At-Tasyrih Jurnal Pendidikan dan Hukum Islam, 11(1) - June 2025 24-397

Development of Web-based Digital Learning Resources for Mathematics Subject

Adrie Satrio [1]
[1] *Universitas Lambung Mangkurat, Banjarmasin, Indonesia*

Corresponding Author: Adrie Satrio, E-mail; adrie.satrio@ulm.ac.id

Received: Sep 09, 2023	Revised: Sep 14, 2023	Accepted: Sep 19, 2023	Online: Sep 26, 2023

ABSTRACT
The advancement of science and technology demands schools to provide and de-velop learning resources. Educational digitization requires innovative develop-ment of learning resources towards digital platforms. The purpose of this re-search is to develop web-based digital learning resources for the mathematics subject in Grade VII of Junior High School and to investigate whether there is an improvement in the students' learning interest after utilizing the developed web-based digital learning resources for mathematics. This research adopts a descrip-tive quantitative research and development (R&D) approach using Alessi & Trol-lip development model. The results of this research and development (R&D) have been deemed highly feasible with an average percentage score of 82% from web design experts and 80% from subject matter experts. The web-based digital learn-ing resources are also found to enhance the learning interest of Grade VII stu-dents in mathematics at SMP Negeri 1 Banjarmasin, as evidenced by the calcula-tion of n-gain from initial and final interest, resulting in an average n-gain value of 0.70, classified as moderate improvement.

Keywords: *Learning Resources, Learning Interest, Mathematics*

Journal Homepage https://ejournal.iainbatanghari.ac.id/index.php/attasyrih/index

How to cite: Satrio, A. (2025). Development of Web-based Digital Learning Resources for Mathematics Subject. *At-Tasyrih: Jurnal Pendidikan dan Hukum Islam*, 11(1), 24-397.https://doi.org/10.55849/attasyrih.v9i2.223
Published by: Pusat Penelitian dan Pengabdian Masyarakat, Institut Agama Islam Nusantara Batang Hari

INTRODUCTION

At this time, digitization is occurring in various aspects of human life. Important as-pects of human life, such as economy and education, have embraced digital tech-nology in their implementation. In the field of education, we have witnessed various forms of digitization, such as the use of e-learning, academic information systems, and digital learning media. The rapid pace of digitization should be utilized by educa-tional institutions to improve the implementation of education. Schools can leverage digital technology to enhance the quality of education.

Speaking of schools, the implementation of education becomes the primary focus that needs to be discussed. The implementation of education in schools is inseparable from the teaching and learning process conducted by teachers and students. The Ministerial Regulation Number 22 of 2016 discusses the core activities in the teaching and learning process. Activities in a learning process involve learning models, teaching

methods, learning media, and learning resources tailored to the characteristics of subjects and students. Learning resources encompass everything that can assist stu-dents in their learning. Nowadays, the digitization of learning resources has taken place, and there are many digital learning resources available, such as e-books, mul-timedia, instructional videos, and more

The use of learning resources can help address learning issues. Currently, there are still many learning problems at various educational levels. One common problem is low student interest in learning. This occurs due to limited use of learning resources. The limited variety of learning resources and monotonous learning processes, as seen in junior high schools [8], are examples of low student interest in learning. Learning will be effective if student interest in learning can be enhanced.

Student interest in learning can emerge with specific motivations [16]. In a learning process, motivation can arise from various aspects such as the environment, teach-ers, students themselves, media, and learning resources. One solution to stimulate interest in learning is by developing engaging learning resources for students. Consid-ering the current tendency of students growing up with digitization, the development of digital learning resources can be justified. Students are more familiar with web-based digital learning resources. Their everyday use of various websites can facilitate the development process.

The researcher conducted an interview with teachers at SMP Negeri 1 Banjarmasin to strengthen the research foundation. Based on the interview with the mathematics teacher of grade VII, the learning process in the school uses textbooks as learning resources. Textbook resources have certain shortcomings, such as having many pag-es, which students find less appealing to read. Books are also less flexible because they require a physical form and cannot be used without carrying the physical book. Interviews were also conducted with grade VII students, who stated that their interest in mathematics was reduced due to learning with textbooks that had a monotonous presentation. Additionally, students mentioned that accessing textbooks becomes difficult when they are not in the classroom or at home. This is the reason why the development of web-based digital learning resources is necessary to facilitate student learning.

Based on the above presentation, the researcher provides an alternative solution by developing web-based digital learning resources that can assist students in learning and enhance their interest in learning. The web-based digital learning resources are developed to include interesting mathematics materials that can be easily accessed by students. This research produces a web-based digital learning resource product with mathematics materials for grade VII students in junior high school.

LITERATURE REVIEW

This research is a development study conducted to produce a specific product. Sugiyono in [14] explained that there are four levels of development, which consist of level one to produce a design, level two to test existing products, level three to revise

existing products, and level four to create new products. This research is at level four, where a web-based digital learning resource will be developed. The digital learning resource is developed for seventh-grade students in junior high school and contains mathematics learning materials. The development procedure in this study refers to the Alessi & Trollip model, which is further discussed in the methodology section.

This research results in a digital learning resource. Learning resources encompass all sources, including data, people, or specific things that students can use for learning [4]. Learning resources can be used separately or in combination. According to Prastowo [3], learning resources can take the form of text, images, photos, speakers, objects, and cultural products. Learning resources are used with the aim of facilitating students in achieving specific competencies. According to Samsinar [12], learning resources have various functions, such as enhancing educational productivity, reduc-ing control functions in education, providing systematic learning foundations, and improving learning consolidation. These functions can encourage students to actively participate in the learning process as they can learn independently with learning re-sources.

Learning resources consist of two main types: learning resources by design and learn-ing resources by utilization [6]. Learning resources by design are intentionally de-signed learning resources to achieve specific learning objectives. Examples of such resources include books, modules, web-based learning materials, instructional films, instructional videos, and others. On the other hand, learning resources by utilization refer to everything around us that can be used for learning. Anything that we utilize for learning can be considered as a learning resource, such as TV broadcasts, print media, online media, zoos, museums, cultural experts, and others. Both learning re-sources by design and by utilization can be in digital form. However, in this research, the development of digital learning resources clearly falls under the category of learn-ing resources by design as they are specifically designed for learning purposes.

Speaking of digital learning resources, technological advancements have given rise to new learning resources. Digitalization is the distinguishing characteristic of these re-sources. Digital refers to the combination of hardware elements (processing, memory, input, and communication) and software elements (operating systems and applica-tion programs) that perform various tasks. According to OECD as cited in Dopo [7], digital learning resources are understood as a combination of hardware and software elements that have the potential to address learning problems and facilitate learning activities. Meanwhile, BECTA's opinion as cited in Dopo [7] states that the use of digital learning resources has brought about improvements in learning quality, includ-ing motivation, retention, learning styles, and creativity.

Web-based learning resources can be used directly during lessons or for self-study. Therefore, in order to use web technology effectively [9], the development of learning resources has gone through nine stages of change. As stated by Hofmann as cited in Sitepu, the changes in the learning process and teaching methods due to technological advancements have gone through nine stages [13]. A website or web is a collection of pages containing digital information, such as text, images, animations, audio, and video,

or a combination of these elements, provided through the internet [11]. As previously explained, the web is considered a learning resource of the Learning Re-sources by Design type, and it falls under the category of materials [10]. This classifi-cation can be referred to as media/software that conveys messages through the use of tools.

Web-based digital learning resources are developed with the aim of enhancing stu-dents' learning interest. Learning interest is a preference and a sense of attraction that generates a voluntary desire to actively engage, characterized by a pleasant feeling without any coercion [5]. Learning interest is the way a person engages in thinking and understanding information and remembers it as acquired knowledge, skills, or attitudes through experience [1]. Students' behavior during the learning process can provide indications of their interest in the learning material. Therefore, it will certainly stimulate their interest as long as what they see has a connection to their own inter-ests.

Interest indicators serve as monitoring tools that provide guidance on learning inter-est. Learning interest can be measured through four indicators, as mentioned by Slameto (2010) in the book [1]. These indicators are the interest to learn, attention in learning, learning motivation, and knowledge. These four indicators serve as the basis for determining the level of students' learning interest. In this study, the digital learn-ing resource was piloted in a seventh-grade class with mathematics as the subject. One of the objectives of this research is to increase students' learning interest in math-ematics.

Mathematics consists of abstract ideas and symbols. It is a collection of abstract ideas and symbols organized hierarchically and deduced through reasoning. The specific objectives of junior high school mathematics teaching, based on the Ministry of Culture's teacher's guidebook for junior high school (2021), are: (1) students under-stand mathematical concepts, (2) students understand problems, create mathemati-cal models, solve models, and interpret the solutions based on everyday life, (3) stu-dents engage in activities that utilize mathematical knowledge. The achievement of these learning objectives can be successful if students demonstrate a high level of learning interest during the learning process. Therefore, this research develops a web-based digital learning resource that is expected to enhance students' learning interest, especially in the subject of mathematics for seventh-grade junior high school stu-dents.

METHODE

This research aims to develop a web-based digital learning resource for the subject of mathematics. This digital learning resource is developed for 7th-grade students in junior high school (SMP). The research includes a product trial to determine whether there is an improvement in the learning interest of junior high school students after using the developed web-based digital learning resource. The trial is conducted with 7th-grade students at SMP Negeri 1 Banjarmasin. This study is a research and development (R&D) study conducted to produce a web-based digital learning resource product. The development procedure refers to the Alessi & Trollip model [2]. This development model consists of three attributes and three stages. The three attributes include standards,

ongoing evaluation, and project management. The three development stages of this model are planning, design, and development. The overall development procedure using the Alessi & Trollip model can be seen in the following figure.

Standards are the initial step or foundation of a research project. Ongoing evaluation is an evaluation that starts from the beginning to the end, referring to the established standards. Project management involves organizing resources such as funding, time, and others. The development procedure in this research starts with the planning stage. The planning stage is a step taken by the researcher to determine the objectives and direction of developing a product. The planning in this research involves things such as: (1) determining the product scope through observation and interviews, identifying student characteristics, (2) identifying student characteristics through observation during field studies, (3) determining and collecting sources related to the subject matter and other references, and (4) brainstorming with mathematics teachers to create the design concept of the product to be developed. The next stage is the design stage. The design stage is related to the development of the initial concept, which describes the program introduction. In the design stage, the researcher analyzes concepts related to the subject matter, creates storyboards to display the design layout of the product to be operated by users, creates flowcharts to display the program structure from start to finish, and determines the software to be used. The third stage is the development stage, which involves translating the design concept into a product. The activities in this stage include: (1) developing the research product, (2) developing content, (3) conducting alpha testing, and (4) conducting beta testing. The research instruments used in this study are expert validation questionnaires and student learning interest questionnaires. The data analysis of expert validation uses a Likert scale with the calculation of validation questionnaire scores using the following formula.

$$P = \frac{\sum a}{\sum n}$$

Description:

P = Presentation

$\sum a$ = Obtained Score

$\sum n$ = Max Score

Figure 1. Feasible Percentage Formula

Furthermore, the results of the score calculation are interpreted into feasibility criteria. Here is the range of product feasibility categories by Suharsimi Arikunto[15].

Table 1. The interpretation of product feasibility

Interval	The Classification
Skor 0% - 20%	Very Infeasible

Skor 21% - 40%	Infeasible
Skor 41% - 60%	Moderately Feasible
Skor 61% - 80%	Feasible
Skor 81% - 100%	Very Feasible

Data analysis is also conducted on students' learning interest. Students' learning interest is analyzed using N-Gain. The gain standard is calculated using the following formula.

$$< g >= \frac{\text{a after} - \text{a before}}{\text{n} - \text{a before}}$$

Description:

<g> = Standard gain

a before = The average score of the questionnaire before using the product.

a after = The average score of the questionnaire after using the product.

n = Max score

Figure 2. N-Gain Formula

After obtaining the gain score, it is then interpreted according to the gain classification table.

Table 2. Standard Gain Score

<g> Score	The Classification
(N-gain) ≥ 0,70	High
0,70 > (N-gain) ≥ 0,30	Moderate
0 (N-gain) < 0,30	Low

RESULT AND DISCUSSION

The results of this study were analyzed using descriptive quantitative techniques. The quantitative data results were then described through qualitative data based on predetermined criteria. This study was conducted using the Alessi & Trollip development procedure. The following are the research findings according to the Alessi & Trollip development procedure.

Planning

The first step in this phase is to determine the scope of the students. The observation results indicate that online-based learning is not yet well-developed, but the school website exists. However, the school website is underutilized by teachers. The learning resources used are thick textbooks. Based on the interviews, several issues are identified in the learning process. The next step is to identify the characteristics of the students. The identification results reveal that the age range of the students falls within the formal operational stage (11-15 years old). At this stage, students begin to think about experiences beyond concrete experiences in a more abstract, idealistic, and logical manner. On average, students prefer a visual learning style, which involves learning by seeing things, whether in the form of images or videos. Based on these findings, the web-based digital learning resources should be developed with visual-oriented content.

The next step is to gather reference materials. The reference materials used in this study consist of the Teaching Module of SMP Negeri 1 Banjarmasin and the Mathematics Teaching Materials for Grade VII of SMP Negeri 1 Banjarmasin. These references serve as the basis for developing the materials that will be used as web-based digital learning resources. The next activity involves brainstorming. The results of the brainstorming session conducted with the Mathematics teachers of Grade VII at SMP Negeri 1 Banjarmasin are as follows: Students tend to prefer a visual learning style. Grade VII Mathematics lessons are still difficult to understand without visualization. There is a need for easily accessible learning resources that can be accessed through students' smartphones without the need for prior installation.

Design

The results obtained from the planning phase are further developed into initial ideas or foundations for developing web-based digital learning resources. This activity is called developing the main concept. The development of these initial content ideas is based on the brainstorming results with the Mathematics teachers of Grade VII at SMP Negeri 1 Banjarmasin. From these results, the initial content idea is to develop web-based digital learning resources that are designed to be as attractive as possible and easily accessible on the smartphones of Grade VII students at SMP Negeri 1 Banjarmasin. Once the ideas are generated, they are implemented by creating a flowchart. The flowchart is a visualization stage of the multimedia concept that will be developed, which includes the user interface with a combination of the designed content material. This is useful as a guide for the program flow within the web-based digital learning resources. The visualization of this media also includes the system navigation and integration of the developed web, thus representing the web product.

The next step in the design phase is to create a storyboard. The storyboard is known as the visualization of the ideas for the application that will be built. It provides an outline of the project and is displayed shot by shot, known as scenes. The final step in this phase is to determine the software to be used. In this case, the researcher uses Sublime as the coding software, Xampp as the server (localhost), Canva and Adobe Illustrator for graphic design, and Dewaweb for purchasing hosting and domain.

Development

The product is developed by incorporating various features into the web-based digital learning resources. The development results in a homepage, which serves as the main page encountered by the users. The top-left corner displays the web logo, while the top-right corner contains menu buttons. Another feature is the destination page, which provides the purpose of developing the web-based digital learning resources for Grade VII Mathematics at SMP Negeri 1 Banjarmasin.

Furthermore, the development results in a content page. This page contains the Mathematics material for Grade VII that aligns with the SMP Mathematics Learning Module and serves as the main content of the web-based digital learning resources. Next, there is a quiz page that includes a collection of questions related to the material, along with a "Submit Assignment" button. This button allows students to submit their assignments by taking photos of their completed work from the exercise book. The "Submit Assignment" navigation is connected to the Zoho Form platform.

Figure 2. Zoho Form

There is also a profile page that provides information about the developers of the web-based digital learning resources for Grade VII Mathematics at SMP Negeri 1 Banjarmasin. The last feature developed is the service page, which allows students to ask teachers questions about any unclear concepts. Here are some visual displays of the developed product.

Figure 3. Home Page

Figure 4. Learning Page

In addition to these features, content development is also carried out in this phase. The result of content development is digital learning material for Mathematics. The content within the web-based digital learning resources consists of three chapters covering the Mathematics material for Grade VII at SMP. The first content focuses on properties of plane figures, the second content covers more properties of plane figures, and the third content revolves around data-related topics.

The next step is to conduct alpha and beta testing. The alpha testing phase is divided into three parts: instrument expert validation, web design expert validation, and content expert validation. Several experts were involved in the alpha testing of this web-based digital learning resource. The instrument expert in this study is Rafiudin, S.Pd., M.Pd. He is a lecturer in Educational Technology at FKIP ULM (University of Lambung Mangkurat) and obtained an average percentage score of 75% with the category "acceptable." The web design experts in this research are Moh.Iqbal Assyauqi, M.Pd., a lecturer in Educational Technology at FKIP ULM, and Novan Alkaf Bahraini Saputra, S.Kom., M.T., a lecturer in Computer Education at FKIP ULM. They obtained an average percentage score of 86% with the category "very good." The content experts in this research are Taufiq Hidayanto, M.Pd., a lecturer in Mathematics Education at FKIP ULM, and H. Ahmad, M.Pd., a mathematics teacher at SMP Negeri 1 Banjarmasin. They obtained an average percentage score of 82% with the category "very good."

After revising the product based on the alpha testing, the next step is to conduct beta testing. According to Alessi & Trollip (2001: 550), beta testing is a comprehensive testing process for the final product by users. The subjects of the beta test in this study are Grade VII students at SMP Negeri 1 Banjarmasin for the mathematics subject. The beta test is conducted to determine students' learning interest. To assess students' learning interest, the researcher distributed an initial interest questionnaire to the students before using the web-based digital learning resource. Then, after one week of using the web-based resource, the researcher distributed a final interest questionnaire. The product testing was conducted twice: first, a small-group test with 7 students, obtaining an average percentage score of 88% with the category "very good," and second, a field test with 32 students, obtaining an average percentage score of 85% with the category "very good." Finally, a final interest questionnaire was filled out. The increase in students' learning

interest from the initial to final assessment resulted in a gain score of 0.70, categorizing it as "moderate."

CONCLUSION

The research process has been conducted according to the Alessi & Trollip model, with three stages: planning, design, and development. Based on the alpha testing conducted on the web-based digital learning resource for Grade VII mathematics, the web design expert rated it as "very good," and the content expert rated it as "very good" as well. In the beta testing, conducted with small and large groups, the web-based digital learning resource received a rating of "very good." The initial and final interest questionnaires showed an increase in the average gain score, categorizing it as "moderate." Therefore, it can be concluded that the web-based digital learning resource for Grade VII mathematics at SMP Negeri 1 Banjarmasin can improve students' learning interest with a "moderate" category.

Based on the findings of this research, it is highly recommended to conduct further studies. Further research could explore the implementation of web-based digital learning resources in other subjects and educational levels. Additionally, implementing the web-based digital learning resource in other educational institutions can be considered. Evaluation of the use of digital learning resources can also be conducted to assess the effectiveness of the development. Further development is recommended to address any shortcomings by adding new features to enhance the web-based digital learning resource.

REFERENCES

1. Akrim. *Strategi Peningkatan Daya Minat Belajar Siswa Belajar PAI Mencetak Karakter Siswa*. CV Pustaka Ilmu Group, 2021.
2. Alessi, S.M. & Trollip, S.R. Multimedia for learning: methods and development 3rd ed. Pearson Education, 2001.
3. Andi Prastowo. *Sumber belajar dan pusat sumber belajar*. Prenada Media Group, 2018.
4. Ani Cahyadi. *Pengembangan Media dan Sumber Belajar: Teori dan Prosedur*. Laksita Indonesia, 2019.
5. Ayuningtyas Putri. Studi Korelasi Antara Minat Belajar Dan Persepsi Terhadap MetodeMengajar Dengan Keterlibatan Belajar Mahasiswa Pada Posisi Duduk Di Belakang. Fakultas Psikologi Universitas Surabaya, 2005.
6. Bambang Warsita. *Teknologi Pembelajaran: Landasan dan Aplikasinya*. Rineka Cipta, 2008.
7. Dopo, F. B., & Ismaniati, C. “Persepsi guru tentang digital natives, sumber belajar digital dan motivasi memanfaatkan sumber belajar digital”. *Jurnal Inovasi Teknologi Pendidikan*, 3.1 (2016): 13-24.
8. Enisa Ananda Putri, Agus Hadi Utama, and Adrie Satrio. "Model Pembelajaran Kooperatif Tipe CIRC Untuk Meningkatkan Minat Belajar Siswa Pada Pelajaran Bahasa Inggris." *Journal of Instructional Technology J-INSTECH* 4.2 (2023): 99-107.
9. Mamarajabov Odil Elmurzayevich. “Cloud technology to ensure the protection of fundamental methods and use of information.” *International Journal on Integrated Education* 3.10 (2020): 313–315.

10. Nana Sudjana. *Teknologi Pengajaran*. Sinar Baru Algensindo, 2007.
11. Rohi Abdulloh. *7 in 1 Pemograman Web Untuk Pemula*. PT Elex Media Komputindo, 2018.
12. Samsinar, S. "Urgensi Learning Resources (Sumber Belajar) Dalam Meningkatkan Kualitas Pembelajaran." *Didaktika: Jurnal Kependidikan* 13.2 (2020): 194-205.
13. Sitepu, B.P. *Pengembangan Sumber Belajar*. Rajawali Pers, 2014.
14. Sri Sumarni. *Model Penelitian Dan Pengembangan (R&D) Lima Tahap (Mantap)*. Universitas Islam Negeri Sunan Kalijaga Yogyakarta, 2009.
15. Suharsimi Arikunto. *Prosedur Penelitian Suatu Pendekatan Praktik.* Rineka Karya, 2008.
16. Zakie Mubarak, M., Mastur, and Adrie Satrio. "Pengembangan Video Animasi Pembelajaran Perilaku Konsumen Dengan Pendekatan Contextual Teaching and Learning Untuk Meningkatkan Minat Belajar Mahasiswa." *Journal of Instructional Technology J-INSTECH* 4.2 (2023): 36-46.