AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 13, No. 4, 2024, 1228 – 1236

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

INTERACTIVE LEARNING USING GEOGEBRA SOFTWARE TO INCREASE MOTIVATION OF NATIVE PAPUAN STUDENTS IN LEARNING MATHEMATICS

Teguh Santoso [1*], Deni Yuliani [2], Khusnul Arisma [3]

[1,2,3] STKIP Muhammadiyah Manokwari, Manokwari, Indonesia
*Corresponding author. STKIP Muhammadiyah Manokwari, 98312, Manokwari, Indonesia
E-mail: teguhsantosoumm@gmail.com [1*)]
yulianideni22@gmail.com [2)]
khusnularisma@gmail.com [3)]

Received 06 February 2024; Received in revised form 06 August 2024; Accepted 10 September 2024

Abstract

Papua students are still less motivated to take mathematics lessons. Students feel that mathematics is difficult and boring, so they are less interested during the mathematics learning process. The purpose of this study is to improve the learning motivation of indigenous Papuan students towards mathematics subjects through interactive learning using Geogebra software. The method in this research is classroom action research. This research will be carried out at SMA N 1 Warmare. The subjects used in this research were native Papuan students in class X at SMA N 1 Warmare. Data collection methods in this research include observation, questionnaire and documentation methods. The data analysis technique in this research uses descriptive analysis, namely qualitative data from observations and quantitative data from the results of the mathematics learning motivation questionnaire. In the pre-cycle, students' motivation towards mathematics was still weak on average, then in cycle 1 students' motivation to learn mathematics increased with an average of strong category, but there were still some students who had sufficient and weak motivation towards mathematics, this was shown with still the lowest score of students in the weak category. In cycle 2 there was a fairly high increase in student learning motivation, with the majority of students having a very high category, this was proven by the fact that there were no students who had weak motivation to learn mathematics. Students have also been active in participating in the learning process. Learning using Geogebra software can increase the motivation of native Papuan students in learning mathematics.

Keywords: Geogebra; Motivation to learn; Papua Students

Abstrak

Siswa asli Papua masih kurang termotivasi dalam mengikuti pelajaran matematika. Siswa merasa matematika itu sulit dan membosankan, sehingga kurang tertarik selama proses pembelajaran matematika berlangsung. Tujuan dari penelitian ini adalah untuk meningkatkan motivasi belajar siswa asli Papua terhadap mata pelajaran matematika dengan pembelajaran interaktif menggunakan software geogebra. Metode dalam penelitian ini adalah penelitian tindakan kelas. Penelitian ini akan dilaksanakan di SMA N 1 Warmare. Subjek yang digunakan dalam penelitian ini adalah siswa asli Papua kelas X di SMA N 1 Warmare. Metode pengumpulan data dalam penelitian ini meliputi metode observasi, angket dan dokumentasi. Teknik analisis data dalam penelitian ini menggunakan analisis deskriptif yaitu data kualitatif hasil observasi dan data kuantitatif dari hasil angket motivasi belajar matematika. Pada pra siklus motivasi siswa terhadap matematika rata-rata sebagian besar masih lemah, kemudian pada siklus 1 motivasi belajar matematika siswa mengalami peningkatan dengan rata-rata kategori kuat, tetapi masih ada sebagian siswa yang memunyai motivasi yang cukup dan lemah terhadap matematika, hal tersebut ditunjukan dengan masih ada skor terendah siswa dalam kategori lemah. Pada siklus 2 mengalami peningkatan motivasi belajar siswa yang cukup tinggi, dengan sebagian besar siswa mempunyai kategori yang sangat tinggi, hal tersebut dibuktikan dengan sudah tidak ada siswa yang mempunyai motivasi belajar matematika yang lemah. Siswa juga sudah aktif dalam mengikuti proses pembelajaran. Pembelajaran dengan menggunakan software geogebra dapat meningkatkan motivasi siswa asli Papua dalam belajar matematika

***Kata kunci**: Geogebra; Motivasi Belajar; Siswa Asli Papua*

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

INTRODUCTION

Mathematics is an abstract concept that improves students' thinking abilities and is considered the basis of many sciences (Santoso et al., 2021). The main goal of learning mathematics is for students to be able to solve problems in everyday life (Phonapichat et al., 2014). Until now, there are still many students who do not like mathematics lessons, students are less motivated by mathematics lessons because they experience difficulties and find learning mathematics boring. Motivation in learning mathematics plays an important role in changing students' perceptions of this subject (Yunos et al., 2021).

Student motivation is important in the educational process (Kiemer et al., 2015). Motivation refers to a person's desire to pursue the goals they want to achieve (Bakar et al., 2010). According to Lin et al., (2017) There are two types of learning motivation, namely: intrinsic motivation, for example personal pleasure in learning a task and extrinsic motivation such as getting rewards or positive feedback. Motivation to learn has several functions, namely First, it can be used as a driving force for learning and Second, to determine the direction of action towards the goals you want to achieve (In'am & Sutrisno, 2021).

Based on the results of observations and interviews conducted at SMA N 1 Warmare, there are still many Papuan students who do not like mathematics. From the results of the interview, Papuan students feel that mathematics is difficult and boring because there are many formulas and calculations. Meanwhile, from the results of observations, most students do not pay attention to the material being taught, and when asked questions, many students do not respond well, and when students are asked to ask questions about the material being taught, students tend to be silent. Most students do not have the courage to ask or express opinions about the material being taught. This is evidenced by the results of Papua students' mathematics learning, most of which are still incomplete and there are not many Papuan students who continue their studies at universities taking mathematics education study programs, so student motivation towards mathematics needs to be improved. There needs to be an interactive learning process that is interesting for students so that students actively participate in the learning process and can increase their motivation towards learning mathematics. Interactive learning means mutual influence or there is a reciprocal relationship in learning between students and the program used where students respond to the program, then the program presents the desired information in learning (Kusumawati et al., 2021). With students being more active in practicing mathematics learning, it is hoped that students will be more motivated when participating in learning.

As technology and communication develop rapidly, this has resulted in the development of interactive learning media for learning mathematics. One technology-based mathematics learning application is Geogebra software. Geogebra is software that is freely available to access. Geogebra can be used for geometry, algebra and calculus material to make it easier to use for teaching and learning mathematics from elementary to university level (Bakar et al., 2010). Geogebra has become a tool that can help teachers to design effective

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

instructional lessons (Arbain & Shukor, 2015). Geogebra can help students' understanding of abstract concepts in mathematics which can be directly displayed using Geogebra (Mwingirwa & Marguerite, 2016). Using Geogebra can also lead to positive results such as helping with understanding, increasing retention and concrete things (Zengin et al., 2013). Using Geogebra makes the learning process fun, allows students to participate in class effectively and creates a positive learning environment competition between groups (Topuz & BiRgiN, 2020).

The material that will be used by using geogebra is geometric shapes. Students can see geometric shapes in three dimensions, know the corner points, edges, sides, diagonals of the space. Students can make nets from geometric shapes that will be formed so that it can make it easier for students to understand the concept of nets from various geometric shapes. Students can also calculate the volume and area of various geometric shapes. Students actively practice each stage in using gogebra for geometric shapes material.

Several studies using Geogebra software have been conducted. Research conducted by Wassie & Zergaw (2019) namely the use of Geogebra with an interesting activity design can inspire students towards their learning and improve academic achievement. Research was also conducted by Recep & Serin (2022) that the Geogebra program has the potential to contribute to better student understanding and interest in mathematics. Research on the use of Geogebra software to increase motivation has also been conducted. Research conducted by Bernard & Sunaryo (2020) student learning motivation on triangle material with the help of JavaScript-assisted Geogebra applications showed positive results. However, research on increasing the motivation of indigenous Papuan students using Geogebra software has never been done before. The difference between this study and previous studies is that this study wants to increase the motivation of indigenous Papua students towards mathematics.

Based on the description above, the researcher is interested in being able to increase Papuan students' learning motivation towards mathematics with interactive learning using Geogebra software. With increased motivation, it is hoped that Papuan students will like mathematics lessons more and can improve student learning outcomes. The formulation of the problem in this study is whether interactive learning with Geogebra software can increase Papuan students' motivation in learning mathematics?

METHODS

This research method is classroom action research. Researchers will implement a learning process using Geogebra software to increase student motivation. This research will be carried out at SMA N 1 Warmare, this school is one of the state schools in Manokwari City, West Papua which is located on the outskirts of the city, precisely in Warmare District. The subjects used in this research were native Papuan students in class X at SMA N 1 Warmare, with a total of 47 native Papuan students.

Data collection methods in this research include observation, questionnaire and documentation methods. Observations were made when applying Geogebra software during the learning process, so that we could find out how students' activities were during

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

learning. A questionnaire was used to measure motivation to learn mathematics after implementing Geogebra software. Documentation is used to capture documentation of student activities during learning. The questionnaire uses an attitude scale consisting of positive and negative questions. To measure the learning motivation of native Papuan students towards learning mathematics, students were given a questionnaire with a Likert scale. There are five statements used in the questionnaire, namely strongly agree (SS), agree (S), neutral (N), disagree (TS), strongly disagree (STS). To avoid the tendency of students to choose neutral or not dare to take sides, neutral points were removed, so that the questionnaire used four scales, namely strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). Before the questionnaire is given to students, the questionnaire statement items are validated first. The validators in this research were two mathematics education lecturers, one Indonesian language and literature education lecturer and one mathematics teacher at high school. The questionnaire values can be seen in Table 1.

Table 1. Learning motivation scale scores

Scale	Points	
	Positive	Negative
Strongly Agree (SS)	4	1
Agree (S)	3	2
Disagree (TS)	2	3
Strongly Disagree (STS)	1	4

This scale is used to determine student responses to the learning motivation questionnaire that has been given. The data obtained can then be the result of increasing or not learning motivation after implementing the learning process using Geogebra software. Then the research results were classified based on the scale percentage criteria, which can be seen in Table 2.

Table 2. Classification criteria for learning motivation scale presentation

Criteria %	Classification
$0 \leq NA \geq 30$	Very weak
$31 \leq NA \geq 50$	Weak
$51 \leq NA \geq 60$	Enough
$61 \leq NA \geq 70$	Strong
$71 \leq NA \geq 88$	Very strong

This classroom action research is conducted through a cycle system. The research cycle in this study will be carried out repeatedly until the standard of completion is achieved, then the research cycle continues to the next cycle. The classroom action research procedure in this study can be seen in Figure 1, which consists of several stages, namely:

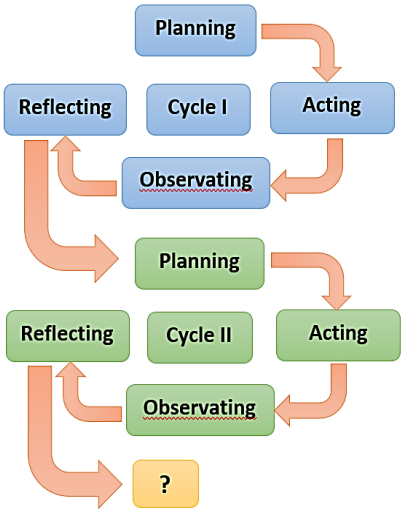

Figure 1. Procedures in classroom action research

The data analysis technique in this research is qualitative data from observations and quantitative data from the results of the mathematics learning motivation questionnaire. Using

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

qualitative and quantitative descriptive analysis based on the results of observations and questionnaires as well as reflections from each cycle, by comparing motivation to learn mathematics in initial conditions (pre-cycle) and cycle I, comparing motivation to learn mathematics in cycle I and cycle II, and comparing motivation to learn mathematics in conditions initial (pre-cycle) and final conditions. Then continued reflection. Researchers carry out data analysis simultaneously or after data collection. This classroom action research is said to be successful if the majority of native Papuan students in class X have motivation to learn mathematics with an average of 70 or in the strong category.

RESULTS AND DISCUSSION

Pre Cycle

The pre-cycle was carried out before learning on Geogebra software with 24 students. The learning motivation data obtained before implementing learning with Geogebra software shows that students' mathematics learning motivation is still low. The results of the pre-cycle questionnaire that has been implemented can be seen in Table 3 below.

Table 3. Pre-cycle results of student motivation in learning mathematics

Description	Mark
Subject	24
Maximum Score	88
Minimum Score	0
Student's Highest Score	55
Student's Lowest Score	37
Average Student Score	49,7

Based on Table 3, it can be seen that the student's highest score is 55 out of a maximum score of 88, this score is in the sufficient category so that students still have a sufficient level of motivation in learning mathematics. Then the lowest score for students is 37 in the weak category or students who have a weak level of motivation in learning mathematics. Meanwhile, the average overall student motivation score, namely 49.7, is in the weak category, which means that the majority of students have weak learning motivation towards mathematics. Based on these results, the level of students' learning motivation towards mathematics still needs to be increased further.

Cycle 1

In cycle 1, the learning process was carried out using the Geogebra application which was carried out over two meetings. In cycle 1 the researcher first explained how to use the Geogebra application and its benefits for learning mathematics, then students practiced using the Geogebra application in groups. The following is some documentation of activities during learning cycle 1.

Figure 2. Learning process in cycle 1

The results of the cycle 1 motivation learning mathematics questionnaire that has been implemented can be seen in Table 4.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

Table 4. Results of cycle 1 student motivation in learning mathematics

Description	Mark
Subject	24
Maximum Score	88
Minimum Score	0
Student's Highest Score	77
Student's Lowest Score	41
Average Student Score	62,7

Based on table 4, it can be seen that the highest student score increased to 77 in the very strong category, this shows that there are students who have very high motivation to learn mathematics. Then the lowest score for students also experienced an increase, namely 41 in the weak category, this also shows that there are still students who have weak motivation to learn towards mathematics. Meanwhile, the average overall motivation score for students has also increased, namely 62.7, which is in the strong category but not that high, which means that some students already have strong motivation, and some still have sufficient or weak motivation, so it still needs to be improved further. student motivation in the next cycle. Based on the results of observations of student activities in participating in the learning process, some students have the courage to ask questions if they do not understand how to use the Geogebra application, but some students are still shy about asking questions and some choose to remain silent even though they have been invited to interact. Based on these results, the level of students' learning motivation towards mathematics was quite good in the strong category, but had not yet reached the predetermined target, so it was continued for cycle 2 with various reflections from cycle 1.

Cycle 2

In cycle 2, improvements were made to the learning process based on the reflection results from cycle 1 so that student motivation towards mathematics increased further. Improvements made include increasing the number of laptops for each student so they can practice using GeoGebra individually, as well as taking a more approach to students who cannot yet use the GeoGebra application. In cycle 2 the researchers increased the number of questions given and the benefits that could be done with the Geogebra application. The following is some documentation of activities during learning cycle 2.

Figure 3. Learning process in cycle 2

The results of the cycle 2 questionnaire on mathematics learning motivation that has been implemented can be seen in Table 5.

Table 5. Results of cycle 2 student motivation in learning mathematics

Description	Mark
Subject	24
Maximum Score	88
Minimum Score	0
Student's Highest Score	80
Student's Lowest Score	58
Average Student Score	72,2

In Table 5, it can be seen that the student's highest score has increased again to 80 in the very strong category, this shows that students have very

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

strong motivation to learn mathematics and have increased from cycle 1. Then for the lowest score the student also experienced an increase, namely 58 in the sufficient category. , this shows that there are no students who have weak motivation to learn mathematics. Meanwhile, for the average student, the overall motivation score also increased from cycle 1, namely 72.2, in the very strong category. This shows that the majority of students already have sufficient, strong and strong motivation to learn towards mathematics. The results of reflection from cycle II can be said that research in cycle II has improved, this can be seen, namely that students no longer feel unfamiliar with learning with geogebra, students appear active during the learning process and dare to ask questions and most students do not forget the previous material if it is connected to newly learned material. Based on these results, the learning process was stopped in cycle 2 because it had reached the predetermined target of completion, namely when it had reached an average student motivation score of 70.

Based on the results of the study conducted for 2 cycles, in the pre-cycle, students' motivation towards mathematics was mostly still weak. In cycle 1, learning was carried out using Geogebra, and students' motivation to learn mathematics increased, but there were still some students who had sufficient and weak motivation towards mathematics, this was indicated by the fact that there were still the lowest scores of students in the weak category. Students were also still embarrassed to ask questions using Geogebra, and there were some students who could not practice directly due to limited laptops so they chose to remain silent. In cycle 2, there was a fairly high increase in students' motivation to learn mathematics, this was evidenced by the fact that there were no students who had weak motivation to learn mathematics. Students were also active in participating in the learning process because they could practice on their own, and they dared to ask questions if there was something they did not understand with the Geogebra application and students did not forget the previous material if it was related to the newly learned material. This shows that interactive learning using Geogebra software can increase students' motivation to learn mathematics. This is in line with his research Sunaryo (2019) that students experience increased learning outcomes with the help of learning media using Geogebra software. This is also in line with his research Priyanto & Yani (2022) that increasing student learning motivation from low to high by using GeoGebra.

CONCLUSION AND SUGGESTION

Based on the results of research carried out in two cycles, it can be concluded that learning using Geogebra software can increase the motivation of native Papuan students in learning mathematics. The results of this research prove that there is an increase in student learning motivation, this is proven in the pre-cycle average learning motivation value of 49.7 with the category of weak student learning motivation. Then in cycle I it increased by 62.7 with the category of strong student learning motivation. Continued again in cycle II which experienced an increase in the average score of 72.2 with the student learning motivation category being very strong and there were no longer any students who had a

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

weak learning motivation category towards mathematics.

For further research, Geogebra software can be used to improve student learning outcomes or the achievements of native Papua students.

ACKNOWLEDGEMENT

The researcher would like to thank the Directorate of Research, Technology and Community Service (DRTPM) of Indonesia for providing research funds for novice lecturers in the 2023 budget year. Hopefully, the results of this study can contribute to learning innovation in Indonesia, especially in Papua.

REFERENCES

Arbain, N., & Shukor, N. A. (2015). The Effects of GeoGebra on Students Achievement. *Procedia - Social and Behavioral Sciences*, *172*, 208–214. https://doi.org/10.1016/j.sbspro.2015.01.356

Bakar, K. A., Ayub, A. F. M., Luan, W. S., & Tarmizi, R. A. (2010). Exploring Secondary School Students' Motivation Using Technologies In Teaching And Learning Mathematics. *Procedia - Social and Behavioral Sciences*, *2*(2), 4650–4654. https://doi.org/10.1016/j.sbspro.2010.03.744

Bernard, M., & Sunaryo, A. (2020). Analisis Motivasi Belajar Siswa MTs dalam Pembelajaran Matematika Materi Segitiga dengan Berbantuan Media Javascript Geogebra. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(1), 134–143. https://doi.org/10.31004/cendekia.v4i1.173

Githua, B. N. (2013). Secondary School Students' Perceptions Of Mathematics Formative Evaluation And The Perceptions' Relationship To Their Motivation To Learn The Subject By Gender In Nairobi And Rift Valley Provinces, Kenya. *Asian Journal Of Social Sciences & Humanities*, *2*(1), 174-183.

In'am, A., & Sutrisno, E. S. (2021). Strengthening Students' Self-efficacy and Motivation in Learning Mathematics through the Cooperative Learning Model. *International Journal of Instruction*, *14*(1), 395–410. https://doi.org/10.29333/iji.2021.14123a

Kiemer, K., Gröschner, A., Pehmer, A.-K., & Seidel, T. (2015). Effects of a Classroom Discourse Intervention On Teachers' Practice And Students' Motivation To Learn Mathematics And Science. *Learning and Instruction*, *35*, 94–103. https://doi.org/10.1016/j.learninstruc.2014.10.003

Kusumawati, L. D., Sugito, Nf., & Mustadi, A. (2021). Kelayakan Multimedia Pembelajaran Interaktif Dalam Memotivasi Siswa Belajar Matematika. *Kwangsan: Jurnal Teknologi Pendidikan*, *9*(1), 31-51. https://doi.org/10.31800/jtp.kw.v9n1.p31--51

Lin, M.-H., Chen, H.-C., & Liu, K.-S. (2017). A Study of the Effects of Digital Learning on Learning Motivation and Learning Outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(7), 3553–3564.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v13i4.9654

https://doi.org/10.12973/eurasia.2017.00744a

Mwingirwa, I., & Marguerite, M. O. (2016). Status of Teachers' Technology Uptake and Use of GeoGebra in Teaching Secondary School Mathematics in Kenya. *International Journal of Research in Education and Science*, *2*(2), 286-294. https://doi.org/10.21890/ijres.83989

Phonapichat, P., Wongwanich, S., & Sujiva, S. (2014). An Analysis of Elementary School Students' Difficulties in Mathematical Problem Solving. *Procedia - Social and Behavioral Sciences*, *116*, 3169–3174. https://doi.org/10.1016/j.sbspro.2014.01.728

Priyanto, A., & Yani, A. (2022). Peningkatan Motivasi Belajar Siswa Kelas X IPA Menggunakan Geogebra Pada Materi Trigonometri. *Jurnal Sosial dan Sains*, *2*(4), 538–544.

Recep, B., & Serin, H. (2022). Students` Opinions about the Use of Geogebra Computer Program as a Technological Tool in Mathematics Lessons. *International Journal of Social Sciences & Educational Studies*, *9*(1), 60-77.

Santoso, T., Cholily, Y. M., & Syaifuddin, M. (2021). An Analysis of Students' Errors in Completing Essay HOTS Questions Based On Watson's Criteria Viewed From The Cognitive Style Perspective. *JTAM (Jurnal Teori Dan Aplikasi Matematika)*, *5*(1), 121–133. https://doi.org/10.31764/jtam.v5i1.3776

Sunaryo, A. (2019). Penggunaan Media Pembelajaran Geogebra Terhadap Hasil Belajar Siswa Tentang Materi Program Linier Kelas X. *Jurnal On Education*, *2*(1), 69-103.

Topuz, F., & BiRgiN, O. (2020). Developing teaching materials supported with Geogebra for circle and disc subject at seventh grade. *Elementary Education Online*, *19*(3), 1–17. https://doi.org/10.17051/ilkonline.2020.735184

Wassie, Y. A., & Zergaw, G. A. (2019). Some of the Potential Affordances, Challenges and Limitations of Using GeoGebra in Mathematics Education. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(8), 1-11.https://doi.org/10.29333/ejmste/108436

Yunos, N. M., Thangal, T. B. T., Sharif, N. F. M., Rashid, N. R. A., & Rahmat, N. H. (2021). Exploring Motivation To Learn Mathematics Through Vroom's Theory. *European Journal of Education Studies*, *8*(11), 122-139.https://doi.org/10.46827/ejes.v8i11.3976

ZengiN, Y., Kağizmanli, T. B., Tatar, E., & İşleyen, T. (2013). Bilgisayar Destekli Matematik Öğretimi Dersinde Dinamik Matematik Yaziliminin Kullanimi. *Mustafa Kemal University Journal of Social Sciences Institute*, *10*(23), 167–180.