

# Framing and Reasoning in Tutorials Over the Course of a Semester

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## ABSTRACT

Observing students working in tutorial groups, Scherr has identified stable clusters of behaviors exhibited simultaneously by the whole group. These 'behavioral clusters' are indicative of how students are framing the tutorial in the moment. We would like to know how the framing of groups develops over the course of the semester, and to identify major influences on that development. The myriad factors involved make this a challenging endeavor. Here we present major research questions, present initial data that speaks to these questions, and identify major obstacles to doing this research.

## Behavioral Clusters

Locally coherent clusters of behaviors of student groups working in tutorials

### BEHAVIOR

- Scherr [5] observed 4 distinct clusters of behaviors that student groups exhibit
- These "behavioral clusters" last from seconds to minutes, and are separated by sharp transitions
- Modes account for most of the time

### FRAMING

- Behaviors are indicative of how students perceive, i.e., "frame" the activity [5], [6]
- We should expect different sorts of explanations from students who are framing the activity differently.

Color	Behaviors	Looks Like	Framing
Green	sitting up eye contact Hands gesturing high vocal register interrupting speech		Discussion
Blue	hunched over eyes on worksheet Hands writing low vocal register intermittent speech		Completing worksheet
Yellow	Shifting in seat eyes around the room Hands fidgeting Laughing		Off-task
Red	Sitting up eyes on TA subdued gestures lower vocal register		Receptive to TA

We coded 15 video clips of 45 minutes for behavior, w/o transcript

IRR: 90%

What sorts of factors contribute to this data?

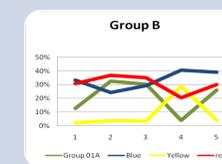
## A Variety of Research Questions from a Mountain of Data!

Are there differences between how the groups frame the tutorial overall?

mode	Group A	Group B
blue	48%	36%
green	11%	23%
red	5%	3%
yellow	11%	9%

Group A seems more apt to frame tutorial as "complete the worksheet" activity than group B

How does each groups' framing of the tutorial change over time?



No overall trend is apparent for any group so far  
Large variance from week to week

Does a group's framing of tutorial correlate with exam grades?

	Group A	Group B
green mode time	11%	23%
exam average	81%	65%

This preliminary data is unexpected, but many factors are involved  
More data is needed to see if a pattern emerges

Does each tutorial differ in the framing that they encourage?



Many groups spent far less time in green mode during tutorial on Conservation of Energy. Why??

## Major Influences on Group Framing throughout Semester

There are many factors that influence how the groups frame the tutorials, making it difficult to come up with a single plausible explanation for any particular piece of data. With this promising coding scheme, however, we can quickly scan many hours of video tape for data that will speak to a particular research question. This gives us insights into many of the influences on student framing throughout the semester.

- How each student frames the course/tutorials
- How each student justifies knowledge in physics

Student Differences



"I don't argue with the laws of physics, I just trust that they work..."

"There's no way you can explain to me how a car and a truck feel the same force"

- How groups balance power
- How groups resolve conflicts
- How groups negotiate framing of tutorial/course

Group Differences



"Yours are all better than mine."

"Okay..."

- How TA's encourage sense-making
- How TA's elicit & pay attention to student ideas
- How TA's encourage discussion

TA Differences



"That's cool that you can say, 'that's how it is but I can't get that...' and that's what we're going to work on..."

- How a tutorial worksheet may encourage discussion
- How a tutorial worksheet may encourage mechanistic reasoning

Tutorial Differences



"Alright...it says we're supposed to reconcile our differences..."

- Timing of tutorial sessions:
  - Morning vs. afternoon
  - Before test vs. after test
- Epistemology of professor
- Feedback from tests, HW

Course Dynamics



"Let's just move on...they're not collecting this anyway..."

## How do leaders fare?

The groups are self-organized; there are no assigned roles. However, a 'leader' typically emerges, establishing themselves by taking the most conversational turns and by making the most bids for frame changes. How do the leaders compare with other group members in typical measures of learning outcomes?

student	Exams	student	Exams
"Kevin"	65%	"Amy"	82%
"Chrissy"	68%	"John"	91%
"Naomi"	64%	"Sam"	78%
"Jenny"	65%	"Maggie"	73%
Group Avg.	65%	Group Avg.	81%

So far, leaders are seen to fare no better than average for the group...

## What Next?

- These preliminary findings challenge some of our basic assumptions.
- What link can be drawn between behavioral clusters and productive student learning?