INTRODUCTION

Thank you to Dolan Professor of Mathematics Ben Klein of Davidson College for agreeing to read my testimony and to Jennifer Graban and the organizers of this meeting for providing this opportunity. I wish the distinguished panel well in this effort, so important to the future of our nation and the millions of children who will be directly impacted.

My own experience includes five years of mathematics teaching in high school, twenty-five years in departments of mathematics, and fourteen years in colleges of education. It also includes short term teaching mathematics at every level from Kindergarten through advanced calculus and frequent observations in urban, rural, and suburban schools throughout the world, as well as authoring or coauthoring eighteen textbooks for three major publishers, refereed articles in eight major journals, and the 1989 NCTM Curriculum and Evaluation Standards.

From this perspective I wish to share several observations and recommendations.

OBSERVATIONS

1. Collaborations like the work of this panel are exactly what is needed. While successful collaborations between mathematicians, mathematics educators, and classroom teachers are possible and do exist, energy is often wasted on nonproductive efforts, such as ad hominem attacks on those addressing the challenges of mathematics education.

2. Polarization is a major impediment to developing a sound mathematics curriculum. Some programs seem to ignore the importance of basic skills, while others are obsessed with it. What we hear from some today, sounds too much like the opening of *Hard Times* where Dickens describes the classroom of 1854 in this way: “NOW, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else.” Dickens aptly pointed out the negative consequences of this approach.

3. With an emphasis on algebra, attention to probability and statistics is lacking. Even within algebra, exponential functions, with important applications in the everyday lives of all students are often neglected. Students who struggle for
weeks to factor binomials too often are not introduced to the concepts of correlation and exponential functions which have major applications to their health and management of money.

4. Though according to U. S. Census figures 25% of the population lives in rural areas, this segment of the population is often overlooked when educational changes are proposed.

5. Technology which supports computation and enhances concept learning and provides new approaches to problem solving is now readily available. Just as it is now accepted that technology has changed the way we teach square roots, trigonometry, and logarithms, technology, which already exists in the form of hand-held computer algebra systems, should impact the way we teach students to manipulate algebraic expressions, solve equations and find derivatives.

6. As an algebra teacher in high school, I saw the deficiencies in students emerging from middle school. As a calculus teacher in university mathematics departments, I saw the deficiencies in students emerging from high school. As a teacher of methods courses for prospective teachers in colleges of education, I saw the deficiencies in students emerging from the courses taught in departments of mathematics. Students are taught to manipulate symbols for fractions, algebraic expressions, and derivatives with virtually no understanding of the underlying concepts or how to apply them. Panel member Liping Ma has reported that in the case of dividing fractions this is true even for an astonishing number of American teachers!

RECOMMENDATIONS

1. Avoid the negative impacts of a “nothing but the facts” approach to teaching.
2. What is needed is a balanced -- or better yet a “best of both” -- approach to skills vs. concepts and problem solving.
3. Look to the future needs of students who will have increasing availability of technology so they know how to use it appropriately. Avoid the extremes of ignoring it or blindly depending upon it.
4. Do not let the curriculum for college-bound students in science and engineering drive what is done for all students, including the non-college bound.
5. Sound mathematics should prevail at all times, but not at the expense of ignoring individual differences or the varied cultures that impact learning. In particular, do not forget rural students.
6. Endorse a broad curriculum including, in particular, exponential functions and probability and statistics, and be sure to call for a wide range of assessment practices that align with this curriculum. Build positively on the Panel’s expertise in achieving mathematical power for all students in a technological society.

Respectfully submitted,
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