

**Department of Mathematical Sciences
Colloquium**

Annie Selden and John Selden

Department of Mathematical Sciences,
New Mexico State University, Las Cruces, New Mexico

**UNDERSTANDING AND CONSTRUCTING PROOFS:
A DESIGN EXPERIMENT**

We will discuss a design experiment, sometimes also called a teaching experiment, for helping advanced undergraduate and beginning graduate mathematics students construct proofs. This course has been taught at least eight times to date and each time we are learning something more about students' proving capabilities. For example, there are certain aspects of proving that mathematicians do automatically, but that students are often unaware of. We define the formal-rhetorical part of a proof to be those aspects of a proof that can be written by examining the logical structure of the statement of a theorem and by unpacking associated definitions. Examples include writing the first and last lines, "unpacking" the meaning of the last line, and considering what strategy one might invoke to prove that. Writing the formal-rhetorical part of a proof can expose "the real problem(s)" to be solved. We call the remainder of the proof the problem-centered part.

Students need to make writing the formal-rhetorical part of a proof automatic, that is, doing so must become a "habit of mind." For example, beginning students often fail to examine the conclusion to see where they are going; instead, they begin with the hypotheses and forge ahead rather blindly. This is a "bad habit" that needs to be replaced by the "good habit" of examining and unpacking the conclusion. We will discuss what we have been learning about students' proving capabilities, present a theoretical perspective that we have been developing, and indicate what we have been doing to help students succeed.

**Friday, October 23, 2009 at 3 pm in Bell Hall 143
The University of Texas at El Paso**

Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.