



## Development of Geogebra-Based Interactive E-Modules to Improve Students' Digital Literacy Abilities

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### ABSTRACT

Many students of Ivet University's mathematics education study program think that mathematics courses are very difficult and boring. This happens because students are positioned as listeners in the learning process so that what happens is that the learning process is too monotonous. So far, teaching and learning activities have only used books as a learning resource, an interactive approach will be able to make students more interested in the learning process. One interactive approach in the learning process is using geogebra-based interactive e-modules. The existence of geogebra-based interactive e-modules will further attract students in the learning process and improve students' digital literacy skills. The aim of this research is to produce a geogebra-based interactive e-module to improve students' valid digital literacy skills. The urgency of this research in learning is very important due to the low level of learning resources used in the learning process and the low level of digital literacy for students. The research that will be carried out will have a big impact on student understanding. It is hoped that the development of this interactive e-module will be able to overcome problems that arise in teaching students. It is hoped that limited learning resources can be overcome by having e-modules as a learning medium to prevent misunderstandings arising when teaching integral material. The result of this research is to produce a geogebra-based interactive e-module to improve students' valid digital literacy skills.

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## INTRODUCTION

The development of science and technology has brought changes in various aspects of human life. These changes have also brought humans into an era of increasingly fierce global competition. In order to be able to play a role in global competition, as a nation we need to continue to develop and improve the quality of human resources. Education is one means of improving the quality of human resources. The world of education in Indonesia is still a concern. This can be seen from the many obstacles that influence improving the quality of education in Indonesia, including the quality of education in tertiary institutions. One of the factors that influences the quality of education in higher education is the learning process. The learning process is influenced by various factors, namely self/internal factors and external/external factors (Kurniawan & Agustang, 2022). Internal factors consist of creativity, talent, motivation and interest, while external factors consist of the environment and learning facilities. One of the learning facilities used in the learning process is the learning resources used in carrying out the learning process. An interesting and non-monotonous learning resource is interactive e-modules. Interactive e-modules are teaching materials from printed form to electronic form that students use to solve problems independently (Winatha, Suharsono & Agustini, 2018). E-modules are modules in digital form that contain digital electronic material in the learning process (Herawati & Muhtadi, 2018). Interactive e-modules can increase students' persistence in learning mathematics (Ramadanti, Mutaqin & Hendrayana, 2021). From the experts above, it can be concluded that interactive e-modules are teaching materials in digital form containing electronic material used in the learning process so that they can train students' perseverance and can solve problems independently in learning mathematics.

The reference in developing Geogebra-based interactive e-modules to improve students' digital literacy skills is a learning approach based on learning media. One of the mathematics learning media that can be used is Geogebra software. The geogebra-based learning process will be more interesting for students so that learning objectives can be achieved. Geogebra is a medium for solving mathematical problems and encouraging conducting experiments on computers (Wahyuni, Fauzan, Yerizon & Musdi, 2022). Geogebra is interactive media with the Geogebra JavaScript programming language (Bernard & Novtiar, 2022). GeoGebra is a mathematics learning media that helps convert mathematical functions into images so that they can provide understanding to students (Rohaeti & Bernard, 2018). Geogebra is a visualization of mathematical concepts used in constructing mathematical concepts (Wahyuni, Edrizon & Fauziah, 2022).

Geogebra learning media uses digital literacy to create learning conditions that are more active, independent, and can be used anywhere and at any time (Hasyim & Kurniawati, 2021). In this digital era, everyone has the same freedom to participate in higher education (Willems & Campbell, 2019). This can be seen from the fact that digital literacy in this era is still very low. Digital literacy is a person's attitude and skills to obtain, create, solve and convey information using sophisticated digital technology (Wahyuni, Fauzan, Yerizon

& Musdi, 2022). Digital literacy is a type of thinking in the digital world (Khasanah & Uswatun, 2019). Based on this explanation, researchers conducted research related to student digital literacy.

## LITERATURE REVIEW

Some research that is relevant to this research includes: Aspriyani and Suzana (2020), developing an interactive e-module based on Realistic Mathematic Education (RME) circular material with the help of Geogebra which has been validated in content and construct, as well as to determine the effectiveness of using interactive e-modules. Pramana et al (2022), developed an e-module assisted by GeoGebra that is valid, practical and effective. Wahyuni et al. (2020), implemented autographs in advanced calculus courses to visualize integral material to make it easier for students to learn.

Dinata (2021), conducted research to find out what abilities student digital literacy carried out by 30 students obtained using simple random sampling techniques. In 2020, Anggrasari's research showed that there was an increase in digital literacy skills by implementing online learning (e-learning) which was carried out in the new normal era during the Covid-19 pandemic.

According to research by Indrawati (2020), through her research, students can improve their mathematical literacy skills by integrating online learning media into learning using computers, laptops or smartphones. Apriliyani (2022), developed an interactive e-module based on geogebra-assisted guided discovery learning that is valid, practical and effective for understanding the concept of flat-sided shapes for class VIII SMP students. Meilasari and Khotimah (2022), developed a foldable integral calculus e-module which was made suitable for use by 72.4% of students achieving optimal learning outcomes.

The main principles that must be considered in development. The media in every learning activity is media used and directed to make it easier for students to learn efforts to understand the lesson material. So that learning media really used to teach students, then the principle What must be considered (Sanjaya, 2006) is as follows:

1. The media used by current teachers is appropriate and directed to achieve learning goals, not as entertainment and solely used to make things easier for teachers deliver material.
2. The media used must be appropriate to the material learning.
3. Learning media must be appropriate to your interests, needs and needs student condition.
4. The media used must pay attention to effectiveness and efficient.
5. The media used must be in accordance with the teacher's abilities in operating it.

## METHODOLOGY

The research stages, namely the preparation stage, include determining research subjects and samples, designing/designing interactive e-modules, developing interactive e-modules, requesting validation of interactive e-modules from validators from media experts and material experts, analyzing the results of validation of interactive e-modules with the aim of revising the interactive e-module.

Analysis is identifying problems, identifying factors causing problems, formulating solutions to problems. Design, in this stage, begins by formulating SMAR (specific, measurable, applicable and realistic) learning objectives, in this case determining the competencies that will be achieved in learning. Next, prepare a geogebra-based interactive e-module and learning instruments that will be used to achieve the expected competencies. The development carried out was to produce a geogebra-based interactive e-module that had been designed, the geogebra-based interactive e-module was validated by validators, limited trials were carried out on small groups. Geogebra-based interactive e-modules that have been validated and instruments have been tested on small groups.

The method used in collecting data is: a) Observation method: observation is carried out in 2 stages, namely analysis and development; b) Documentation method: this method is used to double-check the implementation of geogebra-based interactive e-module trials and the implementation of geogebra-based interactive e-modules developed in the learning process. Expert Validation Data Analysis Method. The data obtained from the validation results is then analyzed descriptively to revise/improve the Geogebra-based interactive e-module. To analyze the validation results, use average analysis, namely calculating the average of each aspect from 2 validators. The validator consists of: 1 material expert and 1 media expert. The validator assessment criteria are as follows:

Table 1. Validator Assessment Criteria

Average value	Classification	Conclusion
$0,00 < Va \leq 2,00$	Not good	Geogebra-based interactive e-modules still require intensive consultation
$2,00 < Va \leq 3,00$	Not good	Geogebra-based interactive e-modules can be used with many revisions
$3,00 < Va \leq 3,50$	Good	Geogebra-based interactive e-modules can be used with minor revisions
$3,50 < Va \leq 4,00$	Very good	Geogebra-based interactive e-modules can be used without revision

## RESULT AND DISCUSSION

Needs analysis was carried out through interviews with students to find out problems related to the process mathematics learning. From the results of interviews with students it was obtained information that the use of interactive learning media in advanced calculus courses has never been done and in student learning activities too not yet actively involved. Students have good skills and experience using computers, this is known from interviews with students, they often use computers for social networking, playing games, and doing school work, besides that, because it is there information and communication technology learning. Based on the results of interviews with lecturers and students, then interactive e-module learning media is needed that can involve students in active learning activities so that they can add students' knowledge, understanding and experience. Development of interactive e-modules mathematics learning in advanced calculus courses.

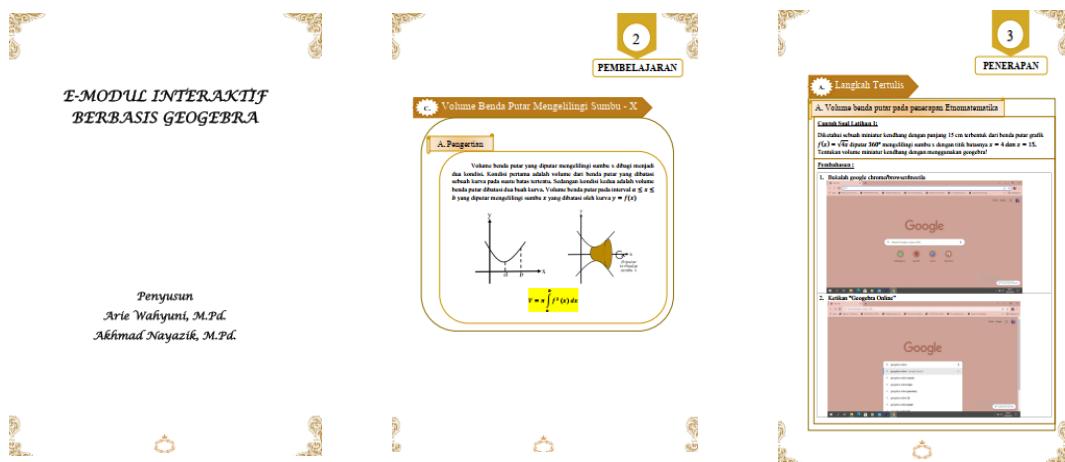


Figure 1. E-Module Cover

Figure 2. Learning

Figure 3. Application

The material expert validation assessment obtained an average value of 3,85. This means that the Geogebra-based interactive E-module can be used without revision. Meanwhile, the media expert's validation assessment obtained an average value of 3.96. This means that the geogebra-based interactive E-module can be used without revision. In this research, a geogebra-based interactive E-module was developed to improve students' digital literacy skills. Development of interactive E-modules in mathematics learning for advanced calculus courses using a geogebraic approach through stages development, namely analysis, planning, development and implementation. The description of the research results described previously describes the steps for developing interactive E-modules and the results obtained. Result of the development in the form of the final product has been tested for validity.

The product is an interactive mathematical E-module that has been developed meets valid criteria based on the results of assessments by material experts and media experts. Media experts are validators chosen to assess e-

module media interactive developed from the media aspect. Assessment by experts. The media is carried out using an interactive e-module media assessment sheet by media experts. Results of validation of interactive e-module media by expert media total average score is 3.96 obtained validity with valid criteria. Material experts are validators chosen to assess e-module media interactive developed from the material aspect. Assessment by material experts. This is done using the e-module media assessment sheet interactive by material experts. As a result of validation of the interactive e-module by material experts, a total average score of 3.85 was obtained validity with very valid criteria. Based on validation results by expert media and material experts stated that Geogebra-based interactive e-modules to improve students' digital literacy skills were valid.

## CONCLUSION AND RECOMMENDATION

The urgency of this research in learning is very important due to the low level of learning resources used in the learning process and the low level of digital literacy for students. The research that will be carried out will have a big impact on student understanding. It is hoped that the development of this interactive e-module will be able to overcome problems that arise in teaching students. It is hoped that limited learning resources can be overcome by having e-modules as a learning medium to prevent misunderstandings arising when teaching integral material.

## FURTHER STUDY

This research still has limitations so further research needs to be done on this topic "Development of Geogebra-Based Interactive E-Modules to Improve Students' Digital Literacy Abilities".

## REFERENCES

Anggrasari, L. A. (2020). Penerapan e-learning untuk meningkatkan kemampuan literasi digital di era new normal. *Premiere Educandum: Jurnal Pendidikan Dasar Dan Pembelajaran*, 10(2), 248.

APRILIYANI, D. (2022). Pengembangan E-Modul Interaktif Berbasis Guided Discovery Learning Berbantuan Geogebra Pada Materi Bangun Ruang Sisi Datar (Doctoral dissertation, Universitas Negeri Malang).

Aspriyani, R., & Suzana, A. (2020). Pengembangan e-modul interaktif materi persamaan lingkaran berbasis realistic mathematics education berbantuan geogebra. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(4), 1099-1111.

Bernard, M., & Novtiar, C. (2022). Pengembangan Media Kalkulus Menggunakan Javascript Geogebra untuk Meningkatkan Kemampuan Penalaran Terhadap Calon Guru pada Pandemi COVID 19. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 5(1), 159-168.

Dinata, K. B. (2021). Analisis Kemampuan Literasi Digital Mahasiswa. *Edukasi: Jurnal Pendidikan*, 19(1), 105-119.

Hasyim, M., & Kurniawati, H. F. (2021). Digital Literacy in Using Geogebra Learning Media in Terms of Self-Directed Learning. *MaPan: Jurnal Matematika Dan Pembelajaran*, 9(1), 40.

Herawati, N. S., & Muhtadi, A. (2018). Pengembangan Modul Elektronik (E-Modul) Interaktif Pada Mata Pelajaran Kimia Kelas XI Sma. *Jurnal Inovasi Teknologi Pendidikan*, 5(2), 180-191.

Indrawati, F. (2020, July). Peningkatan kemampuan literasi matematika di era revolusi industri 4.0. In *SINASIS (Seminar Nasional Sains)* (Vol. 1, No. 1).

Khasanah, Uswatun., & H. (2019). Membangun Karakter Siswa Melalui Literasi Digital dalam Menghadapi Pendidikan Abad 21 (Revolusi Industri 4.0). *Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas Pgri Palembang 12 Januari 2019*, 21, 999-1015

Kurniawan, A., & Agustang, A. (2022). Faktor Penghambat tingkat kedisiplinan Siswa di SMAN 1 BANTAENG.

Meilasari, V., & Khotimah, K. (2022). Pengembangan E-Modul Berbantuan Geogebra Pada Mata Kuliah Kalkulus Integral Lipat. *SIGMA*, 8(1), 1-7.

Pramana, B. W. A., Suwito, A., Lestari, N. D. S., & Murtikusuma, R. P. (2022). Pengembangan E-Modul Berbantuan Geogebra pada Materi Transformasi Geometri SMA. *GAUSS: Jurnal Pendidikan Matematika*, 5(2), 1-14.

Ramadanti, F., Mutaqin, A., & Hendrayana, A. (2021). Pengembangan E-Modul Matematika Berbasis PBL (Problem Based Learning) pada Materi Penyajian Data untuk Siswa SMP. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(3), 2733-2745.

Rohaeti, E. E., & Bernard, M. (2018). The Students' Mathematical Understanding Ability Through Scientific-Assisted Approach of Geogebra Software. 7(2), 165-172.

Sugiyono. 2017. *Statistika untuk Penelitian*. Bandung: Alfabeta

Wahyuni, Y., Edrizon, E., & Fauziah, F. (2022). Pengembangan Bahan Ajar Matematika dengan Pemanfaatan Geogebra. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 6(1), 1120-1130.

Wahyuni, Y., Fauzan, A., Yerizon, Y., & Musdi, E. (2022). Analisis Literasi Digital Mahasiswa dalam Pembelajaran Matematika Berbasis Geogebra.

*Jurnal Cendekia: Jurnal Pendidikan Matematika*, 6(3), 3358-3371

Wahyuni, A., Kurniawan, P., Waluya, B., & Cahyono, A. N. (2020, February). Use of Software Authograph in Integral. In *3rd International Conference on Learning Innovation and Quality Education (ICLIQE 2019)* (pp. 909-915). Atlantis Press.

Willem, Julie., & Campbell, C. (2019). The increasing significance of digital equity in higher education: An introduction to the Digital Equity Special Issue. *Australian Journal of Education Technology*, 35(6), 1-8

Winatha, K. R., Suharsono, N., & Agustini, K. (2018). Pengembangan E-Modul Interaktif Berbasis Proyek Pada Mata Pelajaran Simulasi Digital Kelas X Di Smk Ti Bali Global Singaraja. *Jurnal Teknologi Pembelajaran Indonesia*, 8(1).