

# Constructing Knowledge about Teaching and Learning Physics

Shawn Michael Bullock, Ph.D.

University of Ontario Institute of Technology

# Context

- I teach a full –year “physics methods” course that is required for teacher candidates who wish to be certified to teach physics in Ontario.
- All teacher candidates have, at minimum, a Bachelor’s Degree before coming to the 1-year B.Ed. Program.
- Usually, about 50% majored in physics.

# Starting Points

- Learning to teach is primarily a *cultural*, rather than a policy-driven problem, because most adults have been to school and hence have a (restricted) insider's perspective.
- “Teaching looks easy and is widely regarded as easy.” (Loughran & Russell, 2007)

# The Culture of School



The thousands of hours that students spend participating in cultural ceremonies associated with school result in an “apprenticeship of observation” (Lortie, 1975, p. 62).

# An Insider Perspective

“As observers of schools, we do not come to the task with blank minds. We come with images, expectations, and implicit and explicit attitudes. We come to the task after a long process of socialization and acculturation from which in countless ways, witting and unwitting, we have absorbed conceptions of and attitudes toward school settings.” (Sarason, 1996, p. 14)

# The Problem of Learning to Teach

- The effects of the apprenticeship of observation and its associated limitations have a profound impact on teacher candidates.
- *Teacher candidates have little choice other than to teach as they were taught.*
- How do I, as a physics methods professor, help candidates to interpret and implement the findings from Physics Education Research?

# Research Questions

1. How do physics teacher candidates construct professional knowledge from teaching experiences during their practicum placements?
2. How do physics teacher candidates construct professional knowledge from learning experiences in a physics curriculum methods course?

# Methodology

- Four focus groups with five participating teacher candidates during each of four on-campus blocks of a teacher education program in Canada.
- Individual follow-up interviews with each participant after each focus group.
- A total of 24 interviews were conducted with participants over an 8-month B.Ed. program.

# Early Ideas about Teaching and Learning Physics

# Early Ideas

- Dominant metaphor: *Teaching is Telling.*
- “I thought coming into this program that there was really only one way to teach: You get up and you talk to your students.”
- “If you repeat the textbook, but do it really well, it can be effective.”

# Early Ideas

- “I think the physics I liked the best was when the prof just wrote on the board for an hour . . . that’s where I learned the most, just watching these really complicated proofs.”
- “I could pick up a textbook and read it and pass the class if the teacher didn’t teach anything. I’d remember most of the concepts.”

# Early Ideas

- Although there was consensus that transmission-oriented teaching worked for them, participants realized that had to find ways to engage the “other 80%.”
- Participants were unable to articulate specific teaching approaches they wanted to use, beyond a general sense that concepts were more important than algorithms or rote learning.

# Significant Experiences from the Practicum and the Methods Course

# Significant Experiences: Practicum

- Participants reported that they tended to replicate the teaching they witnessed as students during their early practicum experiences.
- Participants expressed significant frustration because they were unable to teach in ways they envisioned.

# Significant Experiences : Practicum

- Dominant Metaphor: *The Basics of Teaching*

“I think that the things we learn here [at the Faculty] . . . once you’ve figured out *the basic ideas* of teaching you’ll want to incorporate all of these things in your teaching. But at school, you’re learning those *basic ideas* of how to get your class to pay attention and make them learn the thing you’re trying to teach.”

# Significant Experiences: Methods Course

- Participants held the pedagogy used by their physics methods professor in high regard, even though they struggled to name features of his approach.
- Participants spent the third round of interviews theorizing about the impact of being taught using the pedagogies they were encouraged to use during practicum placements.

# Significant Experiences: Methods Course

Participants worked together to name the following features of the professor's pedagogy:

- P.E.R.-based teaching does not happen overnight
- Active learning (e.g., POE, ILD, Peer Instruction)
- Teaching as a relationship

# Reframed Ideas about Teaching and Learning Physics

# Reframed Ideas

## Dominant Metaphor: *Active Learning*

- Defined by the participants as an approach that requires students to be *doing* rather than listening to a lecture.
- Requires a teacher to find ways to *listen* to students' learning needs.
- Requires a teacher to find ways to explicitly challenge students' prior assumptions.

# Reframed Ideas

- “My perceptions of teaching now are totally different than they were in September.”
- “A defining moment [in physics class] was planning our first day and week [for the beginning of a teaching career]. I was thinking about how I can actually do all of these things!”

# Conclusions

- Participants saw the practicum as a place to “practise basic teaching skills.”
- Participants in the study developed a wider view of the teaching and learning possibilities in a physics classroom as a result of experiences in a methods course.

# Voice of a Participant:

When I came to the program I thought there was pretty much just one way to teach. I didn't really realize teaching was so complex and there's so many different ways to teach, and you can't really— There is no “right way” to teach. You've really got to go in there and find out what your class is like. Find out what their interests are, what their strengths are, and you've got to kind of tailor your lessons and your assignments and things like that to meet the needs of your students.

# Contact

shawn.bullock@uoit.ca

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<http://shawnbullock.ca>