SUPPLY AND DEMAND IN MATHEMATICAL SCIENCES

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The employment picture is quite bright for students majoring in mathematical sciences, but the trend in decreasing student interest in mathematical sciences does not bode well for the nation as it tries to remain competitive in business and industry.

Student Interest

Most students interested in mathematics express interest in majoring in mathematics, statistics or engineering in college. The graph in Figure 1 shows the interest expressed by students when taking the SAT test in their senior year in high school [2]. As the graph indicates, there has been a steady decrease in interest in mathematical sciences and engineering over the past five years, with a precipitous decrease in interest in computer and information sciences.

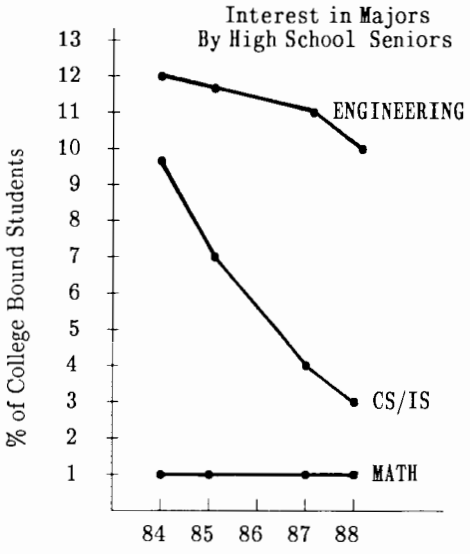

Figure 1

Since trends in numbers of graduates will lag trends in interest among high school students, we will continue to see a decline in the number of graduates in mathematical sciences and engineering for at least another five years despite any efforts to reverse this trend.

A more careful examination of the data (see Figure 2) reveals that, of those expressing interest in computer or information sciences, the percentage of women

has dropped from 42 to 37 percent [2]. This together with the extremely small number of minority students interested in mathematical sciences and engineering are issues of special concern. This concern is amplified in light of the fact that demographers predict that within 15 years, approximately one third of all high school graduates will be minority students and that white males will be a minority among high school graduates.

Areas of Interest Expressed by Seniors Taking the SAT

	1984	1985	1987**	1988
Engineering				
# students	105,468	103,317	109,437	106,958
% students	12 %	11.7%	11 %	10 %
% male/female	84/16 %	84/16 %	84/16 %	83/17 %
CS/IS				
# students	85,254	62,697	36,378	34,362
% students	9.7 %	7.1 %	4 %	3 %
% male/female	58/42 %	63/37 %	65/35 %	63/37 %
Mathematics *				
# students	9,668	9,714	7,114	7,112
% students	1.1 %	1.1 %	1 %	1 %
% male/female	51/49 %	51/49 %	52/48 %	52/48 %

* Statistics is not listed as an area of intended study on the SAT. Thus, presumably, the category "Mathematics" includes students interested in statistics.

** Comparable data for 1986 were not reported by the College Board.

Figure 2

Positions in the Mathematical Sciences

At the risk of oversimplification, I would like to describe the role of mathematical sciences in business and industry. Computing, especially application systems development and maintenance, is by far the most pervasive use of mathematical sciences in business and industry. This is true for large corporations and small businesses. Classical mathematics such as applications of calculus and differential equations is done largely by engineers who understand the application. For example, the mathematics involved in modeling a distillation column in the petrochemical industry usually is done by chemical engineers. Statistics pervades all large business and industries, since all companies are involved in design of

experiments, or the collection and analysis of data. Finally, expertise in operations research is found in all large businesses and industries for to help with applications such as data based decision making, inventory control, scheduling, and optimization. In a large corporation, there typically will be a group of statisticians and a group of operations research analysts who serve as consultants to the rest of the corporation. This group would generally have personnel trained at the baccalaureate, masters, and doctorate level.

Secondary and higher education are other significant employers of people trained in the mathematical sciences. Secondary education has need for graduates in mathematics and computing, while higher education has need for persons with advanced degrees in each of the areas mentioned above for business and industry.

Employment Outlook

In most instances, student interest follows employment opportunities. However this is not the case in mathematical sciences and engineering. While interest declines, the need for graduates in the mathematical sciences and engineering continues to increase for the foreseeable future.

The table in Figure 3 (taken from the Spring '88 issue of the *Occupational Outlook Quarterly*) gives the number of positions in 1986 and a projection for the year 2000 for engineers, computer programmers, computer systems analysts, operations research analysts, mathematicians, statisticians, and actuaries. It also gives the percent increase in each of these professions.

Employment Opportunities in Engineering and Mathematical Sciences

	1986	2000	Growth	Percent Growth
Engineers	1,371,000	1,815,000	444,000	32 %
Computer Progr.	479,000	813,000	334,000	69 %
Systems Analysts	331,000	582,000	251,000	76 %
OR Analysts	38,000	59,000	21,000	54 %
Mathematicians	20,000	24,800	4,800	24 %
Statisticians	18,000	22,400	4,400	24 %
Actuaries	9,400	13,900	4,500	48 %
Totals	2,266,400	3,330,100	1,063,700	

Figure 3

In engineering the greatest area of opportunity and growth is electrical engineering because of the increased demand for computer systems, communications equipment and electronic computer goods. Other engineering areas with high growth rates are manufacturing engineering and mechanical engineering. Much of this growth will stem from investment in manufacturing industries in order to increase productivity and quality while holding the line on costs.

Opportunity for employment in computing will be bright for those with college or advanced degrees in computer related disciplines. The large growth in opportunity projected among computer systems analysts and computer programmers will be greatest for college graduates who have training in systems analysis, programming, as well as application areas. At the bachelors level the greatest opportunities for baccalaureate degrees in mathematics and statistics will be for graduates who also have strong backgrounds in computing. The continuing shortages of Ph.D.'s in mathematics and statistics will provide bright opportunities in these areas. Opportunities for actuaries are expected to increase rapidly because of the rising costs of health care and the increasing age of our population which is causing reevaluation of health and pension plans as well as new forms of insurance. Opportunities for operations research analysts exist at all degree levels as competition increases and companies increase their use of data analysis, decision making, optimization, and modeling as a corporate strategy to gain a competitive advantage.

For a person in any profession in the mathematical sciences, the ability to communicate orally and in writing, to use computing, to understand the business context, to apply problem solving skills, and to change and grow will continue to be keys for success and advancement.

Conclusion

Opportunities and demand for graduates in the mathematical sciences and engineering are increasing while interest among high school students continues to decline. This will result in excellent opportunities and salaries for students who choose careers in these areas. However, unless the trend in decreasing student interest is reversed, there could be serious repercussions in American companies' ability to remain competitive in a world market of goods and services.

References

[1] "2000 Overview", *Occupational Outlook Quarterly*, Spring 1988, pp. 8-21.

[2] The College Board, *National Report College Bound Seniors: Profile of SAT and Achievement Test Takers*, 1984-1987.

[3] U.S. Department of Labor, Bureau of Labor Statistics, *1988-89 Occupational Outlook Handbook*, August 1988.

MATH SCRAMBLER

Unscramble these four mixed-up math terms, one letter to each blank:

D E B U C _____ _____ _____ _____ ☐

A T L O T _____ _____ ☐ ☐ _____

S U B A C A ☐ _____ ☐ _____ _____ _____

N Y E T T W _____ ☐ _____ _____ _____ ☐

Now, rearrange the letters in the boxes to form the answer to the riddle below:

WHICH WAY DID THE STATISTICIAN GO ?

SHE WENT "_____ _____ _____ _____ _____ _____ _____"!

Answer is on page 23.