Strategies for Working with Other Statistics Teachers

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How can you support raising all of your two-year college's statistics classes to the next level of statistical understanding? In this session you discover easy yet effective ways to implement the GAISE Guidelines. The key is to collaborate with other statistics teachers.

http://www.austincc.edu/mparker/talks/uscots07/teach/

Eliciting Collaboration Strategies

1. What is one change you have made in your class?
    a. What inspired you to do that?
    b. Were there any resources, besides the textbook, that were crucial to your doing this?
    c. How did you find those resources? (And who produced them?)
2. What is one change you'd like to make, but haven't yet made?
    a. Why not yet?
    b. Are there resources that the community of statistics teachers could be making available that would help with this? What resources?
3. Have you produced handouts, exercises, or activities for a statistics course that others have used?
    a. When you wrote them, were you thinking of only your course or were you planning them for more than just your course?
    b. What are some attributes of these materials that seem essential in making them useful to others?
    c. How wide an audience do you think might be interested in using them? How can you make them available to that audience?
4. What materials have you produced for your classes that you have not shared with others?
    a. If other teachers were to use them, how would you need to revise them (if at all)?
5. How much impact can you have on other introductory statistics classes at your school taught by other teachers?
    a. How can you have an impact?
    b. In what areas of the subject? (choice of textbook or software, syllabus, use of projects or activities, other)
6. What sets of resources have you found useful? For each, is there anything that would make them more useful?

7. From the point of view of offering a consistently good course across all sections of introductory statistics in your department, what resources would be the most useful to the teachers?

Excerpts from the GAISE Guidelines

http://www.amstat.org/education/gaise/

- Executive Summary
- Making it Happen (Examples of small steps to start and partial list of resources)
- Goals for Students in an Introductory Course: What it Means to be Statistically Educated
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Executive Summary:

The American Statistical Association (ASA) funded the Guidelines for Assessment and Instruction in Statistics Education (GAISE) Project, which consists of two groups, one focused on K-12 education and one focused on introductory college courses. This report presents the recommendations developed by the college group. The report includes a brief history of the introductory college course and summarizes the 1992 report by George Cobb that since that time has been considered to be a generally accepted set of recommendations for teaching these courses. Results of a survey on the teaching of introductory courses are summarized along with a description of current versions of introductory statistics courses. We then offer a list of goals for students, based on what it means to be statistically literate. We present six recommendations for the teaching of introductory statistics that build on the previous recommendations from Cobb's report.

Our six recommendations are:

1. Emphasize statistical literacy and develop statistical thinking;
2. Use real data;
3. Stress conceptual understanding rather than mere knowledge of procedures;
4. Foster active learning in the classroom;
5. Use technology for developing conceptual understanding and analyzing data;
6. Use assessments to improve and evaluate student learning.

The report concludes with suggestions for how to make these changes, and includes numerous examples in the appendix to illustrate details of the recommendations.

Making it happen

Statistics education has come a long way since Fisher and Snedecor. Moreover, teachers of statistics across the country have generally been enthusiastic about adopting modern methods and approaches. Nevertheless, changing the way we teach isn't always easy. In a way, we are all teachers and learners alike, a bit like hermit crabs: In order to grow, we must first abandon the protective shell of what we are used to, and endure a period of vulnerability until we can settle into a new and larger set of habits and expectations.

We have presented many ideas in this report. We advise readers to move in the directions suggested in this report by taking small steps at first. Examples of small steps are

- Adding an activity to your course
- Having your students do a small project
- Integrating an applet into a lecture
- Demonstrating the use of software to your students
- Increasing the use of real data sets
- Deleting a topic from the list you currently try to cover to use the time saved to focus more on understanding concepts.

Your teaching philosophy will inform your choice of textbook, but the recommendations in this report are not about choosing a text, but about a way of teaching.

There are many resources available, including the MAA Notes volumes that deal with teaching statistics, the Consortium to Advance Undergraduate Statistics Education (CAUSE) (causeweb.org), the Isostat discussion list (http://www.lawrence.edu/fac/jordanj/isostat.html), the SIGMAA- Stat Ed group within the MAA (http://www.pasles.org/sigmaastat/), and the ASA website, especially the Center for Statistics Education (http://www.amstat.org/education/) and the Statistical Education Section (http://www.amstat.org/sections/educ/).

Goals for Students in an Introductory Course: What it Means to be Statistically Educated

Students should believe and understand why:

- Data beat anecdotes.
- Variability is natural and is also predictable and quantifiable.
- Random *sampling* allows results of surveys and experiments to be extended to the population from which the sample was taken.
- Random *assignment* in comparative experiments allows cause and effect conclusions to be drawn.
- Association is not causation.
- Statistical significance does not necessarily imply practical importance, especially for studies with large sample sizes.
- Finding no statistically significant difference or relationship does not necessarily mean there is no difference or no relationship in the population, especially for studies with small sample sizes.

Students should recognize:

- Common sources of bias in surveys and experiments.
- How to determine the population to which the results of statistical inference can be extended, if any, based on how the data were collected.
- How to determine when a cause and effect inference can be drawn from an association, based on how the data were collected (e.g., the design of the study)
- That words such as “normal”, “random” and “correlation” have specific meanings in statistics that may differ from common usage.

Students should understand the parts of the process through which statistics works to answer questions, namely:

- How to obtain or generate data.
- How to graph the data as a first step in analyzing data, and how to know when that's enough to answer the question of interest.
- How to interpret numerical summaries and graphical displays of data - both to answer questions and to check conditions (in order to use statistical procedures correctly).
- How to make appropriate use of statistical inference.
- How to communicate the results of a statistical analysis.

Students should understand the basic ideas of statistical inference:

- The concept of a sampling distribution and how it applies to making statistical inferences based on samples of data (including the idea of standard error)
- The concept of statistical significance including significance levels and *p*-values.
- The concept of confidence interval, including the interpretation of confidence level and margin of error.

Finally, students should know:

- How to interpret statistical results in context.
- How to critique news stories and journal articles that include statistical information, including identifying what's missing in the presentation and the flaws in the studies or methods used to generate the information.
- When to call for help from a statistician.

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