SUPPORTING MATHEMATICS AND SCIENCE TEACHERS THROUGH TECHNOLOGY

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Over the last decade, numerous national reports have called for reform in the technical subject areas of mathematics, science and technology education (e.g., National Education Goals Report, 2000). A consensus has emerged that indicates the key for change in our schools is not only integrating technology into classrooms, but also supporting teachers in their practices and professional development (e.g., Roblyer & Edwards, 2000 Newby, Stepich, Lehman, & Russell, 2000; Atar, 2001). However as the results of student performance in mathematics and science indicate (e.g., NAEP), there still appears to be enormous needs for improvement. As one example, less than half of American teachers feel "very well-prepared" to meet the challenges of rapidly increasing technological changes and greater diversity in the classroom and "although many educators and policy analysts consider educational technology a vehicle for transforming education, relatively few teachers (20%) reported feeling very well prepared to integrate educational technology into classroom instruction" (US Dept. of Ed, 1998). The purpose of this paper is to present a number of ripe opportunities for staff development in the areas of mathematics and science education.

We believe that as the world moves toward a global economy, K-12 students must be prepared in mathematics and science. These subject areas are seen as gatekeepers for admission into college and ultimately obtaining productive careers. Moreover, the utilization of advanced technology is becoming an increasingly important skill for workers in the 21st Century. In our view, to increase mathematics and science literacy of students will be highly dependent on investments by teachers' in learning and using new technologies in school curricula. The positive effects of utilizing technology resources with students are well documented. (e.g., Songer, 1998; Roblyer et al., 2000; Settlage, 1995; Linn, 1998). In a collective sense, it seems that increased attention on technology may also closely influence effective ways of teaching mathematics and science. We further believe that utilizing advanced technologies to enhance classroom environments offer exciting possibilities for involving students in learning.

PROFESSIONAL DEVELOPMENT TRENDS

In the following Figure 1, we present important information obtained from public sources to illustrate the longitudinal trends of staff development in the areas of mathematics, science and computer education among K-12 teachers in Florida. The graphs were developed from two data sets that are required of the 67 school districts reporting to the Florida Department of Education (FLDOE). Essentially, we asked officials at FLDOE to crosswalk these two data sets that include: 1) The Number of Elementary, Middle and High School Teachers which is a data element compiled by Management and Information Services (MIS) in the Division of Public Schools to monitor personnel; and 2) Inservice Contact Hours that are generated by the Division of Human Resource Development to qualify inservice teachers for re-certification of their professional teaching licenses.

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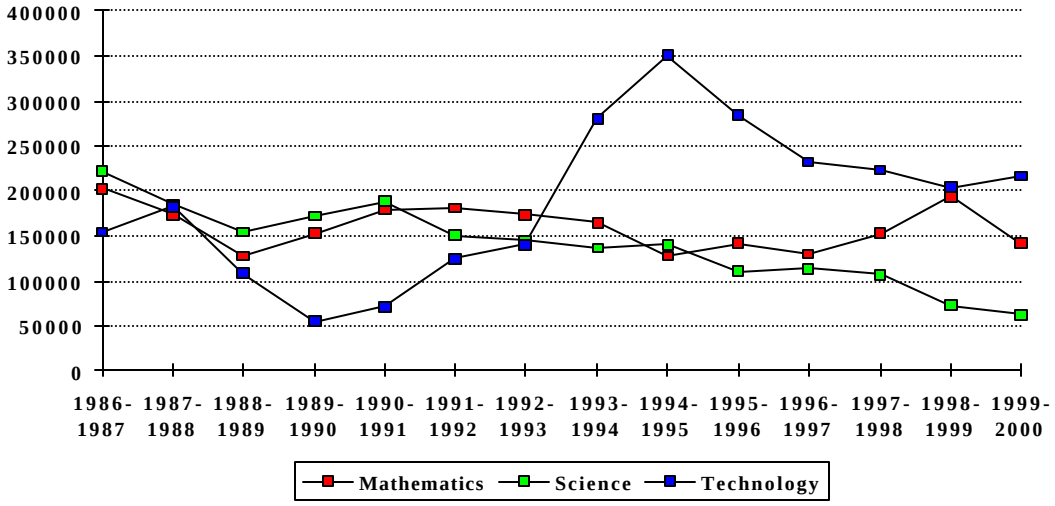
Figure 1. Inservice Contact Hours in Mathematics, Science and Computer Education completed by all Elementary, Middle and High School Teachers in Florida in the Years 1986-2000.



From Figure 1, we can see that in the ten-year period between 1986-1996, there was a longitudinal decline in the number of contact hours being spent by K-12 teachers in staff development activities in mathematics. In 1996, the number of contact hours with K-12 teachers in mathematics began to rise reaching a peak in 1998 (the same level achieved in 1986). In the area of computer education, which FLDOE officials report includes the vast majority of hours in technology education, a steep decline occurred between 1986 and 1990. Then, between 1990 and 1995, inservice hours with teachers in technology showed a significant increase followed by another steep decline. Unfortunately, in the area of science, inservice contact hours with teachers have never improved since 1986-87 levels. Importantly, what is not shown in Figure 1 above, is that the number of K-12 students in Florida has dramatically increased by nearly 1 million and the number of K-12 teachers has increased by over 30,000 teachers. Thus, the corresponding ratio of contact hours per teacher has also decreased proportionally in all areas.

There are some fluctuations in the upward trends that deserve comment. That all areas begin to scale upward during the 1988-89 School Year might be directly correlated to emphasis being given to mathematics, science and technology by the Florida Legislature. After legislative mandates directed its creation in 1988, the FLDOE developed *A Comprehensive Plan for Improving Mathematics, Science and Computer Education in Florida*. This document was adopted by the Florida Board of Education and all 67 school districts in 1989. Also in 1988, the Florida Legislature strongly supported many new staff development fully funded initiatives in these subject areas. Later however in 1991, the states' student enrollment began to escalate and by 1991, the Legislature chose to end appropriations for nearly all of the programs created in 1988.

RECOMMENDATIONS

Pilot testing of the high stakes Florida Comprehensive Assessment Test (FCAT) began in 1997 with full implementation in 1998-1999. In our view, the mathematics peak seen in Figure 1 is a direct response by the Florida Education System to prepare for the FCAT mathematics sub-test. Recently, the legislature of the State of Florida decided to include science content in its student-testing program called FCAT (Florida Comprehensive Assessment Test). Pilot testing of the Science FCAT will begin in 2002 with full implementation in 2003. No doubt that with this new legislative mandate, science teachers in the State of Florida will face new pressures to revise their curricular practices consistent with the changes in FCAT. In this regard, we are hoping that teachers will be given enough time and support as they change their practices and new roles in the classroom. We believe that this support would include professional development in both science content as well as technology.

In our view, the content areas of science and mathematics are uniquely compatible discipline areas for integrating innovative technologies into school curricula. Specifically, middle schools in Florida will seek assistance for improving student performance on FCAT and virtually all schools in the state will immediately need broad-based support and professional development in science due to a longitudinal decline of inservice activities with teachers that began in 1986.

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