An Exploratory Analysis of a Reading-Based Introduction to Proof Course Compared to Business-as-Usual Introduction to Proof

Brittney Fahnestock
Texas State University

Kathleen Melhuish
Texas State University

Paul Christian Dawkins
Texas State University

Kristen Lew
Texas State University

Kyeong Hah Roh
Arizona State University

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Introduction to Proof (ITP) is a pivotal point in the trajectory of mathematics majors. The Reading and Appreciating Mathematical Proofs (RAMP) project is a multi-year study that developed a series of proofs and accompanying author biographies for use in ITP courses (Contreras et al., 2025). Mathematicians each created three proofs designed to be both accessible and engaging for students at this level. The mathematicians were purposefully selected to broaden the kinds of mathematical stories students encounter challenging narrow, stereotypical images of "who does mathematics" and supporting a stronger sense of belonging in mathematics, factors linked to women's underrepresentation and attrition in the field (Good et al., 2012; Piatek-Jimenez, 2008).

Data thus far has been collected from nine sections (four using the curriculum; five not using the curriculum) of introduction to proof from two institutions. The final round of data collection is occurring this year. Students in the classes took a pre- and post- survey covering proof (Logic; Roh & Lee, 2024) and Sense of Belonging (SB; Good et al., 2012): 56 students in (15 women; 41 men) RAMP classes and 47 students (20 women; 27 men) in non-RAMP classes. In this poster, we will present some preliminary analyses of this data, including additional data collected from classes this semester. Our base model (women as reference group) for each survey is $\text{Post} = \beta_0 + \beta_1(\text{Pre}) + \beta_2(\text{Treatment}) + \beta_3(\text{Gender})$. Assumptions were checked and reasonably met. Pretest scores were standardized to allow meaningful comparison. In our initial exploration, the pre-surveys and gender were substantial predictors of logic post-surveys. For sense of belonging, pre-surveys were the only substantial predictor of post-surveys. A one standard deviation increase in the pre-survey score predicts a 3.57-point increase for the logic post-survey and a 5.34-point increase for the sense of belonging post-survey. Women are predicted to score 1.87 points higher on the logic post-survey.

Table 1. Regression Model Predicting Logic and Sense of Belonging Post-Test Scores.

Logic			Sense of Belonging		
	Estimate (SE)	*p*-value		Estimate (SE)	*p*-value
(Intercept)	21.44 (0.83)	<.001***	(Intercept)	55.30 (1.59)	<.001***
LogicPre	3.57 (0.44)	<.001***	SBPre	5.34 (0.87)	<.001***
Treatment	1.17 (0.88)	.19	Treatment	-0.38 (1.77)	.83
Gender	-1.87 (0.92)	.045*	Gender	0.83 (1.84)	.65

Note. * $p < .5$, ** $p < .01$, *** $p < .001$. Adjusted $R^2 = 0.41, 0.29$ respectively.

By the time of the poster, we will have additional student background data and more data to allow for better addressing moderators. For example, we hypothesize that the RAMP classes may have an impact that is moderated by pretest (e.g., those with lower sense of belonging may see more substantial gains.)

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