



The Development of E-modules Based on Realistic Mathematics Education Assisted by Geosway in Phase F

Hena Retnowati¹, Abi Suwito^{1,2}, Susanto^{1,2}, Erfan Yudianto^{1,2}, Didik Sugeng Pambudi^{1,2}

¹Department of Postgraduate Mathematics Education, University of Jember, Indonesia

²Department of Geometry Problems And Learning, University of Jember, Indonesia

ABSTRACT: This R&D aims to produce a valid, practical, and effective Realistic Mathematic Education (RME)-based e-module assisted by Geosway in phase F. This research is a research and development using a 4D model consisting of 4 stages, namely defining, designing, developing, and disseminating. Observations were conducted at SMK Negeri 6 Jember as the research location. The research subjects involved in this study were students of SMK Negeri 6 Jember in grades XI DKV 1 and XI KKBT 1. The research instruments used in data collection were observation sheets, student response questionnaire sheets, readability test sheets, and test sheets. The validation results for the teaching module, e-module, test, observation sheet, and student response questionnaire were 3.73; 3.68; 3.57; 3.63; and 3.81, respectively. This shows that the teaching modules, e-modules, tests, observation sheets, and student response questionnaires were obtained with valid criteria. The practicality of the e-module based on the observation of the implementation of the e-module in the first and second meetings was 3.39 and 3.67, respectively, with the practical category. The effectiveness of the e-module was based on learning completeness, the N-gain category, and student responses to improve students' creative thinking skills. The results of the study showed that the percentage of student completeness reached 87.5%, the average N-gain category was 0.72, and students gave a positive response of 82.07%. This indicates that the e-module is effective in improving students' creative thinking skills. Based on the results of the study, it shows that the e-module based on Realistic Mathematic Education (RME) assisted by Geosway in phase F has valid, practical, and effective criteria.

KEYWORDS: E-module, Geogebra, Sway, Geosway, Realistic Mathematics Education.

INTRODUCTION

Advances in science and technology will make education more advanced and developed (Alpiani et al., 2022). The educational technology industry is growing rapidly and dominating education, becoming a choice in schools (Williamson et al., 2021). One form of technological development in education is the creation of creative and innovative learning media (Aspriyani et al., 2020). This demonstrates that technological developments in education play a crucial role in creating learning media for students.

In the didactic triadic triangle concept, learning media and teaching materials are the main tools in didactic activities (Apriliani et al., 2020). Didactic activities are one of the principles of the Realistic Mathematics Education approach (Anita, 2020). This shows that learning media can support didactic activities in the RME approach.

In the RME approach, in addition to learning media, teaching materials are also needed. Teaching materials can be made as engaging as possible using Sway media (Waskitorini et al., 2021). Using Sway learning media can motivate the development of varied media designs in creating teaching materials, and the presentation of materials can overcome verbalism in the learning process (Gani et al., 2023). One example of teaching materials is an e-module.

E-modules designed using Sway can also be embedded with other applications, such as GeoGebra. This aims to improve conceptual understanding and not only focus on the e-module display. This is supported by research results that GeoGebra-assisted e-modules obtained very valid results with a correlation coefficient (α) of 0.85. In addition, the e-module also met the criteria of practicality with a fairly practical level as seen from the student response questionnaire score of 76.88% and was effective in improving students' conceptual understanding as seen from the average N-Gain of 0.48 (Pramana et al., 2022). Research by (Yullah et al., 2022) found that students' abilities improved after participating in teaching and learning activities with the GeoGebra-assisted discovery model.

GeoGebra can be embedded in e-modules used in the classroom with specific pedagogical practices. One pedagogical practice that can be used is the Realistic Mathematics Education (RME) approach. Based on research conducted by Astuti (2018), the average

student learning outcome with a base score of 69.2 increased to 92.1 in cycle I and increased again to 95.9 in cycle II after using the Realistic Mathematics Education (RME) approach. This indicates that the Realistic Mathematics Education (RME) approach can improve student learning outcomes. Student learning outcomes can also improve due to the teaching materials used in learning (Hidayah et al., 2021). Other research shows that students' creative thinking skills can be improved through RME-based Student Worksheets (LKPD) because they make students enthusiastic in solving problems (Chahyanti et al., 2021). This indicates that RME-based teaching materials will improve students' creative thinking skills.

This study uses the RME approach in developing an e-module assisted by Geogebra and Sway (GeoSway). The learning system in the e-module developed in this study is adjusted to the principles of the RME approach based on Gravenmeijer (in Astuti, 2018), which contains three main principles, namely guided reinvention and progressive mathematization, didactical phenomenology, and a self-developed model.

On the other hand, research conducted by (Atikah et al., 2021) concluded that the elementary school mathematics e-module based on the RME approach was valid and highly suitable for use as a mathematics teaching material because it met the assessment criteria. Furthermore, research by (Fadilla, 2025) showed a gap between the potential of the RME approach and its actual implementation in the field. Furthermore, research by (Mendrofa, 2021) showed that the mathematical reasoning abilities of students at SMK Negeri 1 Gunung Sitoli using the Realistic Mathematics Education (RME) learning method produced higher results than conventional learning. Similarly, research concluded that the Indonesian Realistic Mathematics Approach (PMRI) was able to increase teacher activities in implementing learning, including guiding students both individually and in groups and providing feedback on presentations of discussion results (Pebriana, 2017).

Based on the above research, it is crucial to use RME-based teaching materials in the hope of improving student learning outcomes, both in terms of knowledge and skills. Given real-world problems, students are expected to be able to generate various ideas creatively. Therefore, the RME approach is expected to strengthen students' creative thinking skills.

Furthermore, teaching and learning activities using the GeoGebra-assisted discovery model are effective in improving students' creative thinking skills in the material of geometric transformation and reflection (Yullah et al., 2022). Another application, Microsoft Sway 365, engages students and fosters their enthusiasm for learning mathematics (Efriani et al., 2023). This led to the idea of combining GeoGebra and Sway in a single web-based e-module called GeoSway.

Therefore, the purpose of this study is to describe the process and results of developing an e-module based on Realistic Mathematics Education (RME) assisted by GeoSway in Phase F that is valid, practical, and effective.

METHOD

This development research uses a 4D development model consisting of four stages, namely defining, designing, developing, and disseminating. The subjects of this study were 6 students of SMK Negeri 6 Jember, class XI DKV 1 concentration, 24 students of class XI KKBT 1, mathematics teachers of SMK Negeri 6 Jember, and Mathematics Education Lecturers at the University of Jember. Data collection in this study was through observation sheets, student response questionnaires, readability test sheets, and test sheets. Before this e-module was tested, its validity needed to be tested first by validators, namely 1 mathematics teacher of SMK Negeri 6 Jember and 2 Mathematics Education Lecturers at the University of Jember. Meanwhile, to see the effectiveness of the use of the e-module, an essay-shaped test instrument was used, which had previously been tested for validity on the test instrument. The 4D development model used follows the stages in Figure 1.

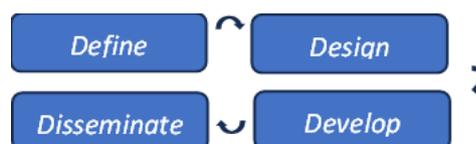


Fig.1. 4D Models

The define stage includes a preliminary analysis, student analysis, concept analysis, task analysis, and learning objective specification. The next stage is the design stage, which involves test development, media selection, format selection, and initial design. Finally, the develop stage involves validating the developed e-module with experts. The instrument validity categories are explained in the table below.



Table 1: Instrument Validity Category

Mark V_a	Validity Category
$1 \leq V_a < 2$	Invalid
$2 \leq V_a < 3$	Fairly valid
$3 \leq V_a < 4$	Valid
$V_a = 4$	very valid

Source: (Hobri Modification, 2021)

The developed e-module was piloted in small groups to assess its readability and in large groups to assess its practicality and effectiveness on creative thinking skills. Data on the practicality of the e-module was obtained from observations of its use. Observation data on the use of the e-module was calculated using the following formula:

$$IO = \frac{\sum_{i=1}^n A_i}{n}$$

Information:

IO = total average for all aspects

A_i = average value for aspect i

n = many aspects

Furthermore, the average aspect value (IO) is referred to the interval for determining the level of implementation of e-module use, which can be seen in Table 2 below.

Table 2: Criteria for Observation Data Results on the Implementation of E-module Use

Score	Conclusion
$1 \leq IO < 2$	Low
$2 \leq IO < 3$	Medium
$3 \leq IO < 4$	High
$IO = 4$	Very high

Source: (Hobri Modification, 2021)

The effectiveness of e-modules is based on data obtained on learning outcomes, N-gain, and student responses. The method for calculating N-gain is as follows:

$$g = \frac{St - Si}{Sm - Si} \times 100$$

Information:

g = N-Gain percentage

St = Posttest Score

Si = Pretest Score

Sm = Maximum Score

E-modules are categorized as effective if the number of students who complete the classical with KKTP 70 is more than or equal to 70% of the total number of students. Based on N-gain, e-modules are categorized as effective if the number of students in the interval $0.3 \leq \text{N-gain} \leq 0.7$ is more than or equal to 70% of the total number of students. Based on student responses, e-modules are categorized as effective if the number of students who state a positive response in each aspect is more than or equal to 80% of the total number of students.

E-modules that have been categorized as valid, practical, and effective then go to the dissemination stage, the e-modules that have been developed are disseminated on a wider scale.

RESULT

a. Define Stage

The initial stage of the 4D model is defining, which includes pre-post analysis, student analysis, concept analysis, task analysis, and specification of learning objectives. Observations were conducted at SMKN 6 Jember, with the results showing that the learning process uses a collaborative project-based independent curriculum, and 65 out of 90 teachers use textbooks as teaching materials. Learning using the limited number of textbooks in the school library is one of the obstacles in implementing learning. This requires adequate teaching materials that can be used flexibly so that they are easily accessible to each student. Therefore, electronic-based teaching materials are needed that can be used by each student independently, one of which is e-modules. E-modules that are interesting and can improve students' creative thinking are highly needed by vocational high school students.

Based on the 2022 PISA (Philosophy of Mathematics and Natural Sciences), creative thinking will be included as an assessment aspect for the first time. Based on this, e-modules based on Realistic Mathematics Education (RME) are needed to support learning with a focus on creative thinking. Meanwhile, student analysis, with the developmental age group of 16-17 years (late adolescence), tends to be more experimental. This aligns with creative thinking, which allows students to develop ideas and experiment with their own methods. Therefore, teachers need to facilitate learning that can spark ideas from students. This facility can take the form of developing engaging e-modules that can be used independently by students, one example of which is the development of an RME-based e-module assisted by GeoGebra and Sway (GeoSway).

b. Design Stage

The stages after defining are designing an RME-based e-module with the help of GeoSway, developing tests, selecting media, selecting formats, and conducting initial design. The test is based on indicators of creative thinking skills. The media used are e-modules with the help of GeoGebra and Sway. The format used is based on the principles of the RME approach. The initial design includes designing research instruments, including validation sheets, observation sheets for the implementation of the e-module, and student response questionnaires.

The RME-based e-module format follows the principles of Gravenmeijer in (Wahyudi, 2016) with 3 main principles, namely guided reinvention and progressive mathematization, didactical phenomenology, and self-developed model. Based on these principles, it can be described as follows.

1) Guided Reinvention

In this principle, students independently rediscover concepts through teacher guidance. In the e-module, this principle is displayed in the independent exploration, as shown in Figure 2.



Fig.2. Guided Reinvention on E-modules

2) Progressive Mathematization

This principle involves a shift from the concrete context of real-world situations to the formal symbolization of mathematics. In the e-module, this principle is displayed in class discussions, as shown in Figure 3.



Fig.3. Progressive Mathematization on E-modules

3) Didactical Phenomenology

This principle provides students with real-world activities. In the e-module, this principle is demonstrated through contextual activities, as shown in Figure 4.



Fig.4. Didactical Phenomenology in E-module

4) Self-Developed Model

Based on this principle, students are given assignments to develop their own self-models. In the e-module, this principle is displayed in assignments such as those in Figure 5.



Fig.5. Self Developed Model on E-module

c. Develop Stage

In the development of this e-module, the structure of the e-module framework begins with the creation of the e-module cover, then the foreword, instructions for using the e-module, e-module identity, learning outcomes, learning objectives, concept maps, introductions, and material relevance. Learning activity 1 contains contextual activities (didactical phenomenology), trigger questions, pre-test, self-exploration (guided reinvention), class discussion (progressive mathematization), let's move from



concrete context to formal symbolization, comprehension exercises, assignments (self-developed model), let's think creatively, let's reflect, and let's use technology. Learning activity 2 contains introduction, material relevance, contextual activities (didactical phenomenology), trigger questions, self-exploration (guided reinvention), class discussion (progressive mathematization), let's move from concrete context to formal symbolization, comprehension exercises, assignments (self-developed model), let's think creatively, do you know, let's reflect, post-test, conclusion, and let's use technology.

The development of e-modules was carried out using Sway media with the following steps.

- 1) Via a browser, go to sway.office.com
- 2) Log in using your registered Microsoft/Office account
- 3) Enter the password used
- 4) Click create new
- 5) Select start from blank
- 6) Fill in the title at the very top
- 7) Add a background to the cover
- 8) Add headings as sub-headings
- 9) Select text to write a paragraph
- 10) Add image media with insert image
- 11) Insert Geogebra using the embed method
- 12) Insert Microsoft Form for pre-test and post-test
- 13) Set the design and layout to choose the theme, colors and fonts.
- 14) Perform a preview to see the results
- 15) Improve less than optimal results
- 16) Publish with share link to anyone

The validator provided notes on the validation sheet for the e-module that had been prepared before it was tested on students. A description of the notes by the validator is shown below.

- 1) In the e-module there are images that are too large so they need to be resized so that the display looks balanced.
- 2) For questions on the pre-test and post-test that come from screenshots, it is better to change the file to PDF format first before screenshotting.
- 3) Question number 2 in the post test does not need to provide information on the length of each side because this will not encourage students to think creatively.
- 4) On the observation sheet, each indicator should be given clarity for each score so that the observer is not confused when filling out the observation sheet.
- 5) The teaching modules that have been prepared are good, but need to be added regarding learning modes and models
- 6) The spelling of the theorem should be improved.
- 7) The e-module needs to include a pre-test answer key as reflection material

The validator's next recommendation was to revise the e-module before testing it with students. After the revisions, the e-module was tested with both small and large groups. The small group trial was conducted with six students in class XI DKV 1 to test the e-module's readability. The results of the e-module's readability test included the following recommendations:

- 1) It is best to use word choices that students can understand.
- 2) The sentence structure in the question needs to be improved.
- 3) It would be better to add visual examples.

The large group test was conducted in class XI KKBT 1 consisting of 24 students. The large group trial was conducted in 2 meetings, namely on August 21, 2025 and September 4, 2025. The data obtained from the implementation of the large group trial were the post-test results data presented in table 3 below.



Table 3: Learning Outcomes

Items	Information
Highest score	96
Lowest score	60
Average	83.88
Number of students achieving a score of ≥ 70	21
Number of students achieving a score of < 70	3
Classical completion percentage	87.5%

On the other hand, to assess the validity of the e-module, a research instrument was used to test the validity of the teaching module, e-module, and test. Based on the validation data analysis, the validity coefficient for the RME-based e-module with GeoSway's assistance was obtained, as shown in Table 4 below.

Table 4: E-module Validity Coefficient

Research Instruments	Validity Coefficient	Category
Teaching Module	3.73	Valid
E-module	3.68	Valid
Test	3.57	Valid

Another thing that needed to be tested for validity was the research instruments, namely the observation sheet and the student response questionnaire. Based on the validation data, the validity coefficients for the research instruments were obtained, as shown in Table 5 below.

Table 5: Research Instrument Validity Coefficient

Research Instruments	Validity Coefficient	Category
Learning Implementation Observation Sheet		Valid
Student Response Questionnaire		Valid

Based on tables 4 and 5, it can be concluded that the e-module and research instruments have fulfilled the valid category.

The practicality criteria for e-modules are based on the results of observations of the implementation of e-module use in large group trials. Data from observations of the implementation of e-module use are presented in Figure 6.

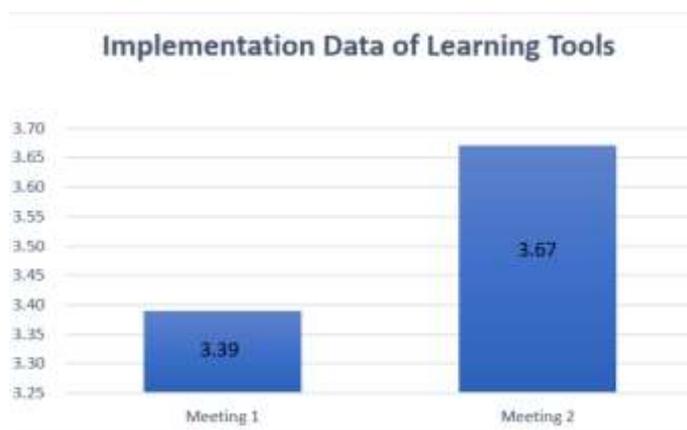


Fig.6. Diagram of the Results of the Analysis of the Implementation of the Use of E-modules

Based on Figure 5, it is known that the average value of the implementation of the e-module use in the first and second meetings was 3.39 and 3.67, respectively. Based on this, the average for all aspects was 3.50, which indicates that the e-module is said to be practical.

The effectiveness criteria were measured using three indicators: learning outcome data completion, N-Gain categories, and student response questionnaires. Learning completion was obtained from post-test results compiled based on creative thinking ability indicators. Based on Table 3, the percentage of classical completion was 87.5%. This percentage indicates that students in the large group were categorized as classically complete.

The pre-test and post-test scores for creative thinking skills were obtained at the first and second meetings. These scores were then tested using the N-Gain test. A detailed summary of the N-Gain scores for the large group can be seen in Table 6.

Table 6: N-Gain Category Results

Category	Average N-Gain	Percentage
Low	0	0%
Medium	0.49	25%
High	0.79	75%
Medium and High	0.72	100%

Based on Table 6, it is known that the average N-Gain is 0.72 with a student percentage of 100%. This indicates that the e-module meets the effectiveness criteria in terms of the N-Gain category.

The final indicator for testing the effectiveness criteria is based on the results of the student response questionnaire. The following is a brief summary of the student response questionnaire, shown in Table 7.

Table 7: Student Response Questionnaire Results

Statement	Average Percentage
Disagree	2.94%
Quiet agree	14.99%
Agree	42.91%
Strongly agree	39.16%

Based on Table 7, it is known that the percentage of students' responses was 82.07% positive. This indicates that the e-module met the effectiveness criteria as seen from the student response questionnaire.

d. Disseminate Stage

This stage is the final step in disseminating the RME-based e-module with the help of GeoSway. At this stage, Sway is configured to ensure the e-module link is accessible to users. The link settings are shown in Figure 7.

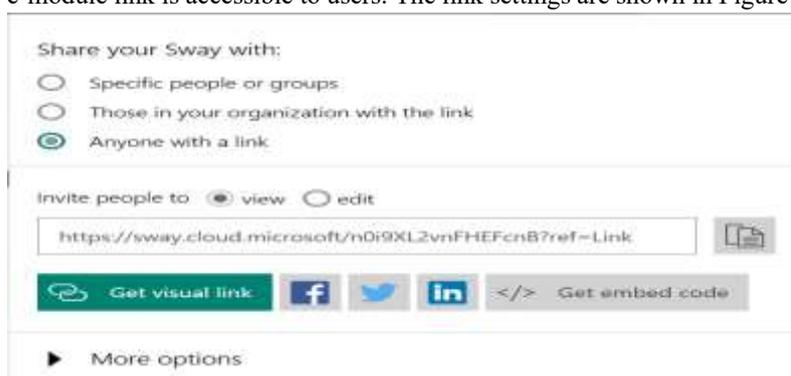


Fig.7. Sway Link Settings

The e-module was also distributed online to SMKN 1 Jember because it was specifically designed for grade XI KKBT, and schools in Jember that have KKBT expertise are SMKN 1 Jember and SMKN 6 Jember. The e-module was also distributed to the SMK Jember Mathematics MGMP community. Evidence of distribution can be seen in Figure 8.



Fig.8. MGMP Community Dissemination

The research conducted is in accordance with research conducted by (Yullah et al., 2020) that Geogebra-assisted learning activities can improve students' creative thinking skills. In addition, the results of other studies also support the results of this study, that the RME-based e-module is worthy of being tested on students (Atikah et al., 2021). The results of other studies on the development of RME-based e-modules are valid and practical for use by students (Benitha et al., 2022). The conclusion of the study (Chahyanti et al., 2021) is that the results of the development of LKPD based on the RME approach on quadrilateral material can improve students' creative thinking skills and the feasibility of LKPD based on the RME approach on quadrilateral material to improve students' creative thinking skills is valid, practical, and effective. On the other hand, the development of a mathematics e-module using Microsoft Sway 365 can be concluded that this research has succeeded in creating a product (Efriani et al., 2023).

This RME-based e-module is digital, aided by GeoSway (GeoGebra and Sway), and can be used and accessed by students independently and flexibly. Numerous studies have been conducted on e-module development to help students learn independently and creatively. One study found that the RME-based module effectively improved students' mathematical creative thinking skills in the topic of flat-sided solids (Rahma et al., 2022). Furthermore, research conducted by (Sapari, 2021) found that the development of a GeoGebra-assisted e-module to improve students' mathematical creative thinking skills resulted in practicality assessments by both teachers and students. The teacher's practicality demonstrated a very practical criterion with a score of 3.6, while the student's practicality demonstrated a practical criterion with a score of 3.0. Therefore, increased research efforts are needed in the form of e-module development as a form of learning innovation for students. This GeoSway-assisted RME-based e-module can have a positive impact on improving students' creative thinking skills. Students will be given tests based on indicators of creative thinking abilities, namely fluency, flexibility, originality, and detail.

The development of this e-module research has resulted in improved creative thinking skills, including fluency, flexibility, originality, and detail. This e-module is easily accessible and flexible for students to use independently, as it is web-based, allowing for study at any time. The results of this e-module development can be used as practical and engaging teaching materials for students to learn independently, especially in situations where textbooks are inadequate for the number of students.



DISCUSSION

The results of the development of e-modules based on Realistic Mathematics Education assisted by Geosway in Phase F met the validity criteria with the validity coefficients of the teaching module, e-module, and creative thinking ability test of 3.73; 3.68; and 3.57, respectively. The e-modules that had met the validity criteria were tested in class XI DKV 1 to determine readability and in class XI KKBT 1 to determine effectiveness and practicality. Based on the analysis of observation data from the trial activities, it was obtained that the e-module met the practicality criteria with a score of 3.5 (practical category). The effectiveness criteria were met, indicated by the percentage of students' creative thinking ability tests that were at least good so that students' classical completeness was 87.5%, the average N-Gain score was 0.72, and positive student responses were 82.07%.

CONCLUSION

Based on the research results above, it is concluded that, (1) the RME-based e-module assisted by Geosway in phase F has met the criteria of valid, practical, and effective; (2) there is an increase in creative thinking skills after using the e-module. The RME-based e-module assisted by GeoSway in phase F has been proven to improve creative thinking skills according to the indicators of creative thinking skills, namely fluency, flexibility, originality, and detail. The researcher's suggestion is that teachers can utilize the RME-based e-module assisted by GeoSway in phase F as an alternative interactive and real learning resource. In addition, there is a need for research development by other researchers in creating more creative and innovative teaching materials at different phases or levels.

REFERENCES

1. Alpiani, N., Pamungkas, A. S., & Jaenudin. (2022). Pengembangan E-Modul Matematika pada Materi Barisan dan Deret Berbantuan Smart App Creator untuk Siswa SMA/SMK. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 06(02), 2110-2121.
2. Anita, F.D. (2020). Penerapan Pendekatan *Realistic Mathematics Education* (RME) Melalui Perangkat Pembelajaran Terhadap Motivasi Belajar Matematika Siswa. *Jurnal Pendidikan Matematika*, 3(2), ISSN 2598-6422.
3. Apriliani, L. R., Irham, M., & Darajat, L. (2020). Pengembangan Media dan Bahan Ajar Interaktif “*Scan It*” Berbasis Geogebra. *Kreano: Jurnal Matematika Kreatif - Inovatif*, 11(2), 213-222
4. Aspriyani, R. & Suzana, A. (2020). Pengembangan E-Modul Interaktif Materi Persamaan Lingkaran berbasis *Realistic Mathematics Education* Berbantuan Geogebra. *Jurnal AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 09(04), 1099-1111
5. Astuti. (2018). Penerapan *Realistic Mathematics Education* (RME) Meningkatkan Hasil Belajar Matematika Siswa Kelas VI SD. *Journal Cendekia: Jurnal Pendidikan Matematika*, 1(1), 49-61
6. Atikah, N., Gistituati, N., Syarifuddin, H., & Fitria, Y. (2021). Validitas E-modul Matematika Sekolah Dasar Berbasis Pendekatan *Realistic Mathematics Education* (RME). *Jurnal Basicedu*, 5(6), 6103-6109
7. Chahyanti, VE., Kamid, & Anggereini, E. (2021). Pengembangan LKPD Berbasis Pendekatan RME Pada Materi Segiempat Untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa. *Jurnal AKSIOMA : Jurnal Program Studi Pendidikan Matematika*, 10(04), 2815-2825
8. Efriani, Y. M. & Bentri, A. (2023). *Microsoft Sway 365 to Develop Discovery Learning-Based E-Module for Grade IV Elementary Students*. *Al-Ishlah: Jurnal Pendidikan*, 15(4), 6321-6332.
9. Fadilla, J., Wahyuni, A., Suripah, Wahyuni, R., & Kadarisma, G. (2025). Upaya Meningkatkan Kemampuan Berpikir Kreatif Matematis Melalui Pendekatan *Realistic Mathematics Education* (RME) pada Siswa SMP YLPI P. Marpoyan. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 09(02), 618-627
10. Gani, R. A., Hikmah, N., Rinaliah, & Siswono, A. F. (2023). Perancangan E-modul Berbantuan Media *Microsoft Sway* Pada Pembelajaran Bahasa Sunda Materi Pupuh. *Journal of International Multidisciplinary Research*, 1(2), 823-832.
11. Hidayah, N.C., Ulya, H., & Masfuah, S. (2021). Analisis Kemampuan Berpikir Kreatif Siswa Sekolah Dasar Berdasarkan Tingkat Kemampuan Matematis. *Jurnal Educatio*, 7(4). 1368-1377
12. Mendrofa, R. N. (2021). Pengaruh Metode Pembelajaran *Realistic Mathematics Education* (RME) Terhadap Kemampuan Nalar Siswa Pada Kelas X SMK Negeri 1 Gunung Sitoli Aloo. *Universitas Dharmawangsa*, 15(01), 104-113.



13. Pebriana, P.H. (2017). Peningkatan Hasil Belajar Matematika dengan Menerapkan Pendekatan Pendidikan Matematika Realistik Indonesia (PMRI) pada Siswa Kelas V SDN 003 Bangkinang. *Journal Cendekia: Jurnal Pendidikan Matematika*, 1(1), 68-79.
14. Pramana, B.W.A., Susanto, Suwito, A., Lestari, N.D.S., & Murtikusuma, R.P. (2022). Pengembangan E-Modul Berbantuan Geogebra Pada Materi Transformasi Geometri SMA. *Gauss : Jurnal Pendidikan Matematika*, 05(02), 2620-8067.
15. Rahma. A. S., Syahputra, E., & Mulyono. (2022). Pengembangan Modul Pembelajaran Berbasis *Realistic Mathematics Education* untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa pada Materi Bangun Ruang Sisi Datar. *Journal Cendekia: Jurnal Pendidikan Matematika*, 6(1), 980-995
16. Sapari, D. M. (2021). Pengembangan E-Modul Berbantuan Geogebra untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa SMP Kelas VIII. *Sarjana thesis, Universitas Muria Kudus*.
17. Wahyudi. (2016). Pengembangan Model *Realistic Mathematics Education* (RME) dalam Peningkatan Pembelajaran Matematika Bagi Mahasiswa Pendidikan Guru Sekolah Dasar . *Jurnal Pedagogik Pendidikan Dasar*, 4(1), 47-57.
18. Waskitorini & Arifendi, R. F. (2021). Pemanfaatan Media *Sway* dalam Pembelajaran Daring untuk Meningkatkan Semangat Belajar Siswa. *Intelegensi: Jurnal Ilmu Pendidikan*, 4(2), 127 – 132
19. Williamson, Ben, Macgilchrist, Felicitas, & Potter, John. 2021. *Covid-19 Controversies and Critical Research in Digital Education, Learning, Media and Technology*, 46(2), 117-127
20. Yullah, A. S., Susanto, & Suwito, A. (2022). Efektivitas Model Pembelajaran Discovery Berbantuan Geogebra Ditinjau dari Kemampuan Berpikir Kreatif Siswa. *AKSIOMA: Jurnal*

Cite this Article: Hena Retnowati, H., Suwito, A., Susanto, Yudianto, E., Pambudi, D.S. (2025). The Development of E-modules Based on Realistic Mathematics Education Assisted by Geosway in Phase F. International Journal of Current Science Research and Review, 8(12), pp. 6316-6326. DOI: <https://doi.org/10.47191/ijcsrr/V8-i12-43>