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THE DEVELOPMENT OF WEB-BASED DIFFERENTIATED MATHEMATICS LEARNING MEDIA USING THE RME APPROACH TO ENHANCE STUDENT'S MATHEMATICAL CONNECTION

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ABSTRACT

Learning mathematics is often perceived as difficult, partly because instructional approaches often lack real-life relevance and do not adequately address the diverse needs and abilities of students, creating a gap in effective learning practices. This study aims to develop website-assisted mathematics learning media using the Realistic Mathematics Education (RME) approach for the topic of Three Variable Linear Equation System (SPLTV), intended to improve students' mathematical connection skills. The media was created using Google Sites with a content differentiation strategy, adjusting material presentation based on students' ability levels for more effective and meaningful learning. This Research and Development (R&D) study employed the Plomp model, consisting of three stages: introduction, development, and assessment. The research subjects were 24 tenth-grade students in the Industrial Electronics Engineering program at SMK Auto Matsuda. Data were collected through interviews, questionnaires, and pretest–posttest assessments, using instruments such as interview sheets, expert validation forms, practicality questionnaires, and mathematical connection tests. Validation results showed the media was highly valid, receiving scores of 91.1% from material experts and 85% from media experts. The test instrument was also proven valid and reliable (reliability = 0.89). Practicality scores indicated very good responses from teachers (90.2%) and students (94.58%). The media's effectiveness was demonstrated by a pretest score increase from 33.85 to 84.94 on the posttest, with an N-Gain of 0.78 (high category). These findings indicate that the developed media is not only feasible for classroom implementation but also holds strong potential for broader adoption through offline or mobile applications.

Keywords: Content Differentiation, Google Site, Mathematical Connection, RME

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INTRODUCTION

Mathematics is a discipline that plays a crucial role in fostering logical, analytical, and systematic thinking skills. One of the essential competencies in mathematics learning is mathematical connection skills, which enable students to relate various mathematical concepts to real-life contexts and other fields of science (Waritsman, 2023). However, previous observations and studies indicate that many students still experience difficulties in linking mathematical concepts with contextual problems. These challenges are often attributed to insufficient understanding of fundamental concepts, limited ability to translate

everyday language into mathematical models, and misalignment between instructional materials and students' proficiency levels. Addressing these issues requires the development of innovative and adaptive learning media aligned with students' needs.

One promising pedagogical framework is RME, which is grounded in Freudenthal's theory that mathematics should be experienced as a human activity and learned through real-world problem contexts (Purwitaningrum & Prahmana, 2021). RME emphasizes the use of contextual problems, guided reinvention, and progressive mathematization to facilitate conceptual understanding and connections between mathematical ideas and daily life (Waritsman, 2023). Complementing this, the application of content differentiation, rooted in Tomlinson's differentiated instruction theory allows instructional content to be tailored to students' readiness levels, interests, and learning profiles, thereby enhancing instructional inclusivity and optimizing learning outcomes (Bendriyanti et al., 2022).

The implementation of innovative and differentiated learning strategies can be further supported by leveraging digital technologies that provide flexibility in content delivery. In this regard, Google Sites serves as a practical platform for developing web-based learning media due to its accessibility, adaptability, and ability to integrate multiple formats such as text, videos, and interactive assessments (Adzkiya & Suryaman, 2021). The present study adopts the Plomp development model, which consists of the Preliminary Phase, Development Phase, and Assessment Phase, to systematically design and evaluate the learning media.

This study aims to develop website-assisted mathematics learning media employing the RME approach combined with content differentiation, and to evaluate its effectiveness in improving students' mathematical connection skills on the topic of the Three Variable Linear Equation System.The media was validated by material and media experts, while practicality assessments involved both teachers and students. Improvements in mathematical connection skills were measured using a pretest–posttest design. This is consistent with the findings of Siregar et al., (2020), which demonstrated that the application of the RME approach can significantly enhance students' mathematical connection skills. It is anticipated that this research will serve as a reference for educators in designing engaging, adaptive, and technology-based learning innovations that address diverse learner needs and align with current developments in educational technology.

METHOD

Research on the development of Differentiated Content Mathematics Learning Media assisted by Websites with the RME Approach is a type of Research and Development (R&D) research with the Plomp development model consisting of 3 stages including: (1) Preliminary Phase: At this stage, researchers conduct interviews to identify problems and collect initial information related to the learning process which includes problem analysis, curriculum analysis, student characteristic analysis, and learning material analysis. (2) Prototyping Phase: At this stage, researchers design website-assisted learning media and develop them using Google Sites which can be accessed through various devices, such as laptops, tablets, and smartphones, thus providing flexibility in their use. In addition, the media developed refers to the RME approach stage preparation standards, as well as the results of the analysis from the preliminary research phase. After that, the feasibility of the media is validated by experts. (3) Assessment Phase: At this stage, the practicality of the learning media is measured by distributing response questionnaires to teachers and students. In addition, the effectiveness of the media in improving students' mathematical connection skills in SPLTV material was assessed through a pretest conducted on February 7, 2025 and a posttest on February 24, 2025, each consisting of two questions. The improvement in students' mathematical connection skills was calculated using the N-Gain formula proposed by Hake (1999), namely:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Ideal\ Score - Pretest\ Score}$$

The use of the N-Gain test allows researchers to categorize the improvement results into three levels: high for an N-Gain value of 0.70 or higher, medium for an N-Gain value between 0.30 and 0.70, and low for an N-Gain value of 0.30 or lower.

The subjects in this study consisted of 24 grade X students majoring in Industrial Electronic Engineering at SMK Auto Matsuda. The data collection instruments in this study included interview sheets, validity sheets, and practicality sheets, consisting of validity sheets for material experts and media experts and practicality for teachers and students. In addition, this study also used a test guide in the form of pretest and posttest questions to measure the improvement in students' mathematical connection skills.

Furthermore, the validity value of the learning media was obtained through trials conducted by experts, namely material experts and media experts. The assessment by material experts was measured using a validity sheet containing assessment indicators from the aspects of curriculum, material, content-differentiated learning, and RME aspects. Then, for the assessment by media experts, it is measured using a validity sheet containing assessment indicators from the media product design aspect and the learning media programming aspect. The results of the validity sheet are analyzed using the validity formula according to Vela et al., (2021) as follows:

$$Validity\ Value = \frac{Sum\ Of\ All\ Scores}{Total\ Score}\ x\ 100\%$$

The percentage of validity values is analyzed based on validation criteria to determine the level of validity of the media developed. This media is categorized as very valid if it obtains a percentage score between 75% - 100%, categorized as quite valid if it obtains a score of 50-75%, categorized as invalid if it obtains a score of 25-50% and categorized as very invalid if it obtains a score <25% (Pribowo, 2018).

In addition to validity, the practicality value of the media is also determined based on the responses of teachers and students after using the learning media. The assessment by the teacher is measured using a practicality sheet containing assessment indicators from the aspects of presentation feasibility, material suitability, and benefits. Then, the assessment by students is measured using a practicality sheet containing assessment indicators from the aspects of the learning process and the aspects of using learning media. The results of the practicality sheet are analyzed using the practicality formula according to Vela et al., (2021) as follows:

$$Practical\ Value = \frac{Sum\ Of\ All\ Scores}{Total\ Score}\ x\ 100\%$$

The percentage of practicality value is analyzed based on predetermined practicality criteria to determine the level of practicality of the developed media. The media is categorized as very practical if it obtains a percentage score between 75% – 100%, quite practical if it scores 50% – 75%, impractical if it scores 25% – 50%, and very impractical if it scores below 25% (Pribowo, 2018). In addition, the N-Gain score was calculated by comparing pretest and posttest results using the formula proposed by Hake (1999). This calculation enables the classification of improvement into three categories: high (N-Gain ≥ 0.70), medium (0.30 ≤ N-Gain < 0.70), and low (N-Gain < 0.30). These analysis techniques covering validity, practicality, and N-Gain were applied to comprehensively evaluate the quality and effectiveness of the developed learning media.

RESULT

Media Development

This study employed an R&D (Research and Development) method using the Plomp development model, which consists of three main stages: the Preliminary Phase, the Prototyping Phase, and the Assessment Phase. The resulting product is a website-based mathematics learning media with content differentiation, using the RME approach for the SPLTV material for grade X students of the Industrial Electronic Engineering (TEI) program. The research outcomes include the development procedure, expert validation, practicality testing, and effectiveness in improving students' mathematical connection skills.

Preliminary Phase

This phase aims to collect initial information for developing the learning media. Activities include problem analysis, curriculum review, student characteristics, and learning material analysis, which serve as the basis for designing media aligned with the RME approach and supporting students' mathematical connection skills.

Problem and Material Analysis

The results indicated that students' mathematical connection skills were still low. Interviews with teachers revealed that students struggled to connect mathematical concepts to real-life situations and to other concepts, often memorizing formulas without understanding their interrelations. The material was delivered procedurally without real-life context, highlighting the need for media integrating RME and content differentiation. A preliminary study on October 8, 2024, showed that 90% of teachers still used conventional lectures and textbooks as the primary resources, while 80% of students had insufficient understanding of SPLTV material.

Curriculum Analysis

The curriculum in use is the "Kurikulum Merdeka," implemented since the 2023/2024 academic year. The media developed aligns with this curriculum and focuses on SPLTV material. The main learning outcome is the ability to solve SPLTV problems, with learning objectives including representing SPLTV in mathematical models and determining solutions using substitution, elimination, or a combination method. Classroom learning is still conventional, and teachers have not systematically implemented content differentiation.

Student Analysis

Diagnostic tests showed that 80% of students could not yet grasp basic SPLTV concepts and had difficulty linking SPLTV to prerequisite materials. Students exhibited diverse abilities and motivation levels, but teaching remained uniform, leaving some students behind while others were insufficiently challenged. The classroom culture is passive, with teacher-student interaction mostly one-way, affecting students' motivation and understanding. There is a need for media that accommodates diverse abilities and learning styles while promoting an interactive and participatory classroom culture.

Prototyping Phase

In this stage, website-based learning media was designed using Google Sites, accessible via laptops, tablets, and smartphones, ensuring flexible usage. The media design follows the RME approach and the results of the preliminary analysis, with its feasibility subsequently evaluated by experts.

Media Design

The following presents various features contained in this media.

Beranda:
The Beranda display can be seen in Figure 1 below

Figure 1. Learning Media Beranda Features

The Beranda of this learning media is designed concisely yet informatively, including the author's identity, introduction, usage instructions, and development objectives. The author's identity is displayed clearly to demonstrate credibility in the field of mathematics education. The introduction contains thanks to the parties who contributed to the development of the media. The usage instructions are arranged systematically so that users can access the features easily. Furthermore, in the development objectives section, it is explained that this media aims to improve students' mathematical connection skills through a contextual approach based on RME, as well as adapting the material to the level of students' learning abilities through content differentiation. The homepage design is made attractive with proportional visuals, soft colors, clear fonts, and illustrations that support the material, in order to create a comfortable and interesting learning experience.

Map Learning Feature

The display of the learning map feature can be seen in Figure 2 below.

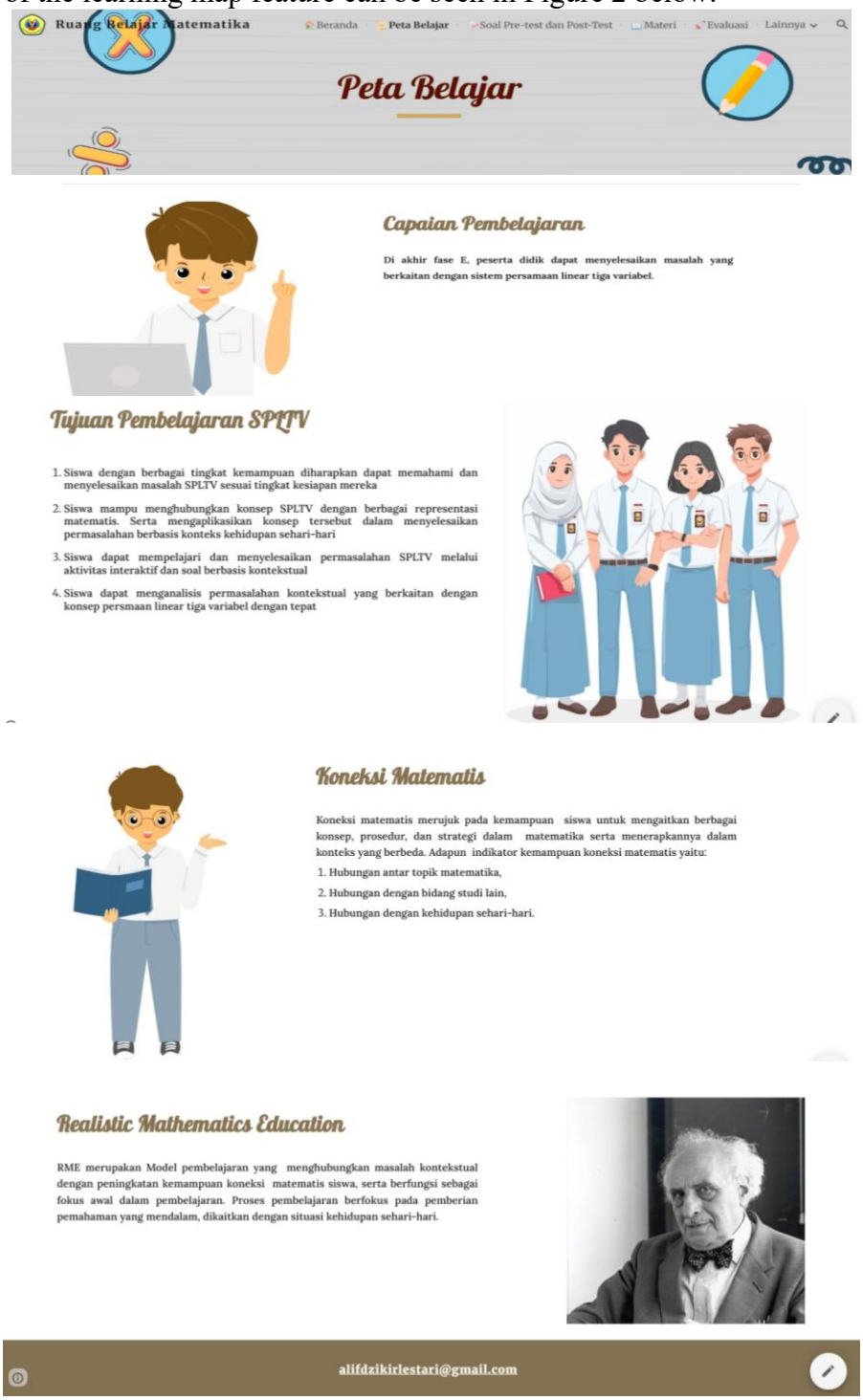


Figure 2. Map Learning Features

The learning map feature in this learning media includes learning objectives and achievements, as well as an introduction to the RME approach and indicators of mathematical connection abilities. Through this feature, students will get a clear Figure of the competencies that must be achieved and the learning stages that need to be passed.

Pretest & Postest Features:

The appearance of the pretest and posttest questions can be seen in Figure 3 below.

Figure 3. Pretest & Post-test Features

This feature is specifically designed to measure students' mathematical connection skills both before and after using learning media. The pretest feature helps to determine students' initial knowledge related to SPLTV material, while the posttest is used to evaluate the increase in understanding and effectiveness of learning media in supporting students' learning process as a whole.

Material Features:

In the material features, teaching materials are presented in levels according to student abilities. A complete display of the material features can be seen in Figure 4 below.

Figure 4. Material Features

Several learning material designs include important parts, starting from the cover, introduction of RME figures, to the four characteristics of RME integrated into the learning

materials. The learning materials are arranged based on the students' ability level. Students with low abilities will start from algebraic material, then continue to SPLDV and SPLTV. Students with intermediate abilities will immediately study SPLDV and then SPLTV, while students with high abilities will immediately study SPLTV material. In addition, there are examples of contextual questions and their solutions presented via Youtube video links. The complete display of the cover design and material content can be seen in Figure 5 below.

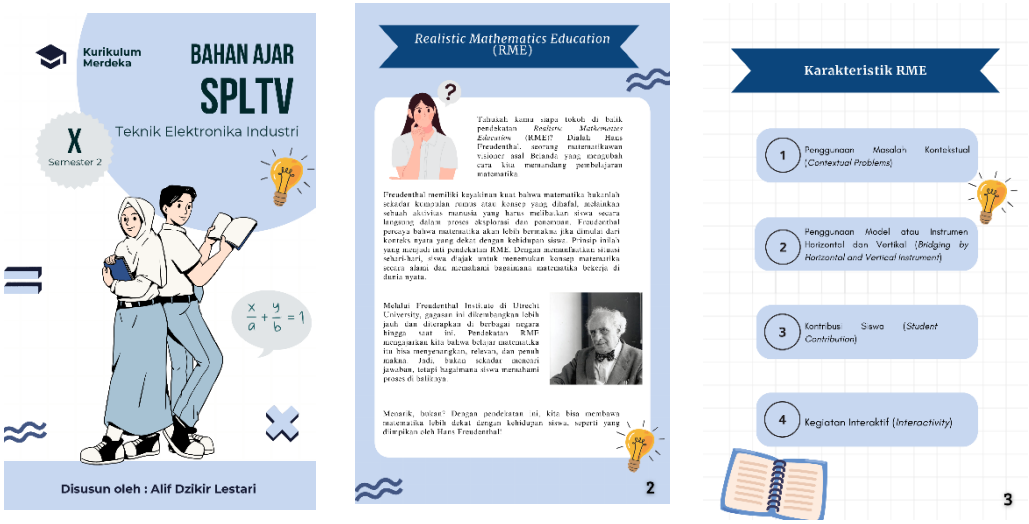


Figure 5 (a). Learning Media Cover

Figure 5 (a) shows the cover display of the website-assisted mathematics learning media teaching material. The cover design is attractive and educational, with a clear and easy-to-read title. An illustration of the RME figure is displayed to introduce the learning approach, followed by brief information about the characteristics of RME, such as the use of contextual problems, vertical and horizontal mathematization, student contributions, and interactivity. This presentation aims to provide an initial understanding of learning theory and the application of mathematics in everyday life.

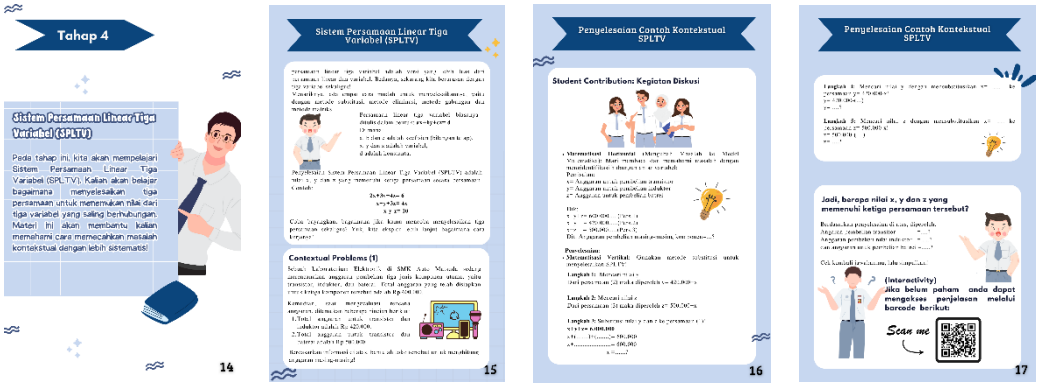


Figure 5 (b). SPLTV Material Display

Based on Figure 5 (b), the learning materials are arranged according to the characteristics of RME, differentiated according to the level of student ability: low (algebra, SPLDV, SPLTV), medium (SPLDV, SPLTV), and high (direct SPLTV). There are also examples of contextual questions with solutions via YouTube videos.

Evaluation Features:

A complete display of the evaluation features can be seen in Figure 6 below.

Figure 6. Evaluation Features

To measure student understanding, an evaluation feature is provided consisting of practice questions A in PDF format in the form of essay questions, practice questions B using Wordwall in the form of multiple-choice questions, and video solutions to questions that can be accessed via Youtube. In addition, learning reflection is carried out via Google Forms to determine the understanding and difficulties experienced by students during learning.

Library Feature:

The appearance of the library feature can be seen in Figure 7 below.

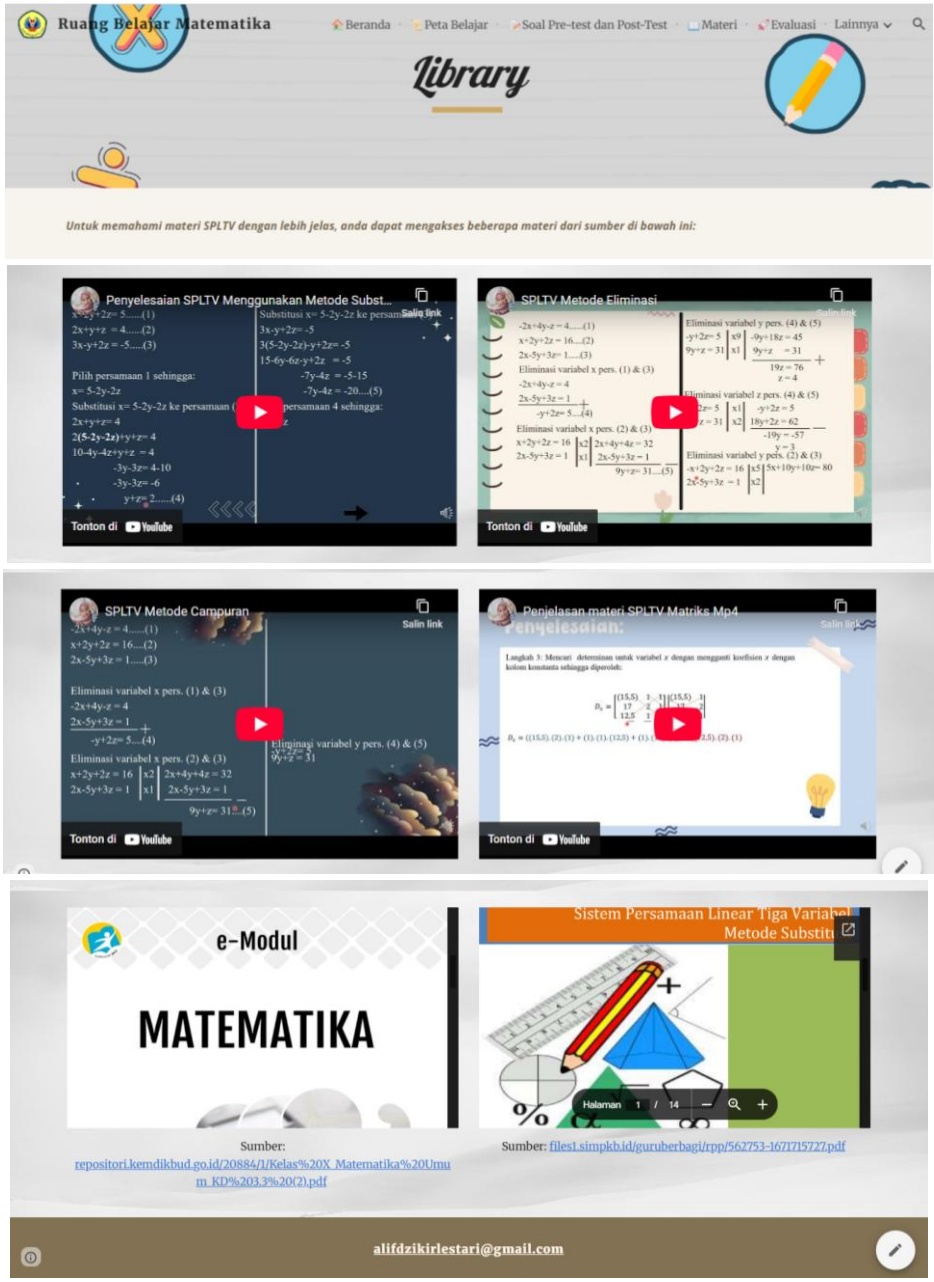


Figure 7. Library Features

In addition, the library feature is provided to give students convenient and structured access to a variety of SPLTV learning videos through Youtube links, allowing them to explore the material at their own pace, review complex concepts as needed, and deepen their understanding independently outside of the classroom setting, thereby supporting self-directed learning and reinforcing the concepts introduced during lessons.

Reference Features:

A complete display of the reference features can be seen in Figure 8 below.

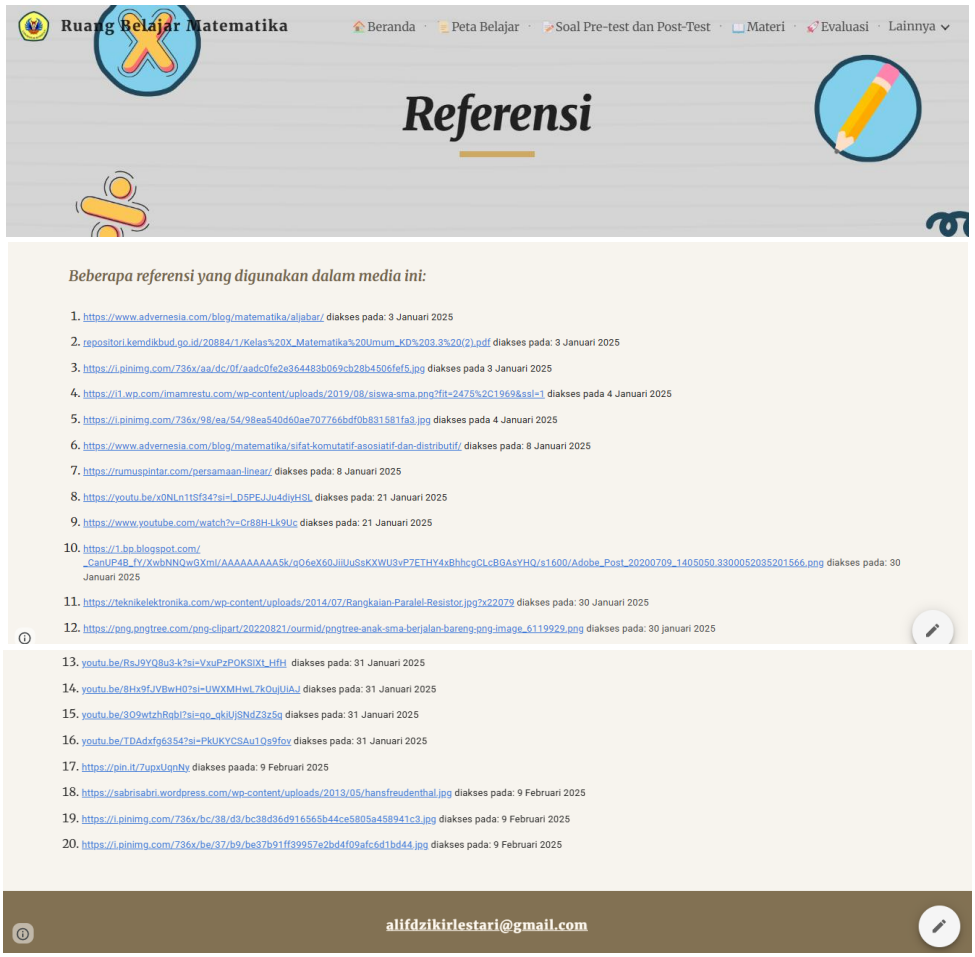


Figure 8. Refrence Features

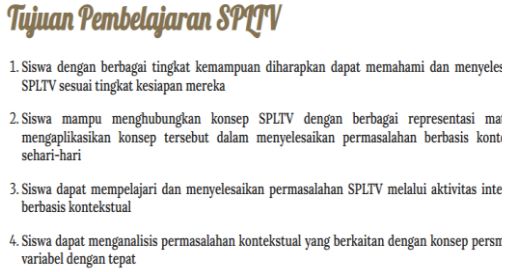
The Reference/Bibliography feature in this learning media includes a comprehensive collection of links to sources used during the development process, such as learning materials, instructional YouTube videos, and sources of images or illustrations that support concept delivery. This feature not only allows students to easily revisit the original sources but also provides them with opportunities to expand and deepen their understanding of the presented material, explore different perspectives, and connect the mathematical concepts they are learning with relevant additional references. As a result, the learning experience becomes more comprehensive, meaningful, and engaging.

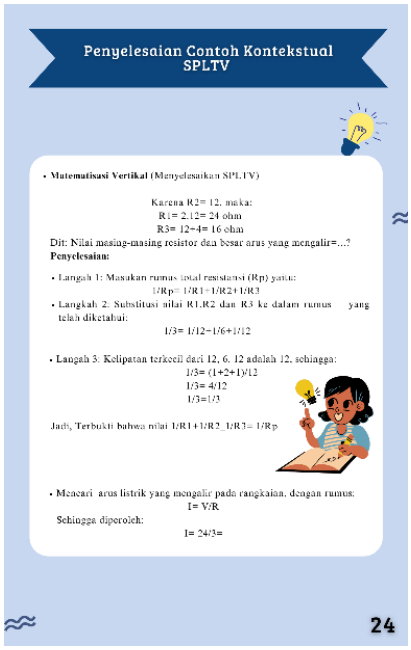
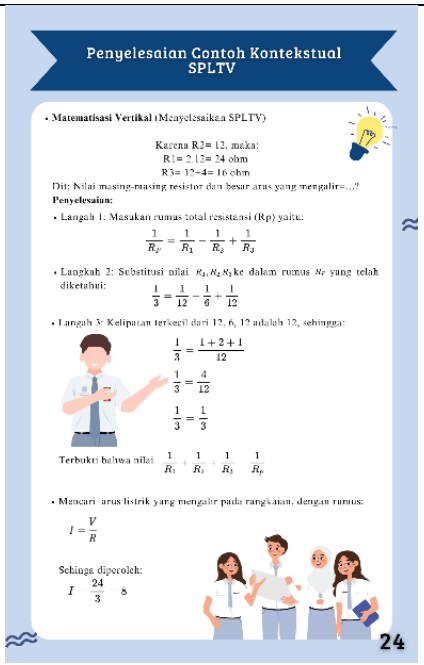
Assesment Phase

Media Design Revision

After the media was developed, the third phase, namely the assessment phase, was carried out. In this phase, the developed media was reviewed and revised by media experts and material experts. Some of the revision results from both media and material experts are presented below. Several revisions to the media that have been developed are presented in Table 1 below:

Table 1. Revisi Desain Media

No	Suggestions	Improvement
1	 The colors and design are adjusted to the target audience, while the title should be changed to follow the name of the material and several symbols should be added that are relevant to the topic of the material.	 Researchers adjust the color and appearance of the media to suit the target audience, as well as changing the media title to suit the teaching material and adding several relevant mathematical elements or symbols.
2	 Add the use of visuals/images so that the information presented is not full of text.	 Researchers added the use of visuals, namely Figures of high school students, to suit the target audience.
3	Add information related to mathematical connections	 Researchers added information about mathematical connections to the “Learning Map” feature.

No	Suggestions	Improvement
4		
	Fix writing of mathematical symbols	Researchers improve writing of mathematical symbols
5		
	Objectives are tailored to the syllabus and connection capabilities	Researchers improve learning objectives to fit the learning objectives that have been set.

Based on Table 1, the website assisted content differentiated mathematics learning media with the RME approach was refined based on the input and suggestions provided. Revisions were made to ensure that the developed media could effectively improve students' mathematical connection skills.

Media Validity

After all the components in the media are arranged according to the storyboard, the next stage is to conduct a validity test and a practicality test by teachers and students. This stage aims to assess the extent to which the media assisted by the website with Google Sites is suitable for use. Media validation is carried out to assess the level of validity and improve the learning media that has been developed, so that the media designed can help teachers in delivering material to students more easily and effectively (Yuliani et al., 2023). The validity of this learning media is measured through a questionnaire instrument that covers various aspects of assessing the media that has been developed. The results of the assessment of the validity of this learning media show an adequate level of validity in supporting the improvement of students' mathematical connection abilities. In the test carried out, the validity of the learning media was assessed by five experts who were competent in their fields. The first expert is three material experts who assess the media from the curriculum

aspect, material presentation aspect, content differentiation aspect, and RME and mathematical connection aspect. Based on the assessment results from the first material expert, Mr. Dr. Anggar Titis Prayitno, M.Pd., the media obtained a total score of 71 out of a maximum score of 75. Meanwhile, the second material expert, Mrs. Dr. Nuranita Adiastuty, M.Pd., gave a score of 62 out of a maximum score of 75. And the third material expert, Mr. Trio Nando, S.Pd., gave a score of 72 out of a maximum score of 75. Overall, the learning media received a total score of 205 out of a maximum score of 225 so that the media validity presentation obtained reached 91.1% which is included in the Very Valid category (Pribowo, 2018). Some suggestions given by the material expert validator are related to the writing of equations so that they are more adapted to the writing of mathematical symbols, then suggestions for learning objectives so that they can be adjusted to the syllabus and mathematical connection abilities, and suggestions related to creating a special page about mathematical connection ability indicators. The results of the validity test of the website-assisted content-differentiated mathematics learning media with the RME approach by material experts are completely presented in Table 2 below.

Table 2. Recapitulation of Material Expert Validators

No	Validator	Score (Maks Score 210)
1	Dr. Anggar Titis Prayitno, M.Pd.	71
2	Dr. Nuranita Adiastuty, M.Pd.	62
3	Trio Nando, S.Pd.	72
	Score Total	**205**
	Validity Value	**91,1%**
	Validity Category	**Very Valid**

Based on the calculation of the percentage of validity, the material expert got a score of 91.1%. Based on the Validity Assessment Criteria, this learning media is included in the very valid category.

Then, the second validator, namely two media experts, assessed the product design and programming of the designed media. Based on the assessment results from the first media expert, Mr. Erlan Darmawan, S.Kom., M.Sc., ph.D., the media obtained a total score of 46 out of a maximum score of 50. Meanwhile, the second media expert, Mr. Jerry Dounald Rahajaan., M.Sn. gave a score of 39 out of a maximum score of 50. Overall, the media got a total score of 85 out of 100 maximum values, so that the presentation of the validity of the media obtained reached 85% which is included in the Very Valid category. Some input from media experts includes the use of media colors to be adjusted to the target audience and it is suggested that there be the use of visuals such as images, so that the media is not filled with text. The results of the validity test of the website-assisted content-differentiated mathematics learning media with the RME approach by media experts are completely presented in Table 3 below.

Table 3. Recapitulation of Media Expert Validators

No	Validator	Score (Maks Score 120)
1	Erlan Darmawan, S.Kom.,M.Si.,ph.D.	46
2	Jerry Dounald Rahajaan., M.Sn.	39
	Score Total	**85**
	Validity Value	**85%**
	Validity Category	**Very Valid**

The results of the calculation of the percentage of validity from media experts show that the media obtained a score of 85%. Based on the predetermined validity assessment criteria, this media is categorized as very valid.

Media Practicality

In addition to the validity test, the media was also tested for practicality by distributing response questionnaires to three mathematics teachers of SMK Auto Matsdua and 24 class X TEI students of SMK Auto Matsuda. This assessment aims to determine the extent to which the media developed is easy to use, in accordance with learning needs, and effective in supporting student understanding. Input from teachers and students is used as evaluation material for improving learning media. The results of the practicality by three SMK Auto Matsuda teachers obtained a score of 203 out of 225 maximum scores with a very practical practicality percentage of 90.2%. The recapitulation of the results of the teachers' practicality is presented in full in Table 4 below.

Table 4. Recapitulation of Teacher Practicality Results

No	Teacher	Score (Maks Score 225)
1	Ulpah Lisbadiyah, M.Pd., Gr.	67
2	Sugianda, S.Pd.	67
3	Trio Nando, S.Pd.	69
	Score Total	**203**
	Practicality Value	**90,2%**
	Praciticality Category	**Very Practical**

Based on the calculation of the percentage of practicality by the teacher, the media obtained a score of 90.2%. Referring to the Practicality Value Criteria, this media is included in the very practical category. The following are the scores obtained based on the aspects of appearance, presentation of content, and benefits in the practicality sheet filled out by mathematics teachers at SMK Auto Matsuda.

Then, the practicality by students obtained a score of 1135 out of a maximum score of 1200 with a very practical practicality percentage of 94.8%. The recapitulation of the results of practicality by students is presented in full in Table 5 below.

Table 5. Recapitulation of Percentage Scores Per Aspect of Student Practicality

No	Aspect	Score Presentase	Criteria
1	Instructional Media	94,52%	Very Practical
2	Learning	94,72%	Very Practical

Based on Table 5, it can be concluded that the developed learning media is included in the very practical category, with a score of 94.52% in the learning media aspect and 94.72% in the learning aspect. The high percentage indicates that this media is considered easy to use, supports the learning process effectively, and is in accordance with student needs.

Efectiveness Of Learning Media

In addition to conducting validity and practicality tests, the effectiveness of the media is also assessed based on the increase in students' mathematical connection abilities as measured by comparing the pretest and posttest scores. The recapitulation of the increase in students' mathematical connection abilities is presented in Table 6 below.

Table 6. Results of N-Gain Test Analysis

Mathematical Connection Indicators	Pretest Score	Posttest Score	N-Gain	Criteria
Relationships Between Mathematical Topics	43,75	90,63	0,82	High
Relationships with Other Fields of Study	43,75	88,54	0,78	High
Relationships with Daily Life	23,96	80,73	0,76	High
Overall Average	**33,85**	**84,94**	**0,78**	**High**

Based on Table 6, data analysis shows that the N-Gain value obtained is 0.78 which is in the high category. Thus, this learning media is able to improve students' mathematical connection skills in the high category. In addition, the N-Gain calculation is also carried out based on the category of students' initial abilities which show an increase in the high category in all groups. Details of the increase in each group can be seen in the following table.

Table 7. Results of N-Gain Test Analysis Based on Students' Initial Abilities

Student Initial Ability	Pretest Score	Posttest Score	N-Gain	Criteria
Low Ability	20,45	82.95	0,78	High
Medium Ability	37,50	82,81	0,72	High
High Ability	57,50	93,75	0,87	High
Overall Average	**33,85**	**84,94**	**0,78**	**High**

Table 7 shows that all categories of student ability experienced significant improvements. The low ability group had an N-Gain of 0.78, the medium group 0.72, and the high group 0.87 all three were in the high category. This proves that the learning media effectively improved mathematical connection skills at all levels of student ability.

The following presents a summary of the results from the development of the mathematics learning media, which has been shown to be valid, practical, and effective in enhancing students' mathematical connection skills.

Table 8. Summary of Research Findings: Validity, Practicality, and Effectiveness of Learning Media

Aspect	Indicator	Result	Notes
Validity	Material & media expert validation	88,05% (very valid)	Meets criteria (Pribowo, 2018)
Practicality	Teacher responses	90,2% (very practical)	Questionnaire assessment
Practicality	Student responses	94,58% (very practical)	Questionnaire assessment
Effectiveness	N-Gain	0.78 (high)	Pretest-posttest comparison (Hake, 1999)

Based on the data presented in Table 1, it can be concluded that the developed website assisted mathematics learning media meets very good criteria for validity and practicality, and demonstrates a significant improvement in students' mathematical connection skills. The pretest and posttest results indicate that the implementation of this media is effective in supporting students' understanding of SPLTV concepts, with N-Gain scores falling within the high category. These findings provide preliminary evidence that the developed media can be effectively utilized in classroom instruction, prior to further analysis in the discussion section.

DISCUSSION

This study employed a Research and Development (R&D) approach using the Plomp development model, which consists of three main phases: the Preliminary Phase, the Prototyping Phase, and the Assessment Phase (Plomp, 2013). The resulting product is a content-differentiated, website-based mathematics learning media designed with the Realistic Mathematics Education (RME) approach, specifically to help tenth-grade students in the Industrial Electronics Engineering (TEI) program understand SPLTV material. The media aims to improve students' mathematical connection skills by presenting material in a more contextual and meaningful way (Hasbi et al., 2019). Initial observations revealed low student interest in mathematics, largely due to conventional, monotonous teaching methods (Purba et al., 2024). To address this, the media integrates digital technology to create a more engaging learning experience, enhancing motivation and participation (Prayitno et al., 2022).

The website-based media, developed using Google Sites, allows students to access learning materials anytime and anywhere, integrating contextual examples, exercises, and multimedia resources aligned with TEI students'(Shobri & Rifqi, 2023). It incorporates key RME characteristics, including contextual problems, horizontal and vertical mathematization, student contribution, and interactivity, which collectively support the development of mathematical connection skills. Content differentiation is applied based on pretest scores, guiding low, medium, and high-ability students through appropriately leveled materials, ensuring all students are challenged and supported (Bendriyanti et al., 2022).

The development process followed the Plomp model systematically. In the Preliminary Phase, student needs, curriculum requirements, and initial challenges in mathematical connection were analyzed. The Prototyping Phase involved designing the media structure and content based on these analyses, including features such as Home, Learning Map, Pretest/Posttest, Learning Materials, Evaluation, and Library, with integrated multimedia and differentiated content. Finally, in the Assessment Phase, the media was implemented in the classroom, evaluated by teachers and students for practicality, and tested through pretest-posttest measures to assess its effectiveness in enhancing mathematical connection skills.

The website-assisted mathematics learning media with an RME approach for SPLTV material was validated to assess its feasibility and effectiveness. According to Yuliani et al., (2023) media validation aims to improve the learning media so that teachers can deliver material more easily and effectively. The results from content experts showed a validity score of 91.1%, categorized as very valid (Pribowo, 2018), covering curriculum alignment with the Merdeka Curriculum, material appropriateness, content differentiation, and the integration of RME characteristics and indicators of mathematical connection skills (Oktaviana & Ramadhani, 2023). Media experts' validation, following Kusuma et al., (2024), yielded an 85% score, emphasizing attractive design, user-friendliness, and stable programming, reflecting media that can be accessed on multiple devices and supports flexible learning processes.

The practicality of the media was measured through teacher and student response questionnaires (Nurhayati, 2017). Teachers rated 90.2% and students 94.58%, both in the very practical category (Pribowo, 2018), indicating that the media is easy to use, clear, and aligned with learning needs. This aligns with Jannah et al., (2023), who stated that effective learning media assists teachers in delivering material more efficiently, enabling students to better understand the lesson. The media's presentation feasibility, material relevance, and utility support an interactive learning process, enhance student motivation, and strengthen mathematical connection skills through contextual content, differentiated instruction tailored

to student abilities, and interactive features. Thus, this media is both feasible and effective in supporting a more contextual, adaptive, and meaningful mathematics learning experience.

The developed learning media is designed to enhance students' mathematical connection skills by providing integrated solutions aligned with indicators such as connections between mathematical topics, connections with other subjects, and connections to real-life contexts. This aligns with Durachman & Cahyo (2020), who emphasize that mathematical connection skills consist of these three aspects. According to Juandi et al., (2022) the RME approach is used to help students link mathematical concepts to real-world contexts, proving effective in improving mathematical connection abilities. Furthermore, RME characteristics, such as the use of contextual problems, enable students to construct knowledge independently and develop meaningful problem-solving strategies (Anita, 2020).

The pretest results indicated that most students had difficulty understanding the problems and determining which formulas to use, reflecting low initial mathematical connection skills, consistent with the findings of Utami & Amidi (2022), who reported that students' limited connection skills are evident from their struggles in identifying the correct formulas. Posttest analysis showed a significant improvement, with high N-Gain values across all indicators: 0.82 for connections between topics, 0.76 for connections with other subjects, and 0.78 for connections to daily life. The content differentiation strategy also supported all levels of student ability, with N-Gain scores of 0.78 for low-ability students, 0.72 for medium-ability students, and 0.87 for high-ability students, in line with Bendriyanti et al., (2022), who emphasizes that differentiated instruction is effective in developing students' potential according to their individual needs and characteristics.

Overall, this study demonstrates that integrating RME and content differentiation in website-based learning media has significant practical potential for enhancing students' mathematical connection skills and provides guidance for educators in designing adaptive, contextual, and technology-based learning innovations.

However, this study has some limitations, such as a relatively small sample size and being conducted in a single vocational school, which may affect the generalizability of the results. Future research could examine long-term retention of students' mathematical connection skills, compare outcomes across different subjects or schools, and develop offline or mobile application versions of the media to expand access and implementation.

CONCLUSION AND SUGGESTIONS

Based on the results of the development and data analysis carried out, it was obtained that the learning media was developed using the Plomp model consisting of the preliminary, development, and assessment phases. The developed media has been validated by material experts and media experts with the results showing a very valid category. The practicality test carried out by teachers and students also showed that this media is very practical to use in learning. In addition, this study demonstrates the practical potential of integrating RME and content differentiation into a web-based platform, as evidenced by the high-category N-Gain score, in enhancing students' mathematical connection skills.

This study has limitations in that it involved a relatively small sample size and was conducted at only one vocational school, which may limit the generalizability of the findings. Therefore, future research could examine the long-term retention of mathematical connection skills by involving a larger sample size and a wider variety of schools, or by comparing the effectiveness of this media across different subject areas and school types. In addition, the learning media should continue to be developed to become more optimal and aligned with the principle of content differentiation. Further development may include providing material links tailored to students' ability levels, adding interactive features to enhance student engagement, and offering offline versions such as Android applications, interactive PDFs, or desktop

versions. Thus, this learning media is expected to become more effective, adaptive, and relevant to students' needs as well as to the advancements in educational technology.

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