EFFECT OF USING SCIENTIFIC CALCULATORS IN LEARNING MATHEMATICS BY SECONDARY SCHOOL STUDENTS IN EMBU DISTRICT IN KENYA

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ABSTRACT
Mathematics plays a crucial role in technological development of any country; attainment in the subject determines the rate of adoption of appropriate technology and industrialization. In Kenya mathematics is compulsory in primary and at secondary school level. Use of scientific calculators was introduced in Kenya secondary schools in the year 2005. However its influence on students’ attitude towards mathematics has not been established. The purpose of the study was to investigate the influence of using scientific calculators in teaching and learning mathematics on students’ attitude towards mathematics in secondary schools in Embu District. The study sought to determine whether there was a difference in attitude towards mathematics when students used calculators. The study employed the descriptive survey research design. The research was carried out in nine secondary schools in Embu District in Eastern province in Kenya. The subjects were form three students and a stratified random sampling technique was used to draw the participating schools. The sample size was 370 students. The instrument used was Attitude Questionnaire for students and a teacher’s Questionnaire, the reliability of these instruments were 0.79 and 0.82 respectively. The raw data was analyzed using both descriptive and inferential statistics. The hypothesis was tested at a significance level of 0.05. The results indicate that use of calculators influence student attitude towards mathematics. The findings of this study are useful to teacher educators and curriculum developers, and the calculators should be maintained in the mathematics class.

Keywords: Attitude, Learning & Scientific Calculator

INTRODUCTION
Despite the important role that mathematics plays in society there has been poor performance in the subject in national examinations. According to Eshiwani (1993) some of the major objectives of mathematics education are the development of thinking ability and logical thought. Due to its importance and use in learning of other subjects, its application in industry and in real life situations, mathematics is compulsory to all students (KNEC, 2001). According to Pomerantz (1997) mathematics has grown substantially in the last fifty years, and the tools available to aid mathematics learning by students have changed dramatically. In an attempt to ease and increase efficiency in mathematical computations slide rules, mathematical tables and now the scientific calculators have been put to use. Calculators are powerful learning tool that allow students to experience the richness and value of mathematics by greatly reducing the need to execute paper-and-pencil computations and algebraic manipulations. The calculator is rapidly becoming an accepted and often preferred mode of computation in everyday life and business at all levels.

Educators do not believe that the calculator is appropriate for use in learning mathematics; regular use may result in weakening acquisition of basic skills and algorithms in computation.
Use of the calculator may hinder development of number concepts and thinking skills, students may become calculator dependant, and sometimes accept incorrect answers just because they are from the calculator (Suydam, 1980). Thus, there is need to establish the effect of using scientific calculators in learning mathematics. Technological advancement has led to development of scientific calculator that has been adopted in teaching and learning of mathematics in secondary schools. The calculator is fed with raw data and then displays the results according to what is wanted without showing the algorithms involved, this denies learners the opportunity to know how to compute, hence the study to investigate the effect of using scientific calculators in learning mathematics by secondary schools students. The following objectives guided the study:

i) Establish availability of the scientific calculator

ii) Establish the efficiency provided by the use of the scientific calculator in solving mathematics problems

iii) Establish the effect of using scientific calculator in learning mathematics

Hypothesis
The hypothesis of the study was:

H01: There is no significant difference in learning mathematics between students who use of the scientific calculators and those who do not use them (α = 0.05).

METHODOLOGY
The study adopted a descriptive survey research design; the independent variable was ‘effect of using the scientific calculator’ and the dependent variable was ‘learning of mathematics’ by secondary school students. The target population was 3,028 form three students in secondary schools in Embu District. Random sampling technique was used to obtain 9 schools stratified as boys’, girls’ and mixed secondary schools with a sample of 370 (152 girls & 218 boys) participants. All the 20 mathematics teachers in the involved schools participated in the study.

The students’ and teachers’ questionnaires were used to provide the needed data; their reliabilities were 0.73 and 0.81 respectively. A mathematics test was administered twice, where calculators were allowed first, then secondly, they responded to same items without using the calculator and showing all the working clearly.

RESULTS AND DISCUSSION
Availability and use of Calculators by students
The data obtained indicate the 89% of the students have a calculator and only 11% who indicated that they have never had a calculator. This tallies with the teachers responses where 95% said students have calculators for use at their disposal. This implies that the calculator is available to almost all the students. On how often students used these calculators, 72% of them indicated that they always use them, 19% sometimes use them and 9% never use the calculator. Thus a total of 91% of students at least use the calculator. A similar number of 92% indicated that they use calculators in examinations. According to Pomerantz (1997) the calculator is essential in learning and teaching mathematics and it is an effective aid when solving problem in mathematics.

Mathematics teachers do encourage their students to use calculator as indicated by 84% the students. Some computations may not necessarily require the calculators and teachers prefer to instruct the students to perform calculations mentally. Students need to be taught to develop good mental estimation skills, internalize concepts and perform simple calculations without calculator. The results of the study are consistent with the findings of Noraini (2002) who...
indicated that calculator should not be a substitute for learning but a tool to let students explore but afterwards the teacher should explain things and justify the mathematics rule.

**Effect of using Scientific Calculator on Learning Mathematics**

The Chi-square ($\chi^2$) was used to test the hypothesis; the obtained computed value was 2.72 while the critical value was 9.49. Thus the critical value is greater than the computed value, hence accept the hypothesis. This implies that there is no loss in using calculators to learning mathematics. According to Torstein and Neville (1985) there is need to help dispel the calculator myths such as calculator use does not require thinking, use of calculator will harm students mathematics achievement, computations with calculators are always faster and calculators are useful only for computation. This will be done by demonstrating that calculators do not think for themselves, not all problems can be solved with a calculator and it is sometimes faster to compute mentally.

A total of 62% of participants in the study indicated that calculators are not complicated to use. Results on Table 1 shows 71% of the respondents accept that calculators make computations easier and faster. This is in agreement with the findings of McClauliff (2004) who claimed that considerable amount of time is saved when students use calculators.

| Table 1: Calculators Make Computation of Mathematical Algorithms Easier and Faster |
|---------------------------------|----------------|
|                               | Frequency | Percentage |
| Disagree                       | 83        | 22         |
| Undecided                      | 27        | 07         |
| Agree                          | 259       | 71         |

Teachers (59%) also confirmed that students take less time in computations when they use the calculators. This implies that a calculator is an effective aid in calculations which enables students to take less time in computations. A calculator is an electronic device that is easy to operate and require simple instruction in order to use.

Data on Table 2 indicate that 59% of the respondent disagree that using calculators make them not to think when calculating, while 31% do agree. This implies that students do use their mental ability as they compute calculations using the calculators. The finding is not consistent with Rey and Arbaugh (2001) who claimed that calculators inhibit logical reasoning of the students. However, Pomerantz (1997) indicated that use of the calculator does not replace mental ability to solve problems but it provides multiple solution techniques, also calculators do not think for students and sometimes it is faster to compute mentally. The calculator influences the students positively by bringing about a spark of interest to otherwise uninterested or bored students. This is confirmed by the responses of students when they were asked whether mathematics is interesting with a calculator. A total of 73% agreed that mathematics is interesting with a
calculator and that they enjoy studying mathematics using a calculator for it generates more enthusiasm about mathematics.

CONCLUSION AND RECOMMENDATIONS

It is concluded that

- Students often use calculators and more so in examinations.
- Teachers accept that calculators motivate learning and they encourage students to use them where necessary.
- Students believe that not all problems require use of calculator; however, they perform better in mathematics and work out more problems when they have calculators.
- When students use calculators they finish their work faster and also it makes mathematics easy, interesting and enjoyable.
- The calculator does not make the students confused but encourages them to think.
- Thus, the effect of using scientific calculators in learning mathematics is positive.

Based on the findings of the study the following recommendations were proffered: calculators should be adopted for mathematics instruction and for use when computing mathematics problems. Implementing calculators in mathematics curricula will allow student to learn more quickly and efficiently while keeping them engaged in what they are learning. By reducing the emphasis on learning computational algorithms, more time will be available to spend on sharpening problem-solving, mental arithmetic, estimation skills and more applications can be considered hence the students who were previously turned off by tedious computations may now be more inspired to explore the richness of mathematics

REFERENCES


