An Examination of the Implementation of Inquiry-Based Learning in a Developmental Mathematics Course

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In order to address the college-readiness of students entering colleges and universities, many universities have developmental mathematics courses to help prepare students for later mathematics courses. To help the students in these courses, active learning is often implemented in the classroom, where students are generally engaging in problem solving and using higher-order thinking skills (Bonwell & Eison, 1991), such as analyzing, evaluating, and creating (Krathwohl, 2002). Active learning has also shown generally positive results (e.g. Freeman et al., (2014), Theobald et al. (2020)). A specific type of active learning model is known as Inquiry-Based Learning (IBL), where students are given investigative tasks that promote the engagement of students in the creation of important mathematical concepts (Laursen & Rasmussen, 2019). Generally, this involves students creating and testing conjectures, making generalizations, providing justifications, and reflecting upon their conclusions and reasoning (Mesa et al., 2020). In addition, IBL often involves student collaboration, where students work together to build their knowledge, while the instructor facilitates the learning, in contrast to being the sole source of knowledge. IBL has generally seen positive effects on academic achievement, as well as reducing learning gaps between groups of underrepresented students (e.g. Kogan & Laursen, (2014); Laursen et al., (2014)). However, the use of IBL varies by practitioner, without a consistent definition, although it is consistent with and supported by education research (Laursen and Rasmussen 2019). Because of this, how IBL gets implemented in the classroom may differ across instructors or universities. My project focuses on how IBL is implemented in a developmental mathematics course by five different instructors.

This project uses classroom observations to see how IBL is being implemented in a developmental mathematics classroom covering college algebra. The classes were taught by five different instructors, who were given a few days of training in IBL as well as activities and worksheets they could implement in the classroom. To measure the level of inquiry, the Inquiry-Oriented Instructional Measure (IOIM; Kuster et al., 2019) is used, which is a well-defined measure of inquiry for Inquiry-Oriented Instruction. In addition, to measure how often the students and instructors were engaged with different activities, the Toolkit for Assessing Mathematics Instruction – Observation Protocol (TAMI-OP; Hayward et al., 2018) was used. I examine the IOIM scores as well as the TAMI-OP data, across four content units, to see any similarities and differences in the IBL implementation. This poster will present the data collected and the resulting analysis, to answer the questions: (1) What are the differences in the implementation of IBL by instructors? (1a) What is the frequency of activities and questions students and instructors engage in? (1b) What are the differences of the levels of inquiry in the classroom?

For five different sections, there was a wide variety of ways IBL was implemented. The percentage of groupwork and lecturing varied between the sections. In addition, the frequency and type of questions varied drastically across sections. The IOIM scores also showed differences across sections, both in terms of the mathematics being completed, as well as the ways the instructors elicited and utilized student contributions.

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