
**DEVELOPING DIGITAL MODULES BASED ON AUDIO PPT EQUATION
TANGENT CIRCLE USING GEOGEBRA APPLICATION**

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ARTICLE INFO	ABSTRACT
Accepted : 08-08-2023	The study aimed to develop GeoGebra-based interactive GeoGebra-based course modules and validate them using expert assessment. The research method used in this study is a research and development method using a 4-D approach. This approach includes four stages, namely Define, Design, Develop, and Disseminate. This research was conducted at MTs PKP and the development research time was carried out from January to March 2023. The results of this study show excellent module quality in aspects of content feasibility, learning quality, display quality, visual clarity, material presentation, language, use of GeoGebra, and visual skills. Trials for teachers and students also produced positive responses, with a very good percentage of success.
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Introduction

The learning program at MTs PKP is currently running very well, but visual media is not optimally utilized, especially in terms of encouraging people to be more active through involvement (Castillo, Doolittle, & Samper, 2021). As a result of technological advances and the current globalization of society, attitudes toward all spheres have changed. But many people only use this technology as a last resort, even though technology creates a vast space for martial arts. The phenomenon identified a large number of elementary to high school students who had active social media accounts in their dormitories but had not been used for academic purposes. Huge concerns exist among children today regarding the digital world, with many children in schools reporting addiction to online games. There should be a strategy to link online gaming activities with useful online initiatives (Castillo et al., 2021).

Seeing the phenomenon of students who are very familiar and enthusiastic with all kinds related to online media, the use of online media in learning allows students to be active in it. The participation and activeness of students in learning are built through learning designs that make students interested and then active so that learning becomes dynamic and students gain skills and knowledge. Types other than examples that make it difficult for learners to meet minimum adequacy criteria. Many students who lack the Minimum Completeness Criteria have a score of 75 (Handayani, Elvinawati, & Alperi, 2021).

By the guidelines set by MTs PKP, the education system is implemented, but instead of using geometry software, students get bored with relevant objects and use the lecture method for a longer period. As a result, one strategy that can be used to successfully use problems is to incorporate innovation into the teaching process while

increasing the relevance of the material taught to students. The lecture method used by teachers at Mts PKP is still not fully in line with current technological advances (Maskur, Syazali, & Utami, 2019). They believe that this method is very helpful and will help students better understand the material that has been taught, but it is less effective in the present if it is not combined with practical methods (such as the GeoGebra method).

An alternative learning media where available is Geogebra software. Geogebra software is a computer application that is designed to facilitate learning mathematics, especially geometry, algebra, and calculus (Hohenwarter and Judith Hohenwarter (2008: 8). In this situation, the teacher can immediately explain and explain the form to be discussed (Subhanudin, Rasul, Ruben, & Sutirta, 2022). The hope is that Geogebra software will function to learn media here, and this Geogebra software can create interest and attention of students and thus arouse their enthusiasm for learning (Mukasyaf & Fauzi, 2019). The creation of a question and answer shows that students pay attention to the material and understand it (Barnes, Green, & De Hoyos, 2015).

By utilizing Geogebra software for learning media, the material where it is distributed is more easily absorbed by students, considering that developing their learning gains also makes students who take part in mathematics learning more fun and students tend to be memorable and willing to learn mathematics (Ramadhan, Indriyani, Asri, & Sukma, 2020). Because the media developed using Geogebra can be used as a tool for students in understanding the tangent material of the circle. In addition, Geogebra media can be developed into media on other materials that can help improve the quality of mathematics learning, when using Geogebra media should be considered first the state of the computer lab (Zukhrufurrohmah & Dintarini, 2021). The situation is also addressed by (Resmi & Rusdi, 2021). He said the use of educational media at the teaching and learning level can create new desires and interests, create motivation, stimulate educational activities, and better mediate psychological influences (Zukhrufurrohmah & Dintarini, 2021).

Starting from the background that exists with it in this proposal seminar essay, the reviewer decided on the title "Developing a Tangent Material Module for Geogebra Application Assisted Circles". The study aimed to develop GeoGebra-based interactive GeoGebra-based course modules and validate them using expert assessment. The research problem consists of the correct module submission process, student education outcomes, and expert validation of students' understanding of modules (Netriwati & Lena, 2017). The main benefit of this research is that it provides modules that can be used as teaching aids for teachers and students, as well as supporting schools in following tangent circles (Cahdriyana & Richardo, 2017). In addition, the purpose of this theoretical study is to improve students' mathematical skills and provide support for mathematics teachers at MTs PKP.

Method

The research method used in this study is a research and development method

using a 4-D approach. This approach includes four stages, namely Define, Design, Develop, and Disseminate. The purpose of this study is to develop a Geogebra-based application in Google Chrome as an interactive learning tool to make it easier for teachers to teach circle tangent material and help students understand the material. This research was conducted at MTs PKP and the development research time was carried out from January to March 2023.

At the Define stage, this research conducts analysis and determination of development requirements. It involves analysis of student characteristics, analysis of tasks, conceptual analysis, and determination of learning objectives. At the Design stage, product design is carried out through test construction, selection of learning media, selection of format, and initial design. The Develop phase involves group discussions and development tests to modify and implement the learning model. Finally, at the Disseminate stage, validation, packaging, distribution, and dissemination of research products are carried out.

This research method uses face-to-face or online learning based on Zoom meetings or Google Meet, depending on the ministry's policy when the research takes place. The steps of model development include preliminary research, observation, analysis of the learning media used, and questions and answers with experts in the field of mathematics. This research aims to produce a software-based Geogebra application that can help teachers and students in understanding the tangent material of a circle.

Results and Discussion

Description of Research Findings

Based on the analysis of assessment data by students in the evaluation section, each aspect of the assessment obtained the Very Decent category. The findings in this study are that students can learn independently with the help of teaching materials assisted by the Geogebra application. Most students do not experience obstacles when using these teaching materials. The average time needed by students to do Learning Activity 1 from material to practice is $\pm 1.5 - 2$ hours. This time is quite long because, in this learning activity, 1 student is new to the Geogebra application. In the first 30 minutes, students often ask researchers about the use and location of the icons contained in the Geogebra application. However, in the following minutes, students can work independently, even some students can explore the drawings they have made.

Discussion of Research Results

After the stages of defining, developing, and disseminating researchers get the results of their research. The results of the feasibility test were obtained from the responses of teachers and students. The teacher who gave a response amounted to 1 person, namely Reni Ariyanti, S.Pd. While the students who were respondents amounted to 29 people with details from grade 8.

1. Teacher eligibility test

A total of 1 teacher responded to the GeoGebra application module of circle tangent material. Reni Ariyanti, S.Pd with NIP. 197602282007102004. The teacher has

responded with a teacher response questionnaire that has 25 questions with a Likert scale of 1 to 5. The results of the teacher's response can be seen in the following table:

Results of trial responses to teachers

Aspects	Criterion	Skor	Max Score	Percentage
User Helpability	By using this media I feel students are more enthusiastic about learning mathematics	5	5	100%
	By using this media, I feel that students are more interested in participating in learning	5	5	100%
	With this media, the intensity of students in circle tangent lessons	5	5	100%
	With this media, the intensity of students in circle tangent lessons	5	5	100%
	With this media, it makes me more enthusiastic about teaching mathematics	5	5	100%
	Using this medium, makes it easier for me to convey circle tangent material to students	5	5	100%
	Using this medium, makes it easier for me to convey circle tangent material to students	5	5	100%
	The provision of exercises is more interesting by using this media so that learning objectives are achieved	5	5	100%
	This media can help motivate students to learn independently	5	5	100%
	I think using this media in learning is very helpful compared to using books alone	5	5	100%
	Ease of understanding button structure	5	5	100%
	Precise and easy-to-use buttons and functions	4	5	80%
	Fill Qualification Competent	Accuracy of material coverage	5	5
Compatibility of module content with competencies and indicators		5	5	100%
Order of material		4	5	80%
Quality of practice questions		5	5	100%
Quality of Learning	Accuracy of language use	5	5	100%
	Clarity of learning objectives	5	5	100%
	Clarity of learning path	5	5	100%
	Increased student motivation	4	5	80%
	Clarity of instructions in media use	5	5	100%
	Accuracy of feedback in practice	5	5	100%

		questions		
Display Quality	Accuracy in use	5	5	100%
	Background selection	5	5	100%
	Word selection and font readability	5	5	100%

Each item of the statement answered by the teacher results in an assessment as in the table. When viewed with a graph it can be seen as follows:

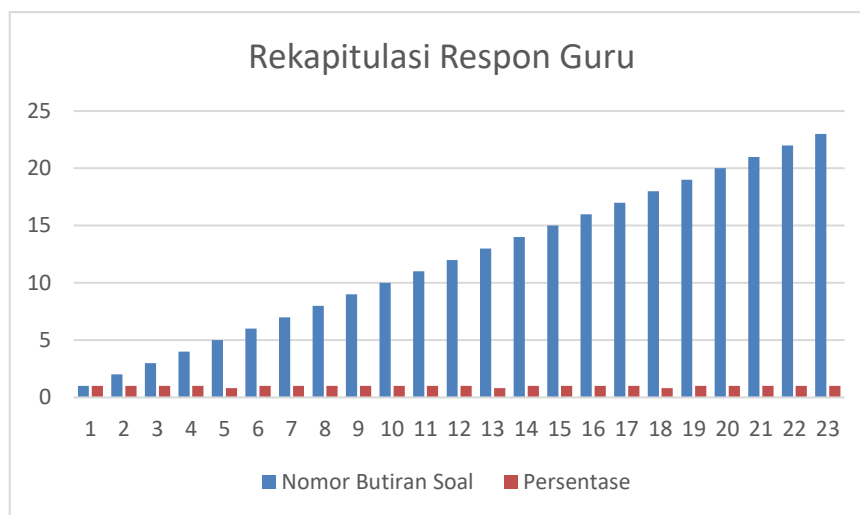


Figure 1
Assessment of teacher responses to modules

After getting a recapitulation of the teacher's response, the researcher then grouped each statement item into every aspect that had been determined. Aspects that assess the response to the Module include User Assistance (1,2,3,4,5,6,7,8,9,10,11, and 12), Content Feasibility (13,14,15,16, and 17), Learning Quality (18,19,20,21, and 22), and Module display (23,24 and 25). The response recapitulation table based on existing aspects can be seen as follows:

Table 1
Recapitulation of the results of the teacher's response to the module

Aspects	Number of Question Items	Shoes	Max Score	Percentage	Category
User Helpability	10	49	5	98%	Excellent
Content Eligibility Component	5	24	5	96%	Excellent
Quality of Learning	5	24	5	96%	Excellent
Display Quality	3	15	5	100%	Excellent
Average	23	112	20	98%	Excellent

Based on Table 1, it can be known the responses from teachers about the development of circle tangent material modules using the GeoGebra application which is reviewed from each aspect. The first aspect is User Assistance with 98% results obtained with a score of 49 out of 5 maximum scores, getting a very good category. The second aspect, namely the Content Eligibility Component, received 96% results with a score of 24 out of 5 maximum scores in the very good category. The third aspect is Learning Quality getting 96% results with a score of 24 out of 5 maximum scores in the very good category. The fourth aspect, namely Display Quality, gets 100% results with a score of 15 out of 5 maximum score in the very good category. Overall, the results of responses from 1 teacher to the development of the circle tangent equation material module using the GeoGebra application, obtained a percentage result of 98% in the very good category (Susanti, Yennita, & Azhar, 2020).

1. Student Eligibility Test

A total of 29 students responded to the development of the material module of the tangent equation of the circle using the GeoGebra application. Students who sit in Madrasah Tsanawiyah (MTs) grade 8 totaling 29 students. Students responded with a student response questionnaire that has 20 points of statements with a Likert scale of 1 to 5. The results of student responses can be seen in the following table:

**Result 2
Student Respondents**

Aspects	Criterion	Shoes	Max Score	Percentage
Content Eligibility	I understand the material presented easily	116	130	89,23%
	I can follow the instructions for the use of the GeoGebra app easily	120	130	92%
	Exercises in the module according to the material presented	117	130	90%
	The use of the GeoGebra application makes it easier for me to learn circle tangent material	123	130	94,50%
	This module strengthened my understanding of the tangent material of circles	119	130	91,60%
	This module helped me solve problems related to circle tangent material	122	130	93,90%
	The use of GeoGebra in learning circle tangents added to my insight	116	130	89,23%
	This module is by technological developments	119	130	91,53%
Language	The text on the module reads clearly on the device I'm using	120	130	92%
	I easily understand the sentences presented in the module	117	130	90%

Serving	The shows and steps to use this module are complete and clear	122	130	93,90%
	The presentation of material on the use of GeoGebra is arranged in sequence	121	130	93,07%
Kegrafikan	The images presented make it easy saya Understand the steps to use GeoGebra	119	130	91,53%
	The type and size of the letters used are easy to read	118	130	90,76%
	Lay out (layout) teaching materials are comfortable to look at	117	130	90%
	The display of teaching materials is attractive	117	130	90%
	The color mix used in this module is comfortable to look at	117	130	90%
	By using these learning media, it makes me not feel bored following Tangent material learning this circle	117	130	90%
Liveliness	I want to do the whole activity-Learning activities using these media	117	130	90%
	I try to be more active in the process Learning	118	130	90,76%

Each statement item is answered by students and results in an assessment as in the table. When viewed with a graph can be seen as follows:

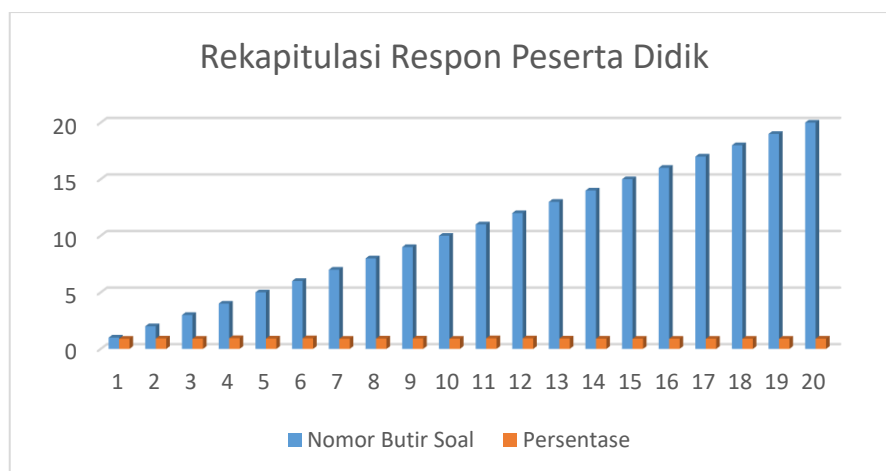


Figure 2
Student Response Results

After getting a recapitulation of student responses, then researchers group each statement item into every aspect that has been determined. Aspects that assess the response to the development of circle tangent material modules using GeoGebra applications include Content Feasibility (1, 2, 3, 4, 5, 6, 7, and 8), Language (9 and 10,

Presentation (11 and 12), Graphing (13, 14, 15, 16, and 17), and activeness (18, 19, and 20). The response recapitulation table based on existing aspects can be seen as follows:

Table 3
Recapitulation of Student Responses

Aspects	Number of Question Items	Shoes	Max Score	Percentage	Category
Content Eligibility	8	952	130	91,54%	Excellent
Language	2	237	130	91%	Excellent
Serving	2	243	130	93%	Excellent
Kegrafikan	5	588	130	90,46%	Excellent
Liveliness	3	352	130	90%	Excellent
Average	20	2372	650	91,20%	Excellent

Based on Table 3, it can be known the responses from students about the material module of the tangent equation of the circle in terms of each aspect. The first aspect is the feasibility of the content with a result of 91.54% obtained with a score of 952 out of 130 maximum scores, getting a very good category. The second aspect is that language gets 91% results with a score of 237 out of 130 maximum score in the very good category. The third aspect is that the presentation gets 93% results with a score of 243 out of 130 maximum score in the very good category. The fourth aspect is that graphics get 90.46% results with a score of 588 out of 130 maximum scores in the very good category. The fifth aspect is activeness to get 90% results with a score of 352 out of 130 maximum score in the very good category. Overall, the results of responses from 26 students to the development of the circle tangent equation material module, obtained a percentage result of 91.20% with a very good category.

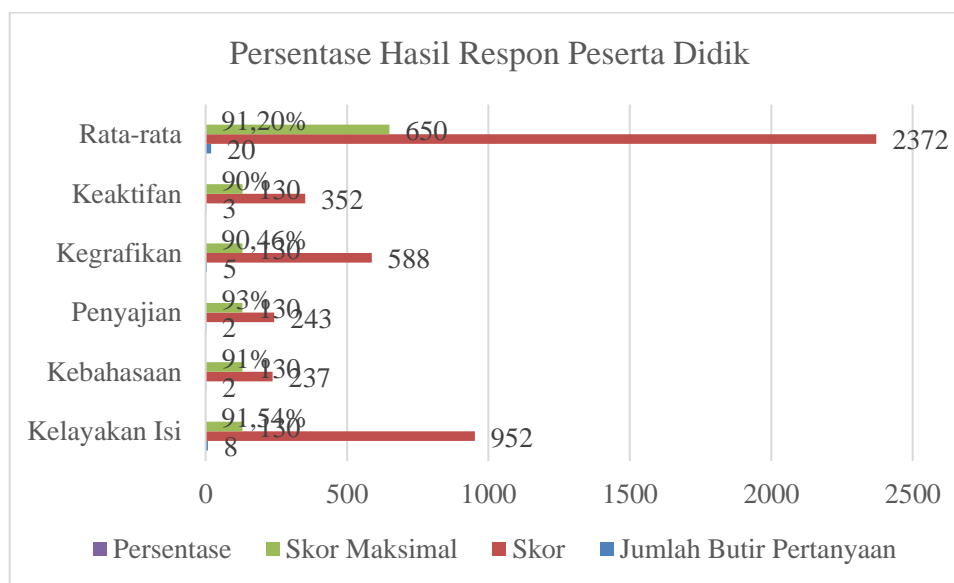


Figure 3
Recapitulation of Student Responses

After calculating the results of teacher and student responses, it was found that developing a module of circle tangent equation material using the GeoGebra application received the Good category. The Gerbera application is also considered more useful for teachers because of its usefulness. With the usefulness offered in the GeoGebra application, it is hoped that teachers can detect difficulties experienced by students. Furthermore, the teacher can also determine the right learning method to be used in the class being taught.

The results of the learning module material tangent equation circle of students that have been detected by the Geogebra application can be handled by teachers. Handling that teachers can do such as changing learning methods, some examples such as using cooperative learning methods (Arianingsih, Arjudin, Wulandari, & Sridana, 2022) or using ethnomathematics learning methods (Ulya & Rahayu, 2017).

1. Differences with Other Research

In the realm of development research, previously conducted research by mathematics teachers at SMPN 12 Madiun, students were still struggling with the problem of tangent equations of two circles. Generally, the difficulties faced by students in this class cannot be distinguished because they forget the prerequisite material, namely the Pythagorean theorem. Distinguish between tangents of inner communion and tangents of communion between tangents of outer equality. As a result, students have difficulty filling out various practice questions. Another obstacle for teachers is the need to draw manuals with rulers and periods when delivering material and practice questions about circle tangents. This drawing process takes quite a long time. When the teacher is drawing, many students carry out activities that are not related to learning. For example, talking with classmates can cause an atmosphere that is not conducive.

The novelty or difference from the previous researchers of this study is the teaching materials produced in this study the creation of a product in the form of modular materials for circle tangents, especially tangent material for circle fellowship which has contained material, exercises, and full evaluation using the GeoGebra application, which is expected to be realized. It is easier for students to understand the concept of circles and easier for teachers than for teachers to explain tangent material. In its application, this teaching material can be used independently by students without teacher guidance, which can increase student learning independence.

The final product of this research is teaching materials assisted by GeoGebra applications in the form of modules on the tangent equation material of the MTs circle class VIII. The resulting product has passed the validation stage by experts, both lecturers and teachers in schools. This teaching material is declared valid based on Aiken's V coefficient in each aspect. Four of the eight validators stated that this teaching material was worthy of being given to students without revision, while the other four stated that it was worthy of being given to students with multiple revisions.

Teaching materials assisted by the GeoGebra application are presented as a whole from the material to the evaluation. The drawback of this product is that the pictures of the steps presented in the teaching materials look rather tight, because if enlarged/stretched worry that the number of pages of teaching materials is too much if only to explain the circle material. In addition, in this study, researchers did not evaluate the value of the circle of students after using teaching materials.

Conclusion

Based on research and development of the GeoGebra application-based circle tangent material learning module, it was found that the module was very useful in learning. This module can help teachers and learners in understanding the material of circle tangent equations. Module development is carried out through a 4D development model, namely define, design, develop, and disseminate. This module has gone through expert validation tests and trials for teachers and students. The results of the validation show excellent module quality in aspects of content feasibility, learning quality, display quality, visual clarity, material presentation, language, use of GeoGebra, and visual ability. Trials for teachers and students also produced positive responses, with a very good percentage of success. In implication, the use of this module can improve the understanding and learning success of learners. For further development, this module can be used in various schools and other IT-related materials. Suggestions provided include further development, development of teacher skills in the use of applications, and improvement of students' basic skills in the field of computer science.

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