Calculator Use in the Mathematics Classroom

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One of the most common difficulties which high school mathematics departments face is the determination of a calculator use policy. Strong convictions, for and against the use of calculators in the classroom, abound. While much research has been done and much has been written about the question of calculator use, there is still debate and disparity within our schools. The search for a one-rule-fits-all solution is, however, misguided. As with all lessons, each instructor should look to the individual lesson objectives for guidance. Unless the lesson objectives are specifically undermined by the use of calculators, students in the contemporary classroom should be allowed to utilize these powerful tools.

According to the National Council of Teachers of Mathematics (NCTM, 2004, ¶ 1), "Electronic technologies – calculators and computers – are essential tools for teaching, learning and doing mathematics." This seems like a straightforward endorsement of calculator use. And yet, NCTM's position is not always accepted as the best position for our students. Some teachers view the use of calculators as a deterrent to the learning of mathematics. In a study by Dion et al. (2001), thirteen percent of Algebra I teachers surveyed did not allow any calculator use in their classes. What could be the reason for this? According to Eric Milou (1999, p. 136-137), "the use of the graphing calculator is still controversial to many algebra teachers…. Many teachers may feel that Algebra I students become too dependent on the graphing calculator and are thus unable to master algebraic manipulations so crucial to the algebra course of study."

Is this a legitimate concern? NCTM, obviously, says no. In their *Principles and Standards for School Mathematics* (2004, ¶ 2), it is argued that "Students can learn more mathematics more deeply with the appropriate use of technology." Milou (1999, p. 133) agrees. "The results of most studies suggest that the use of the graphing calculator in teaching and

learning is beneficial in terms of students' level of understanding and achievement in algebra and precalculus."

In addition to the pedagogical ramifications of the issue, it is also important to consider the real-world consequences of calculator use. Are we robbing students of opportunities by making them more calculator-dependent? Absolutely not. The simple fact is that our society is becoming more and more technology driven. Pocket calculators are so commonplace that it would be foolish to deny their existence. In addition, as scientific and graphing calculators become more advanced, a great deal of skill and training is needed to use them efficiently. Indeed, not allowing our students to use these calculators in the classroom is robbing them of the tools they will need to succeed in the society of the twenty-first century.

One of the most important skills that today's teachers in training are taught is how to write learning objectives. Objectives are the foundation upon which all lessons are built. With regard to technology, specifically calculators, in the classroom, we should also look to the objectives for guidance. Morrison and Lowther (2002) emphasize that the technology used in the classroom should match the objectives for the lesson. Often, in their zeal to utilize available technology, teachers design their lessons around computer drill-and-practice and tutorial software. Morrison and Lowther argue that this is a misuse of the power of technology. Instead, after the lesson objectives have been defined, teachers should determine if the objectives can be attained with the assistance of technology.

This philosophy adapts very well to calculator use. Teachers need to ask themselves, "Will a calculator help my students achieve this lesson objective?" If so, there is simply no reason to withhold them. All too often, teachers decide against the use of calculators, either out of personal philosophy, or in compliance with a school policy. As a consequence, they are

forced to adapt the lesson objectives to accommodate this rule. They are, in essence, allowing their personal convictions to determine what and how students should learn, as opposed to allowing students' needs to dictate the classroom atmosphere. Perhaps worse, some teachers choose to restrict the use of calculators and do not adapt the classroom objectives in response to this. Their students run the risk of becoming bogged down with paper-and-pencil calculations that are unnecessarily time consuming and distracting from the true lesson objectives.

It is natural to be wary of advances in technology. It is also natural to want to protect students from using calculators as a crutch in their mathematical development. But research and scholars tell us that the use of calculators is far from detrimental to students. It is, in fact, beneficial and a necessary part of their mathematical instruction. Teachers must be willing to consider how the use of calculators will benefit their students on a lesson-by-lesson basis. To deny students practice using calculators is to deny them the tools necessary to excel in today's schools and society.

References

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