

1077-M1-2679 **Nicole Engelke*** (nengelke@fullerton.edu), California State University, Fullerton, Department of Mathematics, 800 N. State College Blvd., Fullerton, CA 92831, and **Todd CadwalladerOlsker**, California State University, Fullerton, Department of Mathematics, 800. N State College Blvd, Fullerton, CA 92831. *Identifying Student Difficulties in Combinatorial Proof Production.*

Combinatorial proof, the art of counting a set in two distinct ways to prove a statement, is a technique which emphasizes conceptual understanding of a problem and encourages creative thinking. Past work commonly divides proof production into semantic versus syntactic; combinatorial proofs do not appear to fit either category particularly well. However, we consider this proof production process more semantic than syntactic. We identified four broad categories of difficulties that students may have when attempting to semantically produce combinatorial proofs: language mimicking, inflexibility of context, misunderstanding of combinatorial functions, and failure to count the same set. A common theme emerged from our analysis in which students seemed to be doing more than mere pattern matching, yet failing to fully grasp the true meaning of what they are doing. We term this *pseudo-semantic* proof production; an attempt to write a combinatorial proof by relying on the syntax of previously encountered proofs. We illustrate the categories of student difficulties and pseudo-semantic proof production with four case studies drawn from a study of combinatorial proofs written by students in an upper-division combinatorics course and a graduate-level discrete mathematics course. (Received September 22, 2011)