

## TEACHING FUTURE HIGH SCHOOL TEACHERS TO TEACH STATISTICS

Nancy Boynton  
SUNY Fredonia, USA  
boynton@fredonia.edu

### INTRODUCTION

In New York State there are many required courses for undergraduate students wishing to obtain a mathematics teaching certificate and so we at SUNY Fredonia are only able to require one course in statistics for these students. Secondary teachers must complete their master's degree within five years after beginning to teach in order to keep their teacher certification. There are not as many requirements for what needs to be included in the master's program for these students, which gives us the opportunity to offer a course on the teaching of statistics. Statistics can be difficult for future teachers to understand in the deep way that is necessary for good teaching. A second course that focuses on deepening the future teachers' understanding of the concepts that they will be teaching is important and has been recommended in the *Mathematical Education of Teachers II* (2012). In addition, there are many resources for teaching statistics that our future teachers need to be introduced to. I have been teaching a course for these future teachers. The primary software used in the course is Fathom. The students use Fathom, the StatKey applet (Lock, n.d.) and other applets to explore randomization distributions. Questions from the Assessment Resource Tools for Improving Statistical Thinking (ARTIST, Garfield, n.d.) website served as the basis for some important discussions about the meaning of various statistical concepts.

### COURSE TOPICS

- Simulation & resampling
- Using the StatKey applet and Fathom software to do resampling
- Other websites with applets that help students understand statistics
- Sampling distributions - the t distribution and the normal distribution
- The meaning of a confidence interval and a prediction interval - Using ARTIST questions to help future teacher identify misconceptions.
- The logic of tests of significance – understanding type II error and power
- Paired vs. two independent samples
- Checking assumptions
- Using activities to collect data in the classroom and using the Census at School data
- Using Census at School data to practice conditional probability, relative risk and odds
- Using graphs to show meaning of Census at School data
- Chi-square tests
- Simpson's paradox
- Regression including polynomial regression, residuals and conditions
- Developing lesson plans using classroom activities

### REFERENCES

- American Statistical Association (n.d.). *Census at School*.  
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- Garfield, J. & delMas R. (2006). *Assessment Resource Tools for Improving Statistical Thinking*.  
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- Lock, R., Lock, P., Morgan, K., Lock, E., & Lock, D. (2013). *Statistics: Unlocking the Power of Data*. Wiley.
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<http://www.cbmsweb.org/MET2/met2.pdf>.