

Abstract

WEBER, VICTORIA LYNN. Defining the Relationship Between Learning Statistical Computing and a Student's Ability to Think and Reason Statistically. (Under the direction of Dr. Hollylynne Lee).

The purpose of this study was to begin examining the relationship that exists between a student's use of statistical computing tools and the ways in which students think statistically. To explore this relationship, a qualitative research study was designed to collect multiple instances of statistics problem solving with statistical computing tools in both written form and through a one-on-one problem solving session with the researcher. Fourteen students in a second semester statistics course completed a total of 91 written assignments across a semester. Additionally, a subset of 5 volunteer students also completed task-based interviews. These assessments required the students to use statistical computing software and their core knowledge of statistics to give complete results. A qualitative analysis of the students' work was conducted and an initial definition of the relationship between statistical computing and thinking was formed. The results of the study are organized in three manuscript Chapters.

The purpose of the first manuscript is to show how written work can be used to assess statistical thinking. The paper discusses some popular forms of written assessment used by instructors of statistics and other quantitative fields. An argumentation structure, similar to a model defined by Toulmin (1958) is defined. More detail is then given on three of the writing assignments utilized in the course, their intended assessment purpose and the types of answers teachers may expect to see if they were to give these assessments to their students.

The purpose of the second manuscript is to begin defining the relationship between statistical computing and statistical thinking. Through a qualitative study of the written assessments, five relational patterns between statistical computing and statistical thinking are

identified and illustrated with examples from students work. Implications for teaching and research due to these patterns follow.

The purpose of the third manuscript is to provide an in-depth analysis of how statistical computing is used by students to solve statistical problems. Since written work does not always give the best picture of the problem solving process, task-based interviews from 5 students were conducted and analyzed to provide a more in depth view of how students use statistical computing tools to solve statistical problems. Mimicking a problem solving analysis structure originally created by Lee and Hollebrands, the ways in which students use statistical computing while solving problems are described, and ways in which instructors may be able to help students solve problems using statistical computing software are given.

Results from the study indicate that there is a relationship between statistical thinking and statistical computing. When students are able to use statistical computing and possess good problem solving habits, they tend to produce logical arguments that show the strength of their statistical thinking sophistication. However, when students do not possess the capability to utilize the statistical computing technologies, statistical problem solving becomes very difficult or nearly impossible for some students.