EDITORIAL

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Reform: to amend or improve by change of form or removal of faults or abuses. There continues to be a great deal of discussion concerning "reform" of the mathematics curriculum. This discussion takes place not only in professional journals and conferences, but in the more general media, as well. In some cases the discussion has become strident as we are encouraged to take a stand in favor of or against reform.

Over the past year, I have been involved in a project in which high school mathematics teachers and college/university mathematics faculty have been investigating four of the "reform" mathematics curriculum projects. These projects, funded by the National Science Foundation, have been piloted in a number of schools around the country and the year 1 and 2 materials are now being sold by commercial publishers.

Much of the criticism of mathematics reform has centered on these "new" curricula. While there are differences among the materials produced by these projects, there are more similarities. In general, these materials emphasize an integrated curriculum (year 1, 2, 3, and 4 instead of Algebra I, Geometry, Algebra II, etc.). Further, these curricula are structured around a constructivist view of learning — the learner must construct meaning for mathematical concepts and relationships from his/her experiences. Thus, there is an emphasis in these materials on individual and group "investigations," the use of concrete models and calculators/computers, and using a variety of assessment tools and procedures. Finally, these curricula emphasize that mathematics should be viewed as more than computation and imitation of procedures; mathematics involves problem solving, applications, and relationships.

After investigating these curriculum materials and talking with the directors of the projects and teachers who have been/are using these materials, I have some initial observations about this "reform controversy." First, I do not believe that these materials eliminate fundamental paper and pencil skills from the curriculum. In some cases the paper and pencil algorithms are embedded in the students activities and investigations. Teachers who are using these materials tell me that they do, at times, have to supplement these materials with "drill and practice." These same teachers emphasize that it is easier to supplement drill and practice than it is to supplement relevant, interesting investigations and applications. Certainly, technology provides tools for students that may justify a decreased emphasis on paper and pencil techniques. I believe that the question is not "should technology be used?" but "how can technology best be used?" in the mathematics curriculum.

A second important point to be made is that these materials require a teacher to have a more thorough understanding of mathematics. Many teachers are not very knowledgeable about some of the topics emphasized in these curricula (probability, statistics, discrete topics). Further, in these curricula, the mathematics concepts and relationships are often not as explicit. A teacher must understand mathematics at a level that will enable her/him to help students draw the mathematics out of their investigations and observations. Students do not necessarily learn mathematics because they have engaged in an interesting investigation/experiment. The teacher much develop crucial follow–up questions and activities that will help the students draw "closure" to what they have done. While the students' understanding must grow out of their experiences and observations, a teacher with a thorough mathematical understanding will be needed to help students "see" the mathematics of the activity and make connections with previously learned concepts.

Support for or opposition to these materials should not be based on emotion or anecdotal events. Many critics of these curricula point out that these materials have not demonstrated that they improve students' mathematics achievement and understanding. My colleague, Bob Reys of the University of Missouri, points out that more "traditional" textbooks have never been held to this requirement, i.e. – prove that your book improves achievement and understanding before we will use it. I do believe, however, that we should look at the research that focuses on the effects of using reform curriculum materials. While the initial results are tentative, the data generally show that students using these materials perform as well or better (on standardized achievement measures) than students from a more traditional curriculum. On measures of problem solving/applications, students from these programs have performed significantly better than students from traditional programs.

Finally, we must not allow curriculum decisions to be made by persons who are simply not qualified to make such decisions. Certainly, parents, students, principals, superintendents, and school boards should be a part of the discussion concerning the mathematics curriculum. These groups, no matter how well intentioned they may be, however, should not be overriding thoughtful curriculum decisions made by mathematics teachers. Those of us who teach at the university level must join in the discussion and provide input and support for high school teachers who are facing increased pressure from many directions concerning the mathematics curriculum.