Influence of a Science Methods Course on Prospective Elementary Teachers' Visions of Science Teaching

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Research Questions:

1. Do PSETs' visions of science teaching shift over the course of a semester-long science methods course? If so, in what ways do they shift?
2. What experiences during the methods semester influence PSETs' visions of science teaching?

Participants:

- 85 undergraduate students enrolled in a one semester elementary science methods course in one of four semesters (Fall 2016 – Fall 2017) taught by the first author
    - all pursuing certification as elementary teachers
    - some pursuing early childhood endorsement and/or special education certification as well
- Science methods course occurs in the second semester of a four semester program

Data Collection and Analysis

- Science Methods Course Assignments
    - Visions of Science Survey (Beginning and End of Semester)
    - Science Biography including past experiences with science
- Follow-up Interview (selected participants – 30 across all semesters) Selection Criteria
    - Very positive or very negative feelings about science (science biography)
    - Changes in visions of science survey
- Analysis
    - Quantitative (Visions of Science) – Wilcoxon signed rank test for significant shifts from beginning to end of semester
        - Aggregated and disaggregated based on feelings (positive, negative, mixed) about science

Code	Example from Biography Survey Question About Enjoying Science
Positive	Yes, I loved all of it! It just makes sense to me. Biological sciences and I just click.
Negative	I have never enjoyed science throughout my schooling. I feel that I never got to experience science in a creative, thoughtful process.
Mixed	I did and I didn't. I enjoyed learning about it and being able to explore how things work and why they work that way but sometimes I felt that it was too structured in the sense that the teacher led everything and students didn't really have an opportunity to form their own opinions.

    - Qualitative (Science Biography and Interviews) – thematic coding using the major ideas from the methods course and then open coding

Findings:

- Prospective teachers' visions of science teaching shift towards or maintain alignment with visions of science teaching introduced during their science methods course.

Course Idea	Less Likely	Stayed Likely	More Likely
Providing students with experiences before explanations	"You introduce your unit on ecosystems by defining the terms that students need to know such as carnivore, herbivore, and omnivore.	"You are teaching a unit on the weather. You decided to have your class take pictures of the clouds in the sky and take daily weather measurements. As a class, you try to figure out if there are any patterns in the data."	"You introduce your unit on ecosystems by defining the terms the students need to know such as carnivore, herbivore, and omnivore."
Eliciting and building on students' ideas			"You are teaching about the water cycle. You organize a time for a whole class discussion so that children can talk to each other about their ideas about condensation."
Engaging students in the practices of science and engineering		"You give students batteries, bulbs and wires. You encourage the students to find all the possible ways to light the bulb. Students **make arguments** about how to light the bulb."	"You want students to learn the phases of the Moon. You have students use a light bulb and Styrofoam ball to **model** the Earth-Sun-Moon system."

- Model science activities were particularly influential for prospective teachers' visions of teaching science.
    - Hannah, "I thought she (course instructor) did a great job of teaching us how to teach kids by doing some things with us, and then explaining why it would be meaningful for the students."
    - Taylor, "I also really like how you (course instructor) actually do the experiments with us, as if we were students, so that way we would like have an idea about how to do it in our own classroom, cause I really respond like to model teaching."
    - Emily, "I think, when I first answered that (scenario), I didn't really understand how I would teach that, so I kind of say never, because I was, 'I don't understand how I'd do that.' And then, when we did that thing in your (course instructor) class with all the different sounds and like the drum and stuff, that kind of gave me ways to think about how I could teach it differently of like the same, um so, I think in the beginning it was more just like, I don't really know how I would do this, so I would never teach it, but like, since you taught ways that like we would be able to teach it, then I think now I would be a lot more confident teaching something like that."
- Learning about how students learn science and connections between this and activities that were done in the methods course was also a meaningful part of the methods course.
    - Alexis, "Her (course instructor) giving us like the background on how students learn science and what would be most effective for them, um, really helped me."
    - Hannah also referenced the idea of understanding how elementary students learn science when she described learning "why it (science activities during the methods course) would be meaningful for the students."