

## DEVELOPMENT OF E-MODULES BASED ON STAD COOPERATIVE LEARNING USING RACING GAMES FOR SEQUENCES AND SERIES

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### ABSTRAK

Penelitian ini bertujuan untuk mengembangkan e-modul berbasis pembelajaran kooperatif tipe STAD berbantu game racing pada materi barisan dan deret. Latar belakang penelitian ini adalah kurangnya bahan ajar yang digunakan peserta didik dalam belajar, buku yang tersedia pun terdapat perbedaan dengan kurikulum yang digunakan saat ini sehingga jarang digunakan. Pembelajaran yang dilakukan juga masih secara konvensional sehingga membuat peserta didik merasa monoton dan sulit memahami materi. Metode penelitian yang dilakukan menggunakan model ADDIE meliputi analisis, desain, pengembangan, implementasi, dan evaluasi. Pada tahapan analisis dilakukan wawancara pendidik dan pemberian angket peserta didik untuk mengetahui masalah serta kebutuhan, tahap desain merancang e-modul, tahap pengembangan melakukan uji validasi materi dan media serta uji kepraktisan kepada 15 peserta didik, dan tahap evaluasi dilakukan di setiap tahapan untuk perbaikan e-modul. Hasil rata-rata validasi materi 81% dengan kategori sangat valid. Hasil rata-rata validasi media 89% dengan kategori sangat valid. Hasil uji kepraktisan mendapat rata-rata 89,87% dengan kategori sangat praktis. Pengembangan ini memberikan peluang bagi pendidik mengintegrasikan teknologi dalam pembelajaran kooperatif dalam proses belajar.

**Kata Kunci:** barisan dan deret; e-modul; game racing; pembelajaran kooperatif tipe STAD;

### ABSTRACT

This study aims to develop an e-module based on cooperative learning of the STAD type assisted by racing games on the material of sequences and series. The background of this study is the lack of teaching materials used by students in learning, the available books are also different from the current curriculum used so they are rarely used. The learning is also still conventional so that students feel monotonous and have difficulty understanding the material. The research method used is the ADDIE model including analysis, design, development, implementation, and evaluation. At the analysis stage, interviews were conducted with educators and questionnaires were given to students to identify problems and needs, the design stage designed the e-module, the development stage conducted validation tests of materials and media as well as practicality tests to 15 students, and the evaluation stage was carried out at each stage to improve the e-module. The average result of material validation was 81% with a very valid category. The average result of media validation was 89% with a very valid category. The results of the practicality test got an average of 89.87% with a very practical category. This development provides opportunities for educators to integrate technology in cooperative learning in the learning process.

**Keywords:** e-module; sequences and series; racing games; STAD-type cooperative learning

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## **Introduction**

Technological developments in the Industry 4.0 era have driven innovation in education, including the use of digital-based teaching materials. Teaching materials can be defined as learning content created comprehensively and systematically based on the principles applied by teachers and students in the learning process (Magdalena et al., 2020). The Director General of Islamic Education (2019) also stated that teaching materials are everything used by teachers in the classroom. One form of digital teaching material is an electronic module (e-module), which can present material systematically and can be used for learning (Herawati & Muhtadi, 2018). The use of e-modules has been shown to increase learning independence, facilitate access to information, and foster student motivation (Erdi & Padwa, 2021).

One of the subjects that will utilize technology is mathematics. Mathematics is essential for all of us, as it is related to everyday life (Sirait, 2016). In the context of mathematics learning, the use of technology is crucial because mathematics plays a role in developing critical, logical, and creative thinking skills (Ramadanti et al., 2021). In grade 10 MA, mathematics includes material on sequences and series. This material focuses on developing reasoning skills (Tarihoran et al., 2022).

Based on the results of a pre-survey at MA Muhammadiyah Metro, it was found that the learning resources currently used for mathematics lessons still come from teachers using publisher's books purchased using personal funds. Meanwhile, printed school books are inadequate due to limited quantities, so they are rarely used. There is a difference in the curriculum in school books with the current curriculum, which is also one reason why these books are rarely used. The available books still make it difficult for students to understand the material in mathematics lessons, especially sequences and series. They are less interesting because they are still printed and presented in written form, and the books are also not portable by students. Therefore, it can be said that the school still lacks teaching materials for use in mathematics learning. The books used also do not have educational games in them, while students at the school have a habit of playing games such as Mobile Legends. This habit can certainly be utilized by teachers to add variety in the form of educational games that can be used for group work. The learning model used is still conventional or traditional, making students feel monotonous and difficult to understand the material being taught. With this conventional model, teachers still carry out learning through lectures and assignments by providing problem papers to be worked on together. The conventional model is certainly not suitable for the current curriculum, namely the Independent Curriculum, where students are required to actively explore their abilities while the teacher acts as a facilitator. STAD cooperative learning is considered capable of making students collaborative in solving problems in the learning process. Cooperative learning is carried out by dividing students into small, heterogeneous groups to solve problems, assignments, or do other things to achieve a common goal (Hayati, 2017). The implementation of the TGT Cooperative Learning Model can improve student learning outcomes (Lestari, et al., 2023). In the STAD type, students will be divided into small groups containing 4-6 people heterogeneously (Wardana, et al., 2017). According to Andayani and Jazim (2016), the purpose of STAD cooperative learning is to encourage students to acquire the material presented by the teacher.

Various previous studies have developed mathematics e-modules. Maulina et al. (2023) developed an e-module using Canva and found it feasible to use, but it did not integrate a specific learning model. Alpiani et al. (2022) developed an e-module on sequences and series using Smart App Creator, but it did not integrate educational game elements. Meanwhile, Salsabila's (2022) research developed an e-module based on STAD-type cooperative learning, but it did not combine it with educational games and differed in the materials used.

Based on several studies, there is a new need for mathematics learning media that is not only in the form of...*e-modul*, but also integrated with STAD type cooperative learning and equipped with educational games in the form of *racing.E-module*. E-modules are effective digital teaching materials containing text, images, and materials used in learning. E-modules are teaching materials that utilize technology and can be accessed using a mobile phone or computer. According to Laili (2019), electronic learning, specifically e-modules, helps students measure and manage their learning abilities and intensity. STAD cooperative learning is a heterogeneous group learning method that divides students into 4-5 groups. This method aims to encourage students to understand the learning material presented by the teacher. *Racing game* is a racing game in which students are required to answer questions to win. Educational game-assisted learning has been shown to increase student motivation and enthusiasm for learning compared to conventional learning (Andari, 2020).

The solution to this problem is a cooperative learning-based e-module assisted by a racing game. Therefore, the aim of this research is to develop a valid and practical e-module based on STAD-type cooperative learning assisted by a racing game on sequences and series.

## Research methods

### *Development Model*

This research is a research and development (R&D) with the aim of producing a product in the form of an e-module based on STAD type cooperative learning assisted by racing games on the material of sequences and series. Development is research used to develop and test products which are then developed in the world of education (Maydiantoro, 2021). According to Yani et al. (2022), research and development is conducted through needs analysis to produce a usable product. The development model used is ADDIE (Analyze, Design, Development, Implementation, and Evaluate), as proposed by Branch (2009). This model was chosen because each stage includes an evaluation, allowing for continuous product improvement shows in Figure 1.

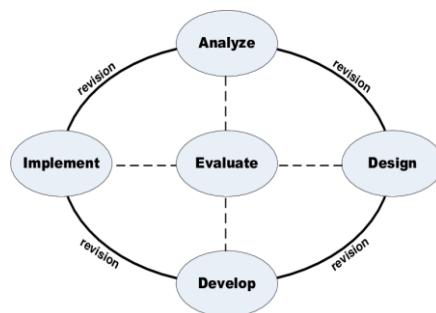


Figure 1. ADDIE stages according to Branch (2009)

### *Development Procedures*

At the stage *analyze*, A needs analysis was conducted through interviews with mathematics teachers and questionnaires were distributed to 10th grade students at MA Muhammadiyah Metro. The analysis showed that learning was still dominated by conventional methods with lectures and assignments using a sheet of paper. Limited teaching materials were used and were not in line with the curriculum, so learning resources came from teachers' personal books. The books used still made it difficult for students to understand the material and were less interesting because they were still printed and presented in written form only. The books also did not include educational games, while students had a habit of playing games. Therefore, the solution to this problem was the development of an e-module based on STAD cooperative learning assisted by racing games on sequences and series material.

*Stagedesign* Based on the analysis results, an e-module product was designed containing the following steps of STAD cooperative learning: (a) conveying objectives and motivation, (b) forming heterogeneous groups, (c) presenting material, (d) group assignments through racing games, (e) individual quizzes, and (f) evaluation and awarding (Wardana et al., 2017 and Wulandari, 2022). The e-module was developed using the Canva application and then converted into a flipbook using SimpleBooklet. The racing game was created using the Blooket platform to add variety to learning activities.

The development stage includes material preparation, e-module creation, and racing game integration. Next, product validation is conducted by material and media experts. The validation results are used to revise and refine the product. After the product is declared valid, a practicality test will be conducted using small groups involving 15 class X MA Muhammadiyah Metro students, as conducted by Sutrisno (2019) in his research. Students are given a tutorial on how to use the e-module and then asked to provide feedback regarding the product's design, content, and language. In this study, implementation was not carried out because it only focused on the validity and practicality of the product.

In the evaluation phase, evaluations are conducted at each ADDIE stage. This is done to minimize product errors and allow for improvements at each stage.

### *Data Collection Instruments*

The data collection instruments used were interviews, validation questionnaires, and practicality questionnaires. Interviews were conducted at the initial stage to obtain information about problems in class X at MA Muhammadiyah Metro. The validation questionnaire was given to mathematics education lecturers from Muhammadiyah Metro University and mathematics subject teachers from MA Muhammadiyah Metro. The practicality questionnaire was given to a small group of 15 class X students.

### *Data Analysis Techniques*

Validity tests are conducted to determine whether a product is valid or not, while practicality tests are conducted to determine whether the product being developed is suitable for use. In validity and practicality tests, according to Apsari and Rizki (2018), the product is in the form of *e-modulis* declared valid or practical

if it reaches a percentage value  $>60$ . If the resulting e-module gets a percentage value  $<60$ , improvements will be made until it is declared valid and practical.

## Results and Discussion

### *Presentation of Development Results*

#### 1. Analyze

Based on the pre-survey, problems were found in the form of learning resources for mathematics subjects that were still limited and did not match the curriculum, learning was also still conventional which was considered monotonous by students. Therefore, with the problems described, the researcher will develop teaching materials in the form of e-modules based on STAD cooperative learning that can make it easier for students to understand the material, especially sequences and series. The results of this study are supported by research. Salsabila (2022) in developing e-modules based on STAD type cooperative learning that e-modules based on cooperative learning can emphasize student cooperation so that students can help each other solve problems given by the teacher, the difference in the research to be carried out is in the use of sequence and series material in class X and the provision of racing games. The books used also do not contain games, whereas students like playing games. The game that will be presented in the e-module is a racing game, the results of this study are supported by Prastiwigari (2020) that racing games are considered interesting games that make students play while learning in a fun way. The difference in the research that will be carried out is that the racing game will be presented in an e-module. Research results by Aulia, et al., (2025) In developing e-modules using educational games, it was revealed that the games in the e-modules can build active student involvement, as seen from their interest in visual, interactive materials and solving practice questions in the games. The difference in the research that has been carried out is that the game used is Quizizz, while the research that will be carried out uses a racing game. Therefore, a teaching material in the form of an e-module based on STAD-type cooperative learning assisted by a racing game on the topic of sequences and series will be developed. The evaluation carried out is a new learning resource in the form of an e-module based on cooperative learning that includes a racing game on the topic of sequences and series.

#### 2. Design

*E-modul* The developed model will contain the steps of STAD type cooperative learning. *E-modul* will be created using the application *canvaas* well as *Microsoft Word*, *racing game* which is presented will be made using the *webbillboard*, The *e-modul* will be converted in the form *flipbook* using the *websimplebooklet*. At this stage, the evaluation includes selecting colors within the module to ensure they blend well and are not too flashy, selecting images and applying the material to everyday life to ensure learning outcomes are met, and selecting a web flipbook to ensure the available game links can be accessed simply by clicking on the links within the e-module. An example of the product display is shown in Figure 2.

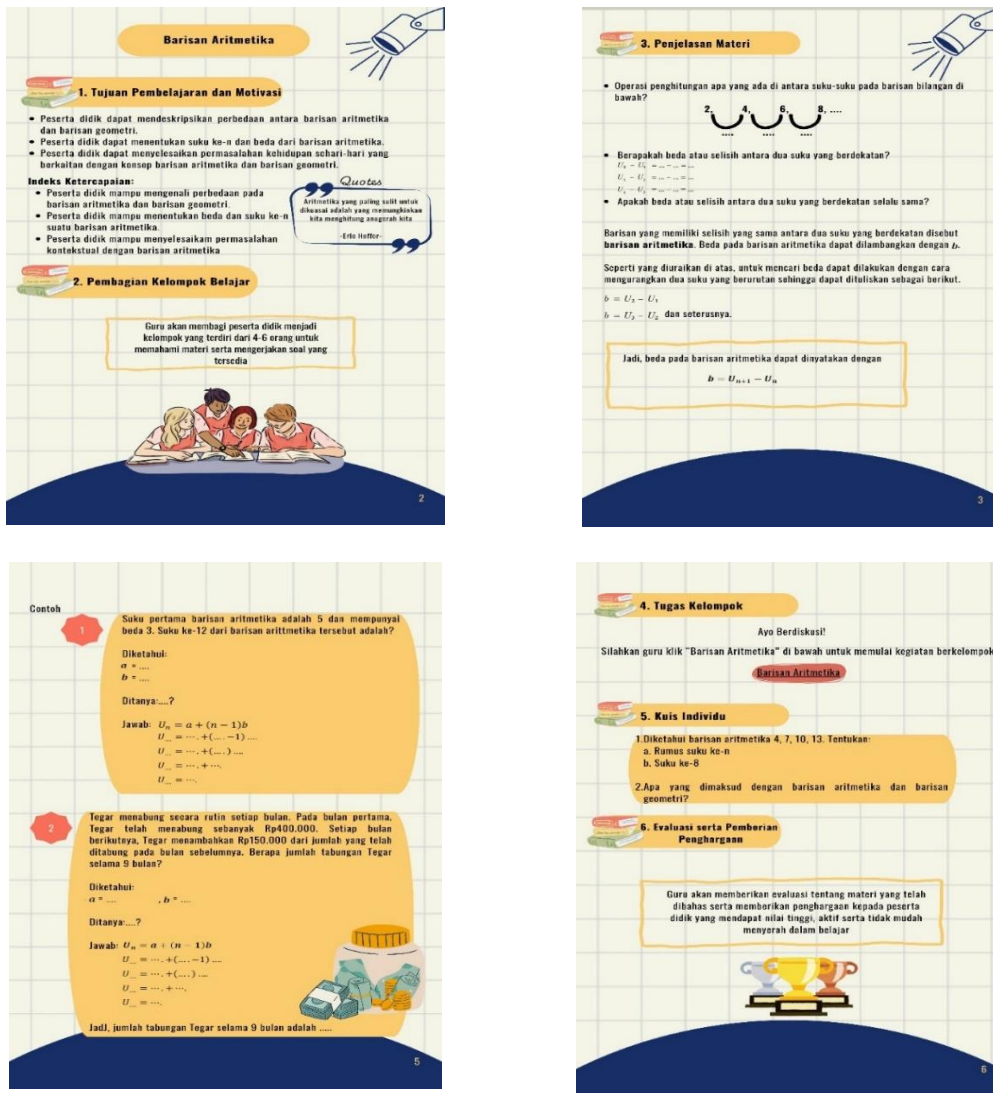


Figure 2. Appearance E-modul

### 3. Development

A material validation test was conducted on Table 1 mathematics education lecturer from Muhammadiyah Metro University and 1 mathematics subject teacher from MA Muhammadiyah Metro.

Table 1. Material Validation Test Result Data

Aspect	Material Expert Validation Results		Average Percentage of Each Criteria
	V1	V2	
Content Suitability Aspect	60%	93%	76.5%
Aspects of Accuracy of Material and Questions	70%	90%	80%
Presentation Aspects	73%	100%	86.5%
Average	68%	94%	81%
Information			Very Valid

Table 1 shows that the average percentage of material validation was 81%, categorized as very valid. This assessment covered three aspects: content suitability (76.5%), material and question accuracy (80%), and presentation (86.5%). Although declared very valid, the validator suggested several improvements to ensure the developed e-module is suitable for use. Table 2 presents samples before and after improvements.

Table 2. Repair Sample E-module of Material Validation


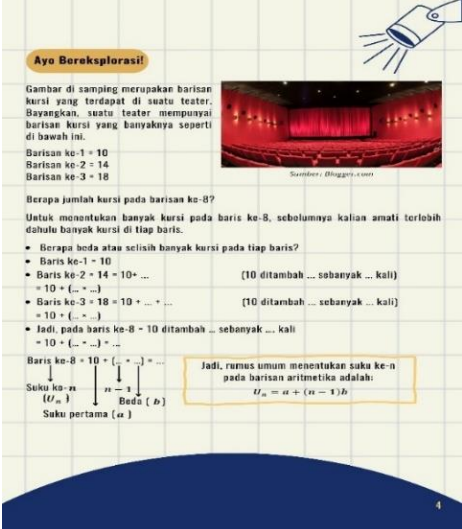
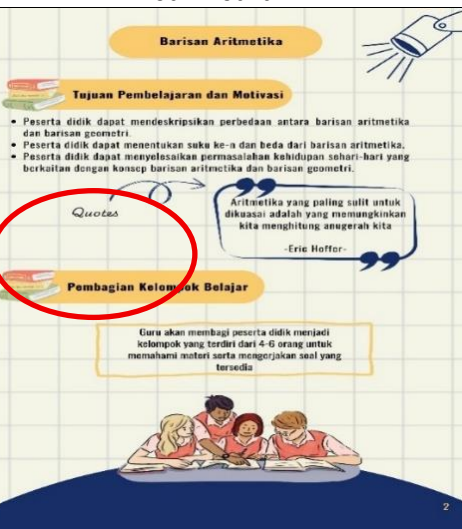
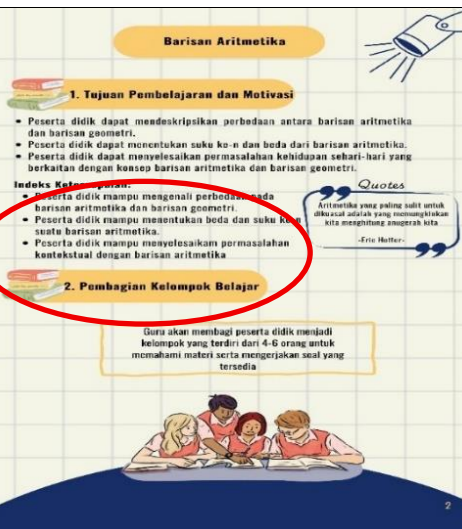
Before Revision	After Revision
 <p><b>Penjelasan Materi</b></p> <p>Gambar di atas merupakan barisan kursi yang terdapat di suatu teater. Bayangkan, suatu teater mempunyai barisan kursi yang panjangnya terbatas dan jumlah kursi yang tersedia meningkat dengan jumlah yang tetap setiap barisnya. Apakah kalian tahu, bahwa kita dapat menghitung barisan kursi ke-<math>n</math> dengan menggunakan barisan aritmetika.</p> <p>Rumus barisan aritmetika          Rumus suku ke-<math>n</math>: <math>U_n = a + (n - 1)b</math>          Rumus beda/selisih: <math>b = U_{n+1} - U_n</math></p> <p>Keterangan:  <math>U_n</math> = suku ke-<math>n</math>  <math>a</math> = suku pertama  <math>n</math> = banyaknya suku  <math>b</math> = beda/selisih</p>	 <p><b>Ayo Bereksplorasi</b></p> <p>Gambar di samping merupakan barisan kursi yang terdapat di suatu teater. Bayangkan, suatu teater mempunyai barisan kursi yang panjangnya seperti di bawah ini.</p> <p>Barisan ke-1 = 10          Barisan ke-2 = 14          Barisan ke-3 = 18</p> <p>Berapa jumlah kursi pada barisan ke-8?          Untuk menentukan banyak kursi pada baris ke-8, sebelumnya kalian amati terlebih dahulu banyak kursi di tiap baris.</p> <ul style="list-style-type: none"> <li>• Berapa beda atau selisih banyak kursi pada tiap baris?</li> <li>• Baris ke-1 = 10</li> <li>• Baris ke-2 = <math>14 = 10 + \dots</math> (10 ditambah ... sebanyak ... kali)</li> <li>• Baris ke-3 = <math>18 = 10 + \dots + \dots</math> (10 ditambah ... sebanyak ... kali)</li> <li>• Baris ke-4 = <math>22 = 10 + \dots + \dots + \dots</math> (10 ditambah ... sebanyak ... kali)</li> </ul> <p>Jadi, pada baris ke-8 = 10 ditambah ... sebanyak ... kali  <math>= 10 + (\dots) \dots</math></p> <p>Baris ke-8 = <math>10 + (\dots) \dots</math></p> <p>Suku ke-<math>n</math> (<math>U_n</math>)          Beda (<math>b</math>)          Suku pertama (<math>a</math>)</p> <p>Jadi, rumus umum menentukan suku ke-<math>n</math> pada barisan aritmetika adalah:  <math>U_n = a + (n - 1)b</math></p>
<p>The explanation of the material is not in accordance with the independent curriculum</p>	<p>The explanation of the material is in accordance with the independent curriculum</p>
 <p><b>Barisan Aritmetika</b></p> <p><b>Tujuan Pembelajaran dan Motivasi</b></p> <ul style="list-style-type: none"> <li>• Peserta didik dapat mendeskripsikan perbedaan antara barisan aritmetika dan barisan geometri.</li> <li>• Peserta didik dapat menentukan suku ke-<math>n</math> dan beda dari barisan aritmetika.</li> <li>• Peserta didik dapat menyelesaikan permasalahan kehidupan sehari-hari yang berkaitan dengan konsep barisan aritmetika dan barisan geometri.</li> </ul> <p><b>Quotes</b>          Aritmetika yang paling sulit untuk dikuasai adalah yang memungkinkan kita menghitung anugerah kita          -Eric Hoffer-</p> <p><b>Pembagian Kelompok Belajar</b></p> <p>Guru akan membagi peserta didik menjadi kelompok yang terdiri dari 4-6 orang untuk memahami materi serta mengerjakan soal yang tersedia</p>	 <p><b>Barisan Aritmetika</b></p> <p><b>1. Tujuan Pembelajaran dan Motivasi</b></p> <ul style="list-style-type: none"> <li>• Peserta didik dapat mendeskripsikan perbedaan antara barisan aritmetika dan barisan geometri.</li> <li>• Peserta didik dapat menentukan suku ke-<math>n</math> dan beda dari barisan aritmetika.</li> <li>• Peserta didik dapat menyelesaikan permasalahan kehidupan sehari-hari yang berkaitan dengan konsep barisan aritmetika dan barisan geometri.</li> </ul> <p><b>Indeks Ketercapaian</b></p> <ul style="list-style-type: none"> <li>• Peserta didik mampu mengenali perbedaan antara barisan aritmetika dan barisan geometri.</li> <li>• Peserta didik mampu menentukan beda dan suku ke-<math>n</math> pada suatu barisan aritmetika.</li> <li>• Peserta didik mampu menyelesaikan permasalahan kontekstual dengan barisan aritmetika</li> </ul> <p><b>Quotes</b>          Aritmetika yang paling sulit untuk dikuasai adalah yang memungkinkan kita menghitung anugerah kita          -Eric Hoffer-</p> <p><b>2. Pembagian Kelompok Belajar</b></p> <p>Guru akan membagi peserta didik menjadi kelompok yang terdiri dari 4-6 orang untuk memahami materi serta mengerjakan soal yang tersedia</p>
<p>Achievement index not yet given</p>	<p>Achievement index has been given</p>

Table 2 presents examples of improvements made, namely, providing image sources taken from the internet and providing an achievement index. In addition, media validation tests were also conducted by two mathematics education lecturers from Muhammadiyah Metro University and one mathematics teacher from MA Muhammadiyah Metro shows in Table 3.

Table 3. Media Validation Results Data

Aspect	Media Expert Validation Results			Average Percentage of Each Criteria
	X1	X2	X3	
Module Design Aspects	93%	77%	100%	90%
Media Attractiveness Aspects	95%	90%	80%	88%
Average Information	94%	83.5%	90%	89%
				Very Valid

Table 3 shows that the media validation results show that the e-module received an average score of 89%, categorized as very valid. This assessment covered two aspects: module design (90%) and media appeal (88%). Although declared very valid, the validator made several suggestions for improvement. Table 4 presents a sample of e-module improvements.

Table 4. Repair Sample *E-module of Media Validation*


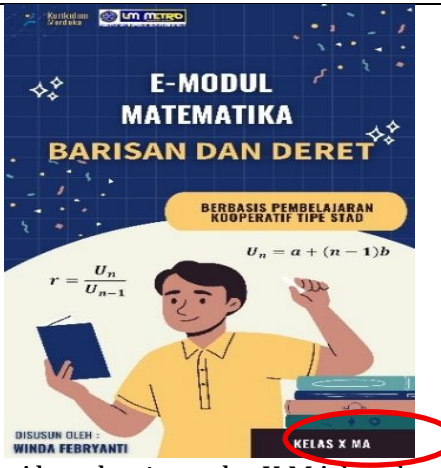
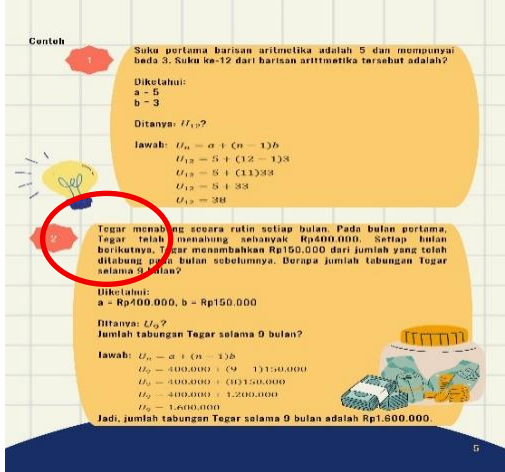
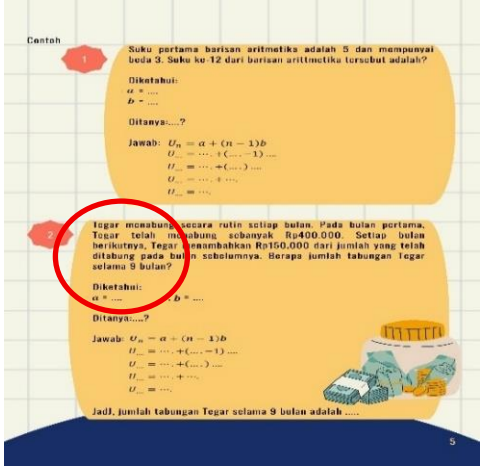
Before Revision	After Revision
 <p><b>E-MODUL MATEMATIKA BARISAN DAN DERET</b>                  BERBASIS PEMBELAJARAN KOOPERATIF TIPE STAD  <math>U_n = a + (n - 1)b</math>  <math>r = \frac{U_n}{U_{n-1}}</math>                  DISUSUN OLEH : WINDA FEBRYANTI                  KELAS X</p>	 <p><b>E-MODUL MATEMATIKA BARISAN DAN DERET</b>                  BERBASIS PEMBELAJARAN KOOPERATIF TIPE STAD  <math>U_n = a + (n - 1)b</math>  <math>r = \frac{U_n}{U_{n-1}}</math>                  DISUSUN OLEH : WINDA FEBRYANTI                  KELAS X MA</p>
X MA level not yet given	Already given the X MA level
 <p>Centang                  Suku pertama barisan aritmetika adalah 5 dan mempunyai beda 3. Suku ke-12 dari barisan aritmetika tersebut adalah?                  Diketahui:  <math>a = 5</math>  <math>b = 3</math>                  Ditanya: <math>U_{12}</math>?                  Jawab: <math>U_n = a + (n - 1)b</math>  <math>U_{12} = 5 + (12 - 1)3</math>  <math>U_{12} = 5 + (11)3</math>  <math>U_{12} = 5 + 33</math>  <math>U_{12} = 38</math></p> <p>Tegar menabung secara rutin setiap bulan. Pada bulan pertama, Tegar telah menabung sebanyak Rp400.000. Setiap bulan berikutnya, Tegar menambahkan Rp150.000 dari jumlah yang telah ditabung pada bulan sebelumnya. Berapa jumlah tabungan Tegar selama 9 bulan?                  Diketahui:  <math>a = \text{Rp}400.000</math>, <math>b = \text{Rp}150.000</math>                  Ditanya: <math>U_9</math>?                  Jumlah tabungan Tegar selama 9 bulan?                  Jawab: <math>U_n = a + (n - 1)b</math>  <math>U_9 = 400.000 + (9 - 1)150.000</math>  <math>U_9 = 400.000 + (8)150.000</math>  <math>U_9 = 400.000 + 1.200.000</math>  <math>U_9 = 1.600.000</math>                  Jadi, jumlah tabungan Tegar selama 9 bulan adalah Rp1.600.000.</p>	 <p>Centang                  Suku pertama barisan aritmetika adalah 5 dan mempunyai beda 3. Suku ke-12 dari barisan aritmetika tersebut adalah?                  Diketahui:  <math>a = \dots</math>  <math>b = \dots</math>                  Ditanya: ...?                  Jawab: <math>U_n = a + (n - 1)b</math>  <math>U_{12} = \dots + (12 - 1) \dots</math>  <math>U_{12} = \dots + (11) \dots</math>  <math>U_{12} = \dots + \dots</math>  <math>U_{12} = \dots</math></p> <p>Tegar menabung secara rutin setiap bulan. Pada bulan pertama, Tegar telah menabung sebanyak Rp400.000. Setiap bulan berikutnya, Tegar menambahkan Rp150.000 dari jumlah yang telah ditabung pada bulan sebelumnya. Berapa jumlah tabungan Tegar selama 9 bulan?                  Diketahui:  <math>a = \dots</math>, <math>b = \dots</math>                  Ditanya: ...?                  Jawab: <math>U_n = a + (n - 1)b</math>  <math>U_9 = \dots + (9 - 1) \dots</math>  <math>U_9 = \dots + (8) \dots</math>  <math>U_9 = \dots + \dots</math>  <math>U_9 = \dots</math>                  Jadi, jumlah tabungan Tegar selama 9 bulan adalah .....</p>
Delete unnecessary light images	The lamp image has been removed

Table 4 presents the improvements made to the media validation, including the inclusion of the MA level and the removal of inappropriate images. After the validity test is completed, a practicality test will be conducted on 15 grade X students at MA Muhammadiyah Metro. The practicality test results are presented in Table 5.

Table 5. Practicality Test Result Data

Aspect	Average Percentage of Each Aspect
Design Aspects	91.6%
Content Aspect	89%
Linguistic Aspects	89%
<b>Average</b>	<b>89.87%</b>
<b>Criteria Obtained</b>	<b>Very Practical</b>

From the results of Table 6, an average score of 89.87% was obtained. This assessment includes 3 aspects, namely the design aspect of 91.6%, this is because the e-module has a suitable color combination, clear text and images according to the material discussed, and the instructions for use make it easy for students to use the e-module and racing game. The content aspect of 89% is because the presentation of the e-module is coherent and clear using the steps of cooperative learning type STAD. The language aspect of 89% is because the sentences used to convey information are in accordance with KBBI so they are clear and easy to understand. As for the sample student answers in Figure 3 to the questions given, 12 out of 15 students were able to work on them although not optimally shows in Figure 3.

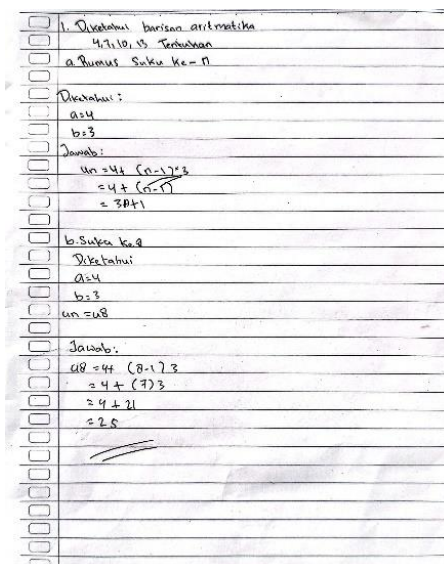


Figure 3. Sample Student Answers

Students commented and suggested that the developed e-module has an attractive appearance, the available material is easy to understand, and it is easy to use independently. This is supported by research by Setiyadi et al. (2017) which

found that it is easy to use independently because it includes instructions..This is supported by research by Turnip et al. (2021) that e-modules are easy to use because they are digital and portable. The available racing games make students more enthusiastic about learning because they are exciting and fun with an attractive appearance. This is supported by research by Putra et al. (2023) that educational games are designed to arouse interest in learning the subject matter through play activities, thus creating a sense of enjoyment that is expected to help children more easily understand the material presented. Students also suggested that e-modules not be used every day because there were some students who did not bring their cellphones, and they were afraid that during learning, students would not open the e-module but instead open other applications. In addition, if the internet signal is not good, students will need quite a long time to access the e-module. A follow-up to the students' suggestions is that when learning will be carried out in groups so that each group only needs one cellphone, the use of e-modules in each group can also be done by choosing a cellphone that has a good internet signal or can connect to the Wi-Fi available at the school. Evaluation during the development phase showed that the developed e-module met the "Very Valid" and "Very Practical" criteria after undergoing validation and testing. These evaluation results indicate that the product is ready for use in the learning process, although some feedback from validators and users requires attention for continuous improvement.

### **Conclusion and Suggestions**

E-modul STAD-based cooperative learning supported by racing games on sequences and series material has proven to be very valid and practical, as evidenced by the results of expert validation tests (average 85%) and student practical tests (average 89.87%). This development has succeeded in overcoming the limitations of teaching materials and monotonous learning methods at MA Muhammadiyah Metro, thus enabling students to better understand mathematics, especially sequences and series. Furthermore, the integration of this racing game significantly increases student interest and motivation, so that the learning process becomes more enjoyable and challenging.

For further utilization, it is recommended that students use this e-module in groups to encourage collaborative discussion and understanding, while educators can adopt it as an innovative alternative teaching material. Future researchers can expand the material's scope, enhance its visual appeal, and add more interactive features, including instructional videos. This will further enrich the learning experience and help students master various other mathematics topics.

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