

# Students use and adopt **relativistic rules of thumb** like memes (units of cultural transmission).

## Sensemaking in special relativity: developing new intuitions

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### Relativity Rules



Relativity requires unique intuitions

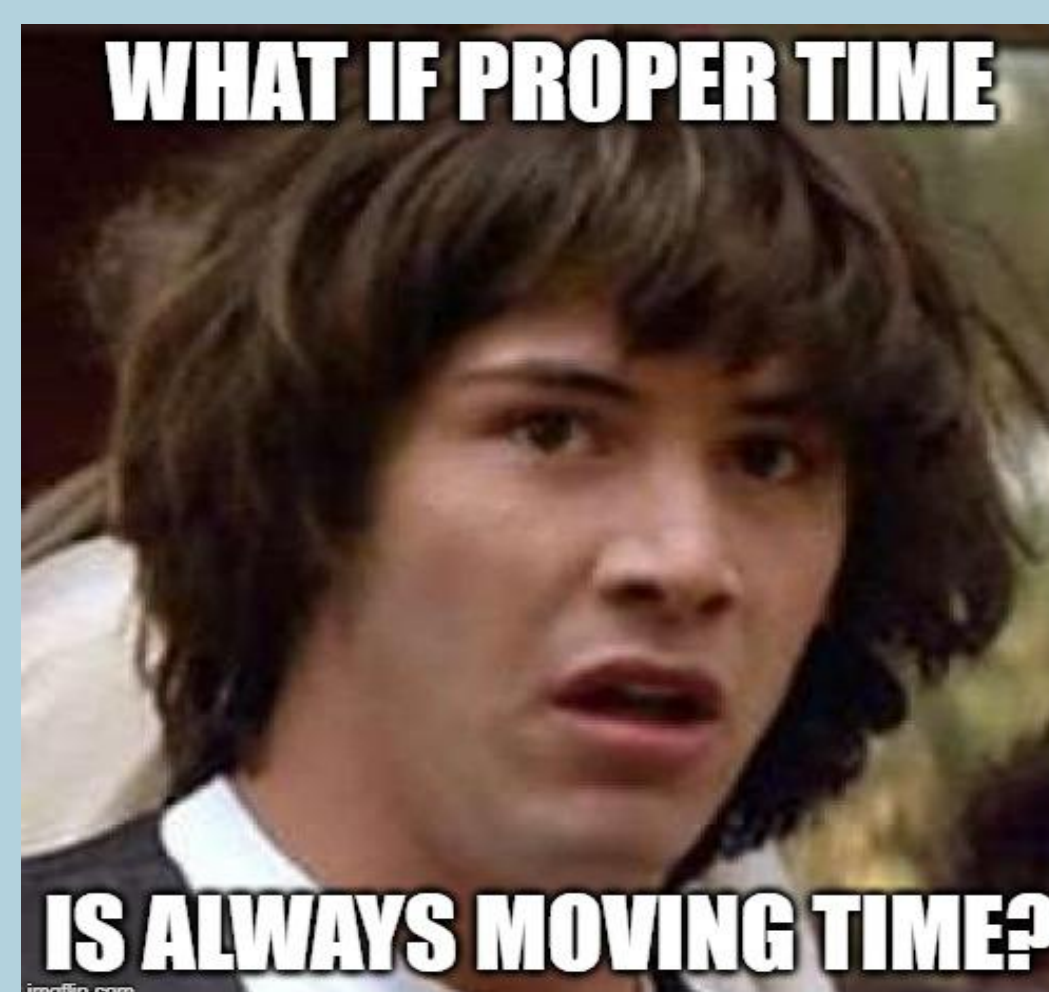


Nothing can travel faster than the speed of light



Each observer sees the other as "moving"

### Time Rules



Proper time is moving time



Proper time is the time between colocated events



Proper time is the shortest time



Moving clocks run slow

### Research Questions

1. What *rules of thumb* do students invoke for solving the Twin Paradox?
2. What role do *rules of thumb* play in student reasoning about special relativity?

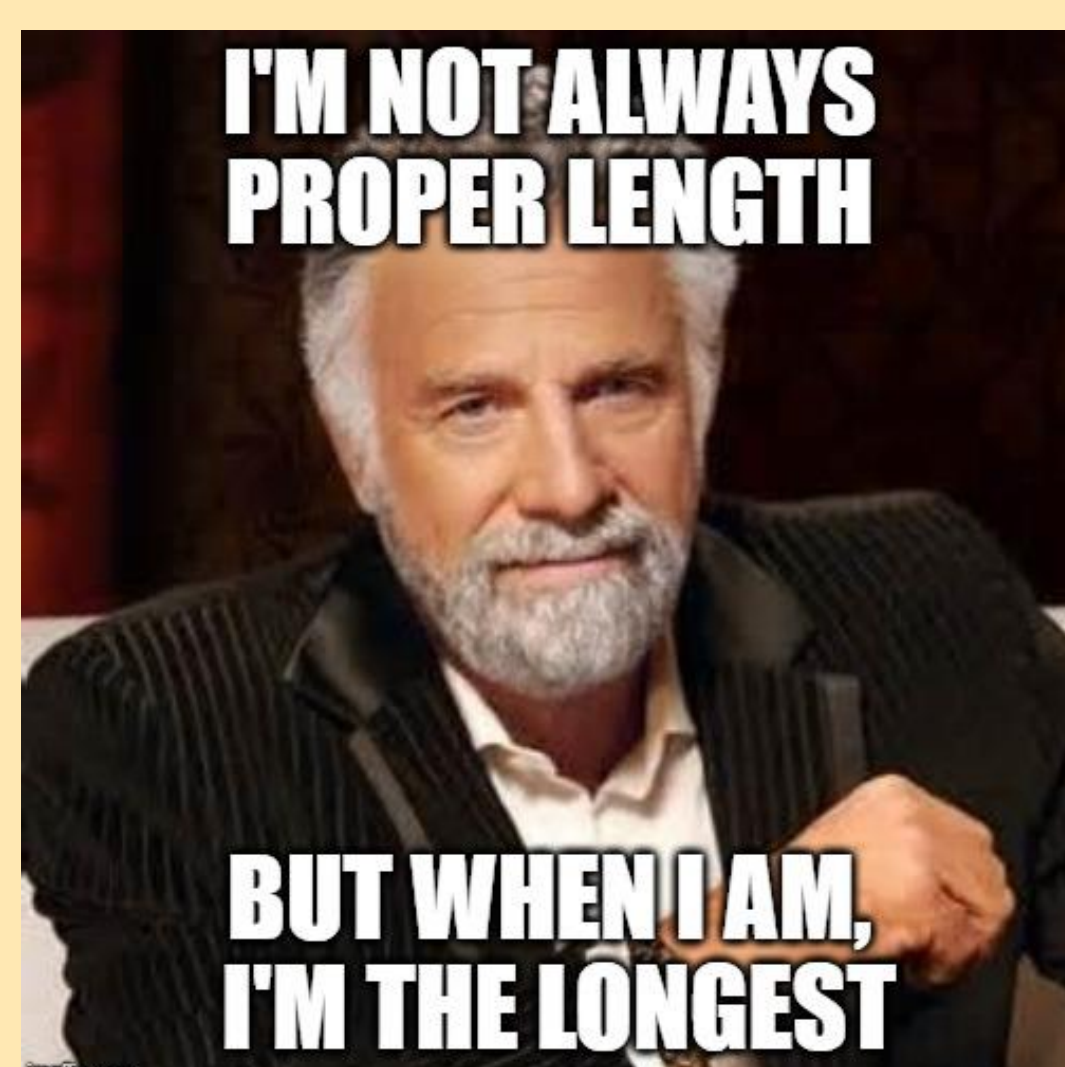
### Methods

- Sensemaking-focused course
- Homework about the Twin Paradox (N=50)
- Phenomenographic Thematic Analysis

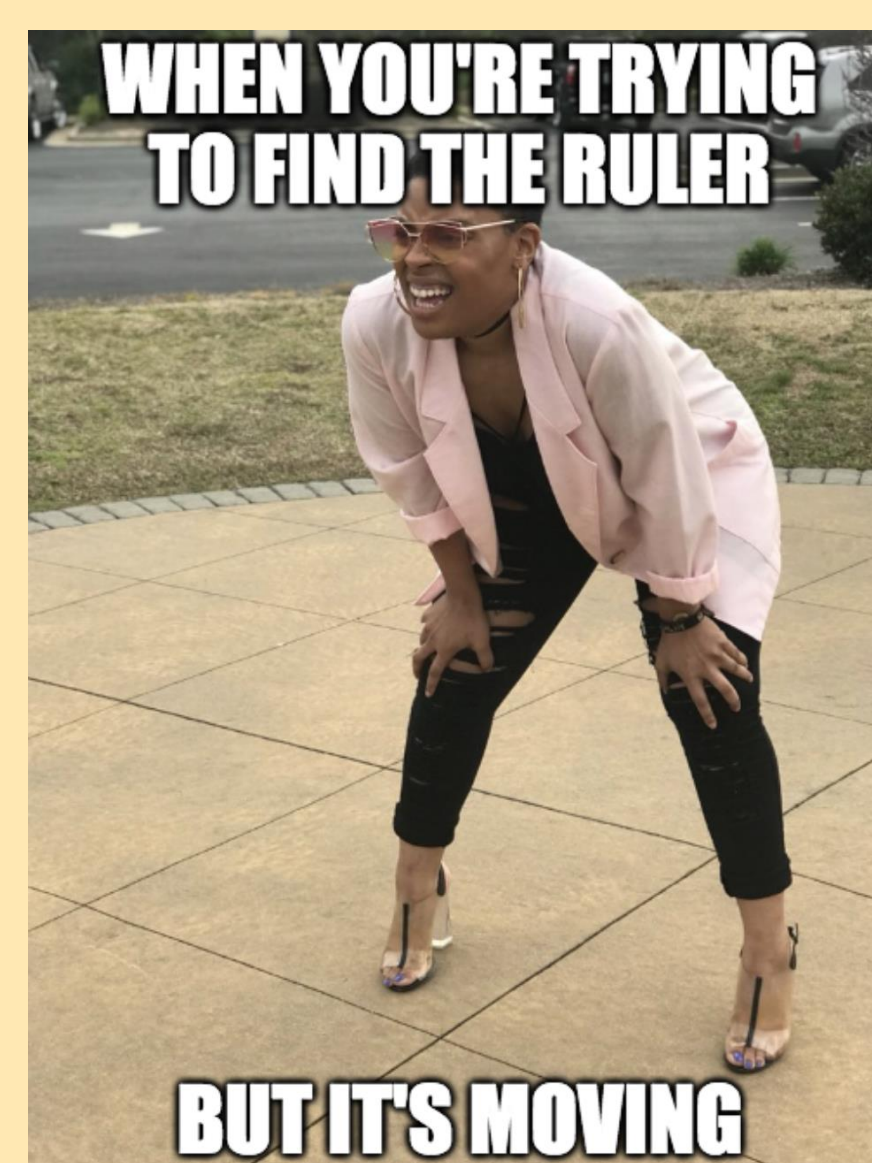
### Rules of thumb:

- Provide insights into student reasoning.
- Aid instructors in helping students develop productive intuitions about relativity.
- May help students sensemake in relativity where p-prims may be less insightful.

### Length Rules



Proper length is the longest length



Moving rulers are shorter



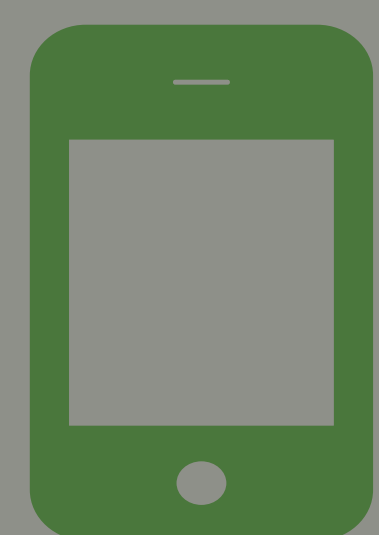
Proper length is at rest

"If the meme is a scientific idea, its spread will depend on how acceptable it is to the population of individual scientists."

– Dawkins [16]



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