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EXPLORING STUDENTS' GRAPHING MEANINGS USING EYE-TRACKING TECHNOLOGY

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Students' abilities to reason about graphs as quantities varying in tandem (i.e., covariation) are critical for their success in STEM fields (Karagöz Akar et al., 2022). Yet, predominant instructional approaches do not sufficiently target such reasoning. This leads to persistent student difficulties in STEM courses and leaves much to be understood about how to support student reasoning and success. Further complicating the matter, a majority of the research on students' graphing meanings has relied on traditional methodologies that are time and energy intensive. In order to contribute to not only our knowledge on how to support students' construction of productive graphing meanings, but also field methodologies, we pursue the research questions of:

- In what ways can eye-tracking technology be used to complement current methodologies for investigating and supporting students' graphing meanings?
- In what ways is attentional focus related to the students' graphing meanings?

The advancement of eye-tracking technology opens new possibilities for mathematics education research, with researchers illustrating its promise for investigating student cognition including in the area of graphing (e.g., Thomaneck et al., 2022). Our research responds to the above questions by building on this work along with extant generalizations of students' meanings for graphs (e.g., Karagöz Akar et al., 2022).

We pair eye-tracking technology with traditional methodologies (e.g., semi-structured clinical interviews) to provide insights into undergraduate students' graphing meanings, including the extent their meanings entail productively reasoning about covarying quantities. Our results provide insights into the ways in which students' graphing meanings correspond to their attentional focus. For example, covariational reasoning involves coordinating the foci of a displayed graph and its projection onto axes. Alternative meanings for graphs involve privileging the displayed graph irrespective of axes. Our initial results also suggest that eye-tracking technology can generate artifacts for use in instruction. Such artifacts enable educators a tool to draw students' attention to specific graphing elements for the purpose of engendering covariational reasoning. In our poster, we discuss our methodological design and affordances, our results to date, and how we are pushing this initial work forward.

References

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