"Bold Problem Solving" in Postsecondary Mathematics Classes: Validation and Patterns

Martha B. Makowski
The University of Alabama

This study (a) validates a measure "bold problem solving" for postsecondary students and (b) examines patterns in bold problem solving tendencies within and across various math classes. A confirmatory factor analysis demonstrates the general construct holds for the postsecondary population. Course and gendered differences in bold problem solving tendencies exist.

At the highest levels, math requires inventiveness, experimentation, and risk taking. However, whether early orientations towards mathematical inventiveness and risk-taking have some relationship to those who choose to pursue careers involving advanced math remains unclear. College students who take Calculus tend to be more confident than those in lower level courses (Hall & Ponton, 2005). However, confidence does not suggest actionable *behaviors* that students can develop to help them become oriented toward math. *Bold problem solving* (BPS), a type of mathematical risk taking that involves a preference for solving problems using novel or invented solutions, a preference for working on more open-ended problems, and a desire to work independently, offers one possible avenue to address this. This study:

- Validates the six-item BPS tendencies scale with the postsecondary population.
- Examines relationships between self-reported "boldness" and students' level of enrollment in mathematics, with a particular focus on gender.

Methods

Data were collected at a large southeastern university during the Fall 2018 semester. Four classes were surveyed: Intermediate Algebra, entry level Finite Mathematics, Calculus I (non-honors), and Discrete Mathematics. These classes loosely capture the standard curriculum of the first few years of the postsecondary mathematics pipeline. The survey asked about students' demographics, math background, and career plans. The bold problem-solving tendencies scale that was piloted and partially validated with a sample of eighth grade students (Author, in preparation), and several other measures of students' attitudes towards math, were also included.

Analysis and Results

Using the entire sample, a confirmatory factor analysis (CFA) was conducted which resulted in four of the original six items being retained. Using the four retained items, BPS scores were created for each individual. Independent sample t-tests were run to examine gender differences in scores within classes. Table 1 presents the results from these analyses. Additional results and discussion will be presented on the full poster.

Table 1. Bold Problem Solving Scores and Differences by Gender

	Sample	Female		Male			
Course	BPS	*n*	BPS	*n*	BPS	Difference	Significance
Intermediate algebra	2.937	74	2.838	29	3.19	-0.352	0.016
Finite mathematics	2.874	86	2.89	17	2.794	0.096	0.62
Calculus I	3.223	111	3.079	86	3.41	-0.331	0.001
Discrete mathematics	3.375	26	3.308	48	3.411	-0.103	0.599

References

Author. (In preparation).

Hall, J. M., & Ponton, M. K. (2005). Mathematics self-efficacy of college freshman. *Journal of Developmental Education*, *28*(3), 26–28, 30, 32.