



UTILIZING THE GEOGEBRA SOFTWARE FOR TEACHING GEOMETRY

EC-6

Abstract

This research brief examines the potential benefits and effectiveness of using GeoGebra, a dynamic mathematics software, in teaching geometry to students in grades EC-6. By reviewing relevant studies and highlighting key findings, this brief provides insights into how GeoGebra can be integrated into the classroom to improve geometry education for young learners. It also offers recommendations for educators and schools to implement the software effectively.

Contributor(s): Mienie Roberts, Ph.D., Associate Professor in Mathematics, Texas A&M University-Central Texas | decock@tamuct.edu



Utilizing the GeoGebra Software for teaching Geometry, May 2023
Published by Branch Alliance for Educator Diversity, an imprint of M.E.B. Alliance for Educator Diversity, Inc., 100 World Drive, Suite 101, Peachtree City, GA 30269
(<https://www.educatordiversity.org>).

**This resource was authored by the BranchED Math Joint Action Group. The content herein is licensed CC-BY-NC-SA. It can be shared and remixed for noncommercial purposes with attribution to the authors*

Table of Contents

Introduction	3
Objectives	3
Methodology.....	3
Main Results.....	3
Implications.....	4
How to guide:.....	4
Recommendations	6
References	7

Introduction

GeoGebra is a dynamic mathematics software that integrates geometry, algebra, and calculus. Its user-friendly interface and interactive features make it an effective tool for teaching geometry to students in early grades. This research brief explores the potential benefits of using GeoGebra in early-grade geometry education and provides recommendations for its implementation.

Objectives

The objective of this brief is to help teacher educators or teachers understand the benefits of using the GeoGebra software to make abstract geometry concepts more concrete for students in early grades and provide how to integrate the software into their own teaching context. It aims to provide insights into the best practices for using GeoGebra in the contemporary classroom and offer an example to illustrate the dynamic features of the software.

Methodology

A systematic literature review was conducted to analyze studies that have investigated the use of GeoGebra in early-grade geometry education. The review focused on studies published in peer-reviewed journals and conference proceedings between 2010 and 2022. A total of 21 studies met the inclusion criteria and were analyzed for this research brief. Based on the 21 studies analyzed, it was found that GeoGebra can promote active learning, increase engagement and motivation, and improve students' attitudes toward mathematics. Specifically, the software's interactive features can enable students to explore and discover mathematical properties, and its visual representations can help students better understand abstract concepts (Ma & Yang, 2022).

Main Results

The GeoGebra software appears to have several benefits for early-grade geometry education. The interactive features of the software allow students to actively engage with geometric concepts and manipulate figures, promoting discovery learning and increasing engagement. Furthermore, students can develop and use formulas related to perimeter and area, providing them with a deeper understanding of geometric properties (Hohenwarter & Preiner, 2007).

The use of GeoGebra for mathematical games and puzzles is also a promising approach to teaching mathematics, as it can create a positive attitude towards the subject and increase students' motivation to learn. The ability for students to explore new concepts without the supervision of a teacher also suggests that the software can facilitate independent learning (Dahal & Neupane, 2022).

Overall, the integration of GeoGebra in early-grade geometry education appears to be a promising approach for promoting active learning, increasing engagement and motivation, and improving students' attitudes towards mathematics.

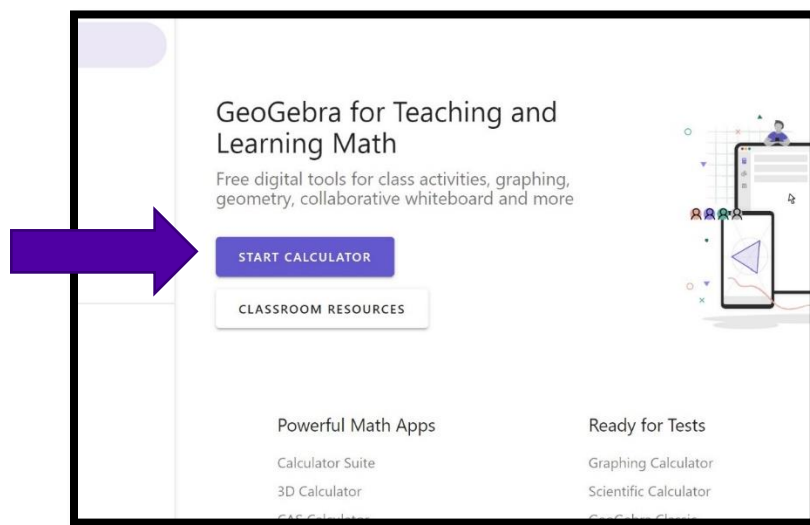
Implications

Understanding which tools are available when utilizing the GeoGebra software is fundamental to student success. Teachers need professional development and support to effectively integrate GeoGebra into their geometry instruction (Hohenwarter & Lavicza, 2009).

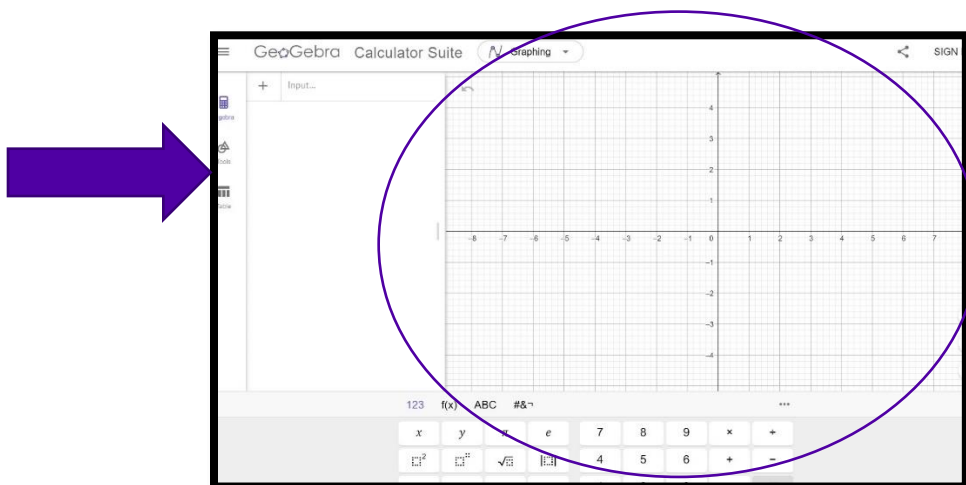
Even though the GeoGebra platform is open-source, schools should consider providing teachers with adequate training, and the necessary resources, such as computers or tablets, for students and teachers.

How to guide:

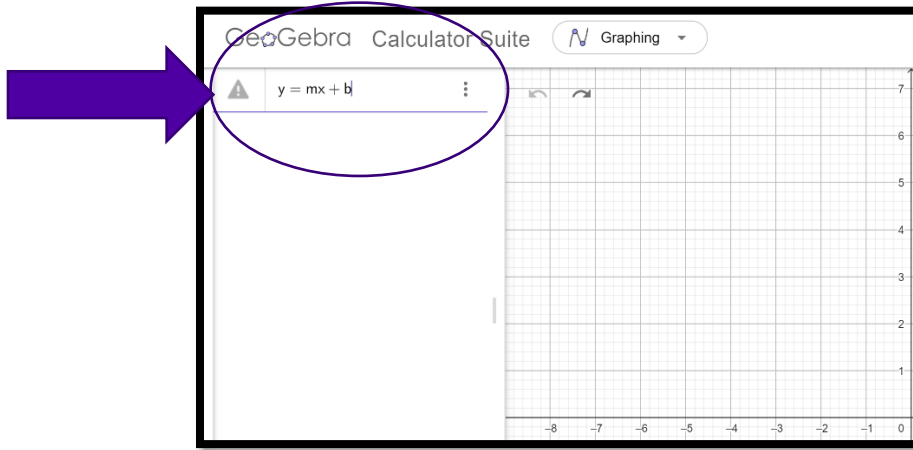
- Navigate to the following website: www.geogebra.org
- Click on “Start Calculator”:



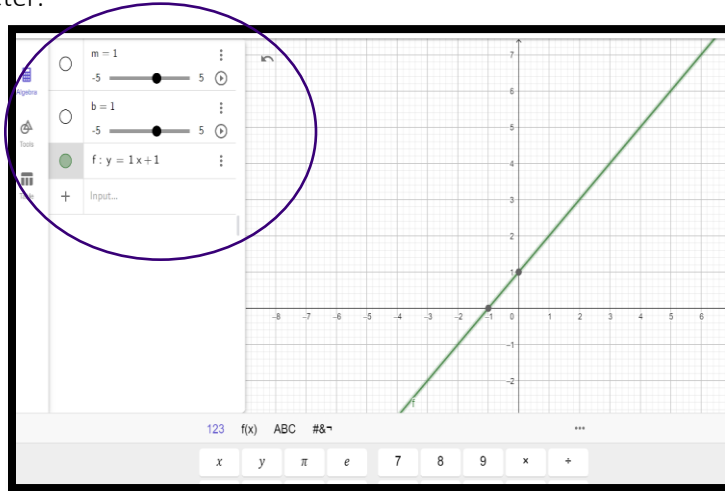
The dialogue window to the left is the Algebra View where the user can enter equations. The Graphics View to the right is linked dynamically to the Algebra View.



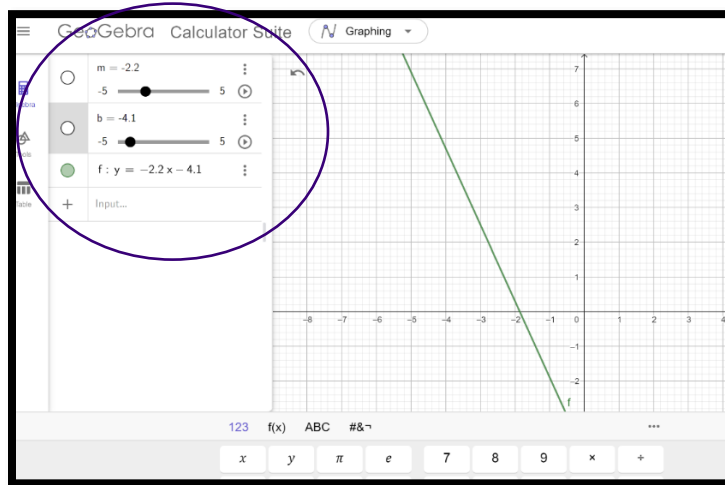
Enter the following equation into the Input Bar in the Algebra View: $y=mx+b$:



After the user hits enter, the GeoGebra software creates sliders for the slope “m” parameter and the y-intercept “b” parameter.



The user is now able to move the sliders “m” and “b” to investigate how the change in slope, and the change in the y-intercept affects the graph of a straight-line $y=mx+b$.



The example above is just one illustration of the dynamic features of the GeoGebra software. The software provides a range of interactive tools. One of the key benefits of GeoGebra's dynamic features is that they provide a more interactive and engaging way to explore mathematical concepts than traditional pen-and-paper methods. Instead of simply looking at static diagrams or formulas, users can actively manipulate and explore geometric objects, leading to deeper insights and a more intuitive understanding of mathematical concepts.

Recommendations

Educators can design lesson plans that incorporate GeoGebra's interactive features to promote active learning and the exploration of geometric concepts, while schools are encouraged to invest in technology infrastructure to ensure all students have access to GeoGebra and other digital tools for mathematics education.

References

- Dahal, R., Uprety, S. B., & Neupane, S. (2022). The Effectiveness of Using GeoGebra Games to Teach Geometric Transformations in Secondary Level Mathematics. *Journal of Mathematics Education*, 1(1), 17-25.
- Hohenwarter, M., & Lavicza, Z. (2009). The role of training in the implementation of GeoGebra into mathematics teaching. In M. Blum, S. Moritz, & M. Craig (Eds.), *Proceedings of the 13th International Conference on Geometry and Graphics* (pp. 65-75). Dresden, Germany: Technische Universität Dresden.
- Hohenwarter, M., & Preiner, J. (2007). Dynamic mathematics with GeoGebra. *Journal of Online Mathematics and its Applications*, 7, 1443-1453.
- Ma, Y., & Yang, J. (2022). The Use of GeoGebra in Early-Grade Geometry Education: A Systematic Literature Review. *International Journal of Emerging Technologies in Learning (iJET)*, 17(3), 174-187.