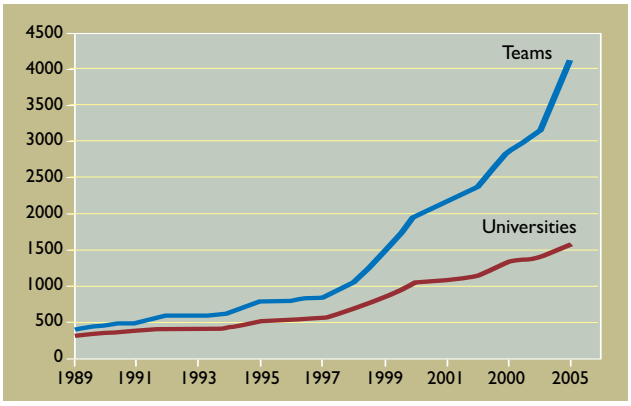
David A. Patterson

Reflections on a Programming Olympiad

Does ACM's programming contest give insight into the relative strengths of IT education around the world?

I am writing this column after being interviewed by the press about the results of the ACM International Collegiate Programming Contest (ICPC), sponsored by IBM. The reporters asked whether a team's success predicts the relative strength of IT education in their country; and if so, do ICPC's results indicate the location of IT talent is changing. Let me first set the context before discussing the questions.

Since 1977, this contest has aimed to develop teamwork, problem solving, and programming prowess in the next generation of IT professionals. To encourage worldwide involvement, ACM now gives free, one-year memberships to all ICPC participants. As I noted in a previous column, ICPC is one of many examples of membership dues helping to broaden participation in IT [1].



The soaring growth in teams and universities participating in the ACM's ICPC since 1989.

The figure here shows the rapid growth of this competition. Since 1989, the number of participating universities grew by more than a factor of 5 and the number of teams grew by a factor of 10. The contest brought the top teams from 144 sites in 71 countries to Shanghai for the ACM-ICPC World Finals in April, and the World Champions traveled to the ACM Awards banquet in San Francisco in June.

The popularity of this large venture is testimony to the fine job done by the ICPC community and, in particular, to Bill Poucher and his staff at Baylor University. I'd also like to thank IBM and Gabby Silberman, the corporate sponsor of ICPC and its representative, as well as past sponsors Microsoft, AT&T, and Apple.

Despite the title, the ICPC is not just coding. For example, one problem was to find the shortest path between two cities and the placement of cell towers to minimize the number of cell phone handoffs along these paths.

Each three-person team gets 10 problems and only five hours and one computer to write and debug programs that properly solve each problem. Judges count bugs in the code and time needed to solve the problems.

The 2005 World Champions from Shanghai Jiao Tong University were the only team to solve eight problems. The level of competition has increased to such a degree that judges now prepare twice the number of problems and have increased the level of difficulty.

In the last decade, only three countries had teams that won the ICPC two or more times: China, Russia, and the U.S. The table here shows the top place by a team from each country during that decade.

Obviously, these are all large countries. They have more teams and universities, and hence, greater chances to have talented teams, if all things are

President's Letter

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equal. *Are* all things equal?

U.S. teams won twice in the 1990s, while Russian teams won three times and Chinese teams won twice since 2000. Clearly, the top Chinese and Russian teams are doing better in recent years than the U.S. teams.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
China	7	8	7	11	4	11	**1st**	5	11	**1st**
Russia	17	11	2	3	**1st**	**1st**	6	2	**1st**	2
U.S.	**1st**	**1st**	5	5	9	2	2	13	5	17

Standings of the three countries to win ICPC two or more times in the last decade.

So what happened? We know it is not steroids; no one has invented a chemical that makes you a better problem solver. I can think of a few possible explanations—more effective preparation, recruiting, or education—I'm sure you can think of others.

Better preparation could simply be some teams are putting in more time, in part by having coaches put in more time, or preparing more effectively, possibly by having coaches that are more motivated.

Recruiting could be a factor as well; no matter how good the program, raw talent is essential for success. Given the publicity of the international competition, does this play a factor in drawing talent to computer science from high school and from other majors? Bill Poucher tells me that World Finals teams often have students from math, physics, and engineering.

The most intriguing explanation would be that ICPC success is simply a by-product of a more effective approach to IT education. I noted that some schools do well repeatedly over the years. To find the answer, it would seem to require a study comparing at least American, Chinese, and Russian approaches to IT education.

There might be an easier answer, as just two universities won four of the recent championships: St. Petersburg State University won in 2000 and 2001 and Shanghai Jiao Tong University won in 2002 and 2005. I'm sure I'm not the only one who would like to learn more about what these two universities are doing, especially if it offered some insights into IT education beyond ICPC.

There might even be reasons outside the classroom. The 2004 World Champions from St. Petersburg University were invited to the Kremlin to meet Russian President Vladimir Putin. Imagine the impact of such news on students deciding what to study and on administrators deciding how much support to give IT on their campus.

U.S. Presidents have long met with collegiate champions—*football* champions, that is. I am pretty sure that, for the foreseeable future, American football will continue to excel. Without comparable commitment to recruiting and developing problem-solving talent in the next generation, I wonder whether the U.S. will continue to be a great power. The future would indeed be bright if every country and its industry leaders encouraged and honored its youth for their intellectual success as it does for athletic success.

Let's hope that countries that have traditionally led IT haven't become so self-assured that they can't learn from countries newer to the IT game. C

Reference

1. Patterson, D.A. Why join ACM? *Commun. ACM 48*, 2 (Feb. 2005), 14.

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