

TO: The ASA Board

From: Tom Moore

Re: Strategic Initiative Grant "Strengthening Connections between Liberal Arts Colleges and Graduate Programs in Statistics."

Date: November 22, 2004

Those listed at the end of this report met on the campus of Grinnell College October 15-17. We had a very productive meeting. This report summarizes the recommendations coming from that meeting as well as plans for future activity of what we are calling the Committee on Connecting Colleges and Universities (CCCU).

We framed our discussions around four questions:

1. How do we motivate undergraduate and younger students to become interested in statistics?
2. Once we have them interested, how do we prepare students for graduate study in statistics?
3. How do we attract graduate students toward careers at liberal arts colleges?
4. Once we have attracted them, how do we prepare graduate students for careers in liberal arts colleges?

We agreed that the most important questions were (1) and (3), the questions about motivation. So we discussed these questions first, but we feel we were successful in discussing the entire set of four questions. This report begins with a "sense of the workshop," that is a description of the consensus opinion we reached on the 4 questions. We then list 4 recommendations to the ASA Board followed by a set of 16 action items that workshop participants have committed to completing in the coming months.

Sense of the workshop

The group reached consensus concerning most issues discussed. As pre-reading for the workshop we read Tom Cech's article "Science at Liberal Arts Colleges," (*Daedalus* Winter 1999) in which Cech persuasively described and documented the inordinate success liberal arts colleges have in producing Ph.D. scientists. We feel that statistics should be able to attain similar success, but is under-appreciated as an important scientific discipline and as an exciting career choice. In part, under-appreciation occurs because statistics typically does not reside in its own department at liberal arts colleges.

We also read a draft report of the "ASA Task Force on Graduate Education and Research" and concurred with that report's conclusion that there is a lack of awareness of graduate education opportunities in statistics. These companion ideas convinced us that our workshop goal of finding ways to link the undergraduate talent represented by liberal arts colleges with U.S. graduate statistics education could result in important productivity improvements in the field of statistics.

Moreover, these readings strengthened our belief that the four questions articulated above were the right ones for us to be discussing. We will now summarize our thinking on each of these four questions.

Getting students into statistics and preparing them for success.

It would be wonderful for someone to create a modern version of the "Against All Odds" video series, with even more pizzazz. We thought that a TV Show called "Statistics: CSI," might grab students in a big way. In a more academic vein, we envisioned the importance of communicating with students and mathematicians the differences between mathematics and statistics, since students and faculty often get bum signals when trying to view statistics through the lens of pure mathematics. Dick DeVeaux likes to use the analogy that "math is music, but stat is literature" as one metaphorical way to probe these differences.

We thought of several more immediate changes that could be implemented to attract undergraduates and AP students to the field. One clear way is to support anything that will improve the teaching of these students, which means education of those in the trenches teaching the introductory statistics courses to our college and high school students. We support the training of teachers at all levels in modern statistics and modern statistics pedagogy, such as workshops for AP teachers or teachers of undergraduate statistics courses. We could have high school teachers visit local college campuses and interact with faculty. St. Olaf College has a “master teacher” program where local high school teachers spend a year teaching at St. Olaf. Several of the action items below give concrete suggestions for supporting teachers of statistics.

Another means of recruitment is to have resources that appeal directly to students. One recommendation described below is to create a killer career web site. The web site should showcase statisticians and their jobs and generate interest in the discipline among those who have not necessarily had a first course. The actuaries have such a web site (with separate URL) dedicated to convincing high school and college students of the appeal of a career as an actuary. Our anecdotal evidence suggests to us that this web site is having the desired effect on students, keeping in mind that these students have not studied actuarial science and typically know next to nothing about the life of an actuary. We have an advantage over the actuaries: after we hook them with our web site, we can seal the deal with a great first course at the high school or undergraduate level.

Nothing will pull in students better than an exciting introductory course, and much has been done nationally to make this a great course. But, given the importance of this course, we must be vigilant in disseminating innovative ideas as widely as possible, and we must be alert to new improvements. We also concluded that we should take some time in this introductory course to actually sell the discipline and the career possibilities.

STATS magazine will continue to be a valuable resource for both students and teachers: for drawing students to statistics, for supporting and encouraging students already interested in statistics, and for supporting teachers in their efforts to promote statistics through their teaching.

Also, courses beyond the introductory course are important for maintaining enthusiasm and satisfying the thirst for knowledge created by the first course. This is especially true for good AP students who enjoyed their high school experience and are ripe for some solid curriculum at the college level. ASA, through the USEI project, already has a good effort underway for improving the state of the undergraduate statistics curriculum.

Beyond second courses, research experiences for undergraduates could be highly motivational for undergraduates considering career possibilities. Below we make a board recommendation to devise a pilot project of statistics research experiences for undergraduates and also describe an action item related to long-term implementation of this idea. Other ideas worthy of further consideration are to establish visits of undergraduates to graduate programs and visits of current graduate students who are LA graduates back to their home institutions or similar institutions near their place of graduate study. We also discussed the possibility that ASA and IMS could consider giving students free or inexpensive subscriptions to key publications.

Getting Ph.D. students interested in a liberal arts career and preparing them for such a career.

Half of the workshop participants were liberal arts statisticians who could give personal testimonial to the pleasures and advantages of their career choice. Most liberal arts colleges have good students and are places that provide an intimate sense of community that crosses disciplines. For aspiring Ph.D.'s who feel a calling to influence the lives of young people in profound ways, teaching at a liberal arts college might be the perfect career choice. Too often, we feel,

this career choice is invisible to the incipient Ph.D., and so we discussed ways to change this.

The group came up with many good ideas for bringing the possibility for a career in a liberal arts college to the attention of graduate programs and incipient Ph.D.'s, along with ideas for preparing interested graduate students for such a career. There was enough enthusiasm for the ideas generated that they have become a series of action items that we will be pursuing in the short term, and which we describe below. These include an email network between LA colleges and graduate programs, a speakers list of LA faculty willing to speak to university programs (students and faculty), and a JSM effort that includes flyers, a poster, and an invited panel for 2006. We also have planned a series of articles in MAA's *Focus* and *Amstat News* about a variety of topics related to this theme. We describe these articles below.

Since teaching is the central role of a liberal arts statistician, it is imperative that budding LA statisticians be given complete responsibility for a course at least once during their graduate career. Of course, many graduate programs give such assignments as a matter of course, but usually it is the better teachers that get such assignments, and we thought that programs should consider making it an honor for the student to land such a position.

Another idea worth considering is to form teaching coops between the LA colleges and graduate programs where grad students could teach courses at nearby LA colleges. Several of our participants are involved in programs related to the preparing of future faculty members, either from the LA college hosting post docs to the graduate programs preparing their Ph.D. students.

Recommendations and Action Items.

At the conclusion of our workshop we had formulated recommendations and action items aimed at improving the flow of students toward the study of

statistics as well as the flow of recent Ph.D.'s in statistics toward careers in liberal arts colleges (and undergraduate teaching in general) as ways for enriching the supply of statisticians and increasing the place of statistical practice and thinking throughout our society and its educational institutions.

The participants took on the action items that we felt we could advance on our own, and the others became recommendations that will require ASA action. We begin with the latter.

Recommendations to the board.

1. "Be a statistician" web site. We recommend that the board implement a "Be a Statistician" web site, modeled after the "Be an Actuary" web site of The Society of Actuaries. The actuary web site— <http://www.beanactuary.org/> — was familiar to several of us and seems to be attracting students to that profession. It was our feeling that while there is solid career information available at amstat.org, it is not as convenient and easy to get at, nor as attractively presented as the actuary site. We recommend obtaining the url "beastatistician.org" and then putting relevant information along the lines of the actuarial site: including video clips, biographical snapshots, focused text to students, parents, counselors, etc. The web site could include a "problem corner" to pique student interest or instructor interest, and should be aimed at both the BA level student and the AP level student. There should be links to graduate schools, industries that employ statisticians, summer internships for undergraduate students, and so forth. The site should be professional and appealing.

1. Establish an email network between the LA and University communities. We recommend that the Board implement an email network in order to: (a) help graduate programs find potential grad students, (b) help LA faculty find out who have been successful as graduate students, both from particular institutions and, more generally, what undergraduate preparation makes for a successful grad student, and (c) help LA faculty advise their

students on where and how to apply. In establishing this email network ASA can build on the successful isostat listserve. (See: http://www.lawrence.edu/fast/jordanj/isostat_listserv.html.)

1. Research stipends for undergraduates. We recommend that the Board allocate Strategic Initiatives money for a pilot program to fund stipends for undergraduate research projects in statistics for students at liberal arts colleges. A larger funding project along these lines could follow this pilot project, if it turns out to be useful in attracting students to the profession. (See action item 5.)
1. MentorNet. We recommend the use of Strategic Initiatives money to initiate what we are calling “MentorNet” that pairs a graduate student with an undergraduate student so that the undergraduate can learn about the life of a graduate student in statistics.

Action Items planned by the CCCU

Here is a list of action items that the CCCU is committed to accomplishing in the next several months to a year. We give a short description of each and identify individuals who have agreed to work on the item. An asterisk (*) marks the person(s) who will take lead responsibility for an item that has several names listed.

1. Committee Report to ASA Board (Tom Moore): This refers to the report you are reading.
2. “Creating a Healthy Discipline” (Shonda Kuiper*, Tom Moore): This refers to a proposed article that describes the place of importance that liberal arts colleges can play in the health of statistics as a discipline. We will aim this article at the readership of *The American Statistician*. Think of this article as an updating of the 1989 article “Statistics at Liberal Arts Colleges”

(*American Statistician*, 43, No. 2, 80-85, 1989).

3. "Top Ten Places to Advertise for a Statistician" (Ann Cannon and Carolyn Cuff): An MAA *Focus* article (*Focus* is MAA's version of *Amstat News*) to inform liberal arts faculty how to place an ad for a position in statistics.
4. "Top Ten Places to Look for a Job" (Doug Wolfe): This will be an *Amstat News* article as well as a mailing to department chairs of statistics programs for advising new Ph.D.'s on where to look for jobs. LA careers will be one option presented.
5. Proposal to create a grant program for undergraduates at LA colleges to receive stipends for summer work with statistics faculty at their institutions (Ken Koehler): This is the companion to the suggestion above that ASA use Strategic Initiatives funds to support summer research experiences in statistics at LA colleges. Many of these colleges currently have vibrant summer research programs in other scientific disciplines.
6. "What is it like to be a liberal arts college statistician?" (Shonda Kuiper, Julie Legler, and Carolyn Morgan): We will produce a flyer and poster on this topic to be available at the booth of the Section on Statistics Education for JSM 2005. We will propose an invited panel on this topic for JSM 2006. The flyer will extol the virtues of working at liberal arts colleges, such as teaching excellent students in small classes and an environment that encourages teaching innovation, the sense of close and interdisciplinary community of a liberal arts college, the opportunity for pursuing a flexible and individualistic scholarly agenda, the ability to work with bright undergraduates on scholarly work, the clear sense of vocation (calling) in shaping young lives, etc.
7. Liberal arts faculty speakers bureau (Carolyn Cuff* and Doug Wolfe): We will organize a list of liberal arts statisticians willing to visit universities to talk to faculty and grad students about LA careers. We will organize this by

region and distribute the information to graduate programs in statistics.

8. Resurrection of the STATS program (Tom Boardman): The STATS program was an NSF funded project that used professional statisticians to teach week-long workshops on modern statistical topics and pedagogy to mathematicians untrained in statistics but who were teaching statistics at their institutions. This very successful program enriched the professional lives of hundreds of undergraduate statistics teachers. We will investigate the possibility of resurrecting this program, which developed a very successful workshop model that involved participants in very active ways in the learning of modern statistics.

(9) – (15) Series of *Amstat News* articles. We propose a series of articles, over several months, around the important conclusions and goals of this workshop. The proposed series is:

9. “Ideas statisticians can use (inside and outside the classroom) to attract students to the discipline of statistics” (Marlin Eby*, Joe Lang*, Deb Nolan, Roger Woodard, and Dick DeVeaux);
10. “Establishing connections between LA colleges and research universities” (Deb Nolan*, Albyn Jones, and Julie Legler);
11. “How do we keep the AP-5 students interest?” (Roger Woodard* and Dick DeVeaux);
12. “Introducing a research component into the undergraduate curriculum” (Julie Legler*, Ken Koehler*, Deb Nolan, Albyn Jones, and Carolyn Morgan);
13. “Overcoming impediments to students taking a statistics course” (Dick DeVeaux*, Tom Moore, Albyn Jones, and Shonda Kuiper);
14. “Preparing graduate students and post docs for an LA career” (Roger Woodard*, Ann Cannon, Doug Wolfe, and Julie Legler).
15. “AP teacher article: Strengthening the links between high school teachers and College and University faculty (Julie Legler* and Dick DeVeaux, with help from Dave Bock, Peter Flanagan-Hyde, Randy Bailey, and Brad Hartlaub).

16.Vignettes (Carolyn Morgan* and Shonda Kuiper): These would be profiles of statisticians going from an initial career in business, industry, or government to academia written for the “Be a statistician” web site.

Note: Item 7 has already been accomplished.

Workshop participants.

Tom Boardman, Colorado State University,
Ann Cannon, CornellCollege,
Carolyn Cuff, Westminster College,
Dick DeVeaux, Williams College,
Marlin Eby, Messiah College,
Albyn Jones, Reed College,
Joe Lang, University of Iowa,
Ken Koehler, Iowa State University,
Shonda Kuiper, Grinnell College,
Julie Legler, St. Olaf College,
Tom Moore, Grinnell College,
Carolyn Morgan, Hampton University,
Deb Nolan, University of California, Berkeley,
Doug Wolfe, Ohio State University,
Roger Woodard, North Carolina State University.