Instructor Moves in an Inquiry-based Undergraduate Mathematics Course for Prospective Secondary Mathematics Teachers

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To support the integration of inquiry-based learning practices in mathematics teaching, many studies have explored instructor moves and their effects on student outcomes (Deshpande & Guglielmo, 2019). In addition, on the topic of functions in mathematics, Breidenbach et al. (1992) apply Action-Process-Object-Schema (APOS) theory to describe the development of the process conception of function. Dubinsky and Wilson (2013) also use APOS theory and ideas of Quine (p. 89) to explore students' understanding of the function concept. Representations of functions (Even, 1998) and covariation (Thompson & Carlson, 2017) play important roles in the understanding of functions. This poster explores the research question: What are the key instructor moves used to facilitate student learning of functions in an inquiry-based undergraduate mathematics course for prospective secondary mathematics teachers (PSMT)?

This study is part of a larger study conducted at a large, diverse, urban university in the southwestern United States. Participants (n=27) worked in groups on an inquiry-based lesson on covariation in a mathematics course for PSMTs (Beach, et al., 2020) over three eighty-minute class periods. Student and instructor interactions were video recorded, focusing on two to three groups at a time. After audio transcription, open coding of instructor moves identified the following codes: Promoting, Probing, Redirecting, Revoicing, Mathematically Precise Speech, Relating to Other Concepts, or Vague/Non-Response. In addition, continuous periods of instructor engagement with a group, typically involving several instructor moves, were clustered as instructor move episodes (IME). Student discourse before and after each IME was assessed on a four-point scale, informed by instructor lesson logs. Level 0 indicated hesitant discourse while Level 2 characterized moderate, on-topic discussion of functions by most group members. Level 1 and Level 3 indicated minimal and maximal discourse, respectively. For each IME, the initial and final level of student discourse and instructor move frequencies within the IME were noted. The data analyzed consisted of four IMEs of the same student task worked by three groups.

Probing was the primary instructor move identified in episodes that shifted discourse about functions from Level 0 to Level 2 and Level 1 to Level 2. However, for the two episodes where discourse shifted from Level 2 to Level 3, Prompting surpassed Probing and frequencies of Mathematically Precise Speech, Relating to Other Concepts, and Revoicing increased.

Preliminary results suggest that the effectiveness of using a particular instructor move may be dependent upon the state of student discourse at the time of use. The move from Level 0 or 1 to Level 2 may be attributed to asking students direct questions (Probing) to facilitate engagement. In contrast, a shift towards a deeper level of discourse may require instructor moves that focus on the introduction of more specific information and precise language. Findings suggest that the shifts in student discourse after each IME also may indicate enhanced conceptual understandings of functions.

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