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Movie Physics

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Motivation

- Movies are a real and tangible part of the world.
- Opportunity to develop reasoning skills and physics knowledge.
- Interesting context for educational researchers to examine what students transfer.
- Make further strides in helping students be informed skeptics of the future.

Background

Since 1990's instructors have used video clips.

- Daley (2004) – "exhibition" in high school classes.
- Dennis (2002) – exercises, "visual word problems"
- Everitt (1999) – "mini block reviews"

Little prior research of how students think of movies and their role in learning physics.

Overarching Goal

Investigate whether and how movies can be used to help introductory students to learn physics.

Research Questions

1. To what extent do students transfer learning from classroom and/or personal experiences to explain the physics underlying movie clips? **Phase I**
2. What factors mediate the cognitive process through which students associate their prior knowledge with the movie clips?
3. To what extent can we use movie clips and supporting instructional materials to help students learn physics?

Framework: Transfer of Learning

- Contemporary perspective of transfer[1].
- Transfer from classroom / personal experiences to situations in action movie segments.
  - Lobato's[2] "actor-oriented" transfer perspective.

Did not pre-decide what should transfer, but examined everything students transferred.

[1]Rebello et. al., (2005) [2]Lobato, (2003)

Phase I – Methodology

- Grounded Approach
- 8 video clips: Plausible and questionable physics.
- Individual, think-aloud, semi-structured interviews.
- Question strategy: Explore students' connections to physics and personal experiences.
- Interviews videotaped, reasoning patterns analyzed.

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Video	Major Physics Themes
Pearl Harbor	Projectile motion
Speed (bus jump)	Projectile motion
Matilda	Newton's laws and circular motion
Speed (bus turn)	Circular motion
Mission to Mars	Gravity and rotation
Tommy Boy	Projectile motion and circular motion
Speed 2	Momentum and collisions
Tango and Cash	Projectile motion and electricity

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Phase I – Data Sources

- 13 students
  - 5 in 1st semester algebra-based physics
  - 8 in 2nd semester algebra-based physics
- 3 physics experts interviewed
  - Faculty
  - Post-doc
  - Graduate student

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Phase I – Results & Conclusions Students

- Reasoned spontaneously about each clip.
- Used general physics terms, but relevant application lacking.
- Correctly pointed out instances of incorrect physics.
- More precise connections with everyday experiences than concepts covered in class.
- Tended to rely on physical intuition rather than on understanding of physics underpinnings.

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Phase I – Results & Conclusions Experts

- Few differences with students regarding major physics themes or concepts.
- Experts presented their themes and concepts in a more structured manner.
- Experts relied less on intuition or personal experiences, more on physics-based reasoning.

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Current and Future Work

Phase II of project

- Development of prompting questions.
- Included stimuli to encourage students:
  - Toy cars, ramps, drawing, and demonstrations
- Aim to identify sets of videos and stimuli.

Phase III of project

- Develop instructional material that utilizes action movie clips to learn a concept: e.g. Artificial gravity
- Pilot-test with small groups of students outside class.
- Classroom implementation.

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