




## Real-World Contexts: Challenges in Curriculum Development


  
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## Why Real-World Contexts?

Real-world contexts ...

- motivate<sup>2</sup> students to learn physics.
- promote inductive reasoning – principles developed from observations.
- provide situations for design-based<sup>3</sup> problem solving.

<sup>2</sup> E.g. Pintrich & Schunk (1996)    <sup>3</sup> E.g. Lobato (2003)

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## Which Real-World Contexts?

Contexts chosen based on following criteria...

- Have all students experienced it in some way?
- Is it amenable to hands-on exploration?
- Are underlying principles in clear view?
- Are principles transferable to other contexts?

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## In spite of these criteria...

Most students have ...

- Seldom given prior thought to how real-world devices work, although they have used them.
- Do not have well formed ideas about the working of these devices.
- Make up their thoughts on the spot, when asked how the devices work.

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(Mateycik, Wagner, et. al., PERC Proc., submitted, 2004)

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## Implications for Physics Education Research

- Stability of knowledge is questionable.
- Framework: p-prim<sup>4</sup>/resource<sup>5</sup> rather than coherent mental model.
- Difficult to probe student knowledge without affecting it.
- Focus on dynamics of knowledge transfer & construction rather than state of knowledge.

<sup>4</sup> diSessa (1999)    <sup>5</sup> Hammer (2001)

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## Implications for Curriculum Design

### Typical Methodology

```

    graph LR
      A[Clinical Interviews] --> B[Curriculum Design & Development]
      B --> C[Pilot- & Field-Testing]
      C --> A
      D[Determine students' prior knowledge] -.-> A
      E[Design interventions to change knowledge] -.-> B
  
```

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## Implications for Curriculum Design

### Alternative Methodology

```

    graph LR
      A[Clinical Interviews] --> B[Curriculum Design & Development]
      B --> C[Pilot- & Field-Testing]
      C --> A
      D[Teaching* Interviews] -.-> B
  
```

\*Steffe (1983); Steffe & Thompson (2000)

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## What is a Teaching Interview?

- 'Mock' instruction:
  - Attempts to change student knowledge.
  - Rich setting for students to express themselves.
  - Variety of instructional strategies.
  - Involve groups of up to three students.
- Researcher's Role:
  - Observer.
  - Instructor.

Engelhardt *et al* (2004)

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## Benefits of Teaching Interviews

Provide insights about ...

- Dynamics of knowledge construction & transfer.
- Effectiveness of materials & strategies.
- Student interactions with...
  - instructional materials,
  - peers, and
  - instructor.

Teaching Interviews are a bridge between research and curriculum development.

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## Summary

- Real-world devices ...
  - provide useful contexts for learning.
  - raise important issues in PER.
  - pose challenges to teaching & instructional development.
- Teaching Interviews can help address these challenges.

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