Mark Earley (2001). *Investigating the development of knowledge structures in introductory statistics.* PhD. University of Toledo, OH. Supervisor: Dr. Thomas G. Dunn.

The main questions addressed by this study were: (a) what do the knowledge structures of introductory statistics students look like, (b) how do these knowledge structures change as the semester progresses, and (c) are there any similarities or differences among different students' structures? Nine graduate students enrolled in an introductory educational statistics course agreed to meet with me one-on-one once every three weeks during the term they were taking the course. Each session, we discussed course concepts and how the student believed they related to each other. Each session included previous concepts we had discussed plus new concepts taught in class since our last session. The final session included a discussion of 45 statistical concepts and their relationships.

The theoretical perspective I chose for this study was Anderson's ACT-R* theory. In particular, I am interested by the idea that students learn more than just *declarative knowledge*, or facts and definitions, and *mechanical knowledge*, or procedures and processes. Anderson and others (e.g., Jonassen, Beissner & Yacci; Byrnes) argue that there is a third type of knowledge students actively build as they learn: *structural or relational knowledge*. This third type of knowledge serves to relate all of the declarative and mechanical knowledge students learn. My thesis is that this third type of knowledge is an indication of a student's understanding of the material they are learning. If these structures are not integrated or complex, then neither is the student's understanding. The main idea here follows the current trends in statistics education research, that students need to know more than what the mean is or how to calculate it (declarative and mechanical knowledge respectively); they also need to know what the mean tells us about a set of data and why it is an important indicator of a sample's central tendency. They also need to understand, for example, why we cannot calculate a mean for nominal and ordinal variables such as gender or class rank.

The results of my dissertation did demonstrate students' ability to organize course concepts in a way that is meaningful to them. With nine different organizations, I also present evidence that even though students are taking the same course, with the same instructor and same textbook, they do build different understandings (constructivism is also an important theoretical perspective captured by this data). Finally, with five different organizations over an entire semester, I present evidence that students' organizations do change. Future research needs to explore these organizations in more depth to determine how students develop these organizations, what might lead them to change their organizations, and what these organizations mean as an indicator of students' statistical knowledge.