

**REPOSITORY OF INNOVATIVE PRODUCTS (RIP)
FOR INSPIRATION IN EDUCATION DESIGN
[CATEGORY: SECONDARY SCHOOL]**

GENIUS MATHS

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Highlights: Most of the lower secondary school students are affected with the problem of understanding the concepts of either signed or negative numbers and in operations on these numbers. Various teaching techniques have already been used among the teachers to teach the students, such as board games, dice, playing cards, as well as the traditional methods of teaching. The effectiveness of these techniques are not very satisfying because there is still a high percentage (40%-60%) of students struggling to understand negative numbers. To solve this issue, we have developed an educational computer application called "Genius Maths" that can be used to teach students about negative number calculations. This study investigated the effectiveness of "Genius Maths" by involving 24 students from Form 1 and Form 2 in a mini-test before and after using the application. Based on the data collected, there was an increase in marks, in which before learning with "Genius Maths", 41.6% of students obtained above 60% mark and 58.4% of students obtained below 60%. After learning with "Genius Maths", 85% of students obtained above 60% mark and only 15% of students obtained below 60%.

Key words: Negative numbers; Mathematics; educational computer application; calculation; secondary school

Product Description

A survey to investigate how well Form 1 and 2 students perform in calculating negative numbers was conducted. This survey was intended to see whether the students develop any misconceptions regarding the calculation of negative numbers. A total of 24 students have participated in this survey through a mini-test and it was observed that more than half of the students obtained marks below 60%, which is 58% out of the total number of participants. Only 10 students (41.6%) obtained marks above 60%. This result shows that the misconception of the calculation of negative number is still a major problem among the students. There is evidence of students who are still unable to solve mathematical questions that involve the calculation of negative numbers.

Due to the problem that has been outlined, we have developed an offline Mathematics program, called "Genius Maths" using SCRATCH programme in order to teach the students about the concept of negative numbers as well as the applications of negative numbers in mathematical calculations in an innovative and fun way. There are two sections in Genius Maths: tutorial and quiz. The tutorial and quiz in Genius Maths are based on Malaysia's Form 1 Secondary School Mathematics Syllabus (KSSM). The language used in tutorial and quiz in Genius Maths is in Bahasa Malaysia, as most of the Malaysian Government School use Bahasa Malaysia to conduct the Mathematics lesson.

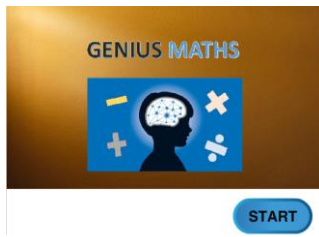


Figure 1: Main page of "Genius Maths"



Figure 2: Tutorial section of "Genius Maths"

Once the students have completed the tutorial, a short quiz with questions will pop up on the screen. The questions in the quiz were adapted from Form 1 past year Mathematics exam paper and syllabus.

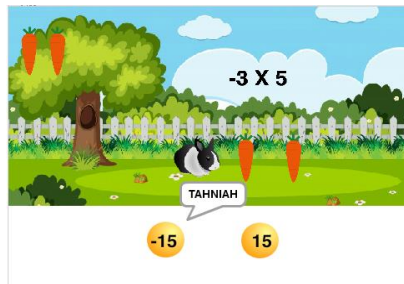


Figure 3: Quiz section of "Genius Maths"

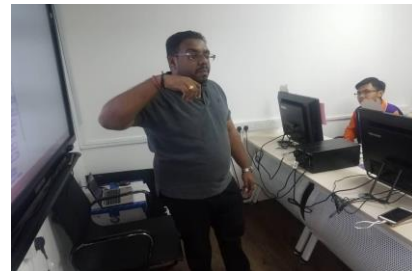


Figure 4: Test run and demonstration to Mathematics teachers

Upon the pre-completion of the developed product, it was first demonstrated to a small group of teachers teaching the subject of Mathematics as seen in Figure 4. This was done to obtain valuable insights on whether or not they find the elements in the product useful or necessary. Amendments to the product were done as needed based on the feedback obtained.

"Genius Maths" computer program can be easily used by all the teachers where teachers only need to possess a computer or laptop to run this program. Teachers would need to pre-install the scratch offline program in their computers which can be done through an installer. Once installed, teachers can freely run the program. If teachers intend to teach the whole class using the program, the teachers would need to connect the computer with a projector.

The end product of "Genius Maths" was tested on a group of 24 Form 1 and Form 2 students. They were first shown and taught using "Genius Maths" on the concepts of negative numbers as well as methods to solve and compute related mathematical problems through the tutorial and mini-game/quiz. The teacher was encouraged to give extra verbal instructions to complement the tutorial and animation shown in "Genius Maths" in order to further enhance the students' understanding. At the end of the product implementation, a post-test was conducted after Genius Maths had been exposed and tested by the students.



Figure 5: "Genius Maths" implementation



Figure 6: Post-test carried out after being exposed to "Genius Maths"

Product Benefit

Table 1 shows the scores of the students before and after learning via Genius Maths. The benchmark was set i.e. 60% for the mini-test, where some students scored above 60% and some students score below 60%. The understanding of the students was measured based on the scores where the students who obtained 60% and above had better understanding on the topic of 'Negative numbers' while the students who obtained below 60% were vague in this particular topic.

Table 1: Marks achieved by the students

MARK	LEARNING WITHOUT GENIUS MATHS	LEARNING VIA GENIUS MATHS
Above 60%	41.6 %	85%
Below 60%	58.4%	15%

Based on the comparison results in Table 1, it is shown that more than half of the students have obtained marks below 60%, which is 58.4% and only 10 students (41.6%) obtained marks above 60% in the mini test by learning without using "Genius Maths". This result shows that the misconception of the calculation of negative numbers is a major problem among the students. Meanwhile, after they have been exposed to "Genius Maths" and learn via this programme, a second mini-test was given in a post-test and the results showed tremendous improvement. The total of students who obtained the mark above 60% is 85% and only 15% of students obtained mark below 60%, compared to the mark they obtained in the pre-test.

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