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Undergraduate students' understanding of logical components in problem solving.

Reasoning and proof are foundational aspects of mathematics, and logic is the basis in making valid arguments and proofs. Unfortunately, mathematics education research indicates that students and teachers do not always share mutual understanding of the meaning of logical components. The purpose of this presentation is to provide issues related to student understanding of logical components that arise when solving word problems in introductory proof courses. Thirty-six undergraduates voluntarily participated in this study. Among them we administered a survey to 31 students who had not taken any proof-oriented mathematics courses, and interviewed 5 others who had already taken an introductory proof course. Both survey and interview questions were based on a logical problem called the King and Prisoner Problem—a linguistically simple, yet logically challenging problem. In this presentation, we describe various invalid student solutions to the problem and discuss the logical fallacy amongst the student solutions. In particular, it is thought-provoking that student's logical fallacy is based on a lack of precise understanding of some basic logical components. This emphasizes the necessity of additional teaching to form mutual understanding of the meaning of the logical components. (Received August 28, 2014)