

Was it Something I Said

Most Important Thing Our Profession Can Do

By Vijay Mehrotra

Softly but steadily, the High School Operations Research project (HSOR) has grown into a potential mass movement with major social implications. Until recently, I knew nothing of it, and I suspect most people reading this are equally clueless. Here, I'll try to describe what HSOR is, where it came from, and why it is important to both our profession and our economy. With a little luck, it is likely to grow dramatically in scope and importance in the next decade.

HSOR didn't begin with Ken Chelst, but it likely would not have evolved nearly as well without him. In the beginning, Chelst recalls, Frank Trippi (as head of the Public Affairs Committee) had the vision to create workshops demonstrating various O.R. techniques for high school math teachers as part of the ORSA and TIMS conferences. Trippi's instincts were right on: teachers who attended these workshops generally found them interesting.

At the 1994 ORSA/TIMS conference in Detroit, for which Chelst was the general chair (his day job is professor of O.R. in the Department of Industrial and Manufacturing Engineering at Wayne State University), there was a huge turnout of teachers who described the presentations as "new and novel." Their major complaint was that they did not have compelling and completed course materials, which made it difficult to actually incorporate what they had learned into their classes.

Sensing a need, Chelst set out to develop some "classroom-ready" materials that high school teachers could use to bring O.R. to the classroom, supplementing current curriculum. With small grants from the National Security Agency ("NSA is the largest employer of mathematicians in the country," Chelst points out) and encouragement from the Public Awareness Committee, Chelst decided to create a few classroom modules, where "each [module] consists of one or two student activity worksheets (four to six pages) in which students discover mathematical concepts while solving a scaled down problem set in a context they can relate to. In addition, each module contains 20 to 30 pages of teacher resource material" [1].

Chelst eagerly invited others along on his journey, and this welcoming spirit has been critical to its success. His primary collaborator was Tom Edwards. Prior to completing a Ph.D. and joining the Wayne State mathematics department, Edwards had been a high school teacher for more than two decades. He has proven to be an ideal collaborator, bringing his own curricular perspective as well as a personal "been there, done that" credibility with secondary math teachers. In particular, he has taken the lead in engaging high school teachers to contribute to the writing of the modules and support materials, which has contributed greatly to the quality and usability of the modules.

Edwards himself is an interesting data point. Before meeting Chelst, he had never heard of O.R., despite having a background in mathematics and engineering. However, upon being exposed to a few O.R. methods, he quickly saw the potential to engage high school students by addressing "real world" problems.

"Every math teacher has been asked over and over again 'when are we ever going to use this stuff?' O.R. problems answer that question really well," Edwards points out, "and that's worth an awful lot to a high school teacher."

Years of Hard Work

Flash forward, through years of hard work by Chelst and Edwards and many other college professors and high school teachers, through small but vital grants that enable a limited amount of writing and distribution of materials, through the creation of the www.hsor.org Web site and the growth (first steady and recently dramatic) in its traffic. To date, 13 content-rich case-based modules have been created and, in 2005, the first 10 modules (covering topics like linear programming, queues, networks, simulation and decision theory) were published in a book entitled "Does This Line Ever Move?: Everyday Applications of Operations Research" [2].

Meanwhile, several other forces were conspiring to push HSOR forward. Since the launch of the Web site, strong word-of-mouth has led to burgeoning interest and adoption of these modules among high school teachers in all sorts of places, leading to opportunities for Chelst, Edwards and their growing network of colleagues to present scores of teach-the-teacher workshops around the country. In addition, America's businesspeople, newspapers and politicians continue to speak out about the growing need for mathematics and science education to drive economic competitiveness and innovation. Most recently, Colorado and North Carolina passed legislation that requires four years of high school mathematics for admission into their state universities, regardless of a student's eventual major. Michigan and Ohio are considering similar proposals. Clearly, not all of these students will be cut out to take differential calculus in their fourth year.

With this in mind, the growing HSOR movement has settled on its next goal: a full-year course covering O.R. methods as well as related topics such as probability and statistics, all taught in the context of real problems and backed by materials developed in a collaboration between O.R. domain experts, learning specialists and high school teachers.

The kicker: students really like this stuff, even the non-mathematical ones. Based on his experience, Edwards confidently believes that "we can make the O.R. context resonate with all students, even the less mathematically inclined."

Robert Young, an IE professor at North Carolina State University, is one of several people who have joined the HSOR effort. He is the point man for connecting with North Carolina's high school teachers; he and Chelst recently gave a workshop to more than 40 percent of the high school math department chairs in the state that was very well received. He is quick to credit Chelst and Edwards for all that they have done: "I'm just a worker bee," he insists, but he also offers a thoughtful perspective from his own geographic vantage point.

Young believes North Carolina (with its manufacturing base under siege) will need to compete for jobs with other states and countries in the global economy, and that a workforce educated in problem-solving will be a key part of this competition [3]. With support from its exceptional High School of Science and Mathematics [4], North Carolina will likely be a leader in bringing an O.R. class to high schools. In the Mathematical Competition in Modeling, North Carolina's High School of Science and Mathematics has won numerous awards against college and university competition from all over the world.

20-20 by 2020

Chelst's current slogan is "20-20 by 2020" — 20,000 high school students across 20 different states taking a course in operations research by 2020. There is a richness to this vision (partnerships between faculty members, school districts and industry professionals, a problem-solving competition between different schools) and to its objectives (creating educated potential consumers of O.R., closing the performance gap between the United States and other countries, helping embattled teachers succeed in reaching students).

It will not be easy. HSOR faces challenges small (getting the right people engaged to create outstanding course materials), medium (finding the funding to radically speed up curriculum development) and large (cutting through the administrative miasma of American secondary education to get the course adopted across many different states and school districts). As a leader, Chelst has both the ability to inspire others and the understanding that it will take many committed people to help this vision become a reality.

Regardless of what happens next, Chelst, Edwards and their colleagues deserve our applause for what they have accomplished already. While very few of us were watching, the HSOR ship has quietly left port, learned to sail and found some terrific tailwinds. With a little more help from funding agencies, faculty members, O.R. industry professionals and high school teachers, HSOR can help us greatly in the Brave New World of tomorrow's rapidly evolving economy. This may be the most important thing that our profession ever does.

Vijay Mehrotra (vjm@sfsu.edu) is a faculty member in the Decisions Sciences Group in the College of Business at San Francisco State University and an operations management consultant.

References

1. www.hsor.org
 2. www.keypress.com/catalog/products/supplementals/Prod_DoesThisLine.html
 3. www.cbc.ca/cp/business/050630/b0630102.html
 4. www.ncssm.edu
-

- [Table of Contents](#)
- [OR/MS Today Home Page](#)

OR/MS Today copyright © 2006 by [the Institute for Operations Research and the Management Sciences](#). All rights reserved.

Lionheart Publishing, Inc.
506 Roswell Rd., Suite 220, Marietta, GA 30060 USA
Phone: 770-431-0867 | Fax: 770-432-6969
E-mail: lpi@lionhrtpub.com
URL: <http://www.lionhrtpub.com>

Web Site © Copyright 2006 by Lionheart Publishing, Inc. All rights reserved.