



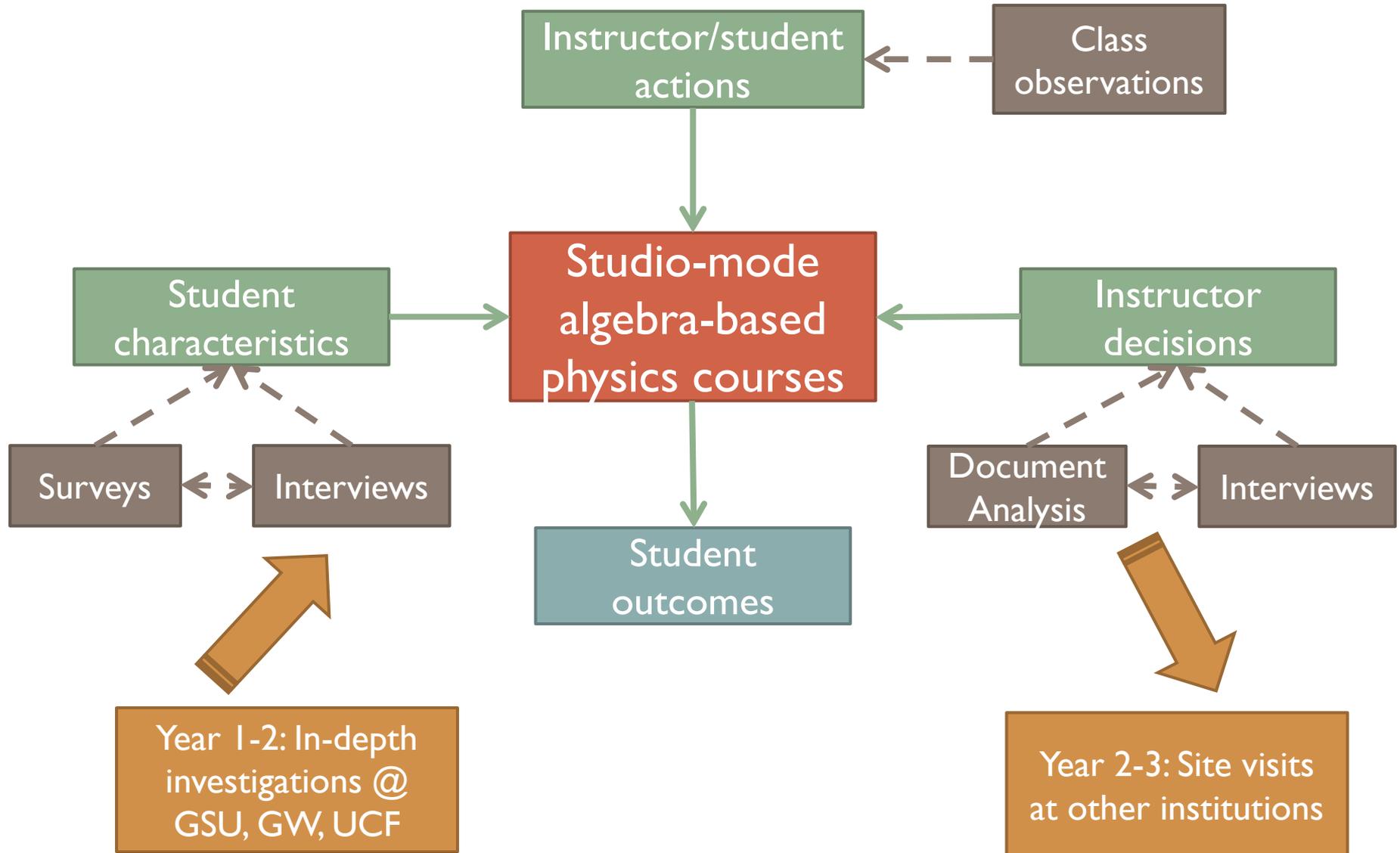
Student Characteristics Influencing Success in Studio Physics: First Steps

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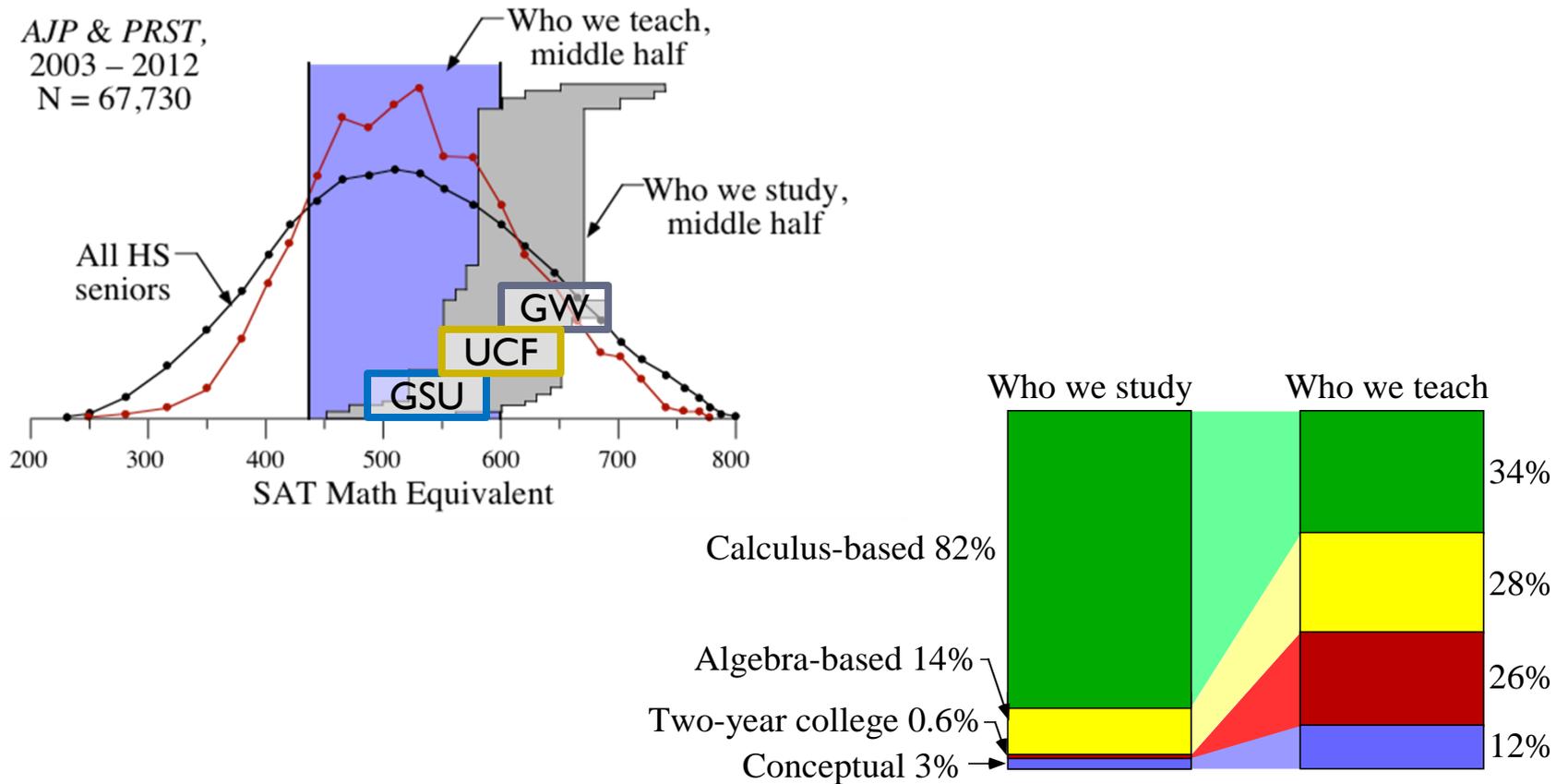
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Project Framework



Motivation

Mismatch between who we study and who we teach.



Figures by Kanim, *Foundations and Frontiers of Physics Education Research*, 2013.

► Source: 2014 College Handbook, College Board

Motivation

Different populations have different strengths and weaknesses.

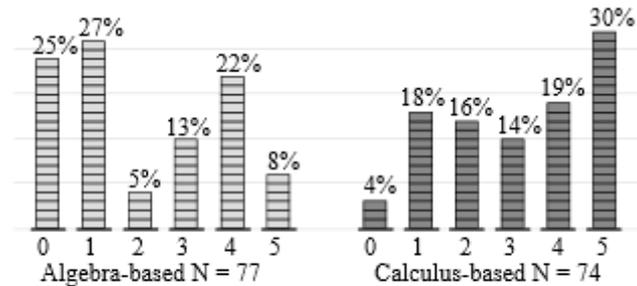
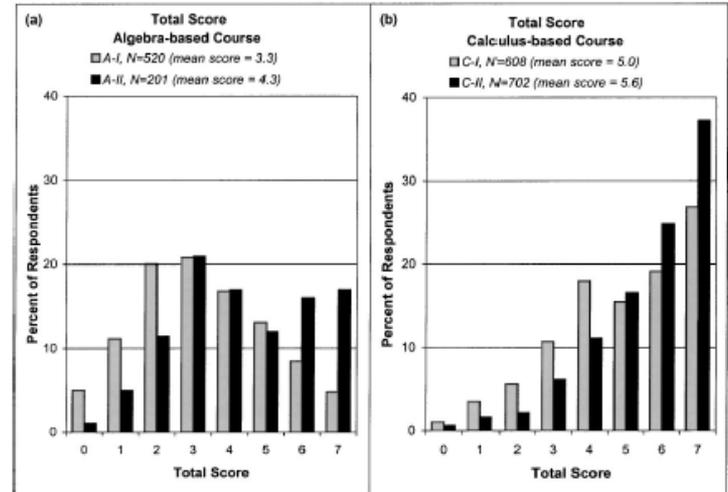


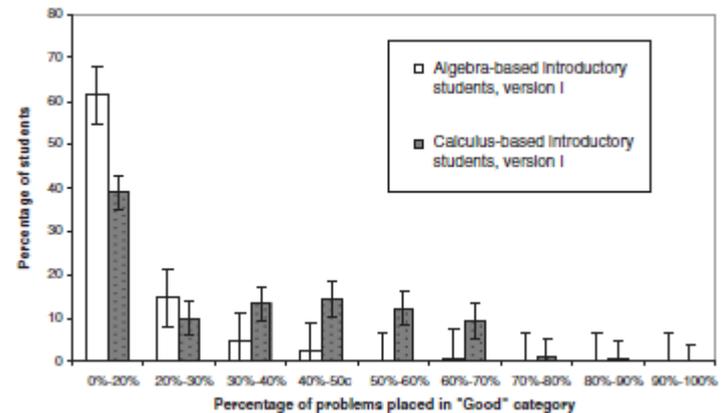
FIGURE 5. Distribution of pretest scores for questions about ratio and proportion. Loverude, Kanim and Gomez. *Proceedings of the 2008 Physics Education Research Conference*, 34-37.

TUG-K Means: Calculus-based: 9.8 vs. Algebra-based: 7.4

Beichner. (1994) *Am. J. Phys.*, 62, 750-762.

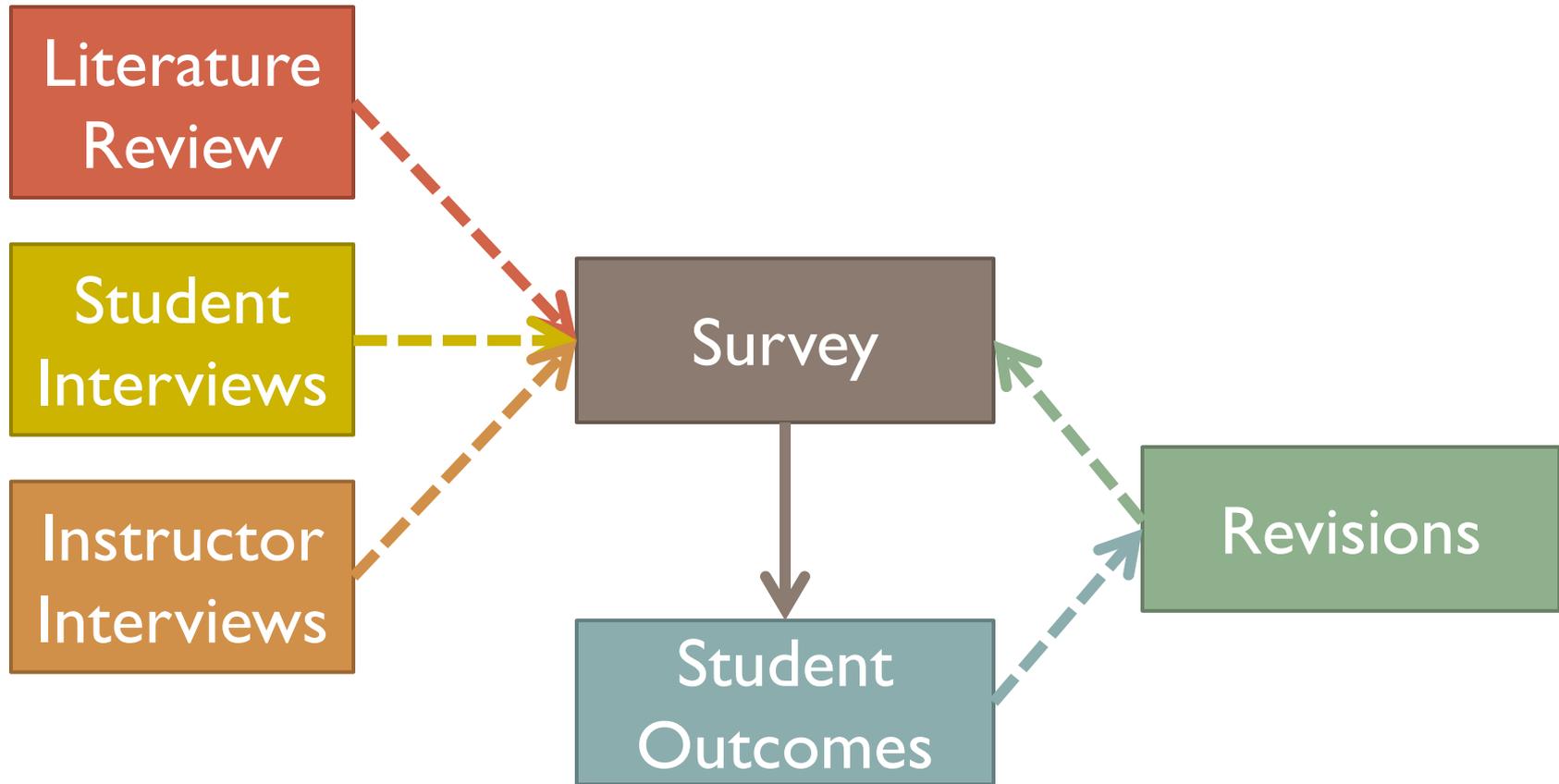


Nguyen and Meltzer. (2003). *Am. J. Phys.*, 71, 630.



Lin and Singh. (2011). *PRST-PER*, 7, 020110.

Student Characteristics: Overarching Approach



Literature: Student-related Characteristics of Interest



- ▶ **Hake (1998) “IE implementation problem” case studies**
 - ▶ Motivation (Rhöneck *et al.*, 1998 ; Amabile *et al.*, 1994; Wigfield & Cambria, 2010)
 - ▶ Discomfort with change (Gaffney, Gaffney and Beichner, 2010)
 - ▶ Beliefs about learning (Rhöneck *et al.*, 1998; Lammers, Onwuegbuzie & Slate, 2001; Credé & Kuncel, 2008)
 - ▶ Science and math preparation (Sadler & Tai, 2000; Meltzer, 2002)
 - ▶ Beliefs about/attitude toward physics and math (Perkins *et al.*, 2004)
 - ▶ Cognitive level (Coletta & Phillips, 2005)

- ▶ **Other**
 - ▶ Demographics (gender, ethnicity, family income, etc.)
 - ▶ Employment (Hawkins *et al.*, 2005; Bozick, 2007; Roksa, 2011)
 - ▶ Living situation (Bozick, 2007)
 - ▶ Learning strategies (Shell & Husman, 2008; Biggs, Kember & Leung, 2001)

May expect effects to be stronger in studio courses.



Spring 2014 Interviews @ UCF

| | Potential Population | Participants |
|---------------------|----------------------|--------------|
| Students | ~400 | 8 |
| Instructors | 5 | 2 |
| Teaching Assistants | 6 | 2 |
| Learning Assistants | 7 | 4 |

Current Focus: What sorts of things do students and instructors talk about as influencing student success in studio courses?



Emergent Themes

Success in studio-mode requires:

- ▶ Willingness to be engaged during class/treat class time seriously (S- 5/8; LA-3/4; F-2/2)
- ▶ Openness to asking questions (S-2/8, LA-3/4)
- ▶ Ability to work in groups (LA- 3/4)

Demographic factors:

- ▶ Female students more frequently engaged (LA-1/4;TA-1/2, F-1/2)
 - ▶ Students from UR groups may not engage with MAJ students (F-1/2)
-



Emergent Themes

Success in studio-mode requires:

- ▶ Willingness to be engaged during class/treat class time seriously (S- 5/8; LA-3/4; F-2/2)

"Some people are just, uh, they want to get the concept and that's it, they just, don't apply it, and to actually have to do problems is an issue for some people. They just wait until he explains what's going on, and then copy down what he did."

"He gave opportunity for every student to come... most of the times, they were girls, I guess, wanted to come."



Conflicting Opinions:

Who does studio work for?



Opinion #1: Studio works for special students

- ▶ **Attitude and expectations may present a barrier** (S- 1/8; LA- 2/4; TA-1/2)
- ▶ **Good method for students who can teach themselves** (S- 1/8; LA-1/4; TA-1/2)
- ▶ **Work/life distractions can interfere** (S-2/8; LA-2/4; TA: 1/2)
- ▶ **Need strong math skills** (S- 3/8; LA- 1/4; TA-1/2; F-2/2)
- ▶ **Need to read textbook** (S-1/8; LA:1/4; F-2/2)
- ▶ **Need to spend time outside of class** (S- 3/8; LA- 1/4; F- 1/2)



Conflicting Opinions:



“When they were doing the labs every day, it wasn't something they were used to, so a lot of students in the beginning, were like, 'How can I learn anything? She's not lecturing at me...' So, it was more so trying to get them to understand that, yes, they can learn on their own, they can learn with us here to help 'em, they're still learning even if they're reading and doing a packet, or asking questions and doing a packet and thinking on their own, that, **the challenge was getting them to understand that lecture doesn't equal learning; learning happens on their part.**”

“I don't want to say 'lazy students', but people, people that don't do work outside of class. I know there a lot of people that... yeah, that don't spend time outside of class.”

Conflicting Opinions: Who does studio work for?



Opinion #2: Studio works for potentially “at risk” students

- ▶ Good choice for students who may struggle (S- 2/8; LA-1/4; TA-1/2)
- ▶ Good option for students who cannot spend time outside of class (S- 2/8*; TA-1/2)
- ▶ Reading outside not required (S- 2/8)

▶ *Different students than prior line

Conflicting Opinions:

Who does studio work for?



Opinion #2: Studio works for potentially “at risk” students

- ▶ Good choice for students who may struggle (S- 2/8; LA-1/4; TA-

“I would say the less math adept student would be perfect for that... someone who needs a little bit more guidance, this is definitely the class style.”

“Yes you have to give up three hours, but if that’s compared to 10 hours of studying for physics, yes, I will commit three hours no issue.”

“They should probably suggest not buying the book for the SCALE-UP... I didn’t need it .”

- ▶ *Different students than prior line

Where do we go from here?

Step 0: Increase interview pools, locally and at partner schools

Step 1: Correlate student outcomes with student characteristics, disaggregated by instructional style¹

Step 2: Compare across institutions- *Do institutions vary in the proportion of students exhibiting characteristics associated with success in studio?*

If “YES”, Step 3: Compare within institutions- *How do some instructors change the micro-culture for their class?*

► ¹Lasry, Charles & Whittacker, 2014

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