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# DIGESTIPEDIA-WEB: Learning media innovation to improve critical thinking skills

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ABSTRACT

Developing students' critical thinking skills in learning was an effort to improve learning outcomes. However, critical thinking skills were still not fully developed. The development of Digestipedia-web or website-based media was expected to improve students' critical thinking skills. The purpose of this study was to examine the feasibility and quality of Digestipedia-web media in improving critical thinking skills. This study used the Research and Development method with the ADDIE model. The research was carried out in November 2022. The developed media was tested for feasibility in terms of material, media and language by two expert validators. The effectiveness of the developed media was tested on 35 students at SMAN 18 Tangerang Regency, Indonesia. The overall results of the media test were categorized as valid and feasible. The results of the students' post-test scores were higher than the pre-test scores. The results of the media effectiveness test with the N-Gain test obtained the medium category. The conclusion of this study showed that Digestipedia-web was valid and feasible to use as a learning medium and can improve critical thinking skills in digestive system material.



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## INTRODUCTION

The rapid development of science requires students to be trained in order to have the skills to live in the 21st century known as 4C, namely critical thinking, communication, collaboration, and creativity. Students can be said to have critical thinking skills as one of the skills in the 21st century, that is, if students can analyze, understand and evaluate arguments in learning activities (Osborne, 2004). This critical thinking ability is needed in responding to a question (Nafingah, 2020).

Critical thinking is a reflective thinking ability that focuses on patterns of decision making about what must be believed, must be done and can be accounted for (Ennis, 2011). Critical thinking is thinking skills (logical thinking and problem solving), intellectual autonomy (having ideas and having reasons to support ideas), and independence from positive and negative aspects (such as considering aspects in the decision-making process) (Chen, 2017). Critical thinking skills are related to in-depth analysis and non-subjective assessment to make the right decision (D'Alessioa, Avolio, and Charles, 2019). Based on some of these explanations, critical thinking skills are skills that involve cognitive activity by using logical and objective aspects sequentially to draw a conclusion.

Critical thinking indicators are needed to show that students already have critical thinking skills. There are 5 stages of indicators of critical thinking skills, namely elementary clarification (providing a simple explanation), the basis for the decision (determining the basis for decision making), inference (drawing conclusions), advances clarification (providing further explanations), and supposition and integration (estimating and combine) (Ennis, 1996). These five indicators are interrelated and necessary in knowing the achievement of students' critical thinking skills.

Critical thinking skills are needed because someone who thinks critically will be able to think logically, answer problems well and be able to make rational decisions about what to do or what to believe. Developing students' critical thinking skills in learning is an effort to improve student learning outcomes. However, critical thinking skills are still not fully developed.

According to research by Agnafia (2019) and Masita et al. (2016) students' low critical thinking skills are due to their lack of training in indicators of critical thinking skills and the lack of application of learning to empower students in the biology learning process in Indonesia which tends to hone aspects of remembering and understanding. In line with Sutama et al. (2014) in biology learning so far tends to only hone aspects of remembering and understanding, which is a low order of thinking (low level thinking), so that many students learn only by memorizing and recording what the teacher conveys and tend to be less active in implementing the learning process . This shows that learning biology in schools has not been able to become a means of growing and increasing the tendency to think critically. Low learning outcomes due to learning activities that only emphasize cognitive aspects in the form of memorization (Sudarmini, Kosim, and Hadiwijaya 2015) indicate that students' critical thinking skills are also still low (Kurniahtunnisa, Dewi, and Utami 2016). Therefore, developing critical thinking skills can be done through efforts to provide appropriate media and models in learning. Choosing the right media can increase student learning motivation so that it has a good impact on increasing students' mathematical critical thinking skills (Nafisa & Wardono, 2019).

Learning media is one source of learning. Learning resources are all things that can be used as learning materials and can increase new knowledge (Ramayulis, 2015). Learning resources can be obtained from anywhere, such as humans, tools, environment, and so on. Learning resources are also obtained from the learning media used by the teacher. Learning media is important in the smooth process of teaching and learning in the classroom. Learning media can channel messages, stimulate thoughts and feelings, and encourage students' abilities in the learning process (Kalatting, et al, 2015). One of the learning media that can be used is to use a website that is developed based on learning materials.

Website-based learning media can be used as a solution to overcome student learning problems such as lack of enthusiasm, boredom and lack of motivation to learn because teachers are less communicative and less varied in conveying subject matter in class. Learning activities using website-based learning media can have several advantages, namely being able to provide opportunities for students to study material without depending on the teacher's explanation, students can determine the choice of material to be studied and learning can be carried out

anywhere and anytime and by anyone either by students or teachers as long as they have access to the internet network. Website-based learning media can foster students to be actively involved in learning activities by developing students' learning creativity to be able to understand the material better, so that it can be expected that learning activities will be more fun and not boring. This is in accordance with Baisa's research (2018), that the application of website-based learning media has an influence on students' critical thinking skills.

The free website builder platform is wix.com. This website attracts the attention of many parties because it makes it easy for users to create a website in a short time. Wix.com is also a website creation site specifically for people who haven't created a website before (Susanti, 2019). According to research by Rahmawati, et.al. (2021), the wix website has an effect on increasing student learning outcomes in the production subject of processing vegetable products at SMKN 2 Cilaku Cianjur because there is an increase in student learning outcomes after learning using the wix website-based learning media.

The developed website-based learning media is called Digestipedia-web. Digestipedia-web is a website-based learning media with material on the digestive system. The advantages of Digestipedia-web compared to other media are that there are videos that can be seen by students, animations that are funny and attract students' attention, and there are quizzes that students can directly access to find out how much understanding they have gained. Many researchers have developed the Wix website, but no one has used digestive system material in developing this website for biology learning. One of them is research from Santoso (2016), which is in the form of module quality assessment from reviewers showing that the Wix web-based module Protozoa material gets a very good assessment mode and the results of the readability test by students get positive responses. Another research from Susanti (2019), regarding the use of online media in the project of making web-based teaching materials in the Vertebrate Zoology course, the results of which show that the average value is in the good category. Digestipedia-web was developed as a learning medium in improving students' critical thinking skills. The purpose of this study was to examine the feasibility and quality of Digestipedia-Web media in improving critical thinking skills.

## RESEARCH METHODS

### Research Design

This study uses research and development methods (Research and Development). The model used in this study is the ADDIE model. Research using the ADDIE model consists of five stages (Figure 1), namely analysis, design, development, implementation, and evaluation (Branch, 2009). This development research was carried out at SMAN 18 Tangerang Regency, Indonesia in November 2022.

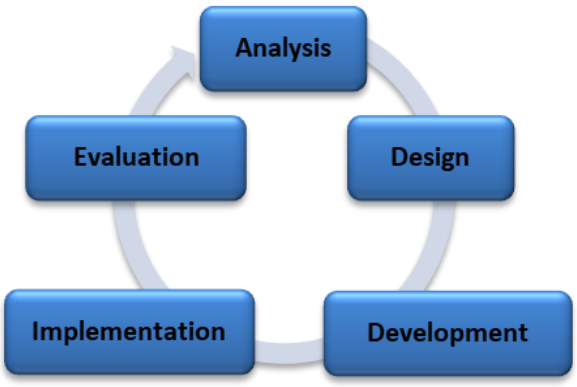



**Figure 1.** ADDIE Stages (Branch, 2009)

## Populasi and Samples

The population used in this study were all 155 students of class XI MIPA at SMAN 18 Tangerang Regency. The sample used was 35 students from class XI MIPA-1. Validation is carried out by two validators; Widi Atmono, S.Pd and Daniar Setyo Dini, S.Pd., M.Pd who will assess the product being developed in terms of material, media and language aspects. Retrieval technique the sample used was simple random sampling. Simple random sampling, namely the method of taking sample members from the population is done randomly without regard to the strata in that population (Sugiyono, 2015).

## Instruments

The critical thinking instrument was developed based on Ennis' (1996) critical thinking indicators and tested for validation by two expert validators. Suggestions from experts related to the instruments that were developed became material for improvement before the instruments were distributed to students. After that, the revised instrument was tested on students and then analyzed for validity and reliability. Measurement of critical thinking skills in the material on the digestive system is carried out by pre-test and post-test with the type of multiple choice questions totaling 15 items. The pre-test and post-test indicators can be seen in Table 1.

**Table 1.** Critical Thinking Skills Indicator

| No. | Critical Thinking Skills Indicator | Question Number |
|---|---|---|
| 1 | *Elementary Clarification* | 1, 6*, 11 |
| 2 | *The Basis for the Decision* | 2*, 7, 12 |
| 3 | *Inference* | 3*, 8, 13 |
| 4 | *Advances Clarification* | 4*, 9, 14 |
| 5 | *Supposition and Integration* | 5, 10*, 15 |

**: Invalid Question*

The critical thinking skills instrument was consulted with an expert validator, namely a biology lecturer and a high school biology teacher with an educator certificate to get instrument improvements. Validation by expert validators includes 3 aspects, namely aspects of language, material, and construction. Each expert validator gives an assessment and then the results will be combined as shown in Table 2. Based on the calculation results, the results of validating aspects of language, material and construction are all with very decent criteria.

**Table 2.** Instrument Validation Results

| Assessment Criteria | Expert Validator (I) | Expert Validator (II) | Average | Criteria |
|---|---|---|---|---|
| *Language Aspect* | | | | |
| The language used is in accordance with the level of development of students | 4 | 4 | 4 | |
| Grammar and spelling according to the rules of the Indonesian language | 4 | 4 | 4 | |
| The sentence in the problem does not cause multiple interpretations | 4 | 4 | 4 | |
| The sentences in the questions are clear and communicative | 4 | 4 | 4 | |

| | | | | |
|---|---|---|---|---|
| There are no terms and sentences that offend any party | 4 | 4 | 4 | |
| *Total* | 20 | 20 | 20 | |
| *Percentage* | 100% | 100% | 100% | Very Valid |
| *Material Aspect* | | | | |
| Conformity of the items with indicators of critical thinking skills | 3 | 2 | 2,5 | |
| The suitability of the items with the question indicators | 3 | 4 | 3,5 | |
| The material asked is according to school level and class level | 4 | 4 | 4 | |
| Questions according to the truth of the concept | 4 | 4 | 4 | |
| The boundaries of the questions and answers asked are clear and not ambiguous | 4 | 4 | 4 | |
| *Total* | 18 | 18 | 18 | |
| *Percentage* | 90% | 90% | 90% | Very Valid |
| *Construction Aspect* | | | | |
| Images, graphs, diagrams, tables and the like are presented clearly | 2 | 2 | 2 | |
| There are clear instructions on how to do the questions | 4 | 4 | 4 | |
| There are scoring guidelines | 4 | 4 | 4 | |
| The subject matter does not provide key clues to the question | 4 | 3 | 3,5 | |
| The answer choices are homogeneous and logical | 4 | 4 | 4 | |
| *Total* | 18 | 17 | 17,5 | |
| *Percentage* | 90% | 85% | 87,5% | Very Valid |

The instrument was tested on 35 students to find out the validity, reliability, discriminating power and level of difficulty. A test said to have empirical validity if it has been tested through experience or on the basis of field observations. Based on table 1, there are 10 valid questions and 5 invalid questions. According to Dewi et al., (2020) an instrument is said to be valid if it can measure what it is intended to measure. Based on the instrument analysis test, the results obtained for the reliability of the instrument were 0.599 in the sufficient category. The more heterogeneous the ability of the test takers, the higher the reliability of the test. The greater the number of test takers, the greater the reliability of the test. The fewer the number of test items, the less reliable they will be because they are not representative (Helendra & Sari, 2021). The results of the difficulty level of the questions were 1 question in the easy category, 11 questions in the moderate category, and 3 questions in the difficult category. The number of questions in the moderate category shows that the types of questions developed are good. This is in accordance with the statement of Murti & Sunarti (2021), that a good question is one that is neither too easy nor too difficult. The different power results show that there are 13 questions in the sufficient category, 2 questions in the good category. According to Murti & Sunarti (2021) questions that have good

criteria show that these questions can distinguish students who do not understand competence and those who already understand competence.

## Procedures

The first stage in the ADDIE design is analysis. The analysis stage is the stage that aims to find out the problems that exist in biology learning at school. Activities at this stage conducted interviews with biology teachers at school. The data obtained from the interview results were then analyzed which would become a guideline for the next stage.

The second stage is the design stage which aims to determine the required learning tools, material analysis, planning the learning process, media or teaching materials used, and other learning support components (Nurseha et al, 2021). The learning tools are syllabus, learning implementation plans (RPP), and teaching materials which are made based on the results of the needs analysis. Material analysis, namely the digestive system material, is adjusted to the contents of the material that will be published on the Digestipedia website with KI, KD, and learning objectives. Storyboard design is carried out based on an analysis of the material to be loaded and the learning model that is used as a reference in product development. The storyboard will be a concept that will be worked on at a later stage of development.

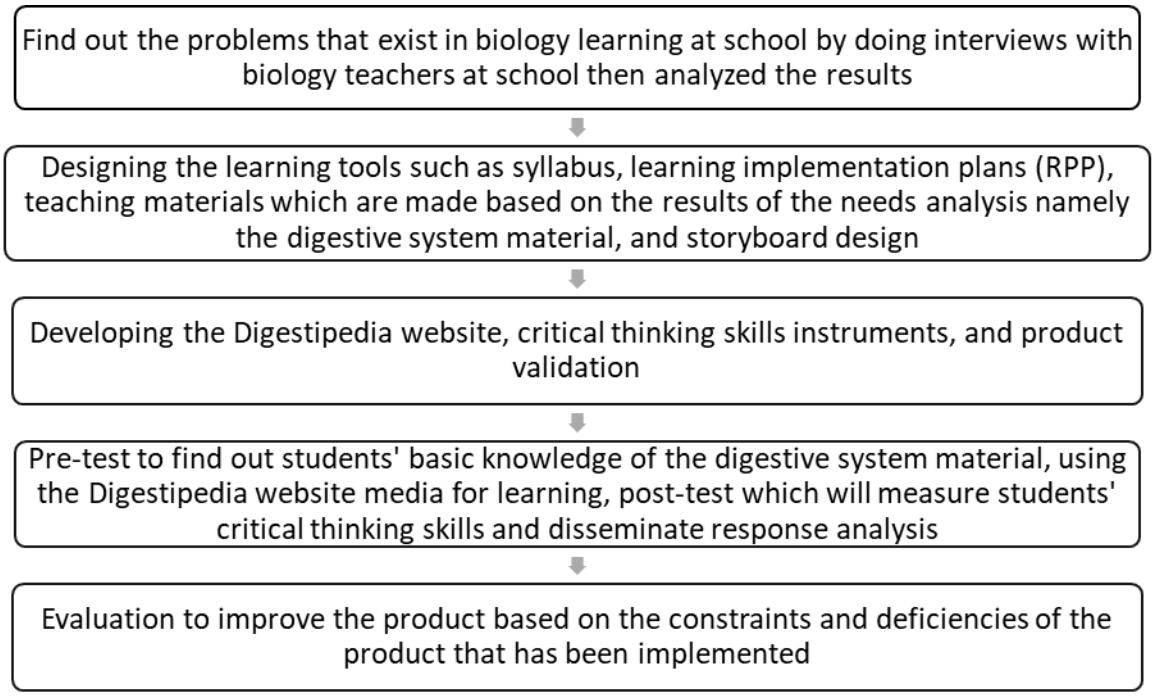



**Figure 2.** Research Procedure

The third stage is the development stage where three activities are carried out, namely developing the Digestipedia website, developing critical thinking skills instruments, and product validation. The learning process that will be carried out is learning using the Wixsite web platform and evaluation using pre-test and post-test instruments. Furthermore, a feasibility test was carried out with expert validation of the developed media. Validation is carried out by two validators who will assess the product being developed in terms of material, media and language aspects. The criteria for an expert validator are 1) one university lecturer with a minimum educational qualification of Masters in biology; 2) one biology teacher who has an educator certificate and teaches biology subjects. Input from experts related to the developed media becomes material for

improving the media that has been developed and the revised product results are carried out at a later stage.

At the implementation stage, the effectiveness of the Digestipedia website was tested. The effectiveness test was carried out at SMAN 18 Tangerang Regency, Indonesia in class XI IPA 1 with a total of 35 students who were selected using simple random sampling technique. The activity begins with a pre-test to find out students' basic knowledge of the digestive system material. Furthermore, learning is carried out using the Digestipedia website media. The final activity at this stage is a post-test which will measure students' critical thinking skills and disseminate response analysis on the use of learning media used.

The last stage is the evaluation stage. This stage aims to improve the product based on the constraints and deficiencies of the product that has been implemented. Constraints and product deficiencies are analyzed and then product improvements are made based on the results of the analysis. The final result at this stage is a Digestipedia website that is feasible and ready to be used in learning. The research procedure is briefly shown in Figure 2.

## Data Analysis

Data obtained from media test results by experts were analyzed using quantitative data analysis techniques. The percentage of data obtained is converted based on the BSNP scale assessment in Table 3.

**Table 3.** Due Diligence Rating Scale

| Assessment criteria | Score |
|---|---|
| Strongly Disagree | 1 |
| Don't agree | 2 |
| Agree | 3 |
| Strongly agree | 4 |

The digestipedia website feasibility quality value is obtained based on the average overall score or can be obtained by the following formula:

$$Score = \frac{score\ obtained}{number\ of\ statements}$$

After the quality value is obtained, the feasibility of the Digestipedia website can be determined based on the interpretation of the feasibility test value from the adaptation of Ratumanan & Laurens (2011). Table of interpretation of due diligence values can be seen in Table 4.

**Table 4.** Eligibility Criteria

| Score in percent (%) | Eligibility Category |
|---|---|
| $3.25 < x \leq 4.00$ | Very valid |
| $2.50 < x \leq 3.25$ | Valid |
| $1.75 < x \leq 2.50$ | Invalid |
| $1.00 < x \leq 1.75$ | Invalid |

This study used a one group pretest-posttest design. The pre-test and post-test scores were tested for normality using the Kolmogorov-Smirnov test at a significance level ($\alpha$) = 0.05. The

score is said to be normally distributed if the significance value (p) is greater than the significance level (α). The results of the pre-test and post-test scores were also tested for homogeneity using the Levene test with α = 0.05. The data obtained is considered homogeneous if the significance (p) is greater than the significance level (α).

Hypothesis testing was carried out by the Wilcoxon test with a significance level (α) of 0.05. The test aims to determine the effect of the media used on learning. If the significance obtained is less than α = 0.05 then there is an influence of the developed media on learning.

The effectiveness test aims to determine how much influence the Digestipedia website can improve the critical thinking skills of the digestive system. The increase in critical thinking skills can be calculated using the normalized gain value (N) with the formula from Hake (Meltzer, 2002), namely:

$$N\ gain = \frac{Skor\ posttest - skor\ pretest}{Skor\ idea - pretest\ score}$$

The average value of N-Gain is then interpreted based on Table 5.

**Table 5.** N-Gain Interpretation

| No | N-Gain average | Interpretation |
|---|---|---|
| 1 | N-Gain > 0.7 | High Effectiveness |
| 2 | 0.7 > N-Gain > 0.3 | Moderate Effectiveness |
| 3 | N-Gain < 0.3 | Low Effectiveness |

## RESULTS

The research and development of the Digestipedia website to improve critical thinking skills is carried out in several stages according to the ADDIE research and development model. Figure 3 shows the results of the due diligence assessment of the digestive system material.

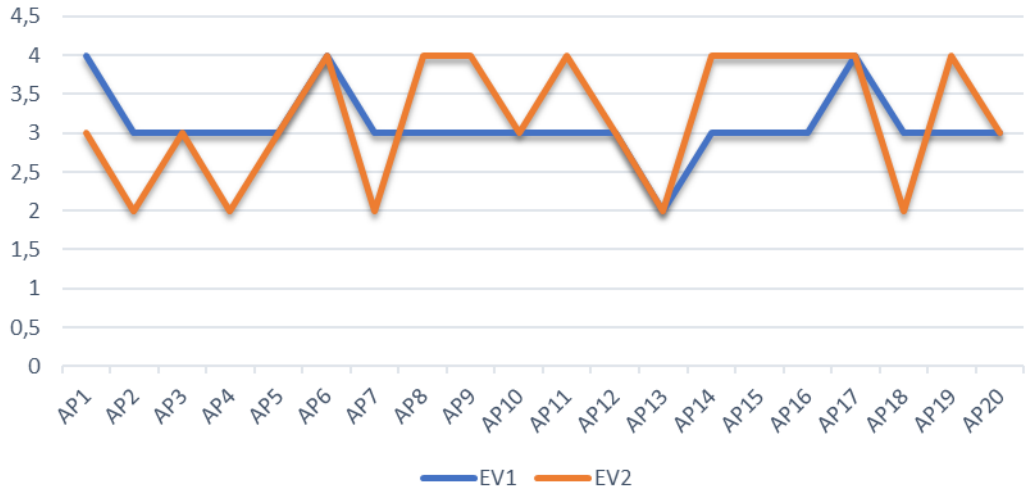



**Figure 3.** The results of the feasibility test of the digestive system material
*EV: Expert Validation
*AP: Assesment Point
AP1: Compatibility of Digestipedia Website content with KI and KD with the current curriculum
AP2: Clearly state the contents of the basic competency of the digestive system

AP3: Appropriateness of Digestipedia Website content with learning objectives of the digestive system
AP4: The Digestipedia website contains aspects of skills found in KI and KD
AP5: The Digestipedia website shows examples of the application of the digestive system according to KD
AP6: Accurate illustration of pictures and videos on the Digestipedia Website with the concepts of the digestive system
AP7: Compatibility of the practice questions with the concepts of the digestive system found on the Digestipedia Website
AP8: Use of standard words on the Digestipedia Website
AP9: Conformity to the level of development of thinking in class XI high school students
AP10: The accuracy of structure and grammar
AP11: Accuracy in the use of biological terms
AP12: The description of the digestive system material is in accordance with the latest scientific developments
AP13: The practice questions cover the entire KI and KD
AP14: The effectiveness of image illustrations in the visualization of system concepts
AP15: The suitability of the video in the visualization of the mechanism of the digestive system concept
AP16: The diversity of presentation of the concept in various features attracts attention
AP17: The diversity of scientific facts related to the material of the digestive system
AP18: Diversity of types of practice questions on the Digestipedia Website
AP19: Image and video models are in accordance with the level of thinking development of students in class XI SMA
AP20: Encouraging student activity in learning

The results of the media feasibility test assessment can be seen in Figure 4. This shows that Digestipeda has been equipped with quality features from various aspects of usability, function, and appearance.

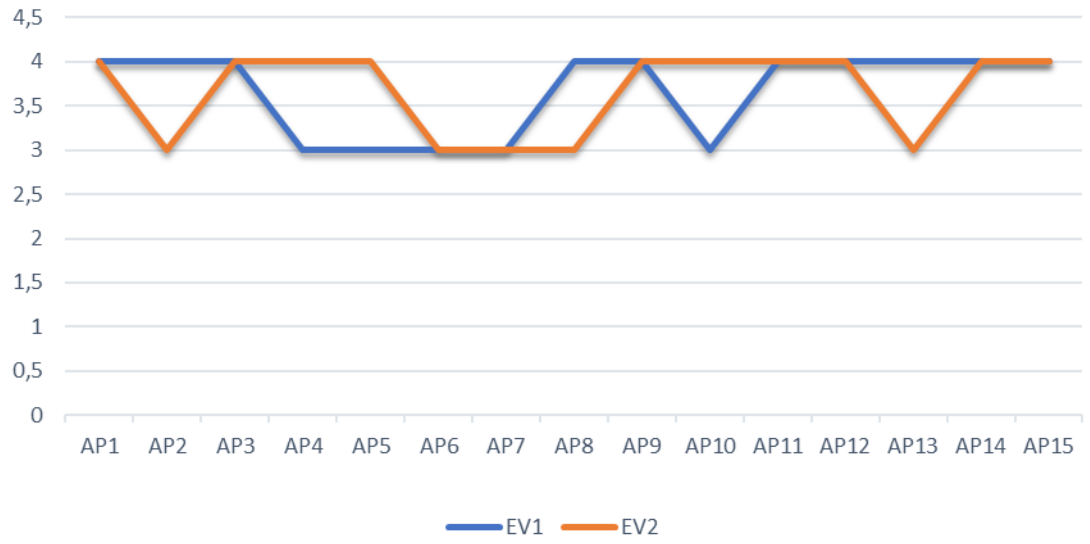



**Figure 4.** Results of the feasibility test of digestive system media

*EV: Expert Validation
*AP: Assesment Point
AP1: Background selection and layout of Digestipedia Website features in general
AP2: The accuracy of choosing the color composition on the Digestipedia Website
AP3: The diversity of illustrations to support the visualization of the material concept
AP4: Diversity of images supporting material on the digestive system on the Digestipedia Website
AP5: The variety of videos contained on the Digestipedia Website
AP6: Diversity in the presentation of website addresses for additional materials for the digestive system
AP7: The Unique Appearance of Each Page on the Digestipedia Website
AP8: The diversity of features that provoke the curiosity of students
AP9: The correct selection of fonts and font sizes so that they read well
AP10: Use of Sentences in accordance with general guidelines for the Indonesian language (PUEBI)
AP11: Accurate writing of words or sentences
AP12: Image quality is not broken when enlarged
AP13: The accuracy of the location of the images and videos contained in the Digestipedia Website
AP14: Video and sound quality is not broken and smooth when displayed
AP15: The accuracy of the presentation of the website address with the intended website

The last assessment carried out by the two experts is to assess the product in terms of language. The results of the language feasibility test are shown in Figure 5.

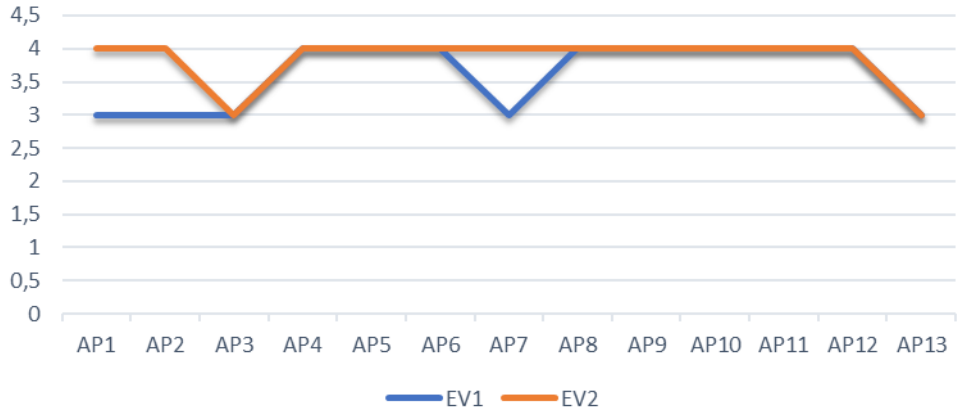



**Figure 5.** Results of the feasibility test for the language of the digestive system
*EV: Expert Validation
*AP: Assesment Point
AP1: The use of sentences does not have a double meaning
AP2: The use of sentences is in accordance with the level of thinking of class XI SMA students
AP3: There are a variety of inductive and deductive paragraphs
AP4: The accuracy of the selection of the size and font of the letters
AP5: The accuracy of choosing the size and font of the letters in writing sources
AP6: Accuracy in choosing the size and font of the explanatory letters on images and videos
AP7: The use of sentences is clear and does not have a double meaning
AP8: The suitability of writing sentences with good and correct Indonesian
AP9: Accuracy in the use of biological terms
AP10: The use of roman symbols is clear and easy to understand

API1: Consistency in the use of terms in sentences
API2: Consistency in the use of symbols in sentences
API3: The use of sentences that encourage the curiosity of students

After the learning activities were carried out, 35 students filled out response analysis questionnaires using the Web Digestipedia. The results of the response analysis are shown in Figure 6.

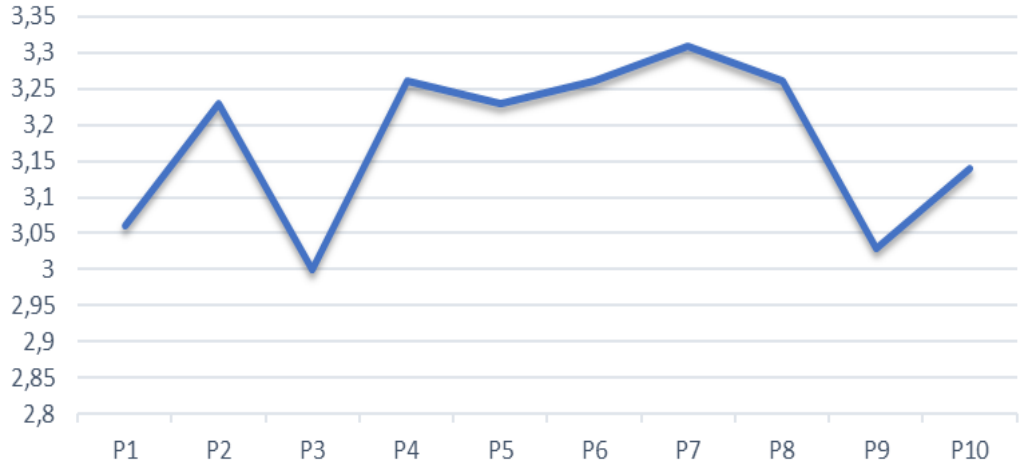



**Figure 6.** Results of response analysis using Web Digestipedia
*P: Point
P1: The contents of the material are sequential and make it easier to master the concept of the digestive system
P2: The contents of Web Digestipedia correspond to the concept of the digestive system
P3: Use sentences that are easy to understand
P4: Selection of attractive layouts
P5: The accuracy of selecting the Web Digestipedia background
P6: Digestipedia's Web features add motivation to learn
P7: Easy to read font size and font
P8: The features in Web Digestipedia are easy to use
P9: Web Digestipedia adds interest in studying the digestive system
P10: Web Digestipedia helps in mastering the concepts of the digestive system

The implementation phase was carried out by 35 students who produced pretest and posttest data. The results of the pre-test and post-test of students are shown in Table 6.

**Table 6.** Results of Average Pretest and Posttest

| | N | Minimum | Maximum | Mean |
|---|---|---|---|---|
| Pre-test | 35 | 20 | 80 | 48.9 |
| Post-test | 35 | 70 | 100 | 82.0 |

Prerequisite tests were carried out on the collected data using the normality test (Kolomogrov-Smirnov test) and homogeneity test (Levene test). Hypothesis testing uses the Wilcoxon test to determine the influence of Digestipedia-web on learning. Results of Prerequisite tests and Wilcoxon test were shown in Table 7.

**Table 7.** Results of Prerequisite tests and Wilcoxon test

| | Significance Level | Description |
|---|---|---|
| Kolmogrov-Smirnov test (α=0.05) | 0.001 | Abnormal |
| Levene test (α=0.05) | 0.602 | Homogeneous |
| Wilcoxon test (α=0.05) | 0.000 | Significant differences |

The effectiveness test uses the N-Gain test to determine the influence of Digestipedia-web. The results of N-Gain are shown in Table 8.

**Table 8.** Result of N-Gain Test

| | Score | Description |
|---|---|---|
| N-Gain | 0.61 | Moderate effectiveness |

The following is the overall Web Digestipedia assessment, which can be seen in Figure 7.

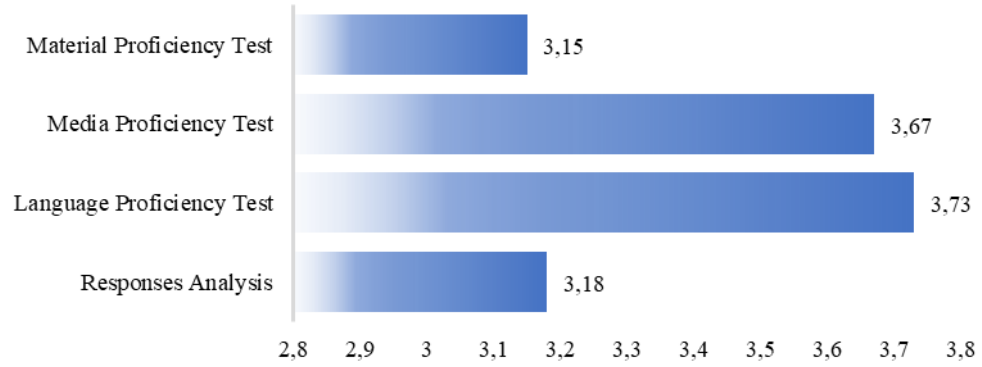



**Figure 7.** Overall Graph of Digestipedia Web Ratings

## DISCUSSION

The research and development of the Digestipedia website to improve critical thinking skills is carried out in several stages according to the ADDIE research and development model. These stages are analysis (analyze), design (design), development (develop), implementation (implementation), and evaluation (evaluation).

1. Stages of analysis (analyze)

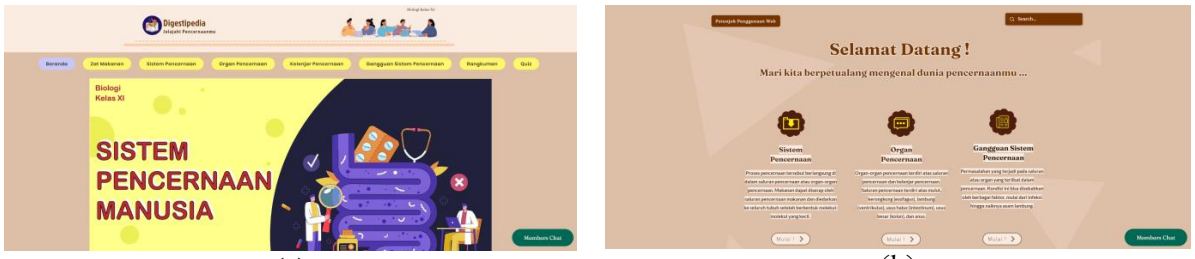
The needs analysis stage is carried out by taking a needs analysis by conducting interviews with teachers at schools. Based on the interview results it was found that teachers at SMAN 18 Tangerang Regency, Indonesia had never used the Wix website to support Biology learning. In particular, it has never been used in researching students' critical thinking skills.

2. Stages of design (design)

The media design stage resulted in material analysis, syllabus, lesson plans, and storyboards. The results of the material analysis are in the form of material adjustments based on core competencies, basic competencies and the results of the needs analysis obtained. In general, the materials contained on the website are nutrients, the concept of the digestive system, digestive organs, digestive glands, and digestive system disorders, summaries and quizzes. These topics are tailored to core competencies, basic competencies, and learning objectives. The preparation of the storyboard is formed according to the needs analysis and material analysis that has been carried out.

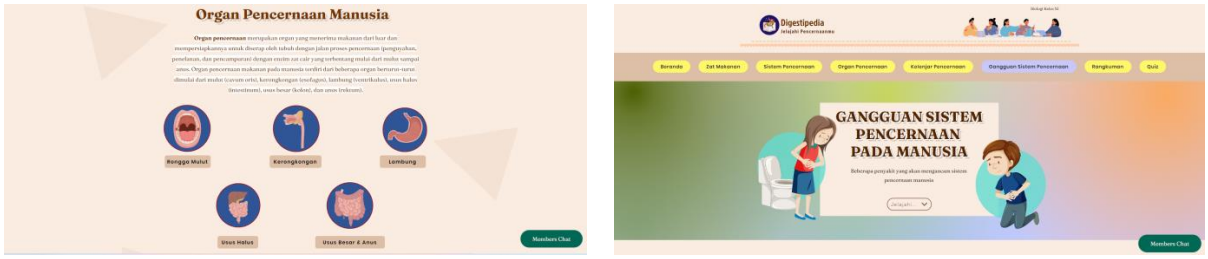
3. Stages of development (develop)

The development stage involved developing the Digestipedia website was media validation, and small group trials. The development of the Digestipedia website begins with making supporting media such as text teaching materials and supporting images. Making supporting media for cartoon images is designed using the Adobe Illustrator application. The integrated material has been adapted to core competencies, basic competencies and learning objectives. The edited material will then be made in the form of a concept map and then arranged in the form of text. After the supporting media has been created, all supporting media are compiled into the Wix website. Wix: Website Editor as the main application used to design website layouts and other features. The Digestipedia development process resulted in a draft such as the main menu which contains a summary of the content contained in the Digestipedia which is presented in a display form as shown in Figure 8 and instructions for using the website are also presented. Content summaries are made so that students can find out how far the digestive system material will be discussed on the website. The addition of other content is supported by supporting pictures and videos from YouTube as illustrations which will indirectly help students remember more easily because they use several senses in their implementation (Purwanti, 2015; Zaenal, 2012). The appearance of the Digestipedia website has a slight difference when opened using a computer and smartphone. These differences are inherent in the Wix website used. Students can access the Digestipedia-web for free by opening the following link https://digestipediaweb.wixsite.com/my-site.




(a) (b)

**Figure 8.** (a) Main homepage of Digestipedia website (after revision); (b) The main menu of digestive system material




(a) (b)

**Figure 9.** (a) Display of the digestive organs menu; (b) Display of digestive system disorders menu (after revision)

After the media has been prepared, it is then validated to assess the feasibility of the media by two expert validators, namely a biology teacher and a university lecturer. The two expert validators assess the feasibility of the product in terms of material, media and language.

Validation in terms of material is assessed based on the suitability of the contents of the Digestipedia website with core competencies, basic competencies and learning objectives in accordance with Indonesian national education standards. The results of the material feasibility test showed a value of 3.15 and included in the valid category. This indicates that Digestipedia is in accordance with the competency achievement indicators that have been determined so that it is in

accordance with the abilities of students (Hasanah & Nulhakim, 2015). good learning media is media that is accurate and can be accounted for and has structured content (Ewins, 2006; Lin & Wu, 2016).

Figure 3 shows the results of the due diligence assessment of the digestive system material. However, there are several notes provided by expert validators regarding website material that need attention. Validator 1 stated questions that were less diverse, material terms and their explanations, the need to add student activities and an evaluation of each material. While notes from validator 2, the information provided on the website is too brief, which can lead to misconceptions. The results of the material assessment items obtained 2.00 are listed in Figure 3, this is because the website has not included KI, KD, and learning objectives and concept maps. Meanwhile, after being validated, the inputs from the validator are given more attention to be revised so that the developed website is better than before.

The feasibility test in terms of the media is assessed based on the quality and completeness and quality of the features as well as the selection of the general appearance of the Digestipedia website. The results of the media feasibility test are classified as very valid with a value of 3.67. The results of the media feasibility test assessment can be seen in Figure 4. This shows that Digestipeda has been equipped with quality features from various aspects of usability, function, and appearance. Digestipedia components such as images, text, and displays are good enough so that students have no difficulty reading the content (Bahri, Syamsuri, & Mahanal, 2016). Images as graphic media are easier for students to digest because of their concrete visual nature so that ambiguity does not occur (Susilana & Riyana, 2008).

There are several notes given by expert validators regarding website media that need attention. Validator 1 stated that the diversity of images, videos, and unique views needed to be developed to make them more attractive. Whereas validator 2 stated that learning videos sourced from YouTube need to pay attention to the language used, each image needs to pay attention to the title and its source, and include instructions for using the website.

The last assessment carried out by the two experts is to assess the product in terms of language. The product feasibility test in terms of language is assessed based on the use of sentences and biological terms as well as the use of type and size of letters in each paragraph written in the Digestipedia website. The results of the product feasibility test in terms of language are included in the very valid category with a value of 3.73. The results of the language feasibility test are shown in Figure 5. There are several notes given by the expert validator regarding the website media that need attention.

After the expert test was carried out as a whole from the material, media and language, an average value of 3.52 was obtained so that it was categorized as very valid and suitable for use as a learning medium by making revisions first.

The Digestipedia website is an implementation of e-learning so that it can be accessed using the internet and used as a forum for sharing useful information for distance learning (Kapezovich & Toktarbekovna, 2014; Wolfe & Cedillos, 2015). The use of e-learning using the website can help teachers to provide various assignments, evaluate learning, to build active discussions online both between students and students with teachers (Rodrigues et al. 2018; Renata & Jana, 2012). In addition, teachers can control, supervise and assign assignments without having to meet face to face with students by using a website-based e-learning learning system and certain learning models (Fayanto et al. 2019).

Website-based learning provides unlimited space for students to participate in learning. The contribution of learning websites can change student learning styles to be more effective and efficient. In addition, the information packaged in the learning website is more interesting, the materials are combined with pictures, motion, animation, and sound, so that the information

presented is interesting and increases the enthusiasm of students to take part in learning activities. This web-based learning media is easy for users to use with simple commands, and users can actively select the desired menu (Kuswanto, 2018).

The advantages of the Digestipedia website as a learning medium refer to the effectiveness and efficiency of learning. The use of Digestipedia can reduce the space and time of learning and improve the quality of the learning process. Meanwhile, the weakness of the Digestipedia website requires students to be independent in learning without teacher assistance. Meanwhile, in learning, communication is needed in the form of direct discussions and also as a medium for improving students' social skills (Rohdiani & Rakhmawati, 2017). While learning takes place using the Digestipedia website requires the use of internet access so that an internet network is needed so that learning can take place effectively.

After the learning activities were carried out, 35 students filled out response analysis questionnaires using the Web Digestipedia. The results of the response analysis are shown in Figure 6. Based on the analysis of responses to media use, Web Digestipedia is categorized as valid with a value of 3.18. Following are some of the comments of students after learning with the media.

"The Digestipedia web is very helpful and makes it easy for me to understand digestion materials easily and learn digestion with pleasure."
*Student Comments 4, 2022*

"The material is good, complete, lots of pictures, and interesting."
*Student Comments 12, 2022*

"It's very easy to understand with the era that is all sophisticated and can help especially those that are not in books with the existence of a media system."
*Student Comments 25, 2022*

In accordance with Aditya's statement (2018), website-based learning media has one of the advantages, namely quite complete content such as supporting videos, powerpoints, and images. This shows that the creation of website-based learning media can be used as a support for learning according to the needs of students. Learning media that have an attractive appearance and provide in-depth information can improve reading habits (Suryawati, 2011).

4. Stage of Implementation (implementation)

The stage of implementation was carried out by applying the developed media in the form of digestipedia-web to 35 students. The stage of implementation was preceded by giving a pre-test to all students before using the digestipedia-web media, was given 10 multiple choice questions. Learning activities were continued by applying digestipedia-web as a learning media. Then students were given a post-test to assess students' thinking skills regarding the material being studied and to measure the success of the product being developed. The results of the pre-test and post-test of students are shown in Table 6. The results obtained for the average overall pre-test score were 48.9, with a minimum score of 20 and a maximum score of 80. The sum of the average post-test results -the overall test is 82, with a minimum score of 70 and a maximum score of 100. So the analysis obtained is that there is an increase in students' scores between the pre-test and post-test.

The result of normality and homogeneity test in shown in Table 7. The normality test aimed to measure the results of the pre-test and post-test obtained normally or abnormal through the Kolmogorov-Smirnov Test. The results obtained were abnormal distributed with score of 0.001 < level significance 0.05. The homogeneity test was carried out as a prerequisite test aiming

to determine the similarity of the data variants. The homogeneity test in this study used Levene's test of homogeneity of variance. The results of Levene's homogeneity test had score 0.602 > level significance 0.05. The results show that the pre-test and post-test values are homogeneous.

The results of the data normality test showed that the data were not normally distributed, so the Wilcoxon test was used to test the influence of the media. Table 7 showed the results of the Wilcoxon test, namely 0.000 < level significance 0.05. These results indicate that there was an effect of the use before and after the application of learning media in the form of digestipedia-web in students' critical thinking on digestive system material. This is supported by the N-Gain results obtained of 0.61 shown in table 8. These results indicate that digestipedia-web produces moderate effectiveness to improve students' critical thinking on digestive system material.

Baisa (2018) stated that the application of web-based learning media can improve critical thinking skills because this learning media has many advantages compared to other learning media (besides computer-based media). The advantages of web-based learning media include learning that is more student-oriented (students are more active). Students have the opportunity to learn about difficult problems repeatedly until understanding is reached. The digestipedia-web there are independent exercises done by students. According to Rusman (2018) the results of self-discovery will be remembered for a longer time by students compared to completely given by the teacher.

The digestipedia-web on the initial appearance there was a concept map and an initial description of the digestive system. According to Nurlina (2020) the use of this concept map can increase students' understanding because concept maps are a way of learning that develops a meaningful learning process, as a means to familiarize the brain with conceptual thinking in all things. Solikhatun et al. (2015) stated that visual images assist students in building knowledge because the information contained in images helps students in constructing or elaborating the knowledge they have before.

The digestipedia-web contained material about the digestive system accompanied by pictures. The picture describes the organs and disorders of the digestive system accompanied by information. Kasmiyatun (2016) stated that pictures accompanied by clear instructions are able to interpret and remember the contents of the accompanying text material, so that abstract explanations will be easily understood by students.

The digestipedia-web contained videos about the digestive system to increase students' understanding of the digestive system. According to Noviyanto et al. (2015) the use of animated videos can make it easier for students to understand subject matter that is difficult to explain concretely. Arsyad (2015) stated that video has an advantage in learning, namely video can describe a process precisely which can be watched repeatedly if deemed necessary; can encourage and increase student motivation; and videos can present and explain complex processes and concepts.

5. Stages of evaluation (evaluation)

This stage is the process of perfecting the Digestipedia Web learning media which includes material on the digestive system. Improvements were made in accordance with the criticisms and suggestions obtained from expert validators and students. The following is the overall Web Digestipedia assessment, which can be seen in Figure 5.

The highest score obtained from the language feasibility test with a value of 3.73. Based on the overall assessment carried out, the average rating is 3.43 and is considered valid. This makes the Web Digestipedia usable in teaching the digestive system in class XI.

Aspects of website development as a whole are supported by the use of the internet which allows broadening of horizons and exploration as well as increasing learning motivation. This is in accordance with the statement of Mehdi and Aurelie (2014) that the implementation of e-learning in general can maintain students' learning motivation through extensive exploration. In addition, good student responses are also supported by the application of website technology as a basis for

media development. This is in accordance with the results of research by Bambang, Dewiyani & Pantjawati (2016) which shows that students in the 21st century as the internet generation (virtual world generation) do not experience obstacles in mastering various ICT-based products. Senthilkumar, Sivapragasam & Senthamaraikannan (2014) stated that learning Biology would be easier, more interesting and more comfortable with the application of various ICT devices.

## CONCLUSION

Based on the research results, it can be concluded that in the validation of material experts, media experts, and linguists are categorized as valid and supported by student responses in the valid category. The results of the digestipedia web effectiveness test using N-gain obtained the medium effectiveness category. The recommendation from the researcher is to increase the effectiveness and efficiency of instruments and media by conducting a product feasibility test on a larger sample. In addition, this instrument can be a basis for developing 4C skills that support 21st century learning.

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