How Pathway Helps Teachers Bring Physics Education Research Into Practice

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Supported the National Science Foundation under Grants 0455772 & 0455813.

Motivation

- What are physics teachers beliefs and attitudes toward educational research-based instructional strategies?
- What is the impact of educational research on their teaching in class and in the lab?
- What can physics teachers learn from educational research?

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Goals

- Improve quality of teaching by facilitating in- and pre-service teacher training.
- Make the educational research accessible to the teachers.
- Tailor the results of educational research to the practical needs of teachers.

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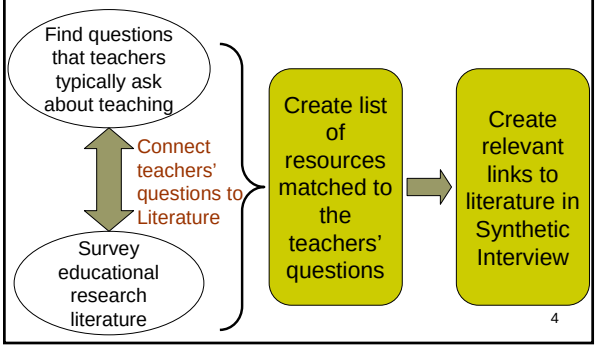
Development Process



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Two Examples

"How should you relate inertia to real-life situations?"

Measuring the moment of inertia of the human body by a rotating platform method, Griffiths, Watkins & Sharpe, *AJP* (2005)

"How to use graphs to demonstrate kinematics?"

Impact of Video Motion Analysis on Kinematics Graphs Interpretation Skills, Beichner, *AJP* (1996),

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Areas of Focus

- Topics
  - Kinematics
  - Dynamics
- Representational Tools
  - Graphs
  - Vectors
  - Coordinate systems
  - Free body diagrams

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Types of Content

- Instructional Resources
  - Demonstrations
  - Hands-on Activities
  - Computer Simulations
  - Interactive video
  - Others
- Assessment Resources
  - Conceptual Inventories (e.g. FCI)
  - Problem-solving
  - Others

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Online Resources

- Databases and Digital Libraries
  - National Sciences Digital Library (NSDL)
  - ComPADRE
  - Physical Science Resource Center (PSRC)
  - Physics Central
- Educational Materials
  - Interactive Lecture Demos (ILDs)
  - Just in Time Teaching (JiTT)
  - Web-based Simulations (e.g. Physlets)
  - Web-based Assessments

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Computer-based Resources

- Simulation Software
  - Physlets
  - PhETs
- Modeling Software
  - Interactive Physics
  - Free Body
- Data Collection & Analysis
  - Real-time Physics
  - VideoGraph & VideoPoint

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Digital Multimedia

- Digital Video Interactive
  - Physics of Automobile Collisions
  - Physics of Sports
- CD-ROMS
  - Physics of InfoMall

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Printed Resources

- Books
  - *String and Sticky Tape Experiments* (Edge, 1987)
  - *How Things Work* (Bloomfield, 1997)
- Articles
  - *Physics Education*
  - *The Physics Teacher*
  - *American Journal of Physics*

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Assessments

- Resources
  - Assessments of problem solving (e.g. TIPERS)
  - Computer-based assessment (e.g. WebAssign)
- Articles
  - Recipes for assessing conceptual understanding of specific topics (e.g. Newton's Laws)
  - Different methods & instruments (e.g. FCI)
  - Assessments based on cognitive psychology

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Patterns Observed

- In general, research-based instructional strategies have been found to be effective
  - Usefulness of specific products yet to be investigated
- Computer-assisted materials not necessarily aligned with educational research
- There are many questions that have not yet been answered by research

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Potential for Future Work

- Collect feedback from teachers about the usefulness of these resources in the Pathway system.
- Conduct statistical analysis of the associations between questions asked by teachers in the Pathway system and the research articles available.
- Use the results of the analysis to improve the Pathway system.
- To establish standards to help teachers evaluate available instructional resources.

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Thank you

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