Teaching Patterns & Where to Find Them

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Introduction

Current science education standards are set according to the three dimensions of the K-12 Framework for Science. From this framework students in grades, K-12 can build upon and develop their knowledge and practice in their science classrooms. The three dimensions are integrated together: (1) practice, students engage in the practices of science, (2) crosscutting concepts, students learn to connect such concepts across different disciplines, and (3) disciplinary core ideas, students utilize dimensions one and two to further their understanding in the discipline.

By focusing on making sense and reasoning, the Next Generation Science Standards (NGSS, States Led, 2013) students are able to go beyond focusing on the "correctness" of their thinking. Using misconceptions as an opportunity, or building blocks helps to guide students in evolving their understanding of core concepts and practices instead of superficial recall (Campbell et al., 2016). With this change, Passmore (2014) instead supports the idea of students becoming "thinkers" by using the main concepts learned in class to figure out problems. To help support this, Passmore (2014) even gave examples of two different classes to help visualize both sides.

Michaels & O'Connors (2012) continue to support this concept of students becoming "thinkers" through the instructional strategy of productive talk. They provide reasons on what makes talk important, how to establish a culture of productive talk, and what teachers can do to promote it. Different moves are highlighted in this work that teachers can use to support students in talk.

This study focuses on the themes that arise from teachers who participated in a professional development focused on supporting teaching in facilitating productive talk in their high school science classrooms. Here, we explored the themes and relationships across themes as we begin the initial work of understanding themes across one of the two groups focused on during the larger project's field study year.

Research Questions

Focusing on three teachers who took part in a professional development focused on science discourse, we used the following question to guide our exploration of science learning at its core:

1. What are the main themes present in the classroom observation data?
2. How does the frequency of teacher engagement relate to the amount of student engagement overall across all three teachers?

Methods

- This study comes from a subset of larger data as part of the Learning Through Collaborative Design Professional Development Project.
- The first two authors identified patterns in classroom observation videos through Nvivo 12.
- The classroom videos selected for this study were a mix between 50-minute class blocks and 90-minute class blocks.
- Three teachers were selected to be the focus of this study for their shorter lessons, which provided more coding to occur, and the use of constant lesson plans. Both focal lessons were not coded for each teacher, with the goal focused on the amount of comparable instruction time.

Teacher	Minutes of Instruction Coded	Course	Lessons & Sections Coded
Charlotte	180 (1-day each section)	Biology Honors	Guppies Section 1 & Section 2
Theo	150 (1-day each section and lesson)	Biology Honors	Guppies Section 1 & Section 2, Fruit Flies Section 1
Savannah	250 (3-days)	Pre-IB Biology	Guppies Section 1

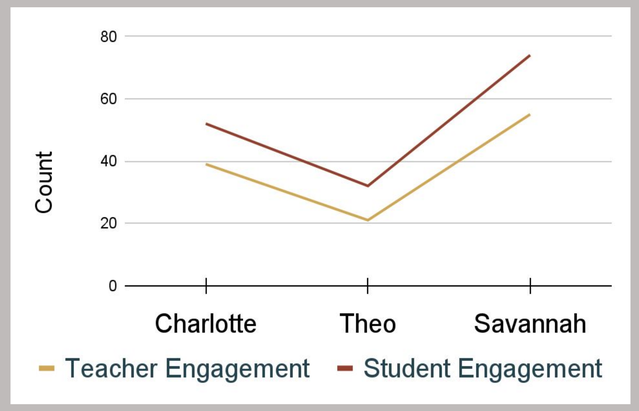
- Analysis of these videos were used to see larger trends across teachers of the study.

Findings

Overall we see six main themes present across all three teachers, questions (n=60) and interactions (n=70) amongst the most prevalent in class video data. Across all the themes, we focused more heavily on affect. Student affect (n=60) is defined as moments when students exhibit excitement, boredom, or frustration as they are engaged with the activity. Teacher affect (n=22) is defined as moments when teachers are sharing their own experiences of frustration, boredom, or joy related to the activity.

Themes	Teachers		
	Charlotte	Theo	Savannah
Student Affect	22	23	15
Teacher Affect	6	7	9
Questions	15	7	38
Vexation	9	3	5
Interactions	23	16	31
Support - Materials, etc.	7	6	28

The frequency of teacher engagement in relation to student engagement shows that Charlotte (TE n=39, SE n=52), Theo (TE n=21, SE n=32), and Savannah (TE n=55, SE n=74) have varied engagement rates but there is a pattern in the amount of teacher engagement and student engagement.



Discussion

RQ1 attends to the themes of teacher and student emotion in relation to the doing/implementation of the task. We selected to focus on affect or emotion because this framework revealed individual student patterns of engagement in relation to teacher patterns of engagement in moment-to-moment coding important for RQ2. The findings revealed that teacher affect might remain low but students will still express emotion in relation to the task. While the focus of this study was not on the positive, neutral, or negative emotions future studies could address the breakdown of types of affect.

For RQ2, we defined engagement as, action in relation to the tasks whether it be a student or teacher engagement the focus is on action (i.e. talking, writing, questioning, etc.) with regard to the goals of the task. Findings from RQ2 support an initial idea that with more teacher engagement, students also will engage more in the task goals. However, more teachers need to be analyzed to support this finding.

Overall, this work is an initial effort to identify themes in teachers' instruction. Our goal is to determine where professional development efforts could best be focused or shifted in order to support teachers in their instruction.

Conclusion

From this study we were able to see salient themes across three high school biology teachers and their instruction. In these themes, we identified a pattern across these teachers that showed the more frequent the engagement of the teacher, the increased student engagement was also seen. Future studies will further these ideas, and seek to explore what relationships these themes have to rigor and equity.

Limitations

Limitations for this study include:

- Small teacher sample size.
- Difference in amount of coded observation data, while similar the quality is not always the exact same between teachers.
- Quality of video was not always indicative of the entire classroom or students in the room.
- *Researcher Positionality

References

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