Getting Starting with Physics Education Research (PER)

Andria Schwortz
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Who am I, and why UW on the slides?

- Quinsigamond Community College
  - Tenured Full Professor of Physics and Astronomy (current)

- University of Wyoming
  - MS Physics (2014), PhD Physics (current)

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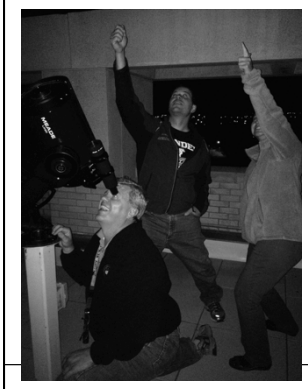
Outline



- What is Education Research?
- Getting Permission
- Styles of Research
- Group Time
- Wrap-Up

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You are already doing education research

- Trying out new ways to teach
- Developing new / tweaking old lesson plans
- Learning how to help students with disabilities
- Fundraising for students with economic hardship to attend class trips
- Encouraging quiet students to participate in class

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What is Education Research?

- Answering questions about teaching and learning which have not already been answered by others
- Collecting, analyzing, and interpreting data related to your question
- Doing this in an ethical manner
- Multiple research styles

Ethics

- People are not lab rats.
- Don't do research **to** or **on** your students, do research **about** and **with** your students.
- Do research about yourself and your own teaching.
- When in doubt, get permission.

Getting Permission: K-12

- What does your school say about getting permission?
- If you're doing something with your students that's outside the scope of normal teaching, talk to your department chair or principal
- Don't need additional approval to share results about **yourself**
- **Do** need additional approval to share about **your students** – pair with higher ed for an IRB

Institutional Review Board (IRB)

- Higher Ed, hospitals, companies, etc.
- Comprised of members of the organization, plus community members
- Check that your plans are ethical and include informed consent (adult students, guardians) and assent (minors)
- Additional protections for vulnerable populations: **minors**, seniors, **people with disabilities**, prisoners

What is Education Research?

In more detail…

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All Research

1. Collect data
2. Analyze and interpret that data

- Compare with Scientific Method
- Data can be quantitative or qualitative
- Often trying to be "objective" or removed from your subjects

Traditional Education Research

Quantitative

- Collect data
  - Test scores, MC
  - Number of times takes an action
  - Amount of time
- Analyze data
  - Statistics (average, standard deviation, t-test, ANOVA)
  - Graphs
  - Tables
  - Cross tabs

Qualitative

- Collect data
  - Free response Qs
  - Watching student actions
  - Interviews
- Analyze data
  - Look for patterns and trends
  - Code for themes (what ideas come up repeatedly)
  - Relationships between ideas

(Mertler, 2014)

Action Research (AR)

- A non-traditional qualitative method that focuses on solving problems, becoming part of the solution, and humanizing your subjects.
- A "next step" after reflective practice or journaling.
- Three guiding principles:
  - Social Justice
  - Democratic Participation
  - Community Empowerment

Action Research's Guiding Principles

- Social Justice – helping the most vulnerable
- Democratic Participation – helping all affected individuals have a voice in the research process and final solution
- Community Empowerment – helping other stakeholders have a voice

Group Work

Let's put this into practice

- Pick a partner/group and discuss an issue that is important to you (Community Engagement)
- How can you draw the students into helping find a solution? (Democratic Participation)
- How can you help your most vulnerable students? (Social Justice)

Share your ideas

Time permitting…

Takeaway

- Research should be driven by and for helping your students
  - Don't invent a problem just for the sake of doing research
- Don't work in isolation
  - Talk to colleagues, talk to students, talk to administrators, talk to parents, talk to people outside your school
  - If you're working alone, maybe you *could* solve your problem, but it certainly won't help anyone else!

Additional Resources

- Mertler, C. A. (2014/2017). *Action research: Improving schools and empowering educators* (4th/ 5th ed.).
- Reason, P. & Bradbury, H. (Eds.). (2008) *The SAGE handbook of action research: Participative inquiry and practice* (2nd ed.).
- Abell, S. K. & Lederman, N. G. (Eds.). (2007). *Handbook of research on science education.*
- Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches.*

My Recent/Upcoming Work

- Schwortz, Burrows, & Guffey. (2016) *Mentoring Partnerships in Science Education.* Educational Action Research. https://arxiv.org/abs/1610.04808
- Schwortz & Burrows. (in prep for 2019) *Using STEM Datasets: The Who and How of Expert/ Novice Levels.* Research in Science and Technological Education
- Schwortz & Burrows. (in prep) *Qualitative analysis of STEM Dataset Use*.

Further questions?

aschwortz@qcc.mass.edu

Slides for this talk, handout, etc.

http://physics.uwyo.edu/~aschwortz

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