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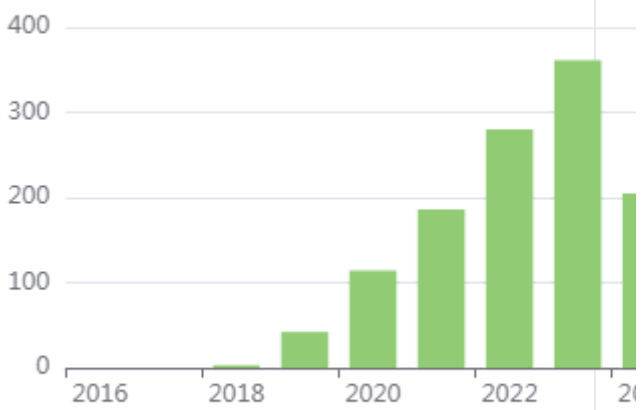


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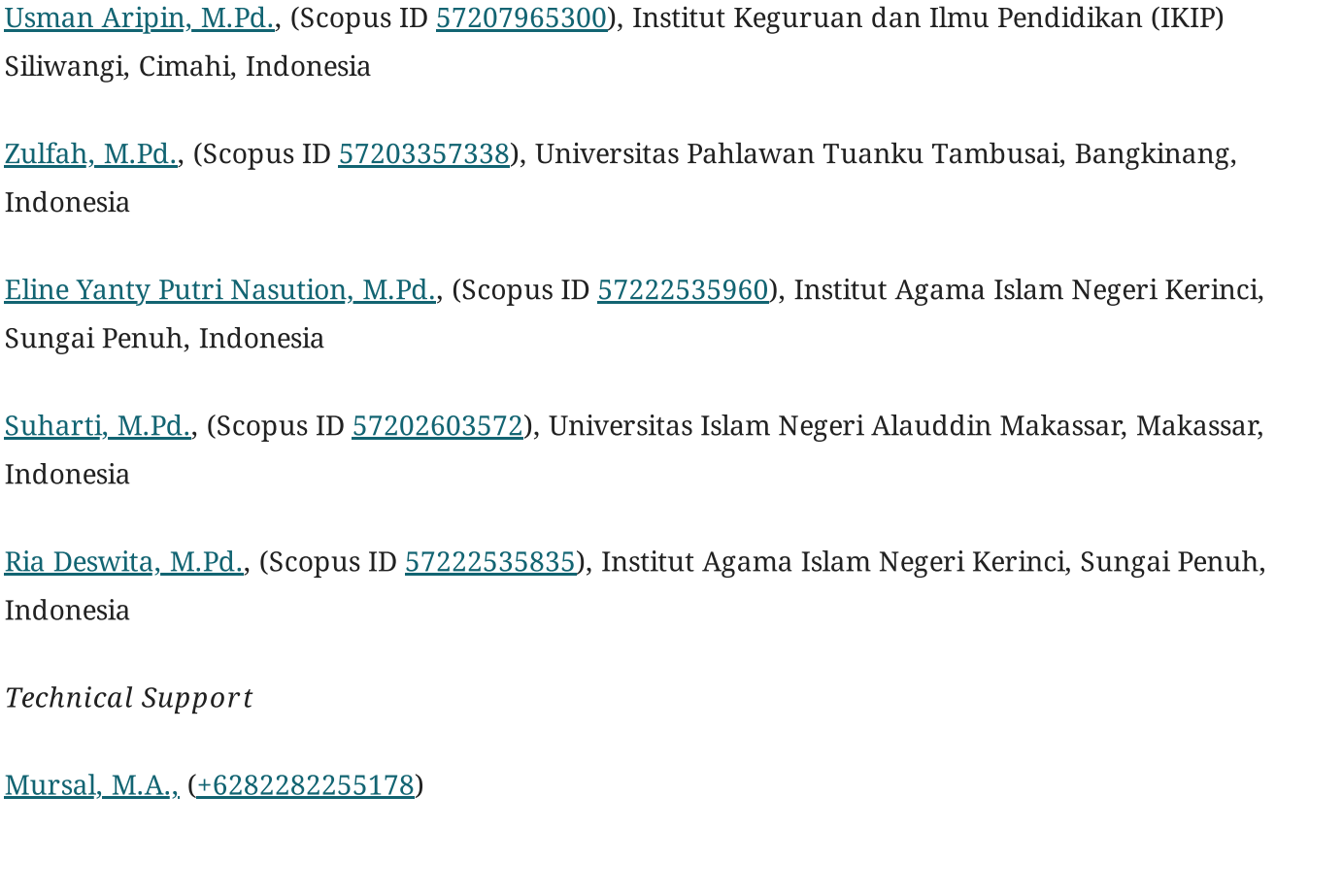

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EDUMATIKA: Jurnal Riset Pendidikan Matematika (EJRPM) received many submissions to be considered for publication in Volume 6, Issue 1, May 2023. There are some articles published in this issue. Those articles were written by many researchers from various affiliations, such as UIN Maulana Malik Ibrahim Malang, STAI Al-Anwar Sarang Rembang, Universitas Sanata Dharma, Universitas Negeri Padang, IAIN Kerinci, Universitas Tanjungpura, and so on. All articles are in full English. In 2023, EJRPM was still officially accredited by Sinta (Sinta 3) from the Ministry of Education and Culture of the Republic of Indonesia.

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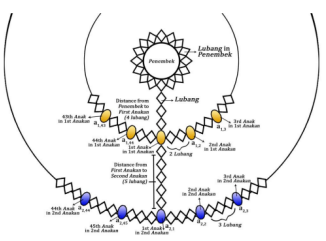

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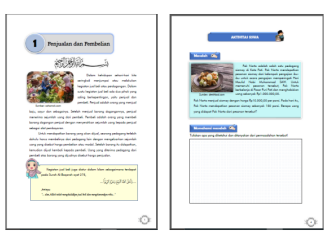

### The Social Arithmetics Module Based on Islamic Values and Realistic Mathematics Education to Improve Students' Problem-Solving Skills

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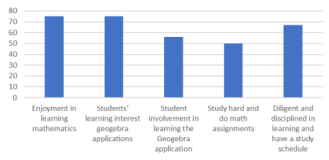
### The Students' Learning Interest in Quadratic Function Topics Using Geogebra

Margaretha Madha Melissa[(1)], Alberto Redianto[(2)], Antonius Venta Wiwahanama[(3)], Lily Maria Maturbongs[(4)],

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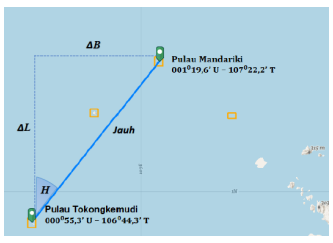


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# Students' Learning Interest in Quadratic Function Topics Using Geogebra Learning Media

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**Abstract.** The impact of students' learning interest on their academic achievement is widely acknowledged; however, a significant number of students still exhibit low levels of interest. Employing effective learning media has been identified as a strategy to enhance learning interest, with dynamic tools such as Geogebra being recognized for their potential. This study aimed to describe students' learning interest by utilizing Geogebra in the context of the quadratic function topic. The research employed qualitative methods and a descriptive approach, involving four students as respondents from a private Senior High School in Yogyakarta, Indonesia. The instructional intervention consisted of mathematics lessons on quadratic functions using Geogebra. Data collection utilized unstructured interviews and close-ended questionnaires, incorporating 22 questions across five indicators of students' learning interest. The questionnaire results revealed an average percentage of students' learning interest falling within the strong category across all indicators. The findings suggest a strong preference among respondents for learning utilizing Geogebra, primarily attributed to its visually appealing interface. Consequently, students exhibited a high level of interest in studying the quadratic functions topic when facilitated by Geogebra.

**Keywords:** Geogebra; Learning Interest; Learning Media; Quadratic Function; Mathematics Learning

**Abstrak.** Dampak minat belajar siswa terhadap prestasi akademiknya telah diketahui secara luas; namun, masih banyak siswa yang menunjukkan tingkat minat yang rendah. Penggunaan media pembelajaran yang efektif telah diidentifikasi sebagai strategi untuk meningkatkan minat belajar, misalnya dengan alat dinamis seperti Geogebra yang diakui potensinya. Penelitian ini bertujuan untuk mendeskripsikan minat belajar siswa dengan memanfaatkan Geogebra pada materi fungsi kuadrat. Penelitian ini menggunakan metode kualitatif dan pendekatan deskriptif, yang melibatkan empat siswa sebagai responden dari sebuah SMA swasta di Yogyakarta, Indonesia. Intervensi pembelajaran terdiri dari pembelajaran matematika pada fungsi kuadrat menggunakan Geogebra. Pengumpulan data menggunakan wawancara tidak terstruktur dan kuesioner tertutup, yang mencakup 22 pertanyaan pada lima indikator minat belajar siswa. Hasil angket menunjukkan rata-rata persentase minat belajar siswa berada pada kategori kuat pada seluruh indikator. Temuan ini menunjukkan adanya preferensi yang kuat di kalangan responden untuk belajar menggunakan Geogebra, terutama karena antarmukanya yang menarik secara visual. Oleh karena itu, siswa mempunyai minat yang tinggi dalam mempelajari materi fungsi kuadrat dengan difasilitasi oleh Geogebra.

**Kata kunci:** Fungsi Kuadrat; Geogebra; Media Pembelajaran; Minat Belajar; Pembelajaran Matematika



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## INTRODUCTION

Having a strong learning interest is crucial for students to derive pleasure and enthusiasm from their educational journey. This interest is characterized by a genuine liking for the subject matter, undivided attention, and an inherent desire to engage in the learning process without external encouragement. According to Hendriana et al. (2018), specific indicators of students' learning interest include a positive attitude towards learning, active participation in the learning process, diligence in completing math assignments, and maintaining discipline and consistency in their studies. Additionally, having a structured study schedule is another key component of fostering and sustaining students' learning interest.

Mathematics encompasses elements such as logic, reasoning, numbers, calculation operations, abstract concepts, and quantitative facts. It involves a relationship of thought patterns in the form of both form and space, fostering a mindset that is not only sensible but also applicable for solving a myriad of problems in daily life (Satori & Komariah, 2018). However, the perception of science, particularly mathematics, as a challenging subject can dampen students' enthusiasm for learning, consequently impacting their academic performance. Current research, as evidenced by the TIMSS and PISA results, indicates that students' mathematical abilities in Indonesia are still below the desired level (Khodijah & Setiawan, 2020). This deficiency in student achievement can be attributed to the challenges students face in comprehending the steps required to solve mathematical problems, leading to a decline in their learning interest in mathematics.

Teachers play a crucial role as facilitators in the learning process, necessitating various strategies to enhance the quality of education. Currently, especially in mathematics learning, educators tend to present formulas and problem-solving procedures exclusively on the blackboard. This approach may contribute to a perception among students that the teaching methods are monotonous and intimidating, particularly due to the perceived complexity of mathematical formulas (Sirait, 2016). It is essential to recognize that students possess diverse abilities and encounter varying levels of difficulty. Despite these differences, students often hesitate to openly express the challenges they face during the learning process. This lack of communication can lead to unresolved learning issues, contributing to boredom and a decline in students' overall learning interest. Importantly, students' learning interest is not static; it can evolve based on the instructional delivery and the incorporation of diverse learning media that resonate with individual students. Recognizing and addressing these dynamics in the teaching approach can play a pivotal role in fostering a positive and engaging learning environment.

In the contemporary educational landscape, it is imperative for education to align with the evolving needs of both teachers and students. Therefore, the integration of technology-based learning media becomes essential to bolster the development of students' interests, talents, and

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comprehension in mathematics. As Sudjana & Rivai (1992) highlight, the advantages of employing learning media are manifold. Firstly, it adds an element of intrigue to the learning process, enhancing student motivation to actively participate in educational activities. Secondly, the use of media facilitates a more straightforward grasp of subject matter, aiding students in achieving learning objectives. Lastly, learning media diminishes reliance on verbal or lecture-based learning, thereby introducing greater variety to instructional methods. This multifaceted approach to leveraging technology in education holds the promise of creating a more engaging and effective learning environment.

Employing captivating learning media is pivotal in elevating students' motivation, interest, and performance (Rau et al., 2008), particularly in the realm of mathematics. Technology-based learning media stands out as an effective tool in this regard. Through such media, teachers can seamlessly illustrate intricate and daunting concepts in mathematics learning, transforming them into engaging, comprehensible, and enjoyable experiences (Calder, 2012). This not only simplifies the learning process but also cultivates a heightened interest in students. Among the myriad of technology-based learning media, GeoGebra emerges as a noteworthy option. GeoGebra is a mathematics software designed to facilitate various aspects of mathematical learning. It serves a versatile role, spanning from training and practice activities to instructional tutorials and learning simulations. By incorporating GeoGebra into the teaching toolkit, educators can enhance the overall learning experience, making mathematics more accessible, interactive, and appealing to students.

Mahmudi (2010) emphasizes the numerous advantages associated with the utilization of GeoGebra in mathematics education. Firstly, the clarity and intricate detailing of images or graphics produced on GeoGebra surpass those achieved through manual methods involving pencils, rulers, or compasses. Secondly, the incorporation of animation and manipulation movements, such as dragging, creates a more authentic visual experience for students, facilitating a deeper understanding of mathematical concepts. Thirdly, GeoGebra enables students to evaluate the images or graphics they generate, fostering a reflective learning process. Lastly, the application aids teachers and students in highlighting the distinctive characteristics of mathematical or geometric objects, enhancing the overall learning experience. GeoGebra, a portmanteau of geometry and algebra, extends its utility beyond these domains and can also serve as an effective learning medium for calculus. Users can access GeoGebra by installing the application on Android devices or laptops. However, the success of learning activities involving GeoGebra ultimately relies on the teacher's creativity in processing topic and implementing dynamic learning strategies within the classroom.

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In this research, we delve into the application of GeoGebra for learning quadratic function topic in tenth-grade. Quadratic functions, represented by the general form $f(x) = ax^2 + bx + c$ or $y = ax^2 + bx + c$, share a close connection with graphing functions, specifically manifesting as a parabolic graph. The use of GeoGebra serves as a valuable tool for skill development among students. Here, students engage in the analytical examination of quadratic function graphs, focusing on variations induced by changes in the x coefficient magnitude. This analytical process enhances their proficiency, ultimately enabling students to make informed estimations about the appropriate graph form. Through this interactive approach, GeoGebra becomes a catalyst for a comprehensive understanding of quadratic functions, fostering a dynamic and exploratory learning experience.

Wulandari's research in 2019, employing GeoGebra, found that students gained a more detailed visual understanding of the graph of a quadratic function. This enhanced visual experience facilitated deeper analysis, making the topic more accessible for students. Consequently, the study observed a higher level of interest among students in learning about quadratic functions. Additionally, Tanziah (2019) emphasizes several benefits of GeoGebra, including its ability to swiftly and accurately illustrate geometry, provide animation and movement features for an enriched visual experience, serve as an evaluation tool for geometric drawings, and simplify the investigation and demonstration of geometric object properties. The current study aims to contribute to the understanding of students' learning interest by leveraging GeoGebra in the context of the quadratic function topic.

## METHOD

This research employed a qualitative method with a descriptive approach to investigate students' learning interest following the utilization of GeoGebra media for quadratic function topic. The descriptive approach was chosen to comprehensively understand the impact of GeoGebra on students' engagement with the quadratic function topic. The researchers conducted the study by delivering instructional sessions to the participants, focusing on quadratic functions with the core competency of "Explaining quadratic functions using tables, equations, and graphs."

The subjects of the study comprised tenth-grade students who had previously been exposed to quadratic function concepts. The research involved four students selected from a private senior high school in Yogyakarta. Data collection was executed through the online platform Google Meet. During this process, students were exposed to the predetermined topic, and closed questionnaires and interviews were administered to gauge their learning experiences and perspectives. This methodological approach aims to provide a detailed exploration of the impact of GeoGebra on students' learning interest in the context of quadratic functions.

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For data collection, a combination of questionnaires and interviews was employed to gauge students' learning interests following the use of GeoGebra media for quadratic function topic. The questionnaire utilized a closed format with a Guttman scale, prompting respondents to provide concise responses of "yes" or "no" for increased accuracy. This method aimed to capture specific opinions regarding learning interests. While, the interview component was incorporated to delve deeper into the gathered information. Interviews were scheduled upon the completion of the provided lessons, allowing researchers to gather more comprehensive insights. The closed questionnaire, administered to respondents engaged with GeoGebra learning media, encompassed five indicators relating to learning interest. A total of 22 questions were included in the questionnaire to thoroughly assess and analyze students' perspectives on learning interest in the context of quadratic functions. This combination of quantitative and qualitative approaches is designed to provide a holistic understanding of the impact of GeoGebra on students' learning interests.

The data analysis in this study adhered to the Miles, Huberman, and Saldana model, as recommended by Miles et al. (2014). This model emphasizes an interactive and continuous approach to qualitative data analysis until saturation is achieved. The iterative activities involved in this process include data reduction, data display, and drawing or verifying data conclusions. In the data reduction stage, the focus was on summarizing and selecting pertinent information to hone in on key aspects. This step was crucial for obtaining a clearer and more manageable picture, facilitating the subsequent analysis and the collection of additional data if necessary. Specifically, in this study, data reduction involved summarizing student responses related to their learning interests when using GeoGebra media.

Moving on to the next stage, the presentation of data involved conveying information through various mediums, such as narratives, charts, category relationships, tables, diagrams, and the like. While narrative text is commonly utilized in qualitative research, alternative formats such as graphs, matrices, and diagrams can also be employed. In this study, the researcher opted for a descriptive approach to present data on students' learning interests. The categorization of students' learning interests was conducted with reference to the percentage scale criteria outlined by Riduwan (2007), as presented in Table 1. This categorization framework served as a guide to effectively communicate the distribution and nuances of students' learning interests in the context of using GeoGebra media.

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Table 1. Category of Students' Learning Interest

| Criteria for Students' Learning Interest (%) | Category |
|---|---|
| $0 \leq NA < 20$ | Very Weak |
| $20 \leq NA < 40$ | Weak |
| $40 \leq NA < 60$ | Enough |
| $60 \leq NA < 80$ | Strong |
| $80 \leq NA \leq 100$ | Very Strong |

*NA = (total score of the student / maxium score of the questionaire) x 100%

## RESULTS AND DISCUSSION

The researchers initiated data collection activities by conducting teaching sessions on quadratic function topic utilizing the Geogebra application. The teaching methodology employed learning practice sessions focused on quadratic function topic using Geogebra learning media, with the active participation of four respondents. The learning process unfolded smoothly, and subsequent to its completion, researchers conducted interviews to gauge students' learning interest following their engagement with Geogebra.

The interview results revealed that all four respondents expressed a preference for learning through Geogebra, citing its engaging display as superior to traditional whiteboard drawing methods. Despite their understanding of Geogebra being contingent on teacher guidance, the students found the application to be comprehensible. They emphasized the benefits of Geogebra for drawing quadratic function graphs, noting its improved clarity, neatness, and detailed representation. However, one student highlighted ongoing difficulties with Geogebra, citing confusion related to the abundance of features on the site that remained unclear.

Following two learning sessions and interviews, the researchers administered questionnaires to assess students' learning interest in using Geogebra. The subsequent section presents data obtained from the questionnaire results, specifically detailing students' perspectives on learning interest, as outlined in Table 2.

Table 2. Questionnaire Results of Students' Learning Interest after Learning Using Geogebra

| **Indicator** | **Question** | **Total score** | **Percentage** | **Category** |
|---|---|---|---|---|
| Enjoyment in learning mathematics | 5 | 15 | 75 | Strong |
| Students' learning interest geogebra applications | 5 | 15 | 75 | Strong |
| Student involvement in learning using Geogebra application | 4 | 9 | 56 | Enough |
| Study hard and do math assignments | 5 | 10 | 50 | Enough |
| Diligent and disciplined in learning and have a study schedule | 3 | 8 | 67 | Strong |
| Average | | | 64,6 | Strong |

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Table 2 provides insight into the students' learning interest after engaging with Geogebra, revealing an average percentage of 64.6%. This figure categorizes their learning interest as strong. To visually represent the distribution of interest across various indicators, Figure 1 presents a bar chart depicting the percentage for each specific aspect of students' learning interest.

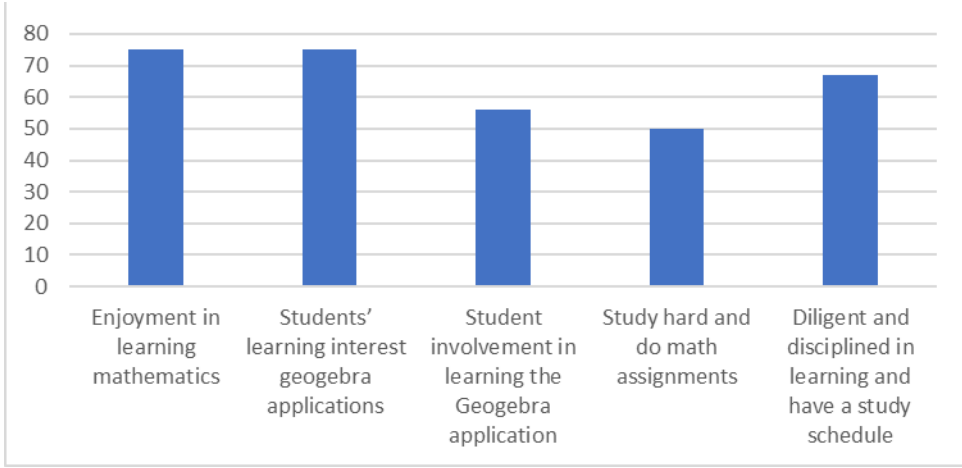


Figure 1. Percentage of Students' Learning Interest after Learning Using Geogebra

The data from both Table 2 and Figure 1 collectively reveal a positive trend in student responses toward learning with the Geogebra application. The average percentage of 64.6% categorizes their overall learning interest as strong.

## Enjoyment in Learning Mathematics

Specifically, the indicator of enjoyment in learning mathematics using Geogebra stands out with a percentage of 75%. In interviews, all four respondents expressed their positive sentiments toward learning with GeoGebra. They highlighted the ease of drawing and calculating graphs, attributing their positive experience to the application's detailed and clear steps. Despite being in the initial stages of using GeoGebra, the students exhibited great enthusiasm in exploring its functionalities. They expressed a keen interest in extending the application's usage beyond quadratic function topic, showcasing a desire to incorporate GeoGebra into their broader learning experiences. This aligns with findings from Subekti & Kusuma's (2015) research, which suggests that students exhibit a sense of happiness and eagerness when engaging with novel learning tools and approaches.

## Students' Learning Interest in Geogebra

The indicator of students' learning interest in using GeoGebra yielded a percentage of 75%, aligning with the liking learning indicator. This consistency was reaffirmed through interviews with all respondents, who collectively expressed a high level of interest in learning with GeoGebra.

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According to them, the application's visually appealing image display and ease of understanding significantly contributed to their enthusiasm. This observation resonates with Ariawan (2015), who asserts that GeoGebra fosters increased student interest throughout the learning process. Students find the application engaging from the beginning to the end of the learning sessions, maintaining focus and interest due to the attractive animations and colors afforded by computer media. This finding parallels the results of Putri & Basir's (2020) study, indicating that educational media, such as analog clocks, contribute to enhanced interest and effectiveness in understanding angle measurement topic.

### Student Involvement in Learning using Geogebra Application

The indicator of student involvement in learning with the GeoGebra application yielded a percentage of 56, falling within the sufficient category. This categorization arises from instances where some students did not actively participate by asking questions or expressing opinions. Despite their liking and interest in learning with the GeoGebra application, certain students lacked the confidence and courage to vocalize their opinions. Consequently, the learning environment was deemed less interactive due to the hesitancy among some students to actively engage in discussions or seek clarification.

### Study Hard and Doing Assignments

The indicator of diligent study and assignment completion using the GeoGebra application yielded a percentage of 50%, placing it within the sufficient category. Notably, this percentage is the lowest among all the indicators. During interviews, two out of the four respondents revealed that their initiative in learning or completing assignments was not optimized. Despite acknowledging the ease and interest fostered by learning with GeoGebra, these students expressed that it did not necessarily enhance their enthusiasm for independent learning, including reviewing topics or completing assignments.

### Diligence and Discipline in Learning and Having a Study Schedule

The indicators of diligence and discipline in learning and having a study schedule, resulted in a percentage of 67%, categorizing it within the strong category. This observation was substantiated during lessons, where students exhibited diligence, discipline, and heightened focus in understanding the operation of GeoGebra. In interviews, all four respondents highlighted that the learning activities facilitated through GeoGebra were more structured, progressing through stages. This structured approach contributed to increased diligence and discipline among students, creating a more conducive learning environment and fostering a sense of comfort. This finding aligns with the research by Putri et al. (2019), which emphasizes a significant increase in student interest,

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particularly in the indicators of diligent study and discipline, when utilizing innovative learning tools.

The research results indicate that the incorporation of GeoGebra in the teaching and learning process positively influences the enhancement of students' interest in mathematics. This finding aligns with earlier research on students' learning interest, as demonstrated by Azmidar et al. (2017). Their research underscores that the concrete-pictorial-abstract approach theoretically contributes to an improvement in students' mathematics interest. Additionally, Arthur et al. (2018) conducted a study, revealing that students exhibit increased interest in mathematics when teachers allocate quality time to practical class exercises and when mathematics is seamlessly connected to other subject areas. The conclusion drawn from this research emphasizes the pivotal role of teachers' ability to integrate mathematics with real-life problems as a crucial and essential aspect of the teaching and learning process.

The study conducted by Nzaramyimana et al. (2021) emphasizes the captivating nature of students' independent learning facilitated by Geogebra's interactive and dynamic software. Their research highlights that the use of Geogebra significantly enhances students' learning interest in mathematics, particularly in grasping complex concepts such as exponential and logarithmic functions. The findings indicate that students, through deep exploration enabled by Geogebra, not only increased their interest but also acquired a more profound understanding of these mathematical concepts.

Parallel findings are echoed in the research conducted by Williams et al. (2017), which focuses on Geogebra's impact on senior secondary school three (SSS3) students' interest and achievement in mathematics. Their study reveals that Geogebra plays a pivotal role in fostering students' interest in the subject, ultimately contributing to an improvement in their academic achievement. This underscores the broader consensus on the positive influence of Geogebra in both enhancing students' engagement and elevating their performance in mathematics.

Other research shows why students’ learning interest is still low when learning online. Setiana et al. (2021) conducted research shedding light on the persistently low learning interest among students in online learning environments. Their findings indicate that only 15.3% of students displayed a positive response to online learning, with a slightly higher percentage of 32% expressing positivity toward online exams. Notably, a substantial portion of students still prefer traditional classroom learning over online alternatives, as the latter tends to diminish their interest in attending classes.

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Several factors contribute to this decline in student interest in online learning, including limitations in internet access, teaching methods, and an increased workload. Recognizing these challenges, the researchers recommend that teachers focus on improving the overall quality of learning experiences. Enhancing the quality of teaching, both in online and offline settings, is seen as crucial to positively impacting student interest. This perspective underscores the rationale behind the researchers' choice to utilize GeoGebra media, aiming to elevate student learning motivation in both online and offline learning contexts.

## CONCLUSION

The implementation of the Geogebra software in teaching the Quadratic Function topic yielded a positive impact on the mathematics interest of tenth-grade students. This positive effect is evident in the consistently high average percentage across all indicators of learning interest, placing them within the strong category. Students reported feeling engaged, happy, and interested both during and after class, attributing this heightened interest to the utilization of the Geogebra application. As a result, students demonstrated increased focus, enthusiasm, and an overall heightened learning interest. The students' enjoyment and active participation in learning with Geogebra stem from their perception that the application simplifies the process of drawing graphs and performing calculations. They find the steps clearer and more detailed, contributing to an enhanced learning experience. The research findings indicate a robust preference among respondents for Geogebra-based learning, emphasizing the visually appealing and user-friendly nature of the software as a key factor influencing their heightened interest in studying the quadratic functions topic.

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