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CalcSteps: A CALCULATOR ASSISTANT APP FOR CULTIVATING MATHEMATICS EDUCATION

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ABSTRACT

As technology plays a more significant role in the teaching and learning environment, numerous educational applications for mathematics are used. Calculators are highly accommodating to user needs and essential in education, particularly for mathematics. Sometimes users are struggling to find the correct steps in solving mathematics questions using scientific calculators due to the multiple steps required to obtain the correct solution. Hence, the objective of CalcSteps focuses on assisting users in using a calculator properly for mathematics questions involving factorization, roots, and exponent operations. CalcSteps was developed using Flutter and Dart languages, with Visual Studio Code as its development environment. It includes step-by-step instructions for two types of calculators, which are the Casio fx-570EX and the Casio fx-570MS. Findings show that the application is very convenient in assisting users with the correct technique to utilize the calculators for several mathematical problems. It is user-friendly, as it is applicable for phone or computer and accessible anywhere without an internet connection.

Keywords: Calculator assistant, Math apps, Mathematics education, Learning materials, Self-learning.

INTRODUCTION

Technology plays a pivotal role in our lives nowadays, and the education field is no exception. The help of technology can potentially enhance understanding and engagement through interactive tools and simulations. The increasing availability and sophistication of mobile learning applications highlight a notable shift in mathematics education, with a focus on nurturing students' advanced cognitive skills and problem-solving capabilities. The creation of mathematics applications has been gaining significant popularity, with mobile learning platforms designed to enhance students' higher-order thinking skills (Yaniawati et al., 2021).

The correct and effective use of scientific calculators is challenging for users, especially for students and teachers. It's not always intuitive, and a lack of understanding can lead to errors or inefficient usage. Different calculators have different interfaces and functionalities. Users may struggle when switching between different types of calculators or when using unfamiliar models. Teachers may become weary of repeatedly demonstrating the same procedures, while students often feel reluctant to seek clarification from peers or teachers regarding the input of values, application of formulas, or appropriate techniques. Such circumstances can contribute to frustration and an increased risk of errors.

The employment of AI in mathematics education, especially at the upper secondary and higher education levels, brings a variety of advantages and opens new pathways for learning. Nevertheless, every innovation comes with its own set of challenges and possible risks, often arising from improper implementation (Panaoura, 2025). The emergence of many calculator apps has ignited significant debate, echoing earlier controversies surrounding the use of tools in mathematics education (Vaerenbergh & Perez-Suay, 2021).

The integration of technology into mathematics classrooms is not merely a response to societal advancements but a strategic move to align education with the demands of a technologically driven world, as emphasized by educational standards. Calculators have a controversial history of being used in mathematics, but it's been argued that when used appropriately, they can be powerful tools, especially when problem-solving is the main focus. There are several mathematics e-learning tools that are designed for mobile operating systems like Android, for example, DoodleMath and GeoGebra (Ruthven, 2009). This research explores the development and implementation of "CalcSteps," a calculator assistant application meticulously designed to cultivate mathematics education by providing step-by-step solutions and fostering a deeper comprehension of mathematical concepts.

There are many readily available educational applications for mathematics. However, not many of these apps will guide users on how to use different models of calculators correctly to obtain the desired outcomes. CalcSteps is envisioned as an interactive mobile application that goes beyond the capabilities of a conventional calculator, transforming it into a personalized learning companion. The application's core functionality revolves around providing detailed, step-by-step solutions to a wide range of mathematical problems, including arithmetic, algebra, and calculus.

METHODS

CalcSteps was developed using Flutter and Dart languages, with Visual Studio Code as its development environment. CalcSteps includes step-by-step instructions on how to use two types of the most common variations of calculators: Casio fx-570EX and Casio fx-570MS. Casio has permitted us to use the calculator interface in our app. CalcSteps is a free app that revolutionizes mathematics education by providing users with interactive and personalized learning experience. CalcSteps incorporates visualizations and simulations that illustrate mathematical concepts and calculator functions. This helps users to develop a more intuitive understanding of how calculators can be used to solve problems. CalcSteps can be downloaded from a link and installed on users' desired devices. It is accessible to anyone and anywhere without internet access. It comes in two versions for computers or mobile devices.

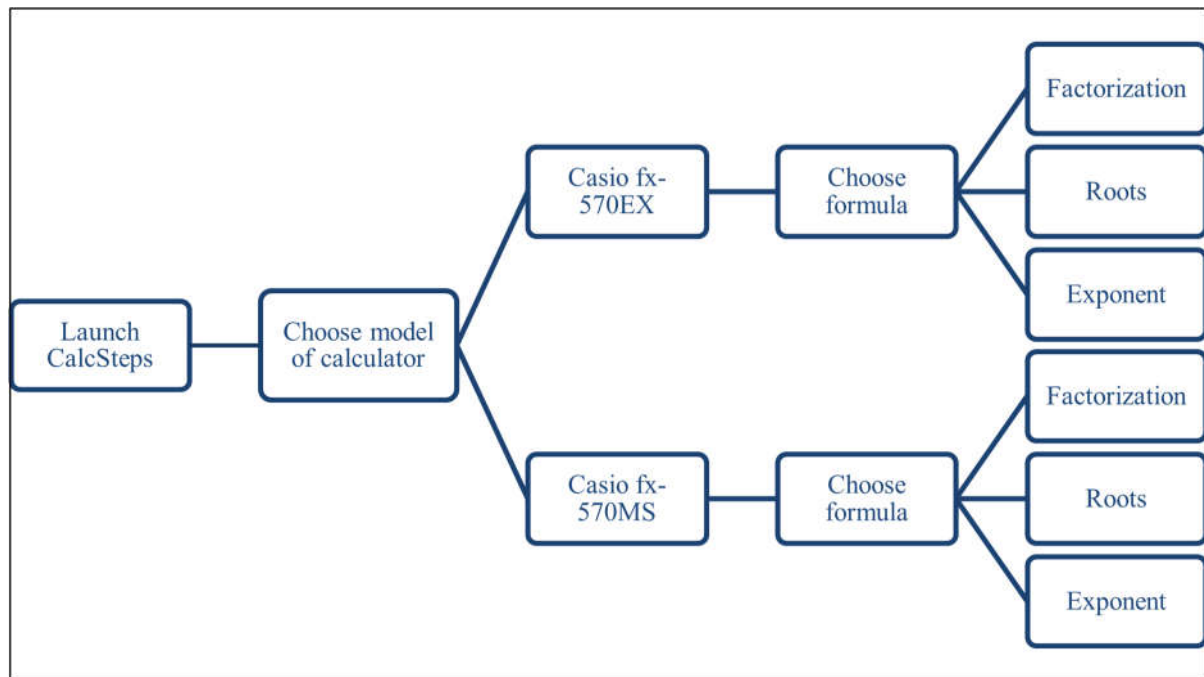
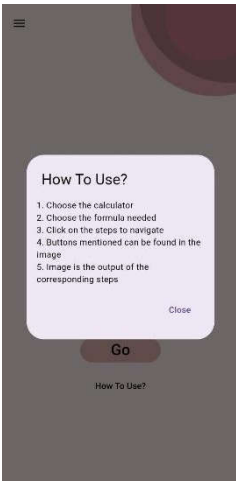


Figure 1.: Hierarchy design of the CalcSteps flow

The hierarchy design of the CalcSteps flow is shown in Figure 1. The navigation of the app is quite simple and easy to understand. The app allows flexibility and caters to the users' personal needs, as it permits users to choose the calculator model and formula according to their preference.

Table 1.: Illustration and explanation of CalcSteps

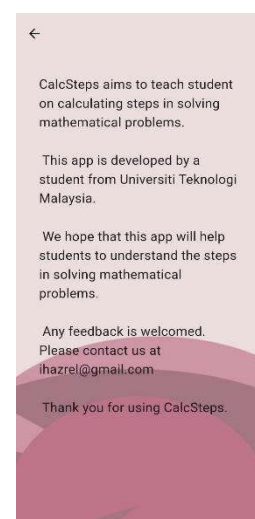
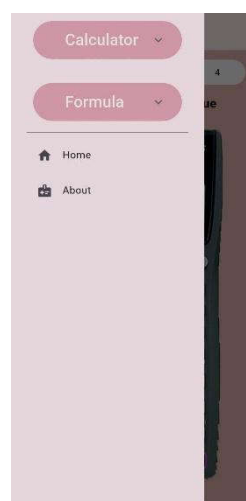
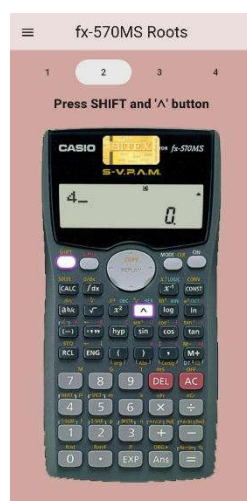
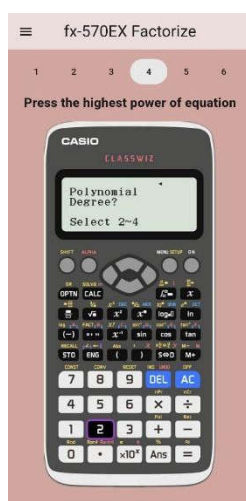
			
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The main navigation page of CalcSteps consists of the options to choose the type of calculator and the formula.

First-time users can click on the “How to Use?” button before they start using CalcSteps to help them use the app better.

Users can choose one of the two models of calculator according to the one they used or desired.

Next, users can choose one of the three formulas, and CalcSteps will provide detailed step-by-step instructions on how to enter the formula into the chosen calculator.



This is an example page of the fourth of six steps if users choose to do factorization on the Casio fx-570EX.

This is an example of the second of four steps if users choose to calculate roots on the Casio fx-570MS.

Users can change the model of the calculator or formula seamlessly here or go to the main navigation page by clicking the “Home” button.

The “About” button provides more information about CalcSteps. Users can also reach out to the email address provided for any inquiries.

RESULTS AND DISCUSSION

CalcSteps has abundant contributions and is very accommodating towards the learning process, especially for mathematical subjects. CalcSteps is designed to support users in the proper utilization of various calculator models, thereby enabling them to derive maximum benefit from the tool. The intention for CalcSteps is purely educational, and it is free for anyone to access. A blind survey was conducted to gain honest feedback from users on the app. Respondents evaluated the app using a five-star rating scale, where one star indicates the lowest mark and five stars signify the highest mark. Respondents also provide their insightful comments and suggestions for CalcSteps.

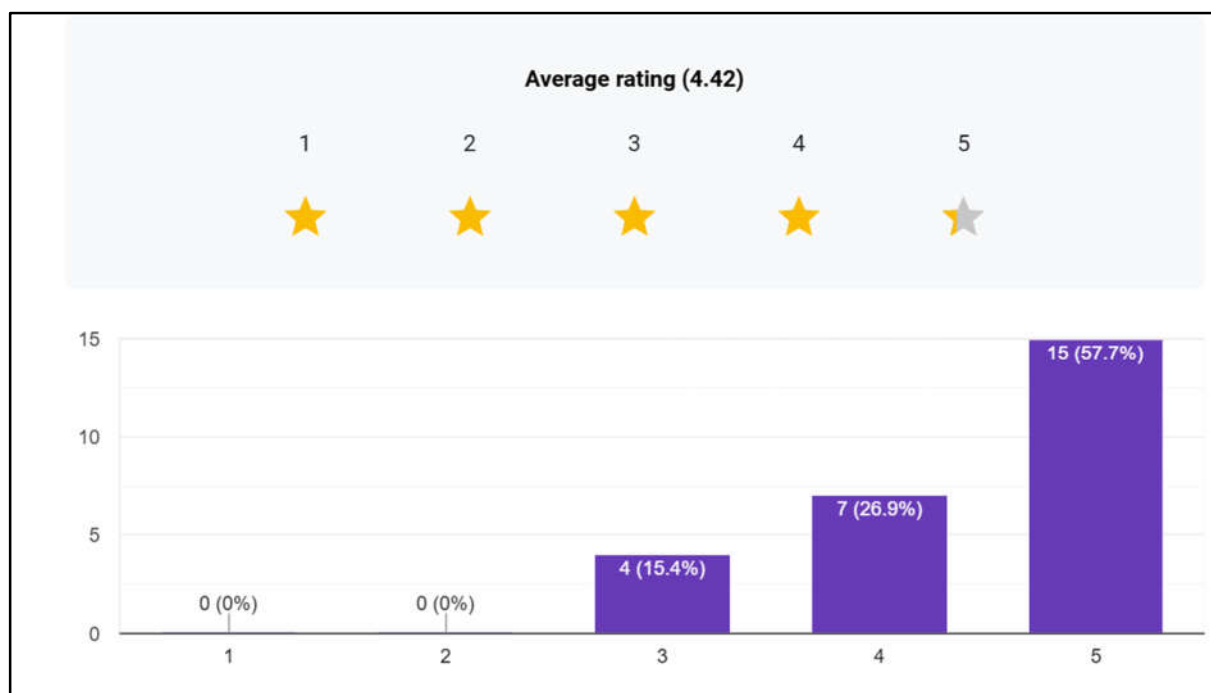


Figure 2.: Feedback on CalcSteps by star rating.

Figure 2 shows that the majority of respondents gave 5 stars, which is the highest rating, followed by 26.9% giving 4 stars, and 15.4% of respondents giving 3 stars for CalcSteps. The overall average rating is 4.42/5, categorized as very good. Here, as shown in Table 2, are some of the comments and suggestions from respondents who have experience using CalcSteps.

Table 2.: Some comments and suggestions from respondents.

No.	Comments or suggestions
1.	Easy to use, and I hope there are more new functions.
2.	Good app, very helpful for those who don't know how to use a calculator.
3.	The app is quite functional for people to use it and if it can, add the decimal to hexadecimal conversion and any other conversion related, since we as computer science students often use that type of conversion. Overall, it's a good app!
4.	The UI navigation could use some minor improvements. It was confusing to navigate the next steps of the tutorial, which suggested putting a little button for "next" and "previous".
5.	It needs a more appealing UI and a better guide to use the application. Overall, the function works perfectly fine, and I am looking forward to future updates and more room for improvement.

CONCLUSIONS

This study proposed a free educational mobile phone app named CalcSteps that acted as a calculator assistant. CalcSteps will help users, especially students and teachers, with how to use a calculator the right way and utilize their calculator to its full potential. Ultimately, it will increase the likelihood of getting the correct answer to mathematics questions and problems. Additionally, the formulas provided are also applicable to other subjects besides mathematics. CalcSteps can encourage students to study and do revision independently. In the future, the app can be improved by adding other models of calculators and adding more functions.

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