International Journal of Multicultural and Multireligious Understanding

http://ijmmu.com
editor@ijmmu.com
ISSN 2364-5369
Volume 12, Issue 8
August, 2025
Pages: 500-509

Development of Website-Based Learning Media Oriented to Junior High School Students' Ability to Understand Concepts and Self-Efficacy

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http://dx.doi.org/10.18415/ijmmu.v12i8.6946

Abstract

This research aims to produce a quality website-based learning media oriented to students' ability to understand concepts and *self-efficacy* reviewed from validity and practicality. The results of the study show that quality website-based learning media is reviewed from validity and practicality. The results of validation by material experts and media experts obtained a very valid category. This research is research and development using the ADDIE development model. The research stages are *analyze, design, development, implementation,* and *evaluate*. The research subjects were grade VIII students at one of the junior high schools in Yogyakarta. The instrument used to measure validity is the validation sheet. The instruments used to measure practicality consisted of observation sheets for the implementation of learning activities and questionnaires for teacher and student responses. The results of the study show that (1) The results of the product validation sheet by material and media experts obtained a very valid category; (2) The results of the teacher's response questionnaire obtained a very practical category. The results of the student response questionnaire obtained a practical category. So it can be concluded that website-based learning media is suitable for use.

Keywords: *Website-Based Learning Media; Concept Understanding Ability; Self-efficacy*

Introduction

The curriculum is an important part of the implementation of education to achieve national education goals. The curriculum is a set of plans and arrangements regarding learning tools and methods used as guidelines for teaching and learning activities (Hamalik, 2017). In other words, the curriculum is the spearhead for the implementation of learning activities. Without a curriculum, it is impossible for education to run as well, effectively, and efficiently as expected. The curriculum currently used is the independent curriculum. The independent curriculum is a curriculum with diverse learning and is applied to train independence in thinking (Khoirurrijal *et al.*, 2022). In addition, one of the bases for the development of an independent curriculum is the use of technology and competency needs in the current era (Marisa, 2021).

A very basic ability that students must have in learning mathematics is the ability to understand concepts (Nurjanah *et al.*, 2021). According to Kilpatrick *et al.* (2001) states that students who have a

good understanding of concepts know various facts and methods. One of the goals of learning mathematics in schools, according to Wardhani (2008), is that students are able to understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently, and appropriately in solving problems. Based on the results of research by Dini *et al.* (2018) and Jannah *et al.* (2019) show that there are still many students who have difficulty understanding concepts in mathematics so that they are not able to apply them correctly to problems and still lack confidence in students in their ability to complete tasks correctly, this is suspected to be a factor causing students' low understanding of mathematical concepts.

In addition to the ability to understand concepts, mathematics learning also requires self-confidence in each student. The self-confidence that we usually hear is self-efficacy. Self-efficacy is an individual's belief in one's own abilities (Lestari *et al.*, 2021). Self-efficacy is an important construct that helps to explain the learning that students participate in and the student's performance in relation to its achievement as well as provide clues to how well students are achieving or making progress (Schunk & Zimmerman, 2012). There are students who have below-average self-efficacy, so students' self-efficacy needs to be improved again (Pratiwi & Imami, 2022). While research by Putri & Prabawanto (2019) shows that students have low self-efficacy, therefore most students in high school lack confidence in solving math problems. This means that most students do not have maximum confidence in their abilities, many students with great potential but lack confidence so that their potential is not optimally channeled in learning

According to Mashuri (2019), media is a tool used by teachers with an adapted design to improve the quality of learning. One of the learning media that can be used by teachers in mathematics learning is website-based learning media. Website is one of the learning media that can be accessed anytime and anywhere. In addition, websites can contain a variety of interactive multimedia content, making it the right choice to support learning (Panjaitan *et al.*, 2022). The use of websites in mathematics learning can create an interesting and interactive learning environment.

A good website has characteristics such as interactivity, independency, accessibility, and enrichment (Rusman, 2012), which allow students to actively engage, learn independently, access materials without obstacles, and gain relevant knowledge enrichment. These characteristics are in line with the opinion of Ekarini (2019) who states that a good website is also seen from usability (ease of use), clear navigation system, attractive visual design, informative content, compatibility with various devices, fast loading times, good functionality, and accessibility for all users. The fulfillment of the above characteristics allows the development of interesting and interactive website-based learning media to help teachers create learning experiences that are relevant to the development of the times, especially in facilitating the ability to understand concepts and self-efficacy.

Website-based learning media can be created with various applications, one of which is Lumi Education. Lumi Education is an e-learning content creation application developed to create interactive content (Fatma & Hatice, 2022). This application can help learning at various levels starting from school, and can produce media products that can integrate with learning, one of which is mathematics (Petri, 2022). The Lumi Education application can be used for free using the website or application. The resulting product can be accessed offline. There are 49 different types of interactive content that can be created in four different categories: gaming, multimedia, questions, and social media (İzmirli vd., 2018).

Based on the description above, students' ability to understand concepts and self-efficacy needs to be improved again. This can be done by providing supportive learning facilities such as the provision of website-based learning media that guide students to achieve learning goals.

Method

This research is research and development using the ADDIE development model. The stages of research are analyze, design, development, implementation, and evaluate. The subject of the study was a grade VIII student at one of the junior high schools in Yogyakarta. The instrument used to measure validity is the validation sheet. Validity criteria if the validation results meet the minimum "valid" criteria. The grid of the validation sheet is as follows.

Table 1. Material Expert Validation Sheet Grid

Aspects	Indicator	Item Number
Fill	Collapse and scope of content	1, 2
	Fit for purpose	3
	Clarity of material division	4
Learning	Clarity of the title of each subsection	5
	Clarity of examples and practice questions	6, 7
	Concept comprehension ability facility	8
	Student *self-efficacy* facilities	9
	Emphasis on key points	10
	Ease of understanding of the material	11
Practice Questions	Clarity of workmanship instructions	12
	Suitability of practice questions	13
	Quality of questions	14
Display	Compatibility of the image with the material	15
	Learning video suitability	16
	Attractiveness of the content of the material	17
Language	The language used is communicative and easy to understand	18, 20
	Language clarity	19

Table 2. Media Expert Validation Sheet Grid

Aspects	Indicator	Item Number
Display	Clarity of titles and instructions for the use of website-based learning media	1, 2
	Readability *of* layouts that make it easier for students to learn	3
	Precision of color selection	4
	Clarity of multimedia display supporting material	5, 6
	The attractiveness of multimedia displays	7, 8
	Compatibility of *the cover design* with the material	9, 10
	Suitability of buttons in website-based learning media	11
Use	Ease of use of the product	13
	Ease of access to product menu	14
	Ease of interacting with products	15
	Completeness of the identity of website-based learning media	16
Utilization	Language	17
	The attractiveness of website-based learning media	18
	Concept comprehension ability facility	19
	Self-efficacy *facility*	20

The instruments used to measure practicality consisted of observation sheets for the implementation of learning activities and questionnaires for teacher and student responses. The practical

criterion is if the percentage of observation results for the implementation of learning activities for each meeting reaches at least 80% and the results of the questionnaire assessment meet the minimum criteria of "practical". The assessment aspects of the teacher and student response questionnaire are as follows.

Table 3. Assessment Aspects of Teacher Response Questionnaire

Aspects	Indicator	Item Number
Presentation of Teaching Modules	General information	1
	Suitability of learning objectives	2
	Meaningful learning fit	3
	Suitability of lighter questions	4
	Selection of learning approaches	5
	Planning of learning activities	6
	Compile assessments	7
	Language compatibility	8
Presentation of Website-Based Learning Media	Material coverage	9, 10, 11
	Concept comprehension ability facility	12, 13
	Student *self-efficacy* facilities	14, 15
	Presentation of web-based learning media	16, 17, 18, 19
	Language compatibility	20

Table 4. Assessment Aspects of Student Response Questionnaire

Aspects	Indicator	Item Number
Material Coverage	Material collapse	1
	Suitability of learning objectives	2
	Clarity of material division	3
Concept Understanding Ability Facility	Questions used	4
	Learning activities on website-based learning media	5
Student *Self-Efficacy* Facility	Presentation of the materials used	6
	Learning activities on website-based learning media	7
Presentation of Website-Based Learning Media	Website-based learning media display	8, 9, 10, 11, 15
	Facilities	12
	Attractiveness	13
	Language	14

The categories of validity and practicality depend on the number of items of the validation sheet instrument. As for the interval distance, the categories of validity and practicality are generally in the following table.

Table 5. Interval of Categories of Validity and Practicality in General

Interval	Category	
	Kevalidan	Practicality
$S_{min} + 4JI \leq V \leq S_{maks}$	Highly Valid	Very Practical
$S_{min} + 3JI \leq V < S_{min} + 4JI$	Valid	Practical
$S_{min} + 2JI \leq V < S_{min} + 3JI$	Quite Valid	Quite Practical
$S_{min} + JI \leq V < S_{min} + 2JI$	Less Valid	Less Practical
$S_{min} \leq V < S_{min} + JI$	Invalid	Impractical

Table 6. Components of the Validity and Practicality Assessment Category

Component	Many Items	Score Minimum	Ideal Maximum Score	Interval Distance
Product Validation of Subject Matter Experts	20	20	100	16
Media Expert Product Validation	20	20	100	16
Teacher Response Questionnaire	20	20	100	16
Student Response Questionnaire	15	15	75	12

Table 7. Validity Assessment Category

Interval		Category
Material Expert	Media Member	
$84 \leq V \leq 100$	$84 \leq V \leq 100$	Highly Valid
$68 \leq V < 84$	$68 \leq V < 84$	Valid
$52 \leq V < 68$	$52 \leq V < 68$	Quite Valid
$36 \leq V < 52$	$36 \leq V < 52$	Less Valid
$20 \leq V < 36$	$20 \leq V < 36$	Invalid

Table 8. Categories of Practicality Assessment

Interval		Category
Teacher Response Questionnaire	Student Response Questionnaire	
$84 \leq P \leq 100$	$62 \leq P \leq 70$	Very Practical
$68 \leq P < 84$	$50 \leq P < 62$	Practical
$52 \leq P < 68$	$38 \leq P < 50$	Quite Practical
$36 \leq P < 52$	$26 \leq P < 38$	Less Practical
$20 \leq P < 36$	$14 \leq P < 26$	Impractical

In addition to developing website-based learning media, this media facilitates the ability to understand concepts and self-efficacy. The indicators of the ability to understand the concepts used are restating a concept of data investigation, representing data, identifying the properties of data types and determining appropriate diagrams, as well as applying/applying bar and circle diagrams to present, interpret data, and solve mathematical problems. The self-efficacy indicators used are the confidence to organize and do something, the confidence to solve mathematical problems/tasks at various levels of difficulty, the confidence to complete various mathematical tasks in various situations and conditions, the belief in having tenacity in learning mathematics, and the belief in perseverance to achieve success in completing mathematics tasks.

Results and Discussion

Results

The product developed uses ADDIE's research and development model which consists of five stages, namely analysis, design, development, implementation, and evaluation. The product developed is

a website-based learning media oriented to students' ability to understand concepts and self-efficacy. The developed website-based learning media can be used in the learning process as a support for learning resources.

The initial stage of the analysis consists of the analysis of needs and materials. The analysis was obtained from the results of observations and interviews with teachers. The results of the analysis are used as a basis for developing website-based learning media according to the curriculum, namely an independent curriculum that is adjusted to the conditions in schools and students.

The second stage is the stage of planning products and research instruments that are relevant to needs and materials based on the results of previous analysis. The stages of designing products and designing learning are carried out by designing product content and orientation. Product planning by preparing materials and applications for Lumi Education. The product is designed in the form of a website-based learning media that can facilitate students' ability to understand concepts and self-efficacy.

The third stage is the development stage which is carried out by making instruments and products. The product is a website-based learning media made using the Lumi Education application which is tailored to facilitate students' ability to understand concepts and self-efficacy. The research products and instruments that have been developed are then validated by experts who obtain valid results for all instruments and website-based learning media.

The fourth stage is the implementation of website-based learning media oriented towards students' ability to understand concepts and self-efficacy that has been developed and validated, so it can be applied to the research subject, namely grade VIII students. This trial aims to evaluate the practicality of website-based learning media. The implementation stages were carried out in four meetings of learning activities. The first meeting studied data investigation by formulating questions, collecting data, processing and interpreting it to answer questions. The second meeting learned to differentiate the data types and determine the diagrams that correspond to the data type. The third meeting learned to use bar charts to present and interpret data and make estimates based on the data presented. The fourth meeting studied using pie charts to present and interpret data and make estimates based on the data presented. Learning runs smoothly during the implementation process of website-based learning media.

The fifth stage is the evaluation of instruments and products in the form of website-based learning media that have been used. Assessments and suggestions are given for instruments and products that have been used in the implementation stage. The evaluation activity consists of assessment of the practicality of website-based learning media which is oriented towards students' ability to understand concepts and self-efficacy. The practicality of website-based learning media is obtained from the practicality sheets that have been filled out by students and mathematics teachers, in addition to that there are also observation sheets for the implementation of learning activities that have been carried out.

After the development of the necessary research products and instruments, it is followed by validation of website-based learning media. The results of the validation are as follows.

Table 9. Validity Results

Validation Components	Maximum Value	Score	Category
Product Validation of Subject Matter Experts	100	89	Very valid
Media Expert Product Validation	100	86	Very valid

The analysis of the practicality of the product was assessed based on the observation sheet of the implementation of learning activities, teacher response questionnaire, student response questionnaire. The

results of the implementation of learning implementation of website-based learning media are described as follows:

Table 10. Results of Observation of the Implementation of Learning Activities

Meeting to	Maximum Score	Teacher Activity Score	Student Activity Score	Percentage
1	17	15	14	85,29%
2	17	15	15	88,24%
3	17	16	15	91,18%
4	17	16	16	94,12%
Average				89,71%

Based on the results of observations, the implementation of learning activities using website-based learning media was obtained on average 89.71%, which means ≥ 80%. Therefore, website-based learning media is declared practical when reviewed from the results of observation of the implementation of learning activities. The results of the assessment of the teacher and student response questionnaire are described as follows.

Table 11. Practical Results

Validation Components	Maximum Value	Score	Category
Teacher Response Questionnaire	100	92	Very Practical
Student Response Questionnaire	75	60,8	Practical

Based on the above results, the website-based learning media was declared practical to be reviewed from the questionnaire of teacher and student responses. Based on the implementation sheet of the learning process and the response questionnaire of teachers and students, it can be concluded that the website-based learning media that has been used is declared practical.

Discussion

Website-based learning media is oriented towards students' ability to understand concepts and self-efficacy, for the data materials and diagrams that are developed, can be accessed with a qr-code or can be opened with a link https://qr.me-qr.com/cUqaicgP can be used offline, but to access learning videos and practice links, internet access is required. The developed website-based learning media has several characteristics, namely:

1. Interactive: The web-based learning media developed is designed to encourage students to actively engage in the learning process through a variety of interactive features. There are several interactive menus, namely: (a) Material, there are pictures and buttons to provide further information for the material studied; (b) Video, there are learning videos that students can access repeatedly; and (c) Sample and practice questions, there is a feedback feature that allows students to learn independently by identifying and correcting their mistakes.

2. Independecy: The developed website-based learning media provides flexibility in time and place. The products developed can be studied anytime and anywhere according to the needs of students in learning the material before class and in increasing students' understanding after learning. The developed website-based learning media can be accessed through a qr-code or the available link.

3. Accessibility: The developed website-based learning media provides easily accessible learning resources for data materials and diagrams that can be accessed using mobile phones and laptops through qr-codes offline and online. In the developed website-based learning media, learning resources are available in the form of materials, videos, sample questions, practice questions, and reflections.

4. Enrichmeny (Enrichment): The developed website-based learning media consists of a cover page, instructions for use, introduction, content section, and summary. The cover and summary section is a menu available in the Lumi Education application so it needs to be adjusted to the material used. The instructions for use contain instructions for buttons and menus available on the website-based learning media. The introduction contains learning objectives, perceptions, triggering questions, and material charts as well as indicators of students' concept comprehension ability and self-efficacy. The content section contains six sub-contents in the form of material, videos, practice questions, and reflections that are adjusted to the sub-material used. The website-based learning media developed uses an attractive and interactive display to facilitate concept comprehension skills with practice questions adjusted to indicators of concept understanding and self-efficacy with encouraging sentences to increase students' self-confidence in the material, videos, practice questions, or reflections adjusted to self-efficacy indicators. Data materials and diagrams in web-based learning media are adjusted to the independent curriculum which produces six sub-materials, namely various data, diagrams in statistics, bar charts, pie charts, and choosing the right diagrams.

Products in the form of website-based learning media are tested for feasibility and quality in terms of validity. The validity of website-based learning media is carried out by validating instruments and products that have been developed by experts/validators. Products in the form of web-based learning media meet the validity criteria reviewed based on the validation results of material experts and media experts. The research instrument met the validity criteria reviewed based on the results of the validation of the test instrument, the ability to understand the concept, and the self-efficacy questionnaire instrument. According to Plomp & Nieveen (2013), a product is declared valid if it is developed in accordance with its theory or scientific field (content validity) and there is consistency in each component (construct validity). The product developed is declared valid if the validator that the learning tool meets the minimum validity criteria of "valid" and feasible to use (Plomp & Nieveen, 2013).

The results of the validation of website-based learning media by material experts obtained a score of 89 with a very valid category, the results of the validation of website-based learning media by media experts obtained a score of 86 with a very valid category. Based on the results of the validation of research instruments and website-based learning media, it was declared valid so that it was feasible to use.

Products in the form of website-based learning media are tested for feasibility and quality in terms of practicality. The practicality of website-based learning media is reviewed from the results of the percentage of implementation of the learning process, teacher response questionnaire, and student response questionnaire. According to Plomp & Nieveen (2013) stated that the criteria for practicality are linked to two things, namely teachers and other experts consider the developed product to be usable, and it is easy for teachers and students to use the product in accordance with the development objectives. In this study, the web-based learning media developed was declared practical if the results of the practicality assessment from teachers and students reached the practical or very practical category and the average percentage of implementation of the learning process reached 80% (Kusumah & Dwitagama, 2012).

The results of the implementation of the learning process using website-based learning media were obtained on average 89.71% which means ≥ 80%. The results of the teacher's response questionnaire obtained a score of 92 with a very practical category. The results of the student response questionnaire obtained a score of 60.8 with a practical category. The existence of this website-based learning media is

expected so that students are directed to become active learners because they can read or study the existing material first before participating in classroom learning (Sadjati, 2012). Based on the learning process implementation sheet and the response questionnaire of teachers and students, it can be concluded that the website-based learning media that has been used is declared practical and feasible to be used in the learning process.

Conclusion

Website-based learning media developed in accordance with the characteristics of website learning media which contains interesting and interactive materials, videos, sample questions, practice questions, and reflections. This product can also be used and accessed independently through a mobile phone or laptop offline or online. This product adjusts to indicators that can facilitate the ability to understand concepts and self-efficacy. The results of the validation of website-based learning media by material experts obtained a score of 89 with a very valid category, the results of the validation of website-based learning media by media experts obtained a score of 86 with a very valid category. The results of the implementation of the learning process using website-based learning media were obtained on average 89.71% which means ≥80%. The results of the teacher's response questionnaire obtained a score of 92 with a very practical category. The results of the student response questionnaire obtained a score of 60.8 with a practical category. So it can be concluded that website-based learning media oriented towards the ability to understand concepts and self-efficacy can be used in the classroom as learning support materials.

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