How one GTA used Data to Promote Student Engagement

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Student engagement is essential for rich learning (Middleton et al., 2017). Research shows that student engagement consists of emotional, social, cognitive, and behavioral components (Middleton et al., 2017); tends to decline in mathematics classrooms over any time interval (e.g., Martin et al., 2015), in-the-moment states fluctuate (e.g., Williams, 2022); and that classroom environments can be designed to promote engagement (Fredricks et al., 2004). Given research on college instructors attending to engagement is rare, the purpose of this study is to investigate how one GTA reflected on student self-reports of engagement during a precalculus course to promote engagement. We also discuss whether and how students responded to the GTA's strategies.

Theoretical Framework

Classrooms are dynamic environments influenced by a myriad of factors. We draw on dynamic systems theory (Vauras et al., 2013) to attend to the interpersonal back-and-forth between instructors' pedagogical strategies and students' reactions.

Methods

We address the questions: (1) How did a GTA use student engagement data to make pedagogical decisions?, and (2) How did students respond to the GTA's implementation?.

We collected self-reported information about student engagement using the experience sampling method (Nakamura & Csikszentmihalyi, 2009). The survey instrument was informed by flow theory, and has been used in college mathematics classrooms (e.g., Williams, 2022). These data were then aggregated and visualizations were shared with the GTA during virtually conducted and recorded meetings. We also recorded classroom observations. We used qualitative analysis methods and state space grids (e.g., Turner et al., 2014) to produce results.

Results and Conclusions

The GTA's primary strategy to promote engagement was group work, and the students' self-reported engagement, on aggregate, improved when group work was implemented. However, the GTA could rationalize when and why group work would either not be appropriate or would potentially not influence student engagement with hypotheses that included activity length and problem difficulty. Classroom observations also revealed patterns in student-teacher conversations and group work activity. The GTA's location in the classroom was related to whether students asked the GTA questions versus asking their peers. The amount of visible interaction between group members was based on the details and instructions provided by the GTA's when introducing activities. Our results show a link between the GTA's expected student involvement in groups with the self-reported levels of engagement and data to offer potential explanations for these relationships. Thus, we propose GTAs can attend to student engagement in ways that support students' growth and instructors' pedagogical goals during a single semester in a mathematics course.

References

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109.

Martin, A. J., Papworth, B., Ginns, P., Malmberg, L. E., Collie, R. J., & Calvo, R. A. (2015). Real-time motivation and engagement during a month at school: Every moment of every day for every student matters. *Learning and Individual Differences*, *38*, 26–35.

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Nakamura, J., & Csikszentmihalyi, M. (2009). Flow theory and research. In C. R. Snyder & S. J. Lopez (Eds.), *Oxford handbook of positive psychology* (2nd ed., pp. 195–206). Oxford University Press.

Turner, J. C., Christensen, A., Kackar-Cam, H. Z., Trucano, M., & Fulmer, S. M. (2014). Enhancing students' engagement: Report of a 3-year intervention with middle school teachers. *American Educational Research Journal*, *51*(6), 1195–1226. https://doi.org/10.3102/0002831214532515

Williams, D. A. (2022). Student engagement in college mathematics: Self-reported engagement and perceptions of classroom environments, confidence, and relevance. *MathAMATYC Educator 113*(2), 51-60.

Vauras, M., Kinnunen, R., Kajamies, A., & Lehtinen, E. (2013). Interpersonal regulation in instructional interaction: A dynamic systems analysis of scaffolding. In S. Volet & M. Vauras (Eds.), *Interpersonal regulation of learning and motivation: Methodological advances* (pp. 125–146). Routledge.

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PURPOSE & MOTIVATION

- Research shows that student engagement
  - is a complex meta-construct consisting of behavioral, social, emotional/affective, and cognitive components (Fredricks, Blumenfeld, & Paris, 2004; Middleton, Jansen, & Goldin, 2017)
  - tends to decline in mathematics classrooms over any time interval (e.g., Martin et al., 2015)
  - in-the-moment states fluctuate (e.g., Williams, 2022)
  - and that classroom environments can be designed to promote engagement (Fredricks et al., 2004).
- Given research on college instructors attending to engagement is rare, the purpose of this study is to investigate how one GTA reflected on student self-reports of engagement during a precalculus course to promote engagement.
- We also discuss whether and how students responded to the GTA's strategies.

RESEARCH QUESTIONS

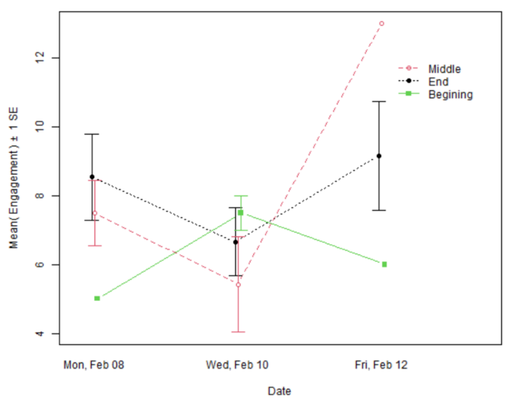
1. How did a GTA use student engagement data to make pedagogical decisions?
2. How did students respond to the GTA's implementation?

THEORETICAL FRAMEWORKS

Classrooms are dynamic environments influenced by a myriad of factors. We draw on dynamic systems theory (Vauras et al., 2013) to attend to the interpersonal back-and-forth between instructors' pedagogical strategies and students' reactions.

METHODS

Facilitating Discussions/Reflections



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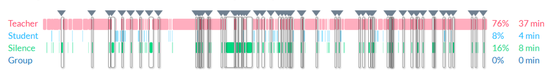


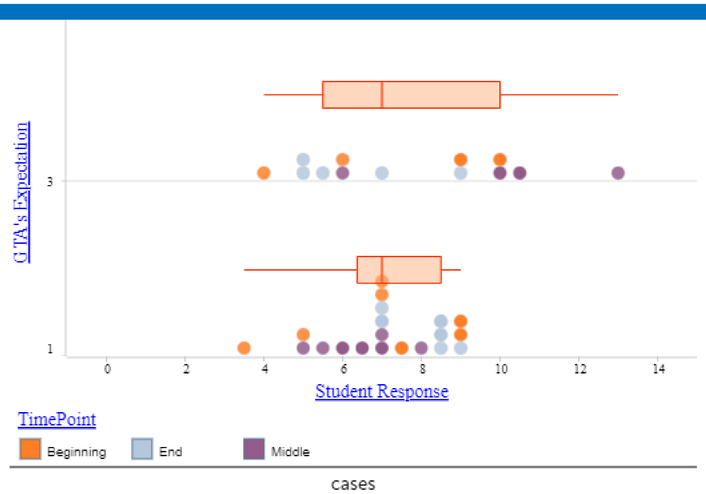
METHODS

Analyzing Video Data

subInterval	GTA Expectations	Student Report	Date	TimePoint
4	0	7.5	10-Feb	Beginning
8	1	7.5	10-Feb	Beginning
12	0	7.5	10-Feb	Beginning
16	1	7.5	10-Feb	Beginning
20	2	5.5	10-Feb	Middle
24	1	5.5	10-Feb	Middle
28	1	5.5	10-Feb	Middle
32	0	5.5	10-Feb	Middle
36	1	7	10-Feb	End
40	0	7	10-Feb	End
44	3	7	10-Feb	End
48	3	7	10-Feb	End

GTA Expectation	Student Response	Date	TimePoint
1	7.5	10-Feb	Beginning
1	5.5	10-Feb	Middle
3	7	10-Feb	End

RESULTS



RESULTS

GTA Statements During Discussions/Reflections

"On Friday, it is supposed to be all group work…I think that will be good. Maybe even more so than on Monday…or maybe group work goes too far sometimes."

"Admittedly, today was more of a lecture format because I wanted to get a lot of stuff out of the way, so I expected those on the right to be way lower."

"I had them working together on the end but through the whole like first part it was like I had some questions where it was supposed to just be like alright them themselves think about it."

CONCLUSION

- The GTA's primary strategy to promote engagement was group work
  - The students' self-reported engagement, on aggregate, improved when group work was implemented
  - However, the GTA could rationalize when and why group work would either not be appropriate or would potentially not influence student engagement with hypotheses that included activity length and problem difficulty.
- Classroom observations also revealed patterns in student-teacher conversations and group work activity.
  - The GTA's location in the classroom was related to whether students asked the GTA questions versus asking their peers.
  - The amount of visible interaction between group members was based on the details and instructions provided by the GTA when introducing activities.
- Our results show a link between the GTA's expected student involvement in groups with the self-reported levels of engagement and data to offer potential explanations for these relationships.
- Thus, we propose GTAs can attend to student engagement in ways that support students' growth and instructors' pedagogical goals during a single semester in a mathematics course.

REFERENCES

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Martin, A. J., Papworth, B., Ginns, P., Malmberg, L. E., Collie, R. J., & Calvo, R. A. (2015). Real-time motivation and engagement during a month at school: Every moment of every day for every student matters. *Learning and Individual Differences*, *38*, 26–35.

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