# Professional Development: Case Study with Everyday Electrical Devices

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## Overarching Question

How do we effectively prepare our graduate students for successful career in physics education research (PER)?



## Prepare our students to...

- lead teams of researchers, teachers and students to conduct high quality, independent research,
- facilitate the integration of research and educational endeavors,
- collaborate with a broad range of students, teachers, administrators, researchers and faculty in the sciences and in education,
- seek and obtain external funding to support a vibrant research program,
- provide effective mentoring and professional development to others over a range of levels, and
- engage in lifelong professional growth to continually broaden their intellectual horizons from a diverse multidisciplinary perspective.



## Challenges

Incoming grad. students typically have...

- strong physics background, but seldom adequate preparation in pedagogy.
- diverse non-U.S. educational backgrounds.
- diverse career paths: Ph.D. in
  - Physics with emphasis in education.
  - Science Education with emphasis in physics.

**Need flexible professional development**



## Current Efforts

- "Teaching University Physics" course
  - Broad survey of PER.
- Several Education courses
  - Methods, Statistics, Educational Design, etc.
- Weekly PER Seminar each semester
  - Present and critique each others' research.
  - Discuss other relevant research.

Need: Students face difficulties in applying the principles learned in the courses to their own research

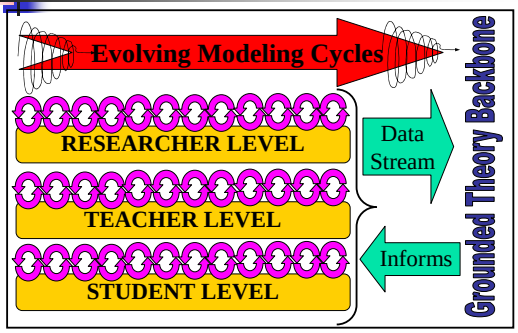


## New Program at KSU

- Administrative Framework[1]
  - Communicating with teachers & students.
  - Integrating research & education.
  - Scalability for larger projects.
- Research Framework
  - Multiple methodologies.
  - Segmented phases.

[1]Lesh & Kelly, (2000)

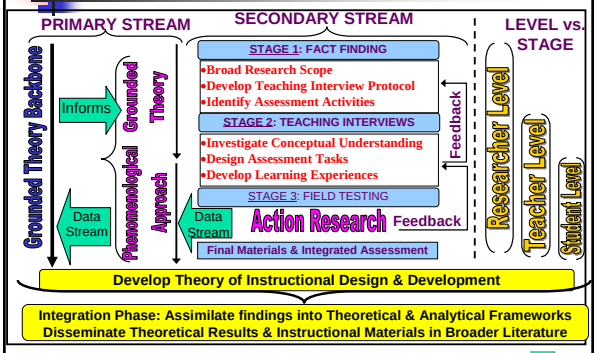
## Administrative Framework




[1]Lesh & Kelly, (2000)

7

## Research Framework




8

## First Implementation

- Fall 2004 / Spring 2005 – PER Seminar
  - Overview of methodologies.
  - Discussion of interview techniques.
- Positives
  - Helpful in connecting with previously taken courses.
  - Learned questioning and interview coding.
- Negatives
  - Recipe-like implementation of methodologies.
  - Focus exclusively on physics content in interviews.

9

## Next Implementation (1 of 2)

- Project: Everyday Electrical Devices
  - All students participated as researchers.
- 1st Week: Generating themes, topics & questions
  - Worked individually.
  - Avoided exclusive focus on physics.
- 2nd Week: Narrowing focus
  - Shared ideas in large group.
  - Collapsed themes, topics and questions.

10

## Next Implementation (2 of 2)

- 3rd – 5th Week: Designing & Conducting Interviews
  - Worked in pairs.
  - Alternated roles: interviewer & observer.
  - Critiqued partner in front of larger group.
- 4th – 6th Week: Transcript Preparation & Analysis
  - Transcribed individual interviews.
  - Generated personal log, analytical log and codes.
- 7th Week Onwards: Research Project Critique
  - Presented and critiqued each others' ongoing research.

11

## Feedback from Grad. Students

- One page reflection on experiences.
- Students liked:
  - Focus on methodologies.
  - Application of knowledge to own research.
  - Sharing ideas presented by others.
- Some students would have preferred...
  - ".. some kind of a sample set of steps, a template - ... we also had to choose more physics-related subjects to discuss so we could really use our expertise "

12

## Our Reflections

- Continue with focus on…
  - Methodologies
  - Applications to students' own research.
- Use program to provide framework for facilitating mentorship of new graduate students by advanced graduate students.

13