

## ABSTRACT

An abstract of the dissertation of Matthew Alan Ciancetta for the Doctor of Philosophy in Mathematics Education presented January 10, 2007.

Title: Statistics Students Reasoning When Comparing Distributions of Data

This research was a qualitative study designed to investigate university students' reasoning strategies as they were engaged in making informal statistical inferences about pairs of data sets. The 275 university students who volunteered, were enrolled in at least one statistics course, and completed a task-based web survey where they reasoned about data set comparisons. Six, in-depth, follow up interviews were analyzed to support and initially validate the findings from the surveys. A major component of the research was focused on building and then refining an interpretive framework for reasoning about distributions of data. The framework was organized in a five-tiered lattice structure: Level 0 (Idiosyncratic); Level 1 (Local); Level 2 (Transitional); Level 3 (Initial Distributional); and Level 4 (Distributional).

Students enrolled in their first undergraduate level general statistics course tended to respond to the tasks at lower framework levels and compare the data sets from a local perspective. Students enrolled in graduate level statistics courses tended to respond to the tasks at higher framework levels and compare the data sets from a global perspective. Students enrolled in either an undergraduate level statistics course for engineering majors or enrolled in their second undergraduate level general statistics course tended to respond to the tasks at the middle framework levels and compare the data sets from a perspective that was in transition, from local to global.

Students who tended to compare data from either a local or transitional perspective also had difficulty in understanding statistical measures, such as mean and standard deviation, as group representatives.

Across all the groups there was a clear separation between students who could reason proportionally and those who could not, and that separation was correlated with students who appeared to view data from a global perspective and those who did not. Thus proportional reasoning is one of the keys to gaining a global perspective of data. This implies that statistics courses, particularly introductory courses, need to give explicit attention to developing proportional reasoning in the context of describing and comparing data, in order to promote students' understanding of distributions of data from a global perspective.