

## Doctoral Dissertation Defense

### “Proof Processes of Novice Mathematics Proof Writers”

by

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Previous studies have shown that a large portion of undergraduate mathematics students have difficulties constructing, understanding, and validating proofs. However, proofs are the foundation of mathematics; it is therefore essential that every university mathematics student be able to step through the proof writing process. Even at the secondary education level, students should be able to “produce logical arguments and present formal proofs that effectively explain their reasoning” (NCTM, 2000).

Previous research has sought to describe the strategies involved in the process of mathematical problem solving. It has covered both the larger process, based on Polya (1973), of read the problem, devise a plan, implement the plan, and verify the results, as well as the individual strategies which would be included within these larger categories.

This study seeks to describe those distinct strategies specifically related to the process of proof writing. The framework for this study was based on the three large categories of proof-writing processes defined by Weber (2004): procedural, syntactic, and semantic processes. This study expands on Weber’s definitions by adding to the description of the individual strategies involved in each of these types of proof productions. That is, it seeks to describe the detailed processes and strategies used during the proof-writing process in order to more completely understand this process.

Specifically, this study is designed to answer the following questions:

- What are the proof writing strategies of a novice mathematics proof writer?
- What strategies are in use during a successful proof writing attempt?
- In what specific ways do novice mathematics proof writers use heuristics or strategies when working through a proof, which go beyond the application of standard problem-solving heuristics?
- Do the strategies used by individuals remain constant across multiple questions or do the questions affect the choice of strategies?

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9:10 a.m. in Jeanette Rankin Hall 205