Science Teachers' Vision for Promoting Productive Classroom Talk

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Introduction

Abstract

- We explored the instructional vision of two biology teachers who attended an NSF-funded professional development program (PD) focused on fostering productive epistemic discourse in science classrooms.
- The vision interviews focused on understanding how teachers envision high-quality science instruction.
- We explored how the teachers' instructional vision maps translated into the vision of high-quality science instruction discussed in the literature. We explored the level of sophistication in teachers' vision based on vision rubrics.
- The results of data analysis supported to reveal for a holistic view of the teacher's vision. Exploring teachers' instructional vision and its development can allow us to promote development of a shared vision between teachers and stakeholders, allowing for the goals of reaching a high-quality science environment to be mutually understood.

Study Purpose

- Students' engagement in productive talk is essential for promoting the development of scientific proficiency and skills such as critical thinking, reasoning, collaboration, and communication (e.g., NRC, 2012)
- Productive classroom talk involves students' discussions to figure out science phenomena or solve problems (e.g., NRC, 2012; Resnick et al., 2018).
- However, facilitating productive talk remains to be complex and challenging for many teachers even with reform-based teaching efforts (e.g., O'Connor & Michaels, 2019).
- Prior research predominantly has framed teachers as practitioners and focused on teachers' practices in the moment of teacher, however science teachers' thinking regarding productive science talk and how to promote this talk remains an area that requires further investigations (e.g., Pimentel & McNeill, 2013).
- To address this need, we aim to explore science teachers' vision of high-quality science instruction with a particular focus on classroom talk to better understand how to generate science lessons that promote opportunities for engagement in science talk.
- Teachers' instructional vision refers to how teachers characterize high-quality instruction and what aspects of instruction teachers highlight for enacting high-quality instruction (Munter, 2014).

Research Question

- How did two science teachers who attended a professional development program about promoting epistemic discourse in science classrooms, envision high-quality science instruction?
  - The PD program included a summer workshop and three cycles of PD consist of three parts (a) co-designing a science lesson with another teacher or a research team member, (b) teaching the co-designed lessons, (c) reflecting on the lessons (Southerland et al., 2017).

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Method

Research Design

Participants

- Ms. Shelly had 1.5 years of biology teaching experience whereas Ms.Tina had 14 years of experience. They worked in different high schools.

Data Source

- After PD, teachers engaged in vision interview which focused on how teachers envision high quality science instruction.
- The interviews began by asking the following question:
  - *If you were asked to observe a teacher's science classroom for one or more lessons, what would you look for to decide whether the science instruction is high quality?*
  - Depending on the teachers' response, following questions are asked:: *Why do you think it is important to use/do …. in a science classroom? Is there anything else you would look for? If so, what? Why?* Then, more specific questions were asked.
- The interviews were transcribed for further analysis to take place.

Data Analysis

- We analyzed the transcripts by using instructional vision rubrics (Munter, 2014; Tekkumru-Kisa et al., 2021) which designed to explore the level of sophistication in teachers' vision based on the criteria for high-quality science learning and teaching discussed in the literature (see Table 1).

Dimensions of Instructional Vision	Low level of sophistication	High level of sophistication
Teacher Role	(1) Teacher seen as "deliverer of knowledge"	(4) Teacher seen as "more knowledgeable other"
Nature of Classroom Talk	(2) Talk among students about the investigation	(4) Talk should encourage spawning new investigations
Structure of Classroom Talk	(1) Stresses importance of passive engagement	(2) Stresses importance of active engagement
Student Questions and Explanations	(1) Traditional lecturing without debate or inquiry	(4) Whole class conversation independent of the teacher
Teacher Questions	(3) Promotes straightforward student questions	(4) Promotes student questions that drive instruction
Student Engagement in Classroom activity	(1) Aid in keeping students on task	(4) Aid student explanation and develop student's thinking

Findings

- Our analysis revealed that teachers had sophisticated vision for most of the dimensions of instruction (see Table 2).

Dimensions of Instructional Vision	Ms. Shelly	Ms. Tina
Teacher Role	Level 4	Level 4
Nature of Classroom Talk	Level 3	Level 4
Structure of Classroom Talk	Level 2	Level 2
Student Questions	Level 4	Level 4
Teacher Questions	Level 4	Level 2
Student Engagement in Classroom activity	Level 4	Level 4

Results

- In this study, we focused on two biology teachers who attended the PD around fostering productive epistemic discourse. We found that they had sophisticated vision for most of the dimensions of science instruction promoting productive classroom talk.
- Teacher Role (level-4): Both Ms.Shelly and Ms.Tina characterized the teacher as more knowledgeable other in a high-quality instruction. They discussed teachers as proactively supporting students' collective sensemaking by promoting students' productive disciplinary engagement.
- Patterns and Structure of Talk (level-4): They emphasized whole classroom discussions led by the students and allowing more room for student independence and contributions.
- Nature of Classroom Talk (level-4): They characterized classroom talk as being conceptually oriented including construction and critique of arguments, explanations, models regarding natural phenomena to promote students' engagement in scientific practices.
- Teacher Questions (level-4): They discussed the variety in questions (what, how, why types of questions) and their functions in lessons.
- Student Questions and Explanations: Ms. Shelly discussed their questions and explained how students should be able to justify their answers (level-4), whereas Ms. Tina was not clearly discuss and justify her ideas of student questions and explanations.
- Student Engagement in Classroom Activity: They both discussed classroom activities as students engage in investigations and present their findings, while being accountable for their actions and behavior within the classroom.

Discussion

- Exploring teachers' instructional vision can help us to gain a better understanding of discrepancies and areas of strength in teachers' instructional vision.
- Exploring teachers' instructional vision can inform and shape the professional development programs to address teachers' development of vision.
- Supporting the development of a shared vision between teachers and stakeholders can promote the shift in science classrooms to foster students' engagement in science talk.

Key References

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