Learning By Teaching:
Microteaching In Geoscience Content Courses For Preservice Elementary Teachers

Matthew A. d'Alessio, Dept. Geological Sciences, California State University Northridge, matthew.dalessio@csun.edu

California State University Northridge

Poster 243-4

1.

Do you teach science classes for future teachers?

Teachers that think they can do a good job doing science actually do a better job teaching science, on average. This "self efficacy belief" is so important that we make it a focus in several of our science content courses for future teachers.

We tracked students' self efficacy in a traditional science content course and ... **it didn't change**! Students scored well on exams and learned science content, but **learning science content doesn't make teachers more confident in their ability to teach science.**

Why not? What can we do about it? Read more to find out!

2. What is Self Efficacy Belief (SEB)?

Self Efficacy = Self Confidence + Other dimensions

Education researchers typically avoid this phrase because you can be "confident" that you will be a terrible teacher.

See Section 4 for an example

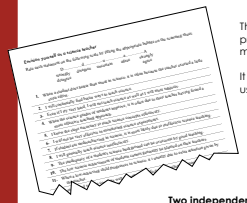
3. Self Efficacy matters a lot for effective teaching

Classroom teachers with higher self efficacy beliefs about their science teaching have been shown to have:

- Higher student achievement [1, 2]
- More time on task during science teaching [3]
- Use student-centered teaching strategies like inquiry more often [4]
- Ask higher order questions [4]
- Try more innovative teaching & take more teaching risks [1, 3]
- Higher expectations for students [1, 2]

(1 - Ashton & Webb, 1986; 2- Gibson & Dembo, 1984; 3 - Ashton 1985; 4 - Czerniak & Schriver, 1994)

4. Measuring SEB's with the STEBI-B



The STEBI-B (Science Teacher Efficacy Belief Instrument – version B is for pre-service teachers) is a validated instrument used internationally to measure SEB's.

It basically asks, "how good a science teacher do you think you'll be?" using a series of 23 more subtle questions.

Two independent dimensions of SEB measured by the STEBI-B:

PSTE - Personal Science Teaching Efficacy

Low PSTE: I can't teach science. I'm bad at that.

High PSTE: I think I'll do a great job teaching science lessons

STOE - Science Teaching Outcome Expectancy

Low STOE: Some kids get science and some don't. What I do won't matter.

High STOE: Kids need a really good teacher and then they'll understand science.

In this poster, we focus mostly on PSTE

5. Microteaching as a form of content delivery

In GEOL 406, pre-service elementary teachers are supposed to apply their science knowledge gained during 3 previous science courses. Rather than have University faculty deliver content to the students, we have students teach small groups of their peers, "microteaching."

Student "microteachers":
1. Download a pre-designed lesson plan.
2. Study background information.
3. Practice lesson sequence.

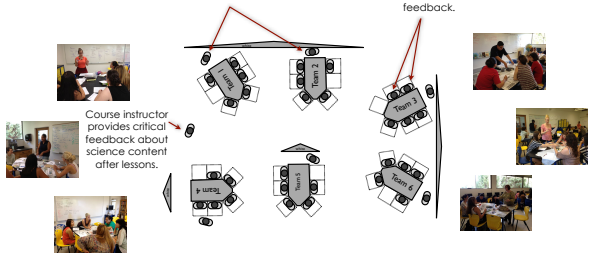
We find that our students are not yet prepared enough as scientists or educators to produce their own lessons.

We (CSUN) provide:
1. All materials.
2. A space for 6 mini-classes to teach the same lesson simultaneously.

6. What microteaching looks like in a classroom

One student from each team is the teacher for the lesson.

Students participate during the lesson. Afterwards, they provide anonymous feedback.



Course instructor provides critical feedback about science content after lessons.

7. Microteaching includes elements that are known to improve self-efficacy

The whole concept of SEB comes from the social-cognitive work of Albert Bandura, a social scientist. He documents four types of experiences that tend to increase SEB:

Bandura's experiences that improve SEB	How microteaching presents this experience	Details
Mastery experiences (actually succeeding!)	Students teach an entire 45 minute science lesson three times during the semester.	For most, this is their first experience teaching an entire science lesson. In the course, they teach three lessons and emphasis is placed on improvement. Bandura claims that success is often internally measured as growth, not objective standards.
Witnessing peers succeed (vicarious success)	Students watch their peers teach 15 full lessons.	For most, this is their first experience teaching an entire science lesson. In the course, they teach three lessons and emphasis is placed on improvement. Bandura claims that success is often internally measured as growth, not objective standards.
Verbal encouragement and persuasion that success is possible	Students receive anonymous peer comments, which are both critical and very encouraging.	We have worked hard to create a climate where students take the anonymous rubric and written comments very seriously, offering constructive criticism throughout. However, without any effort on our part, the comments almost universally end with positive encouragement from the peers.
Emotional State (coping with physical stress & 'butterflies in the stomach')	Students complete a post-teaching reflection where they assess their nervousness, how it changed from previous lessons, and how it affected their teaching.	Despite the fact that 100% of our students are future teachers, almost all of them are visibly nervous during their first microteaching experience – even though it is presented to tiny group of 5 friendly peers and not a class full of 3rd graders. By the third time they microteach, most students are having fun with teaching the lessons and are not nervous.

Conclusions:

Future teachers don't always start off feeling like they can be good instructors of science. In traditional, 'content-focused' science classes, they learn content without any change in self efficacy. Microteaching is an effective strategy for teaching content **and** improving self-efficacy beliefs.

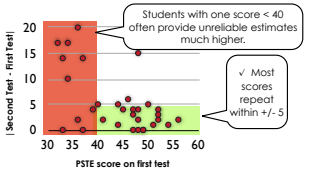
8. STEBI-B @ CSUN

We administer the STEBI-B at the beginning and end of each science content course in the B.A. program for pre-service elementary teachers. This repetition allows us to track the effectiveness of each course and see students growth over time. We have data from 3 years.

9. STEBI-B is reliable within +/- 5 points

Some students enroll in two of our courses concurrently. They therefore take the same test two times within a few days.

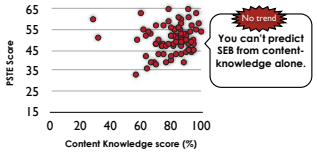
This gives us a measure of the STEBI-B's reliability as an instrument.



10. High SEB is not correlated with strong content knowledge

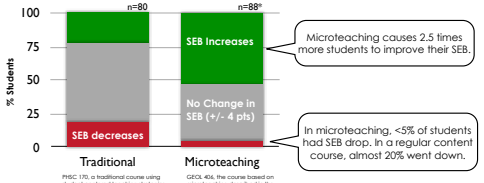
Content knowledge is important for effective teaching, but it is not enough to help students gain high SEB about science teaching.

Many students have very high scores on content tests but still have low SEB.



11. Microteaching is more effective at increasing SEB than a traditional content-focused course.

Below is a simple qualitative comparison of microteaching compared with our usual content course. We break down each class into three groups – those whose end-of-semester PSTE scores were within +- 5 points of the pre-semester (grey), those with >5 points increase in PSTE (green) and >5 point decreases (red). More quantitative analyses are in progress.



PHSC 170, a traditional course using student-centered teaching strategies (based on the "Physical Science of Everyday Thinking" curriculum for future teachers & funded by NSF.)

GEOL 406, the course based on microteaching described in the middle panel of the poster. All lessons are delivered by peers during microteaching.

* These results are all for 1 instructor, the author. We've started having graduate students direct the microteaching and results are similar, but not as impressive. We're trying to create a model that allows growth regardless of instructor.