Report of Working Group 8 – The Needs of Industry in a Mathematics Education

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The Working Group format was that of a discussion group to allow a free flowing conversation in order take best advantage of the skills and experiences of the participants.

The focus was on the skills needed by, and the employment opportunities (outside of the teaching) for, Bachelors prepared mathematics graduates. As many math programs are built with the goal of producing students for graduate programs, this perspective was stimulating and thought provoking. In fact, the discussion centred on the concept of the clear identification of math careers and of the mathematician.

The following are some of the skills required by industry identified through the experience of the participants.

- Statistical analysis, including survey methods
- Data mining for targeted distribution of publications and advertising.
- Simulation and Operational Research, scheduling
- Financial Mathematics
- Fluid dynamics, finite element methods / partial differential equations
- Modelling
- Critical thinking

While it was suggested that the inclusion of mathematicians is key to productivity issues, it seems that many of the key skills are not necessarily in, what we would call, the exclusive domain of mathematicians, e.g., many industrial employers would expect a solid grounding in statistics and a good comfort level with computing. This raises the question of distinctions between, for example, computer scientists, statisticians, and mathematicians. If industry hires for a skill set, and if it matters little how the skills are obtained, then we should ask why a math degree is more desirable than a degree that requires a strong math component. In fact, it is the pervasiveness of our discipline across all the sciences and engineering that is its strength, and, its weakness.

It was noted that if we could convince industry even of a ratio of, say, 20 engineers to 1 mathematician, then we would improve the career opportunities for mathematicians.

Perhaps we need to differentiate a mathematician from an engineer, a computer scientist, and a statistician. If we cannot differentiate, how can we expect a differentiation from industry when they seek employees? Perhaps we only need to recognize and promote the concept that an education in mathematics, like all university programs, leads to increased employment opportunities. Or, perhaps we should be more proactive and give a clear definition of a professional mathematician and promote the skill sets that mathematicians bring to an organization. That begs the questions, “can we define what we mean by a mathematician?” We can start our search with examples provided by the Canadian Operational Research Society, the Canadian Association of Physicists, and the Society of Actuaries.

We can also help the process of recruiting students to mathematics and of selling math graduates to industry through the creation of a careers database. To accomplish this we need to take advantage of, and continue to develop, links with our math alumni. We would have to be proactive and aggressive in getting this information to the secondary school students, teachers and guidance counsellors; and to employers.

Of course, we would have to be ready to perhaps develop new programs to adjust to the information we receive from our alumni and their employers, making sure that we deliver the graduates that will be in demand. A side benefit of such a data collection exercise is that we may be able to articulate the needs of society for mathematicians.

Recommendation

1. A survey is needed to determine the industrial / government / business needs for mathematicians. The National Societies and Institutes might form a partnership to complete this task. Human Resources Development Canada might also have an interest. This could include a survey of all bachelor graduates of math programs to determine their career paths and successes. The survey could be patterned after the SIAM report from several years ago (SIAM report on mathematics in industry, 1998).