NEEDS ANALYSIS OF LEARNING DEVICES WITH RECIPROCAL TEACHING MODEL ASSISTED BY GEOGEBRA ON GEOMETRIC TRANSFORMATION MATERIAL

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ABSTRACT

The practice of learning mathematics students find it difficult to understand the material of geometry transformation. The success of students in learning geometry transformation is still low because teachers use conventional teaching and have not implemented learning innovations. Learning tools become one of the components that support the success of learning activities. This study aims to analyze the results of teacher interviews and student questionnaires to analyze the needs of learning devices with reciprocal teaching models assisted by GeoGebra on geometric transformation material. The research method used is descriptive qualitative. Respondents in this study were mathematics teachers and students at SMA Negeri 2 Jonggol with a total of 60 respondents in class XI. This research instrument uses interviews and needs questionnaires to students presented on the google form platform. Data analysis techniques by analyzing and describing mathematics teacher interview data and student questionnaire data are analyzed in detail. The results of this study are 1) schools use Merdeka Curriculum in mathematics learning activities, 2) the material that students have difficulty with is geometric transformation material, 3) teachers have never used the reciprocal teaching model in learning mathematics, 4) teaching materials used include PowerPoint, LKPD, modules, and school textbooks, 5) GeoGebra has been used for two-variable linear inequality material, but not yet for geometric transformation material. It can be concluded that students and teachers need learning tools using the reciprocal teaching model assisted by GeoGebra which is implemented in mathematics learning, especially geometric transformation material.

Keywords: *Analysis, Learning Tools, Reciprocal Teaching, Geogebra, Geometry Transformation*

ABSTRAK

Praktik pembelajaran matematika siswa merasa kesulitan memahami materi transformasi geometri. Keberhasilan siswa dalam mempelajari transformasi geometri masih rendah dikarenakan guru menggunakan pengajaran yang masih konvensional serta belum menerapkan inovasi pembelajaran. Perangkat pembelajaran menjadi salah satu komponen yang menunjang keberhasilan kegiatan pembelajaran. Penelitian ini bertujuan menganalisis hasil wawancara guru dan kuisioner siswa untuk menganalisis kebutuhan perangkat pembelajaran dengan model *reciprocal teaching* berbantuan *GeoGebra* pada materi transformasi geometri. Metode penelitian yang digunakan adalah deskriptif kualitatif. Responden

dalam penelitian ini adalah guru mata pelajaran matematika dan siswa di SMA Negeri 2 Jonggol dengan jumlah responden 60 siswa kelas XI. Instrument penelitian ini menggunakan wawancara dan kuisioner kebutuhan kepada siswa yang disajikan pada platform *google form*. Teknik analisis data dengan menganalisis dan mendekskripsikan data wawancara guru matematika dan data kuioner siswa yang dianalisis secara mendetail. Hasil pada penelitian ini adalah 1) sekolah menggunakan Kurikulum Merdeka dalam kegiatan pembelajaran matematika, 2) materi yang menjadi kesulitan siswa adalah materi transformasi geometri, 3) guru belum pernah menggunakan model *reciprocal teaching* dalam pembelajaran matematika, 4) bahan ajar yang digunakan meliputi PowerPoint, LKPD, modul, dan buku paket sekolah, 5) *GeoGebra* telah digunakan untuk materi pertidaksamaan linier dua variabel, namun belum untuk materi transformasi geometri. Dapat disimpulkan bahwa siswa dan guru membutuhkan perangkat pembelajaran dengan menggunakan model *reciprocal teaching* berbantuan *GeoGebra* yang diimplementasikan pada pembelajaran matematika terutama materi transformasi geometri.

Kata kunci: *analisis, perangkat pembelajaran, reciprocal teaching, geogebra, transformasi geometri*

A. Introduction

Education is the most important part of our lives. The quality of education can foster reliable human resources who have expertise and skills, which can accelerate the progress of the Indonesian nation. Education is very important for the progress and change of the nation. Therefore, education must be planned for future use.

Education issues are closely related to learning issues as learning is an important component of the education process. So the quality of education is closely related to the quality of learning. Various fields of knowledge, such as science, social, and language, contribute to the learning process carried out in schools. Mathematics is a branch of many sciences. Mathematics is a universal science that has a very important role in various disciplines and advances human thinking (Kasri, 2018). Mathematics always provides services to various branches of science to develop themselves, both in the form of theory, especially in its application (Kamarullah, 2017). This implies how important mathematics is to be learned by everyone, especially students.

The curriculum determines the objectives of education, because the scope of the curriculum is a set of lesson plans for the material to be studied and the process of learning. And the curriculum also directs how to evaluate as a benchmark for the success of students in mastering learning (Qolbi & Hamami, 2021) .With an independent learning curriculum, teachers are expected to be able to connect with the character building of students in subject matter that emphasizes talent in the form of abilities that each student masters in their field and the intelligence of students (Marisa, 2021). Especially in mathematics lessons, students are given the freedom to explore their potential and ability to think. As well as being equipped with ways of thinking, reasoning and using logic with continuous lmental activity (Nuryanti, 2022). Given the importance of mathematics, it needs to be given to

all students from elementary school to college to equip them with the ability to think logically, analytically, systematically, critically and creatively as well as the ability to work together. Thus students can use math in real life to improve their thinking skills, increase their activeness, and increase their own confidence. Learning is not just remembering a number of facts, but learning is a process of thinking (learning how to think), namely the process of developing the potential of the whole brain (Hosnan, 2014).

Mathematics is an important aspect in creating a superior generation, but in reality, students' mathematical abilities are still far from what is expected. The results of the evaluation report from the Program of International Student Assessment (PISA) in 2022 found that: "The achievement of Indonesian children in mathematics is still low, only ranked 72 out of 78 participating countries in mathematics with a score of 379" (Girsang et al., 2022). The low quality of student learning outcomes in mathematics is an indication that the specified learning objectives have not been achieved as expected. The expectation to be achieved is the selection and use of appropriate mathematics learning tools. Teachers must be able to choose the right learning model and teaching materials, because the right learning model and teaching materials are essentially an effort to optimize student learning outcomes (Abidin, 2019).

The reality in the field is different from what is expected, from the results of observations made on mathematics learning at SMA Negeri 2 Jonggol, it appears that the learning process so far is still not optimal. In the learning process that occurs at school, it is more focused on the teacher. The learning process starts with the teacher explaining the subject matter and then giving example problems and at the end of the lesson giving exercises to students. The problems given to students are usually routine problems, so they have difficulty solving varied problems that require critical thinking. Such learning makes students less active and not independent and always wait for answers from the teacher, so that students only receive and are less trained in constructing or building their own knowledge in solving math problems presented in the subject matter. Therefore, mathematics learning activities like this do not show the ability of student learning outcomes so that student learning outcomes are less than satisfactory. Many math learning outcomes are below the Minimum Criteria (KKM) which is 75.

In order for the learning process to be more optimal, it is necessary to have learning tools that support its implementation, namely Teaching Modules which include lesson plans and LKPD. Learning tools play a role in guiding the learning process. The availability of adequate learning tools will assist teachers in carrying out the learning process to achieve the expected learning goals and objectives. Learning tools found in the field have not fully facilitated the achievement of learning objectives so that they need to be improved, especially in building students' knowledge and mindset. One of the things that determines the quality of learning is the use of the right learning model with the material being taught because it can affect the role and activities of students in learning (Ammy, 2022).

Learning model is one of the

approaches in order to deal with changes in student behavior adaptively and generatively. Nowadays, there are various types of learning models that can be applied to improve student learning outcomes, especially mathematics learning. Each learning model certainly has different efficiency in its application. One of the learning models that can be applied in learning mathematics, namely the reciprocal teaching model (reverse teaching) (Ammy, 2022).

Reciprocal teaching is one of the learning models implemented so that learning objectives are achieved quickly through the process of self-learning and students are able to present it in front of the class, so that the learning objectives are achieved and students' ability to learn independently can be improved (Ammy, 2022). In reciprocal teaching learning, students will become more active and creative in finding new ideas in solving math problems through teaching and learning activities (Andira et al., 2018). In addition, students can communicate their ideas to other students or friends, so as to create positive interactions between students in the classroom.

The reciprocal teaching learning model teaches students about four cognitive strategies that students do in groups so that students can understand a subject matter well (Tolongtong & Adunyarittigun, 2020). The four strategies described by Palinscar (1986) include reading the teaching materials provided, summarizing teaching materials that are considered important, making questions, predicting, and clarifying (Irawan et al., 2015).

The utilization of IT in learning can be an independent learning system (instructor independent) or also combined with a direct learning process (face-to-face in class) that relies on the presence of a teacher. The learning model that is related to IT and is now a concern in the world of education is the ICT (Information and Communication Technology) based learning model (Isman, 2016). One of the uses of IT that can be utilized in learning mathematics, namely GeoGebra. GeoGebra is a dynamic math software that can be used as a tool in learning mathematics. This software was developed for the teaching and learning process of mathematics in schools, which is observed to have at least three uses, namely; mathematics learning media, tools for making mathematics teaching materials, and solving math problems (Hidayat & Aripin, 2020). In addition to helping students understand the concepts they have learned, this software can help students understand new concepts.

There is a material in mathematics called geometry transformation. Geometric transformations at the senior high school level are studied in class XI. Geometric transformations include a series of changes in the position, shape, and orientation of geometric objects without changing their size or other intrinsic properties. These transformations can consist of translations (shifting), rotations (turning), reflections (mirroring), and dilations. Translation is the shifting of an object from one location to another without changing its shape or orientation. Rotation involves turning an object about a certain point, while reflection mirrors an object about a line. Dilation, on the other hand, involves changing the scale or size of the object. Geometry transformation is an important concept in mathematics. A deep understanding of geometric transformations is not only important for the development of students'

mathematical skills, but also has significant relevance in practical applications in various fields of life (Fatmawati & Yahfizham, 2024).

Based on the description above, considering the importance of using technology-integrated learning models in preparing teaching devices, the purpose of this research is to analyze the needs of learning devices with reciprocal teaching models assisted by Geogebra on geometric transformation material.

B. Research Methods

The research carried out applied descriptive qualitative methods. This research method is used to gain an understanding of the reality under study and is concerned with the accuracy of the data (Adlini et al., 2022). Qualitative research collects data using research instruments and emphasizes observation of a phenomenon and then examines the substance of the meaning of the phenomenon (Fahmi Mauliansyah et al., 2023). The purpose of qualitative methods is to get answers from research related to data analysis based on interview activities, observations, and documents (Malahayati & Zunaidah, 2021). Meanwhile, descriptive qualitative research is a research method for examining a natural object by emphasizing inductive thinking that produces descriptive data (Karisma et al., 2023). The research carried out aims to analyze the needs of learning devices with the reciprocal teaching model assisted by Geogebra on geometric transformation material.

This research instrument uses interviews and questionnaires of student needs that have previously been validated by Mathematics Education Study Program Lecturers. Observation is carried out directly by researchers by observing the process of learning mathematics at school. Interviews will be conducted with mathematics subject teachers in accordance with the grids in table 1. Meanwhile, student questionnaires will be distributed to grade XI students using google form in accordance with the grids in table 2. The interview grids and student questionnaires can be seen in table 1 and table 2.

Table 1. Mathematics Teacher Interview Question Grid

indicator	No	Question
Curriculum analysis	1	Has this school implemented the independent curriculum?
Learner analysis	2	Do students in this school have telecommunication equipment?
	3	Are learners interested in learning math?
	4	What are the main difficulties in the math learning process?
Learning needs analysis	5	In your opinion, what materials are often considered difficult by students?
	6	Have you ever applied the mathematics learning process with the *reciprocal teaching* learning model?
	7	What teaching materials do you use in implementing mathematics learning?

	8	Do you think the teaching materials used for students are effective and in accordance with the learning objectives of mathematics?
	9	What teaching materials do you think you need for the learning process besides math textbooks?
	10	In your opinion, what kind of learning resources do you expect?
	11	Have you ever used *GeoGebra* software/application in learning?
	12	How do you think *GeoGebra* can be used in learning math?
	13	What do you think about learning mathematics using *GeoGebra-based* teaching resources?
	14	In your opinion, what things should be present or displayed in *GeoGebra-based* teaching resources?
	15	How is the students' readiness for this ICT-based learning?
Sumber daya pendukung	16	What is the availability of teaching resources at school?

Table 2 Student Needs Questionnaire Grid

Aspects	No	Indicator
Math Materials	1	Learners' interest in math subject.
	2	High school subject matter that is difficult for students.
	3	Factors that make it difficult for students to learn the material.
	4	Learning resources used by students to overcome difficulties in learning mathematics.
Classroom Learning Process	5	Learning methods used by teachers in the classroom.
	6	Learning resources or teaching materials used by teachers in the classroom.
	7	Learners' views on learning resources or teaching materials used by teachers in the classroom.
	8	Types of learning media used by teachers in the classroom.
	9	Use of computers in schools to learn math.
	10	Telecommunication tools that learners often use.
Needs	11	Learners' knowledge of ICT learning media.
	12	Learners' views on the use of math *software/applications*.
	13	Learners' knowledge of *GeoGebra software*.

| 14 | Learners' views on the use of *GeoGebra software*. |
| 15 | Learners' knowledge about using *GeoGebra software*. |

The subjects in this study were class XI students totaling 60 students and teachers in mathematics subjects at SMA Negeri 2 Jonggol. After obtaining data from the results of interviews and questionnaires, data processing and analysis are then carried out. The results of data analysis are needed to determine the level of needs and problems that exist during the implementation of learning in class XI. After obtaining the results of data analysis, then draw conclusions, evaluation, and suggestions and input for further research.

C. Result And Discussion
Mathematics Teacher Interview

Based on the results of interviews with mathematics teachers at SMA Negeri 2 Jonggol, the curriculum used in learning activities is the Merdeka Curriculum. Then the material that is often considered difficult by students is geometric transformation material. Geometric transformation material in the Merdeka Curriculum is contained in phase F. The obstacle experienced by students is that many students still have difficulty solving it from algebraic form to graphical form. In line with research (Wasilah, 2023) students' difficulties can be seen in the way they solve problems related to geometric transformation material. In learning geometry transformation, students must have the ability to explain events in the real world graphically, words, and equations, as well as the ability to convey mathematical ideas, both orally and in writing (Putri et al., 2023). To overcome this difficulty, there needs to be a more integrated learning approach and the use of visual aids that can facilitate students' understanding of these abstract concepts.

During teaching mathematics, mathematics teachers have never used reciprocal teaching learning models in learning activities. According to (Pradja & Firmansyah, 2020) the reciprocal teaching model can be used by educators, especially in mathematics learning to improve students' mathematical abilities, increase students' activeness in learning, motivate students better, increase students' reasoning skills, and increase the effectiveness of students' mathematical communication skills.

Teaching materials used by mathematics teachers in the implementation of mathematics learning are power points, LKPD, modules, and school textbooks. Teaching materials needed for the learning process in addition to mathematics textbooks are technology-enabled LKPD. According to (Suwastini et al., 2022) technology-enabled LKPD can increase learning interactivity. Then the expected learning resources are learning resources that make it easier for students to understand the material being studied, and make students active in learning activities.

In the context of using GeoGebra in mathematics lessons, mathematics teachers have used GeoGebra in two-variable linear inequality material in class X. Based on his opinion, the math teacher has never used GeoGebra on geometric transformation material. Learning mathematics using GeoGebra makes it easier to deliver material that is abstract to visual. Mathematics teachers also said that GeoGebra-based learning tools are very useful

tools in teaching mathematics, especially because of their interactive and visual capabilities. According to (Suhaifi et al., 2022) the benefits of using GeoGebra in learning mathematics are that GeoGebra can be used for simulation or demonstration, as a tool in mathematics learning activities, for

mathematical exploration and discovery, and GeoGebra can be used to solve problems or verify problems in mathematics.

Student Questionnaire

Based on the results of the student needs analysis questionnaire, totaling 18 questions from 60 respondents, the following results were obtained.

Figure 1: Students' views on math
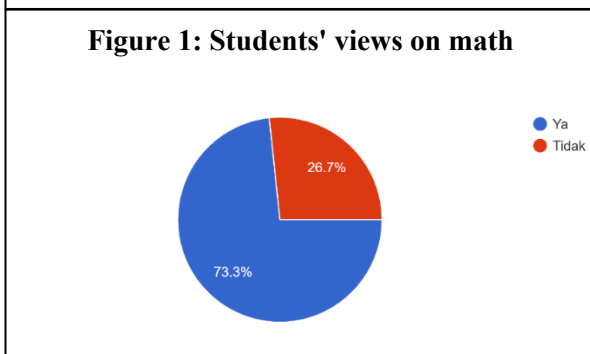
Figure 2: Students' views on math

Based on Figure 1, it is known that the "Yes" option was chosen by 76.7% of respondents, and the "No" option by 23.3%. This means that most respondents find math lessons difficult. Furthermore, based on Figure 2, it is known that the "Yes" option was chosen by 73.3% of respondents, and the "No" option was 26.7%. This means that most respondents feel that math is a fun lesson. From these results it can be seen that students find it difficult to understand math topics. However, even though students find it difficult, students still have enthusiasm in learning math. According to (Syakur et al., 2021) the

factors that cause difficulty learning mathematics come from internal factors and external factors. Internal factors originating from students include IQ or intelligence, student attitudes in learning mathematics, low student motivation to learn, suboptimal body health and poor sensing abilities. While external factors that come from outside students include the lack of teacher teaching variations, the use of learning media that has not been maximized, infrastructure at school and the family environment.
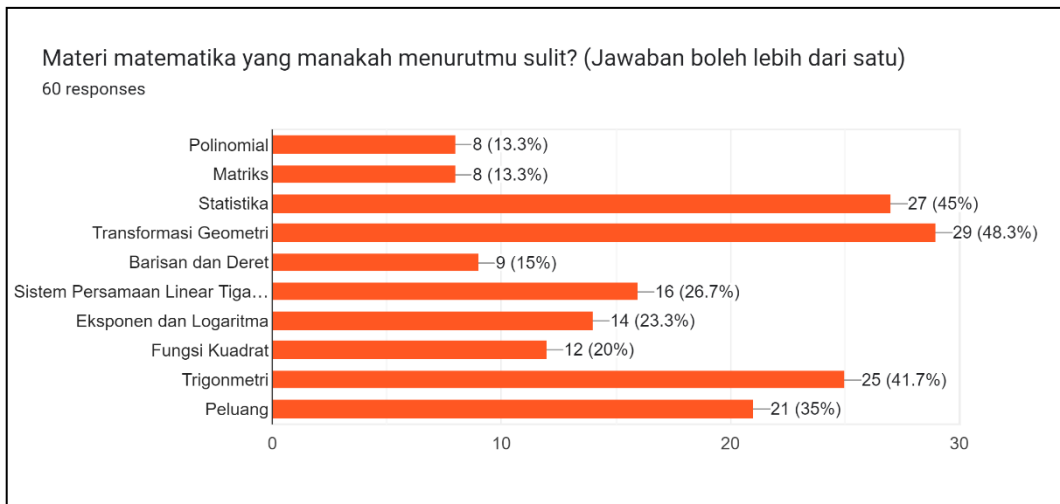
Figure 3: Math materials that are difficult for students

Based on Figure 3, it is known that the geometry transformation material was chosen by 48.3% of respondents, followed by statistics material chosen by 45% of respondents and trigonometry material chosen by 41.7% of respondents. This means that most respondents find it difficult in geometric transformation material. This is in line with the results of interviews with subject teachers that in geometric transformation material there are still many students who score below KKM 70. Geometric transformation material is one of the materials that are difficult to learn by students at the high school level (Wahyuni, 2023).
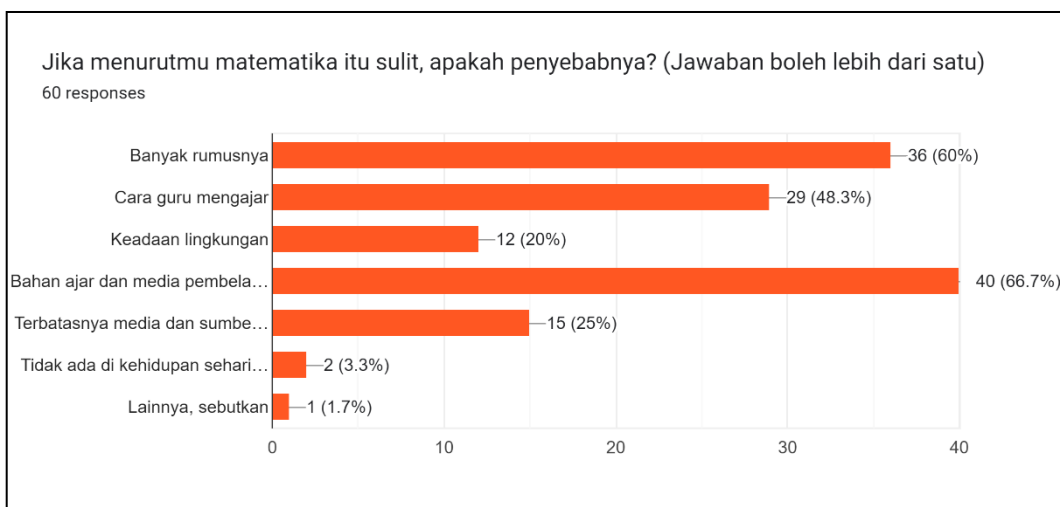
Figure 4. Causes of students' difficulties in learning mathematics

Based on Figure 4, it is known that the biggest cause of learning math is difficult for students is in teaching materials and learning media which received a response of 66.7%. The role of teaching materials and learning media is very important. In the process of teaching and learning activities, teaching materials and learning media support students in order to facilitate the delivery of the sequence of material and so as not to make students bored during the learning process (Sagita, 2016; Audie, 2019). Therefore, it is necessary to develop teaching materials combined with learning media that are in accordance with the needs of students.
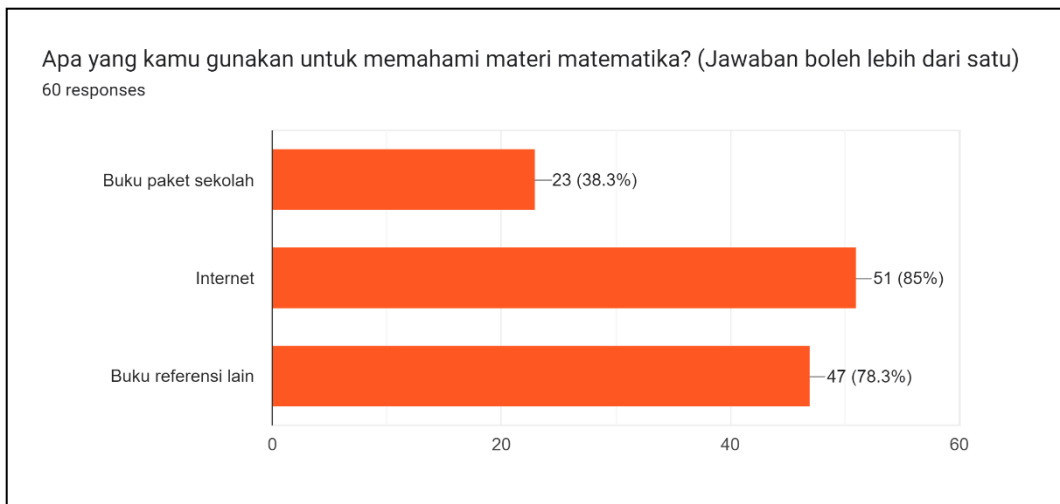
Figure 5. Teaching materials used by students in learning math

Based on Figure 5, it is known that the internet received a response of 78.3%, other reference books received a response of 85%, and school textbooks received a response of 78.3%. This means that in understanding mathematics material, students use the internet more than textbooks. The internet is used by the world as a medium for searching and delivering learning information (Nurlaeli & Abadi, 2023).

Figure 6. The method used by the teacher to deliver math materials

The lecture method is also called the conventional method. The lecture method is a method where the teacher presents the material through speech and is delivered to students (Khauro et al., 2020). This method is a one-way learning from teacher to learner, where the teacher conveys information orally by lecturing. It can be seen in Figure 4 that a percentage of 63.3% percent was obtained. This means that in delivering mathematics material the teacher uses the lecture method (conventional). The results of research using the lecture method show that students often do not understand the material presented by the teacher (Khauro et al., 2020). As a result, students have difficulty in understanding the learning done by the teacher. So that the KKM value that must be obtained by students is 70 but many students get a score below 70 so that the learning outcomes are still very poor (65%). The solution to overcoming the negative impact of the lecture method on learning outcomes is to apply a more effective learning model in learning
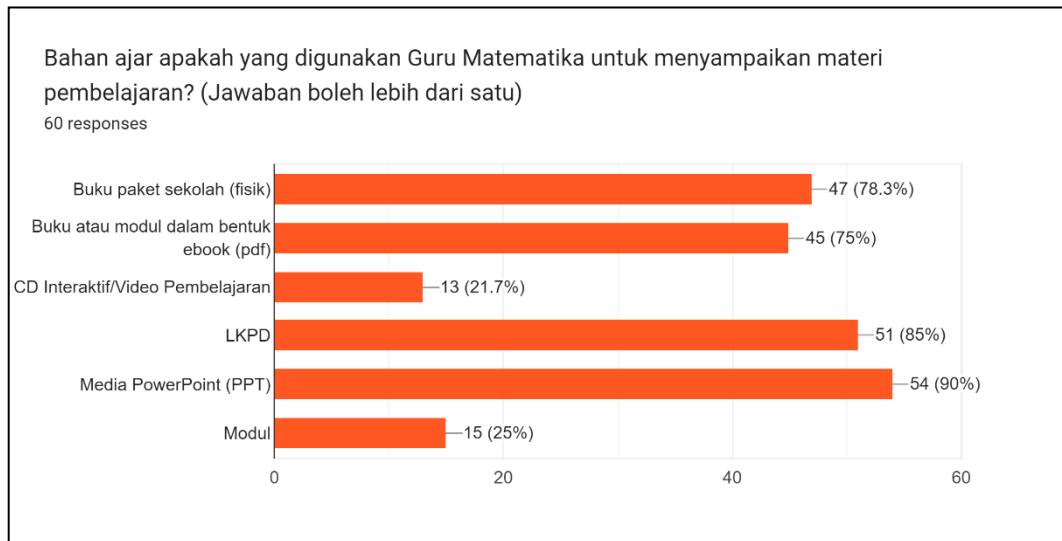
mathematics.

Figure 7. Teaching materials used by teachers to deliver math materials

Based on Figure 6, it is known that the teaching materials used by teachers in delivering material on PowerPoint (PPT) with a percentage of 90%, followed by LKPD and school package books (physical) with a percentage of 85% and 78.3%. Then the use of teaching materials for books or modules in the form of ebooks has a percentage of 75%, modules with a percentage of 25%, and learning CDs / videos with a percentage of 21.7%. It can be seen that the most widely used teaching material is PowerPoint (PPT). In addition, the use of modules and other teaching resources also plays a role in the learning process, although with a smaller percentage, thus providing an overview of the variety and diversification of tools used in teaching.

Figure 8. An interesting way of delivering the material

Based on Figure 8, it is known that an interesting way of delivering material that is difficult to understand is to use ICT-based learning media, which received a response of 76.7%. While lectures and discussions received a response of 23.3%. This means that by using ICT-based learning media, the delivery of material is more interesting in delivering material that is difficult to understand compared to lectures

and discussions. According to (Muslih, 2016) ICT-based learning media can be applied in the teaching and learning process, where learning is more efficient and students are more enthusiastic so that the material provided can be absorbed by students optimally,

Figure 9. Students' responses to the learning media used

Based on Figure 9, it is known that the "No" option was chosen by 66.7% of respondents, and the "Yes" option by 33.3%. This means that most respondents feel that the learning media used during class learning is less interesting. According to (Azhar, 2013) the use of learning media in the teaching and learning process can arouse new desires and interests, arouse motivation and stimulation of learning activities, and even have psychological effects on students. In addition to arousing the motivation and interest of students, learning media can also help students improve understanding, present data in an interesting and reliable manner, facilitate data interpretation, and condense information (Sihombing et al., 2023).
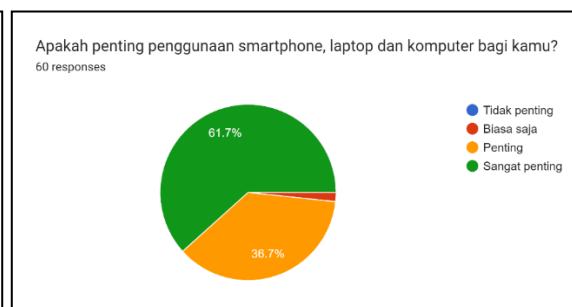

Figure 10. Use of school computers

Figure 11: Use of mobile devices

Based on Figure 10, it is known that the "No" option was chosen by 78.3% of respondents, and the "Yes" option by 21.7%. This means that most respondents have never used computers at school in learning math. Furthermore, based on Figure 11, it is known that the option "very important" was chosen by 61.7% of respondents, the option "important" was 36.7%, the option "normal" was chosen by 1.7% of respondents, and the option "not important" was chosen by 0% of respondents. This means that most respondents feel that the use of smartphones, laptops and computers is very important for students. Mobile devices such as smartphones or adroid phones, laptops, computers, tablets, and iPhones that can

be used to access information anytime and anywhere (Gikas & Grant, 2013). The use of mobile technology has a major contribution in educational institutions, including the achievement of learning objectives (Dewi et al., 2022).
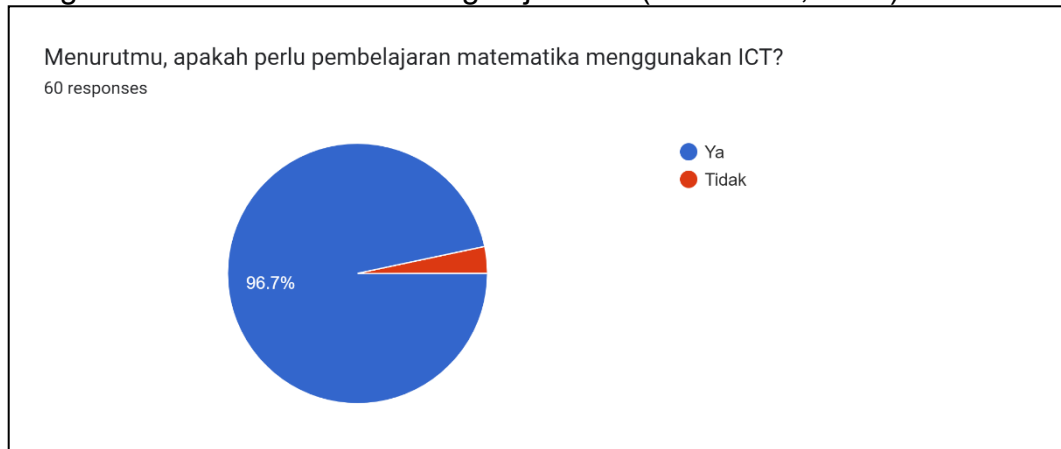

Figure 12. Students' responses on *ICT-based* learning

Based on Figure 12, it is known that the "Yes" option was chosen by 96.7% of respondents, and the "No" option by 3.3%. This means the need for learning mathematics using ICT (Integrating Communication and Technology). The success of learning carried out in an educational activity is how students can learn, by identifying, developing, organizing, and using all kinds of learning resources. Thus, problem solving efforts in the ICT approach are to utilize learning resources (Diana, 2020). The use of ICT as a medium for learning mathematics can indeed attract and increase children's learning motivation, especially when children learn about concepts related to mathematics.

Figure 13. Student feedback on math *software/applications*

Furthermore, the question of how important is the use of mathematics software/application for you? From 60 respondents, it can be summarized into 3 categories: very important, important, and quite important.

1) Very important
   - Applications are very helpful in understanding material that is difficult to understand.
   - Helps students learn abstract math concepts more efficiently.
   - Increases effectiveness and efficiency in assignments and problem solving.
   - Makes it easy for students to find out answers quickly and accurately.
   - Supports learning that is more sophisticated and relevant to technological developments.
   - Helps understand concepts that cannot be applied in the real world.

2) Important
   - Helps students become more competent and makes it easier to work on problems.
   - Makes learning more interesting and improves student understanding.
   - Facilitate understanding of material with the help of applications such as

GeoGebra.
- Increase the speed in knowing the results and equate with the results of their own calculations.
3) Quite important
- Facilitates the learning process even though there are students who prefer manual calculations.
- Helps understand material that has not been understood more easily.
- Increases efficiency in learning and searching for information.
- The application helps in understanding how the software works and uses it, although it is not always necessary for all students.
- Helps speed up problem solving and understand the material better.

From the students' responses, it can be concluded that the use of apps in math learning is considered very important by many students because it can help them understand difficult material, especially abstract concepts, more efficiently. Math apps also increase effectiveness in task completion, enable students to find out answers quickly and accurately, and support more modern learning that is relevant to technological developments. For some students, math apps are important in improving competence, making learning more interesting and helping to understand the material more quickly. However, some students consider math apps to be quite important because although they help in making learning and problem solving easier, they feel that manual calculations are still needed in some situations. Overall, the use of math *apps/software* technology plays a big role in improving learning efficiency and making it easier to understand the material. This is in line with research (Bito & Masaong, 2023) that technology contributes very importantly to learning activities, especially mathematics learning. The application of technology in learning should be able to improve students' ability to have more creative and innovative thinking. The application of technology can facilitate understanding of mathematics and solving mathematical problems, one of which is the use of technology in delivering teaching materials (Nurdyansyah & Aini, 2020).
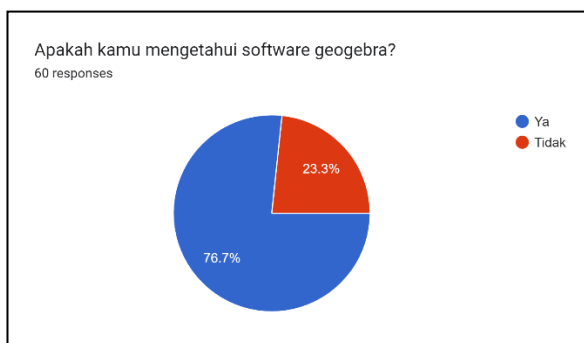

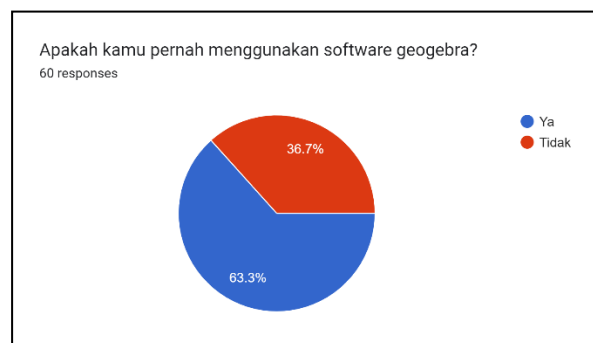**Figure 14. Students' responses about** *geogebra software*

Figure 15. Students' responses about *geogebra software*

Based on Figure 14, it is known that the "Yes" option was chosen by 76.7% of respondents, and the "No" option was 23.3%. This means that most respondents know *GeoGebra software*. Furthermore, based on Figure 15, it is known that the "Yes" option was chosen by 63.3% of respondents, and the "No" option was 36.7%.

This means that most respondents have used *GeoGebra software. GeoGebra* is a dynamic, free, and multi-platform program that combines geometry, algebra, tables, graphs, statistics and calculus in one easy package and can be used for all levels of education which has facilities to visualize or demonstrate mathematical concepts and as a tool for constructing mathematical concepts (Sagala & Sagala, 2023). The use of *GeoGebra* software is expected to make math learning more interesting and fun, so that students' interest in learning math will increase (Syahputra, 2015).
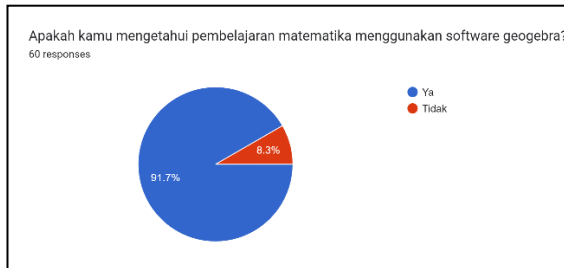

Figure 16. Students' responses about *geogebra software* **in math learning**

Figure 17. Students' responses about *geogebra software* **in math learning**
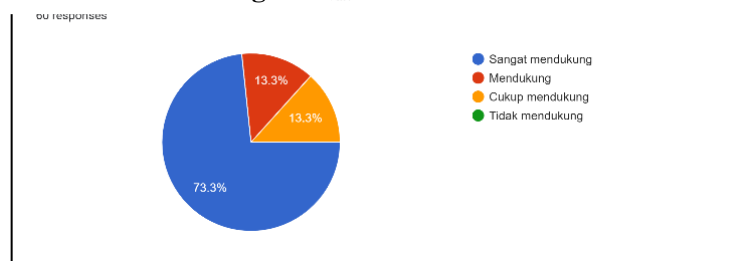
Figure 18. Students' responses on the use of *geogebra software* **in learning mathematics**

Based on Figure 16, it is known that the "Yes" option was chosen by 91.7% of respondents, and the "No" option was 8.3%. This means that most respondents know student learning using *GeoGebra software*. Furthermore, based on Figure 17, it is known that the "Yes" option was chosen by 98.3% of respondents, and the "No" option was 1.7%. This means that most respondents want to learn math with the help of *GeoGebra software.* And based on Figure 18, it is known that the "Strongly support" option was chosen by 73.3% of respondents, the "Support" option was chosen by 13.3% of respondents, the "Moderately Support" option was chosen by 13.3% of respondents, and the "Not Support" option was chosen by 0% of respondents. This means that most respondents strongly support learning with the help of *GeoGebra software. GeoGebra* is a computer program to teach students the concepts of geometry and algebra. According to (Putrawan et al., 2014) *GeoGebra* is multi-representational, namely: 1) there is an algebraic display; 2) there is a graphical display; and 3) there is a numerical display. These three views are dynamically interconnected. This helps students learn abstract geometry and algebra objects (Putrawan et al., 2014). The advantages of *GeoGebra* in the context of geometric transformations can improve the visualization process of geometric transformations, thus potentially increasing students' interest in learning (Fatmawati & Yahfizham, 2024). This is reinforced by research conducted by (Suhaifi et al., 2022) *GeoGebra* application is

proven to function to improve student learning outcomes.

D. Conclusions

Based on the results and discussion derived from interviews with mathematics teachers and student questionnaires in the needs analysis, it is known that 1) schools use Merdeka Curriculum in mathematics learning activities, 2) the material that students have difficulty with is geometric transformation material, 3) teachers have never used the *reciprocal teaching* model in learning mathematics, 4) teaching materials used include PowerPoint, LKPD, modules, and school textbooks, 5) *GeoGebra* has been used for two-variable linear inequality material, but not yet for geometric transformation material. According to the results of the needs and problem analysis, it can be concluded that students and teachers of class XI SMA Negeri 2 Jonggol need learning tools using the *reciprocal teaching* model assisted by *GeoGebra* which is implemented in mathematics learning, especially geometric transformation material.

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