

## Abstract

Existing literature suggests that students often struggle with proportional reasoning. In the present study, our challenge was to help students develop proportional reasoning in an online environment. The student participants were about to enter eighth grade. Our research questions were: (i) What techniques help foster online discourse?, and (ii) How does students' proportional reasoning develop during online discourse? We addressed these questions in the context of a summer mathematics program in which we played the dual roles of teacher and researcher. In order to inform the content of our lessons, we conducted an individual pre-interview with each student. The pre-interviews revealed that some students struggled to understand proportional relationships and use multiplicative reasoning to solve problems. Some were able to correctly solve problems but lacked strong reasoning skills. We implemented seven weekly one-hour lessons to help students develop proportional reasoning. The study concluded with post-interviews. All interviews and lessons were video recorded and transcribed via Zoom. We analyzed the lesson videos using edTPA prompts for planning, implementation, and assessment. These weekly analyses were used to develop each lesson. We used and adapted lessons from *Illustrative Mathematics* to engage students in proportional reasoning. Using online chat box, Zoom break-out rooms, and mathematics-specific discourse techniques helped us foster discourse in an online environment. During the study, some students struggled to work with proportional relationships. However, by the end of the study, all students exhibited the mathematical confidence needed to be active discussion participants and deepened some aspects of their proportional reasoning.