Preparing K-12 Teachers to Navigate the Data Stream: Great Opportunities and Challenges

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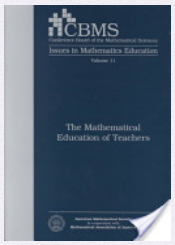
2001 MET 1 and 2003 ASA TEAMS Conference



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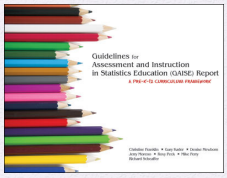


2012 Common Core and Statistics

COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

Math Standards
Common Core State Standards

Statistics in the Common Core

- The presence of statistics in elementary school is important but is limited
  - It is important to prepare elementary teachers to reason statistically to lay the groundwork for their students to move successfully to the middle grades
- Main topics in middle school include
  - Statistical variability
  - Distributions
  - Drawing inference about populations using samples
  - Simulations
  - Bivariate data analysis
- Main topics in high school include
  - Categorical and quantitative data analysis
  - Inference
  - Conditional probability and probability rules
  - Probability for decision making

Huge Opportunities

- Statistical Literacy for All!
- Rethink College Course

Huge Challenges

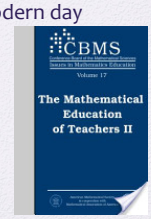
- Preparing K-12 teachers to deliver the statistical content in the CCSS – both pre-service and in-service teachers
- Rethinking the college intro course and the second course in statistics
- Are colleges prepared for the increased number of students wanting to major and minor in Statistics?

How will CCSS change the Standard Intro Course?

- Students will come to college having covered much of the current college intro course content in K-12
- Possibility including more advanced topics from the second course in the first course?
- Change the focus of the intro course with randomization tests instead of traditional probability distributions for inference?
- Different types of technology?
- The need for a second course in statistics?

MET 2

- Recommends a statistic course beyond intro statistics for middle school
- Recommends for high school a modern day one or two intro course sequence
- Emphasizing concepts
- Utilizing activities and technology



The Statistical Education of Teachers (SET)

- Writers:
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The Statistical Education of Teachers (SET)

- The report emphasizes that teachers of all grade levels need to understand the "statistical process"
  - Formulate statistical question
  - Data production
  - Data exploration and modeling
  - Inference

- The statistical process components are the common headings in the three chapters (elementary, middle, and high) of SET

Connections

- We want teacher preparation in statistics to be connected throughout the grade bands
  - Elementary → Middle → High
- We want content at each grade band that will progress teachers through the statistical thinking process
- Let's look at an example that can be used in each grade band differently to develop the appropriate skills of the level

Example Illustration

- Statistics Teacher Network (STN) article
- http://www.amstat.org/education/stn/pdfs/STN68.pdf

Recommendations for Elementary Teacher Preparation

- SET recommends that elementary teachers take
  - A special section of an intro course

  OR
  - An entire course in statistics content for teachers

  OR
  - A reconfiguration of an existing content course for teachers to include at least 6 weeks of study of statistics and related ideas in probability

Recommendations for Middle Teacher Preparation

- SET recommends that middle school teachers take
  - A special section of an intro course

  AND
  - A course focused on the statistical content they will be teaching using the GAISE framework as a model
    - This course should also help teaches understand connections across grade bands as well as between statistics and other areas of study in middle grades (mathematics, science, social science, etc.)

Recommendations for High School Teacher Preparation

- SET recommends that high school teachers take:
  - An introductory course that emphasizes modern data analysis, simulation approaches to inference using the appropriate technologies
  - A statistical modeling course based on multiple regression, including the use of both categorical and numerical explanatory variables and the fitting of exponential and power models
  - A course exposing high school teachers to the theory of statistical inference through one- and two-sample classical inference procedure and an introduction to analysis of variance

Summary of "Courses"

- Elementary
  - 6 weeks to 1 course
- Middle
  - 2 courses
- High
  - 3 courses
- These recommendations are consistent with the MET II report

The Intro Course

- The standard college level intro stat course is *not* adequate for teacher preparation
- SET recommends a modern day intro course emphasizing
  - data analysis and simulation approaches to understanding inference,
  - more on modeling, and
  - statistical theory that ties in with probability theory (e.g., the use of conditional probability in contingency tables and the chi-squared test)
    - The current typical standard course tends to be formula-based, going through the list of hypothesis tests and probability theory somewhat removed from the statistical concepts being covered

What Should Math, Math Ed, and Statistics Departments Do?

- Carefully examine the intro stat course to see how it can be reconfigured to meet the needs of teacher preparation possibly opening up a specific section of the course for all K-12 teachers
- Additional teacher coursework can be tailored to the grade levels a teacher will be teaching
- Work collaboratively with statisticians who have experience in statistics education to design courses

Experience at UGA

THE UNIVERSITY OF GEORGIA
DEPARTMENT OF STATISTICS
FRANKLIN COLLEGE OF ARTS AND SCIENCES

THE UNIVERSITY OF GEORGIA
College of Education

Joint ASA – NCTM Committee

ASA K-12Resources

STatistics Education Web
STEW
online journal of K-12 statistics lesson plans

MWM
Meeting Within a Meeting
a statistics workshop for K-12 teachers

The Statistics Teacher Network

CENSUS at SCHOOL

Exciting NSF Projects

LOCUS
Levels of Conceptual Understanding in Statistics

PROJECT-SET
Statistics Education for Teachers

Teachers are the Key to Success