject of individual trial involves one teacher

of SMAN 6 Singkawang and the limited trial involves 13 students of class XII of SMAN 6 Singkawang. The types of data in this study are qualitative and quantitative. Qualitative data are obtained from input and suggestions from experts, while quantitative data are in the form of scores obtained from validation questionnaires, individual trials, and limited trials. Data collection methods include interviews with teachers of SMAN 6 Singkawang, classroom learning observations, and questionnaires. The questionnaire instrument grid is presented in Table 1.

**Table 1.** The Limited Trial Questionnaire Grid

No	Aspect	Indicator	Number of Items	Item No.
1	Ease of Understanding Material	Complete presentation of material Ease of understanding the material Easy to understand language	2	1 and 2
2	Ease of Use	Instructions for use make operation easier	2	3 and 4
3	Appearance Attractiveness	Attractive images and animations Matching the combination of background colors, text and images	2	5 and 6

The techniques used in analyzing data in this study are qualitative and quantitative descriptive analysis. Qualitative descriptive analysis is used to process data obtained through input and suggestions from experts. Quantitative descriptive analysis is used to process data obtained through questionnaires in the form of scores. Filling out the questionnaire assessment using a Likert scale in the form of a checklist with a scale of 4, point 1 represents the lowest score and point 4 represents the highest score. Then the score is interpreted into a table of feasibility assessment criteria with 5 percentage scales. The media feasibility assessment criteria are presented in Table 2.

**Table 2.**The Media Appropriateness Assessment Criteria

No	Score in Percentage (%)	Category
1	< 21%	Totally Unworthy
2	21% - 40%	Not feasible
3	41% - 60%	Quite Decent
4	61% - 80%	Worthy
4	81% - 100%	Very Worth It

(Arikunto & West Java, 2018)

### 3. RESULTS AND DISCUSSION

#### Results

The development of website-based learning media is carried out using the ADDIE model which consists of 5 stages. The first stage is analysis, at this stage an analysis of the needs of teachers and students, and interviews are carried out. The results of the needs analysis and interviews conducted with biology teachers provide information that is the basis for the development of website-based learning media. The results of the questionnaire and interviews show that the media in learning are less varied, the learning media used is not optimal, learning media that is interesting for students is needed, learning media that facilitates improving student learning outcomes is needed, and website-based learning media can be one alternative to overcome these problems. The results of the needs analysis state that 76.9% of students have difficulty understanding genetic substance material, as many as 76.9% of students want electronic learning media, and as many as 92.3% of websites can be used to support learning to be more interesting.

The second stage is design. At this stage, the process of compiling website-based learning media begins with analyzing basic competencies, compiling material presentation content, and designing the website. Basic competencies in compiling website-based learning media are analyzed based on the syllabus of the 12th grade Biology subject on genetic substance material to determine indicators of competency achievement and learning objectives. Compiling design material presentation content begins with determining the type and size of fonts, website background, designing the framework and concept of teaching materials, layout, supporting images, and thought-provoking questions, and a glimpse of information to increase students' insight. Website-based learning media includes several components, namely the home page, instructions for use, competencies, materials, evaluations, bibliographies, and

developer profiles. The third stage is development, at this stage it is carried out to realize the previously designed design. The stage of creating website-based learning media uses the Google Sites platform and the Canva application to get images, videos, and website background designs. After the product creation is complete, the learning media will be validated by experts. The results of the development of website-based learning media are presented in Figure 1.

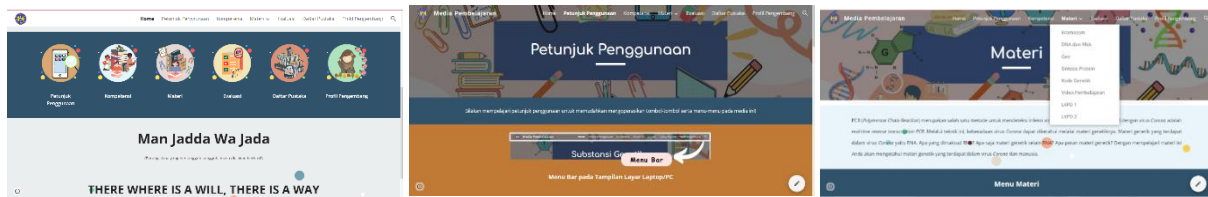


Figure 1. The Results of Website-Based Learning Media Development

The developed product will undergo validation testing by material experts and media experts. The validation test aims to obtain comprehensive suggestions and input from experts in both media and materials on the learning media developed by researchers and to determine the level of feasibility of website-based learning media. The website-based learning media has been validated by experts, tested individually (teachers) and tested limitedly to students. The recapitulation of the results of the website-based learning media trial is presented in Table 3.

Table 3. The Recapitulation of Website-Based Learning Media Trial Results

No	Subject	Percentage Results	Category
1	Subject Matter Expert	100%	Very Worth It
2	Learning Media Expert	87.50%	Very Worth It
3	Individual Trial	100%	Very Worth It
4	Limited Trial	85.79%	Very Worth It

The fourth stage is implementation, at this stage product trials are carried out including individual trials to teachers and limited trials to students. The fifth stage is evaluation, this stage is carried out to validate the products that have been made. The evaluation process is not only carried out at the end of the media development process, but is carried out at every stage of development.

### Discussion

The results of the study indicate that website-based learning media is suitable for use in learning. Website-based learning media makes it easier for students to learn. Website-based learning media helps students access the latest information, HOTS questions, and displays something real that was initially impossible to see, as well as learning materials that can be accessed repeatedly according to the wishes of the students. Interesting learning media will make it easier for students to understand the material presented (Arsyaf et al., 2022; Safira Datu et al., 2021; Suryandaru & Setyaningtyas, 2021). Website-based learning media makes it easier for students understand the material (Munawaroh & Indah, 2022; Salsabila & Aslam, 2022). In addition, the website also provides new experiences and atmosphere, making the learning process more diverse, interactive and innovative, and improving student achievement (Rahman et al., 2020; Rijal & Jaya, 2020). Website-based learning media can be used in the high school biology learning process on genetic substance material.

The website-based learning media developed is suitable for use in the learning process at school. The development of website-based learning media is designed in accordance with KI, KD, indicators, and learning objectives (Pinatih & Putra, 2021; Suryandaru & Setyaningtyas, 2021). In this website-based learning media, it is equipped with a login process to organize users who enter the website, menus are displayed to make it easier for students to access each material according to their needs and there are instructions for use to help students operate the website clearly (Andre & Tileng, 2019; Astuti et al., 2020; Munawaroh & Indah, 2022). Students need an interesting way of learning to get optimal results. Systematic, simple, and non-misconception-free presentation of material can make it easier for students to understand the material (Azaly & Fitrihidajati, 2022; Kusuma, 2018; I. Suwarti et al., 2020). The use of language that meets PUEBI requirements also helps make it easier for students to understand the information conveyed (Linda et al., 2021; Wahyuni & Rahayu, 2021). Readability of the material makes learning media more interesting, easy to use, increases knowledge (cognitive), and makes it easier for students to learn to achieve

learning goals (Pramana et al., 2020; Sarip et al., 2022). In addition, the appearance of website-based learning media is presented in an attractive way, the use of colors and writing is not monotonous, the combination of text, images, and animations, as well as appropriate videos, and the ease of operating the website can attract students to use website-based learning media (Hafidz et al., 2019; Nurlatifah et al., 2022; Pinatih & Putra, 2021; Utami et al., 2020)

This finding is reinforced by the results of previous research which stated that website-based learning media can improve students' learning outcomes and motivation (Kuncoro & Hidayati, 2021; Susanti & Suripah, 2021). The advantages of the developed website-based learning media are that the material presented is in accordance with the learning objectives, the use of simple language and in accordance with PUEBI, the presence of images, videos, and animations that represent the contents of the material, and the presence of HOTS quizzes in accordance with the material studied in the media. The application of website-based learning media is expected to help students understand the contents of the material more easily. The implications of this research are provide motivation to teachers to use more varied media in the learning process at school. The limitations of this study are that website-based learning media were developed based on the needs of grade XII high school students who were the objects of the study, so that they can only be applied to subjects who have appropriate needs. The implications of this study are to provide motivation to teachers to use media in the learning process at school.

#### 4. CONCLUSION

Based on the research results and discussion, it is concluded that Website-based learning media is suitable for application in biology learning on genetic substance material. Feasibility website-based learning media is obtained based on the assessment that has been carried out by expert validators of material and media experts, individual and limited trials. The use of website-based learning media can contribute to the biology learning process on genetic substance material.

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