Creativity in Proving Through Individual, Small Group, and Whole Class Contexts

Amanda Lake Heath
University of Houston - Downtown

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Calls to foster creativity and collaboration in undergraduate mathematics have grown in recent years (e.g., Conference Board of the Mathematical Sciences, 2016; Saxe & Braddy, 2015; Schumacher & Siegel, 2015). Yet, little is known about how students perceive collaboration or individual work as supporting their mathematical creativity. Prior studies have largely measured creativity before and after instructional interventions (e.g., Asahid & Lomibao, 2020; Gilat & Amit, 2014, Levav-Waynberg & Leikin, 2012, Yuan & Sriraman, 2011; Zazkis & Holton, 2009), with limited attention to students' lived experiences. Further, few have examined proof-based courses or explicitly explored how collaboration may shape mathematical creativity.

This study investigates students' perspectives on experiences of mathematical creativity in an introduction-to-proof (ITP) course. Specifically, after a semester-long introduction-to-proof course taught with collaborative, inquiry-based methods, how do students recall individual, small-group, and whole-class activities as fostering their mathematical creativity?

Theoretical Framing and Methods

I adopt a relative perspective on mathematical creativity, defining it as the process of generating or implementing mathematical ideas or strategies perceived by the individual as non-routine. Feeling creative is thus taken as evidence of being creative (Satyam et al., 2022).

Data were collected from undergraduate students (n = 7) enrolled in an ITP course at a large public university in the southeast United States. Primary data for this study were participant responses to an end-of course reflection asking, "Did you feel creative in your Introduction to Proof course? Provide as many details as possible in your response." Responses were first open coded (Saldaña, 2016) to highlight students' words describing the contexts in which they felt creative. Codes were refined through iterative analysis, and findings were triangulated with course artifacts and video data to contextualize students' perspectives.

Findings

Students described feeling mathematically creative across individual, small-group, and whole-class contexts. Students felt creative in **individual** work when they independently overcame proving impasses, often by revisiting class videos, applying learned strategies, or experimenting through scratch work. Participants reported working in **small groups** allowed them to be creative because collaboration fostered shared ownership of ideas, helped with moving past stuck points, and revealed multiple valid approaches to a proof. Lastly, **whole-class** work fostered long-term creativity by positioning students as responsible for gaining their own understanding and short-term creativity when the instructor provided specific guidance and questioning. Insights from this study can inform the design of instruction in proof-based courses to intentionally use collaboration to cultivate students' creativity in mathematics.

This poster presentation will communicate detailed findings, including participant quotation and secondary data such as course artifacts and invite feedback and conversation about how to continue this work for a more explicit comparison of individual, small group, and whole-class contexts in undergraduate mathematics courses.

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