

Statistics Education, Quality and the Making Statistics More Effective in Schools of Business (MSMESB) Conferences

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A Little History

- “What do you teach?”
- 1986: Chicago - Tiao, Easton & Roberts.
- Title/mission of conference -- Roberts
“...reminds all us statisticians in business schools that it is important to do something about making statistics more effective.”

What I'm Trying To Do Tonight

- Make statistics more effective
- MSMESB history/recommendations
- Something for everyone
- Learn something useful/practical
- Evening talk
- ~~Encourage~~ Force you to participate

Statistics Education in 1986: Basic (First) Course Content

- Elementary probability and tools
- Simple Regression / Correlation
- (Time permitting)
 - Multiple Regression
 - ANOVA
 - Time Series / Forecasting
- Nothing on control charts or quality.

Statistics Education in 1986: Typical Process

- Classes often **passive** -- “push” model -- “I talk, you listen”.
- Little use of **graphics** except histograms and scatterplots -- text-based stuff -- maybe stem-and-leaf
- **Computer** use? Maybe multiple regression, graphics...
- **Exams** -- often closed-book. **Projects?**

A First Question

- Was this a roughly accurate description of how you started teaching or learning?

Is this easy to remember?
Was this effective?

George Tiao's Initial Goals for MSMESB

- Increase ratio of **statistics** course registrations to **total** registrations in our business schools.
- Use our knowledge of statistics to **help our faculty colleagues** do better research in their own fields.
- Take ownership of **quality management** and help diffuse its concepts within our schools.
- Recruit and train **good doctoral students** in business statistics.

What Happened At The First Seven Conferences?

- **worked hard on** increasing our share of the internal market by **improving teaching**
- **learned about the fields** of our colleagues **outside of statistics** to become more helpful
- devoted lots of attention to **quality management**
- devoted segments of conferences to **doctoral studies in business statistics**

Status Quo in the Classroom

- **Veterans**
What is the single biggest problem you face in **teaching** statistics?
 - **Students**
What is the single biggest problem you face in **learning** statistics?
- Both:** Have you changed? Results?
Has the environment changed?

Improving Statistics Teaching

- Stop alienating students!
- De-emphasis of **mathematical formalism**, (probability, hypothesis testing).
- Focus on learning how to do **practical data analysis**: real data and “hands-on”
- Emphasis on **projects** that gather real data to accomplish relevant goals like improvement of forecasting or quality/productivity.
- Use of **case studies** as effective simulations of real decision-making functions.

Statistics Education: Chasing a Moving Target

- Old: formal grounding in theory of probability and statistics
- New: development of literacy in the practice of data analysis
- **Bowerman**: “most textbooks in business statistics spend at least 400 pages before getting to material that business students find interesting and useful.”

Three Key Concerns for Statistics Education at MSMESB

- How to incorporate quality ideas into our courses
- How to introduce computers into course material, classes, exams
- How to get students more directly involved in doing statistics, i.e. engaged actively in learning.

Setting the Quality Agenda

- A major concern of early conferences was how to include the most important **quality control/improvement** ideas.
- **Deming** at NYU in 1987 -- not flattering in his view of business schools, offered many challenges to statisticians in business schools.
- Wisconsin and Tennessee headlined quality management/improvement

MSMESB 1988 – Box on Research Opportunities

- Interaction of management, engineering, statistics, psychology, organizational development, etc.
- Finding out what the customer wants
- How do you get teamwork?
- Do we need gurus?
- “Unrealistic,” “inefficient” nature of SPC

MSMESB 1988 - Golomski on Implementation Issues

- The Role of the Social Sciences
- The Current Situation
- Aids to Implementation
 - Statistics and policy matters are a part of every consultation
 - Need for ladder innovation and incremental product improvement

Most Important Quality Improvement Ideas?

- General sense was that absolute minimum was the idea of control charts for means and variability.
- More could (probably should) be done, e.g. capability - can process meet specs?
- Most books did nothing on quality.

On Quality

- One of the crucial ideas that comes up here is the very idea of **process** -- organized activity with a goal.
- Another issue: integration vs. redundancy -- support **for** and **from** other courses students will take.
- **TQM for Professors and Students** – Bateman and Roberts (MSMESB 1992)

Statistical Thinking

- Statistical Thinking as philosophy of learning and action based on the following fundamental principles:
 - All work occurs in a system of interconnected processes
 - Variation exists in all processes
 - Understanding and reducing variation are keys to success
- Statistical Thinking >> Statistical Methods

More Recent Insights

- Six Sigma was a large part of MSMESB 2000 at Syracuse
 - William Hill, Allied Signal / Honeywell / General Electric – plenary speaker
 - Karen Riding from GE Power Systems on quality / customer focus / cultural change - 6σ as a source of common language and themes

Roger Hoerl at MSMESB 2000

- Teach the process of applying statistical methods – overall approach to improvement – leads to Hoerl/Snee text.
- Curricular Change?
 - Start over – what are my objectives?
 - What do I want them to do or know when they leave?
 - Process / Improvement / Graphics
 - Tools in back, not front.

Roger Hoerl on Six Sigma and Deming's Concerns

- 6σ emphasizes financial impact (does stress satisfaction)
- Repeated failure not tolerated (element of fear)
- Statistical control not dealt with in DMAI, just in C at the end
- Hypothesis testing key part of tools
- The rest is “vintage Deming”

What do business schools do?

- How do they handle quality issues?
- Is there a problem having faculty adapt? Part- or full-time?
- Are quality improvement ideas perceived as **relevant** by students?

Computers
Active Learning
Conclusions

Using the Computer Effectively in Statistics Education

- Which package do you use?
- Are you satisfied or not?
- How do students feel about this package?
- How if at all has it changed your classes and exams?

Which package to use?

- Excel
 - pros: ubiquitous (unavoidable?), familiar to students, low to negligible cost
 - cons: toolbox data analysis module is almost universally regarded as terrible (some ghastly examples - John McKenzie)
 - possible solution: program add-ins? (Prentice Hall, and others)

Statistical Software

- Closest competitor - **Minitab**
 - inexpensive in student version
 - fairly easy to learn
 - easy to reproduce for exams
 - much more reliable than Excel
- Other packages favored by smaller numbers of instructors - **JMP IN, S,** etc.

Using The Computer

- Web Sites for Statistics Classes -- Bill Parr's article at MSMESB home page
- Powerpoint Presentations and distance learning -- Tom Johnson
- Presentational Issues
- Resources
- Blackboard, etc.
- Laptops in class?

Quality
Active Learning
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Getting Students Actively Involved in Learning Statistics

- What do the students do on a typical day in your class?
- How much lecturing do you do?
- What kinds of assignments do you use?
- What kinds of assessment tools?

Some Suggestions

- Case Studies
- In-class demonstrations
 - Brain-friendly activities - multiple intelligences
- Projects - learn by doing
- Exam Styles
 - The Challenge of Assessment

Activities - Value?

- What do you do?
- Do you feel that such activities are worth the time?
- How do students react?

Quality
Computers
Conclusions

Roberts' "Proposals for Shock Therapy"

- In all business school statistics courses,
 - there should be substantial infusion of quality management ideas.
 - there should be required data analysis of real data collected by students.
 - As much as possible, data should be relevant to improvement of businesses processes and functions.

Roberts: Directions We Should Be Moving In

- The progress of statistics is tied to the **effective use of computers**.
 - Students who are not exposed to these advances are seriously short-changed.
- Statisticians should be eternally vigilant in combating **misuses of statistics**.
 - Most people resist careful statistical thinking, and if they attempt it, find it difficult.

Ten Suggestions from MSMESB (Love & Hildebrand)

- Practice What We Preach: Remember Our Customers
- Use Projects
- Use Real Data
- Students Need to Use Technology Well
- Lecture Less

Ten Suggestions from MSMESB (Love & Hildebrand)

- Use Case Studies
- Focus on Statistical Thinking
- Encourage Collaboration
- Focus on Useful Tools
- Presentation of Ideas Matters

ASA Undergrad Curriculum Guidelines (Amstat News 2/01)

- Emphasize real data and authentic applications
- Present data in a context that is both meaningful to students and indicative of the science behind the data
- Include experience with statistical computing
- Encourage synthesis of theory, methods, and applications.
- Offer frequent opportunities to develop communication skills

Have You A Good Suggestion?

- Have you ever gotten or given a useful piece of advice on teaching?
 - From the educational research literature?
 - From a colleague?
 - From personal experimentation / observation?
- What would you say to a colleague who wanted to teach, but was struggling?
- How do you assess yourself?

"Declare Victory" and Go Home?

- Integration through the curriculum
- Statistics in Action
- Agility in the Face of Change
- What are our biggest remaining challenges?
- Are **you** effectively combating misuses of statistics?

Next MSMESB Conference:

MSMESB 2002:

**Getting Real with Business Statistics
will be held on June 6-8, 2002
at the Terry College of Business
University of Georgia
Athens, Georgia**

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MSMESB on the Web

<http://weatherhead.cwru.edu/msmesb>

Highlights from the MSMESB Archives:

- **Say What Your Model Says** by A. S. C. Ehrenberg
- **Quality and Productivity** by George Box (on Research Opportunities) & William Golomski (on Implementation)
- **Statistical Thinking in Finance: Forecasting Financial Variables** by Bob Holthausen and Andrew Lo
- **TQM for Professors and Students** by George Bateman and Harry Roberts
- **A Report on the Basic MBA Course** by Samprit Chatterjee
- **Report on the Workshop on Statistical Computing and Graphics** by Peter Rossi and Robert Miller