Influence of Assessment Features on Student Epistemology in Physics

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How can we use assessments to shift student problem solving?


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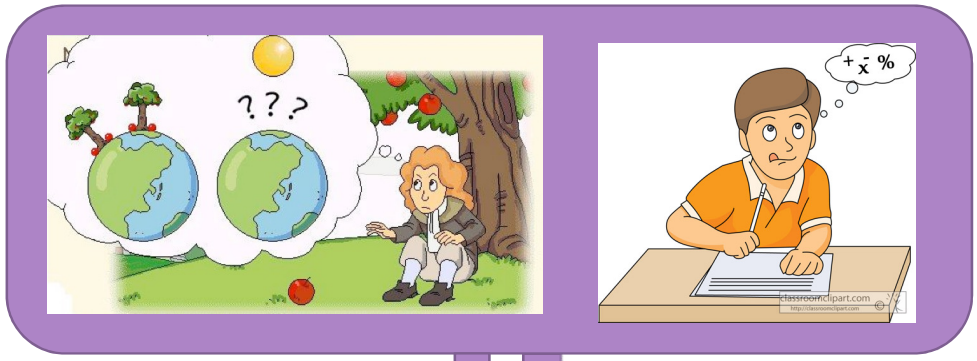
Problem Solving in Physics



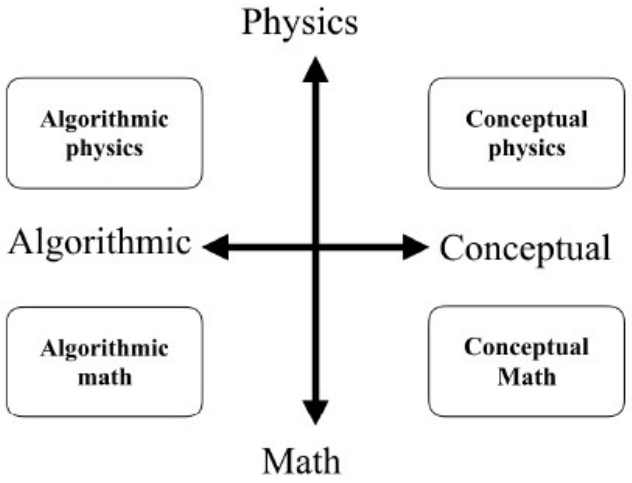
Epistemic Form

The Ending Condition to the Question

- Reasoning
- Number
- Comparison Table
- List

(Hammer, D., & Elby, A. 2002).

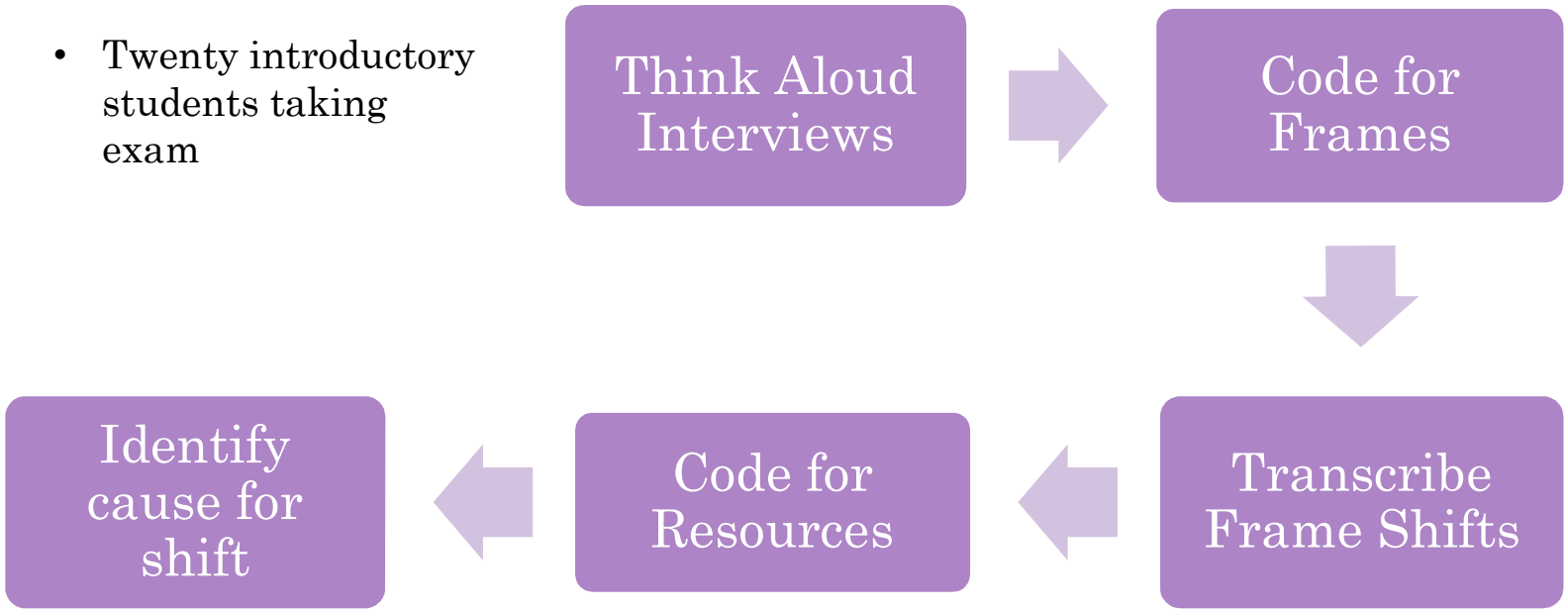
(Tuminaro, J., & Redish, E. F. 2007)



(Chari, D.N., Nguyen, H. D., Zollman, D., Sayre, E. C. 2017)

Methods

- Twenty introductory students taking exam



- Coded for **frame** use with behaviors

Frame shifts can be caused by a shift in Resource.

4-B. If the dashboard readings for the positions are 5.2, 10.4, 16.7, 25.2, 35.9 (in m) in each second (until 5 s), is the feature working correctly? Assume position is considered to be zero at time zero (0 s).

Statement- Luke	Coding
Okay, so the positions are… these make sense. So, as its moving, it's accelerating at 2.2 meters per second every second. It's accelerating. So… 5.2… Since it's not accelerating during this time. Well, I guess I proved here that the difference in between is one second, so I guess that is the correct position. I feel like there is a simpler way of doing this that I'm overlooking. Um… (re-reads the problem silently)…	Conceptual Physics
Interviewer: When you find the positions, you can compare. The question is giving position. It is asking for validation.	Shift in Epistemic Form
Oh, I think I assumed the wrong thing when I did it this way. Because I assumed that… Well, I guess… So I assumed that… yeah... So then going to this point, I guess I would have to do this same thing again. That's just a lot of math	Algorithmic Physics

Assessment features can shift a Resource

6. Consider a Ferris wheel in an amusement park in California. A Ferris wheel is a large circular machine with seats attached to the rim of it. The seats can freely rotate so that when the Ferris wheel is spinning, the seats hang downwards at all times. Assume the wheel is rotating with angular velocity ω and the diameter of the wheel is D. At what point in the motion does a rider feel "heaviest" and "lightest"?

Approximately how large would ω have to be for this to have a noticeable effect on your weight?

Statement- Lisa	Coding
Lisa: Um… (picks up equation sheet) Where's centripetal force? (Writes down centripetal force equation)	Algorithmic Physics
Hm… (looks at equation sheet) <u>not given any numbers.</u>	Shift in Epistemic Form
It's just weird to me because it seems like nothing is changing. I mean, this is just going to be D over 2. The mass of the person isn't changing. Angular velocity is not changing. All I'm thinking about is that your potential energy is going to be the highest when you're at the top, lowest at the bottom, so I think those are going to be the points at which you're going to be feeling heaviest	Conceptual Physics

Assessment features can shift a Resource

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Statement- Jack	Coding
(Picks up equation sheet) We'll see, the angular velocity equation. I should look for the angular velocity equation. I should, yeah. (Flips through equation sheet) It's this one. Moment of inertia. Um, it doesn't tell you the mass.	Algorithmic Physics
So, I guess because this is a conceptual question…	Shift in Epistemic Form
I am going to guess, for that, um, okay, so the greatest force you would be feeling (points upward) since you're going up, that means you would feel the lightest at the top, and the heaviest at the bottom. Because, like, you're going, accelerating faster at the bottom, and your mass is the same, so like the force would be greater at the bottom than it would be at the top.	Conceptual Physics

In application,

To shift student thinking, focus on the Resource level

Consider what epistemic messages assessments send students

References & Acknowledgements

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