# FLIPPED MATHEMATICS INSTRUCTION OBSERVATION PROTOCOL

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Keywords: Instructional Activities and Practices, Technology, Research Methods

Although flipped instruction is often viewed as a unified instructional model, many variations of flipped implementations exist in mathematics (de Araujo, Otten, & Birisci, 2017). Some teachers assign videos for homework and follow that with individual activities in class, whereas others assign videos with embedded questions followed by group projects in class. Extant observation protocols do not adequately capture the nuances between different variations of flipped lessons. Thus, we developed a classroom observation protocol robust enough to capture variations in flipped and non-flipped lessons.

Our Flipped Mathematics Instruction Observation Protocol (FMIOP) draws upon existing frameworks (e.g., Stein, Grover, & Henningsen, 1996), observation instruments (e.g., MQI), and advice from experts in educational technology and mathematics education. We then iteratively revised the protocol based upon teacher interviews and observations of flipped lessons. FMIOP consists of two components: in-class and at-home. The in-class component captures two aspects of the lesson: instructional quality and interactivity. Each aspect has sub-characteristics (e.g., mathematics development, video involvement). The protocol also distinguishes the whole-class and non-whole-class formats. In a departure from prior protocols, aspects such as the nature of authority are not combined into the instructional quality score but instead held separately as descriptive features of the lesson since evidence from different disciplines is contradictory about which authority pattern will be predictive of student learning. The at-home components are examined along three aspects: instructional quality, multimedia design, and interactivity. In addition to lecture videos, FMIOP captures the use of set-up videos, which are those that establish a non-mathematical context to intrigue students about what will happen in class.

Looking back, we see that instruments for lesson observations have progressed as new instructional models took hold. Looking ahead, the use of technology will continue to grow, so our observational tools must advance to account for key features of instructional videos and how videos are used in lessons so that we might distinguish implementations of flipped instruction and draw meaningful conclusions about how the instruction relates to student learning.

## Acknowledgments

This study is funded by the National Science Foundation grant no. DRL-1721025.

## References

de Araujo, Z., Otten, S., & Birisci, S. (2017). Teacher-created videos in a flipped mathematics class: Digital curriculum materials or lesson enactments? *ZDM Mathematics Education, 49*, 687–699.

Stein, M. K., Grover, B. W., & Henningsen, M. (1996). Building student capacity for mathematical thinking and reasoning: An analysis of mathematical tasks. *American Educational Research Journal, 33*(2), 455–488.