

The real Soviet curriculum may be different from the textbooks, but U.S. mathematics education does need improvement.

Soviet Mathematics Education: *A Response*

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Although I agree with Wirszup that the ambitious improvements being attempted by the Soviets certainly pose a challenge to the technological leadership of the United States, I feel that we should react cautiously.

As any supervisor knows, the written curriculum of course guides and textbooks may bear little resemblance to the real curriculum which is actually taught in the classroom. How many high school geometry students truly understand and appreciate the nature of a mathematical proof and the part it may play in the development of Euclidean geometry, even though this may be explained in the textbook and listed among the objectives of the course? Similarly, how many first-year calculus students really understand the proof of the mean value theorem even though it is given in the textbook and they may even be asked to reproduce it on a test? These same concerns may well apply to the Soviet mathematics curriculum. Indeed, Wirszup suggests that the attempt to provide such a sophisticated mathematics program for all students is causing frustration for many students, parents, and teachers, much as did the "new math" in this country during the 1960s and 1970s.

The evidence provided does not necessarily suggest that our mathematics instruction is inferior to that of the Soviets. In fact, our best mathematics students stand up to any in the world as evidenced by their per-

formance in the International Mathematical Olympiad competitions.¹ It should be noted also that even during a time of decreased emphasis on mathematics and science, enrollment in high school calculus has increased significantly in the U.S. (from 55,000 in 1972-73 to 105,000 in 1976-77). Of greater importance, though, is that these accomplishments have been achieved through choice and encouragement rather than by compulsion as in the Soviet Union. In the Princeton City School District, for example, 85 percent of the students in grades 9-12 are enrolled in mathematics even though only one year is required during the four high school years. It should also be noted that the U.S. educational system works to provide the best education possible for all students, regardless of background or ability, with the goal of allowing each individual to develop as a productive and satisfied member of our society.

Despite these figures, there is a real need to improve the mathematics preparation of our students. We are moving into an era where greater number competence will be required of all citizens. The widespread availability of calculators and computers makes it possible to process numerical information rapidly and easily, thus broadening the range of applications of mathematics. This increased ability to use numerical information will enable the U.S. to improve productivity only if workers are increasingly able to understand and apply mathematics concepts. This implies that a higher level of mathematical competence will be required of a greater number of our citizens.

In order to meet this increased need for mathematical competency, I recommend that:

- More time should be devoted to mathematics in the elementary grades. Nationwide, U.S. students average 41 minutes per day of mathematics instruction in grades K-three, and 51 minutes per day in grades four-six. This is not sufficient time to allow the necessary concept development to occur in addition to providing the "basic skill" level being expected by the public.

- The geometry and applications content, which are given excellent treatment in many of our present elementary textbook series, should be taught thoroughly. I suspect that these topics are often skipped as there is not sufficient time in the daily schedule.

- The Position Paper on Basic Mathematics Skills of the National Council of Supervisors of Mathematics should be reviewed by all administrators, supervisors, and teachers as they decide what basic skills in mathematics should be emphasized.

- Increased attention should be given to providing thorough preparation in teaching mathematics to elementary teachers and encouraging college students with strong mathematics backgrounds to enter secondary teaching. At the present time there is a shortage of qualified secondary mathematics teachers, and too many elementary teachers still feel uncomfortable with mathematics.

- Topics such as probability and statistics, problem solving, applications, and the use of calculators and computers should be integrated into the mainstream of the mathematics curriculum beginning in the elementary school. These topics, recognized as providing an important part of the basic mathematics content which every citizen should learn, are often taught only to the brighter students as enrichment topics or courses.

- Proper encouragement should be given to secondary students to take as much mathematics as they can. Business and industry should be called on to assist in this task, as they are best able to say what specific mathematics competencies are needed by their workers. ■

¹ Results are reported annually in the *American Mathematical Monthly*.

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