

Teachers' Disposition towards Use of Scientific Calculators in Mathematics Instruction in Meru County in Kenya

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Abstract

Mathematics occupies a core status in secondary school curriculum because it is a key to opening career opportunities for students. Educational technology is recognized as an essential component of the instructional process and thus use of scientific calculators was introduced in Kenya secondary schools in 2005. However teachers' disposition towards use of scientific calculators has not been established. The purpose of the study was to investigate the teachers' disposition towards use of scientific calculators in mathematics instruction in secondary schools in Meru County. Descriptive research design was used and data was obtained from mathematics teachers using a questionnaires. The results indicate that teachers have a positive disposition towards use of scientific calculators in mathematics instructions. This finding is helpful to curriculum developers and they can integrate the calculators in mathematics instructions.

Keywords: Disposition, Instruction and Scientific Calculator

1. Background of the study

Mathematics is seen as the wheels or foundations of development of any nation. Menial tasks should be replaced by working smarter with the help of technology (Brumbaugh & Rock, 2001). According to Porter (1991) 60% of elementary teachers in California District use calculators with students, although the amount of time allotted to calculator activities and the type of activities are very limited. Ruthven (1996) say that ten years after calculator introduction in mathematics curriculum in the United Kingdom many important issues surrounding their use during instruction remained poorly conceptualized by some teachers. Goos, Galbraith, Renshaw and Geiger (2000) reported a similar situation in Austria that when calculators are freely available in the mathematics class, teachers use them in a conservative way. There is no universal acceptance by teachers and administrators of the role of calculators in mathematics education. There are contradictions such as teachers who fear that students using calculators will lose basic computations skills (Spiker, 1991).

There is strong empirical evidence to support that hand-held technology can and should play an important role in mathematics instruction (Smith, 1997). Effective implementation of scientific calculators in instruction necessitates that mathematics content and assessment methods change so that the calculators are used for their intended purpose (Rosenstein, 2002). Despite the prevalence of calculators, however their role in mathematics has not reached the goal of integrating it into school mathematics programs in redefined curriculum.

2. Statement of the problem

Scientific calculators have not yet reached their full potential in mathematics instruction. Mere presence of scientific calculators in the mathematics classroom does not guarantee their effective use during instruction. This has been attributed to many factors that range from shortages of calculators and curricular materials, improper use of calculator by students, lack of training and in-service opportunities. Hence, the need to investigate teachers' disposition towards use of scientific calculators in mathematics instruction in secondary schools.

3. Objective

The objective of the study was to find out teachers' disposition towards use of scientific calculators in mathematics instruction in secondary schools.

4. Methodology

The study adopted descriptive research design; a questionnaire was used to provide the needed information from 36 mathematics in 10 randomly selected schools in Meru County in Kenya. Data obtained was analyzed quantitatively. Likert scale (5-point) was used and conclusions were made based on the majority of teachers' responses in the Strongly Disagree (SD) and Disagree (D) or Strongly Agree (SA) and Agree (A) category. A consensus response was recorded in the questionnaire. The consensus items were defined by over 70% agreement or disagreement responses on the items in the questionnaire (Fleener, 1995). The mathematics teachers' dispositions were categorized into three major themes of cognitive, experiential and affective. Cognitive disposition are beliefs about effects and appropriate use of scientific calculators. Experiential disposition involve the experience with and the use of scientific calculators in instruction. Affective disposition are beliefs about results of using scientific calculators in the classroom instruction

5. Results

The following results were obtained;

a) Availability of Calculators

Data obtained indicate that 83% of teachers agreed and strongly agreed that most of the students have their own calculators. According to National Council of Teachers of Mathematics (NCTM) (1989) calculators should be available to all students at all times. The Kenya National Examination Council (KNEC) indicated that many students displayed inability to use calculators in examinations, though simple basic calculations should be done without the calculator unless otherwise stated (KNEC, 2007).

b) Cognitive Disposition

Majority of teachers (89%) indicated that students take less time in computations when they use calculators. This implies that teachers agree that a calculator is a very powerful and effective aid in calculations if used correctly which enables the student to take less time in computations. Calculators allow students to spend more time using critical thinking to solve problems, and spend less time on tedious computations that the calculators can perform for them. Groves (1997) says that calculators are highly adaptable teaching aid that has the potential to radically transform mathematics teaching by allowing students to experiment with numbers and construct their own meanings. Calculator is an instructional aid in teaching mathematics to explore mathematical ideas and to verify results. Calculators are only tools for doing calculation more quickly was indicated by 75% of teachers, calculators should be used in mathematics homework by 78% also calculators have advantages over mathematical tables when learning mathematics was indicated by 78% of mathematics teachers.

However, 83% teachers disagreed that use of calculators for instruction changes the role of the teacher. This implies that use of calculator does not eliminate the teaching of the basic algorithmic skills and processes of mathematics. Calculator is an important learning tool for exploring number operations. Also, 58% of teachers expressed views that agreed and 36% disagreed that calculators use will cause a decline in basic arithmetic facts. This confirms the negative attitude that teachers have on the effects the calculators have on students learning. This disagrees with findings of Hembree and Dessart (1996) that calculators do not inhibit learning of basic facts but improves students' skills. Calculator serves as a computation tool to help students perform tedious computations.

Teachers were asked whether the students should not be allowed to use a calculator while taking mathematics test. Results in Figure 1 shows teachers prefer students to have calculators during mathematics tests. Hembree and Dessart (1996) emphasize that to deny students use of calculator for both instruction and testing is an antiquated policy that should be changed. Although, according to Zand and Crowe (1995) teachers fear that student will not master basic concepts and this plays an important role in limiting calculator usage.

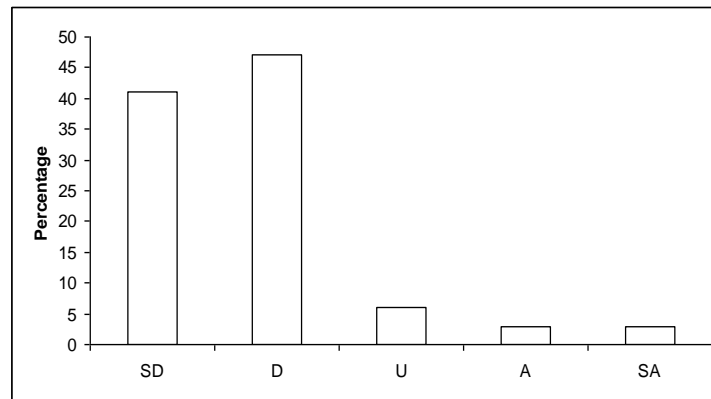


Figure 1: Students should not Use Calculators in Mathematics Test

There was consensus when teachers were asked whether all students should learn to use calculators since, 80% strongly agreed and 20% agreed. All teachers agreed that a calculator is a tool that students should be taught the right way to utilize it. This outcome is consistent with Terranova (1990) findings that students need training in the usage of calculator before they can utilize them in their classroom. The pedagogical shifts that are necessary for successful teacher implementation are not only mediated by mastery of skills to use scientific calculators, but also by their personal philosophies of mathematics content and mathematics teaching and learning (Goos *et al*, 2000).

c) Experiential Disposition

Consensus was found on several items as shown on Table 1 on experiential disposition. This implies that teachers are proficiency in using calculators, they know how to use effectively and that they are competent to teach using calculators.

Table 1: Consensus Items

Item	% Agreed
I am proficient at using scientific calculators.	71
I know ways I can use the calculator effectively in classroom	75
I feel competent to teach students how to use calculators effectively	77

Since, data obtained also indicate that 3% of teachers disagree that they have lots of ideas about how to use the calculator while 34% are undecided this indicates that there is need for in-service training to equip teachers with necessary skills on usage of calculators. In absence of professional development on instructional technology and curriculum materials that integrate technology use into lesson content, teachers are not particularly likely to embed technology-based or technology-rich activities into their courses (Ferrini-undy & Breaux, 2008).

d) Affective Disposition

When teachers were asked whether using calculators will make students work harder, 33% strongly disagreed and 36% disagreed. Thus a total of 69% at least disagreed which, indicates a negative inclinations of teachers calculators. This disagrees with the findings of Porter (1991). Also 76% of teachers at least agree that calculators make mathematics enjoyable. This shows that calculators provide a rich mathematical environment for students to explore and promote the development of number sense. A calculator also makes students comfortable to learn mathematics. This agrees with the findings of Pomerantz (1997) who concluded that calculator generates more enthusiasm about mathematics and makes students enjoy what they are learning. About 72% of the mathematics teachers at least agreed that calculator makes mathematics fun while 61% agreed that calculators motivate students to learn mathematics. This is consistent with the conclusion of Noraini (2006) who asserted that using calculators in learning mathematics provides the complex and relevant stimuli necessary to allow learning to occur easily.

6. Recommendations

Based on the findings, it is recommended that;

- i) The Ministry of Education should set taskforce to review policies regarding the use of calculator and organize seminars that concern calculator use in mathematics instruction.
- ii) Curriculum developers should set topical requirements of scientific calculators so that the students can learn to use calculator as a tool to aid computations.

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