Making the Most of Flipped In-Class Time

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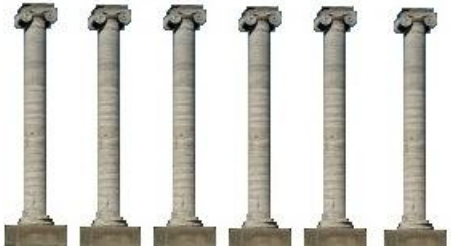
www.FlippedMathStudy.net

Agenda

1. Lesson Activity Structures
2. Personal Introductions
3. Criteria for Lesson Observations
    a. Sample Video 1
    b. Sample Video 2
4. Two Profiles of Flipped Instruction
5. Conclusion and Q&A

Lesson Activity Structures

HOMEWORK

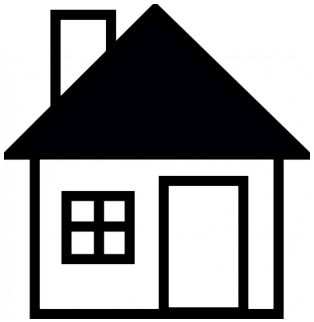


INDIVIDUAL WORK

SMALL-GROUP WORK

*CLASSROOM BUSINESS

Lesson Activity Structures - Flipped Instruction



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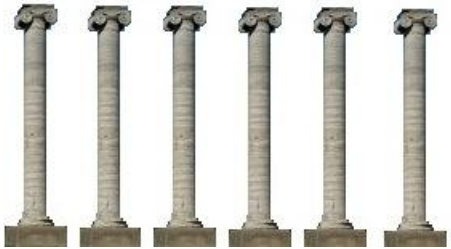

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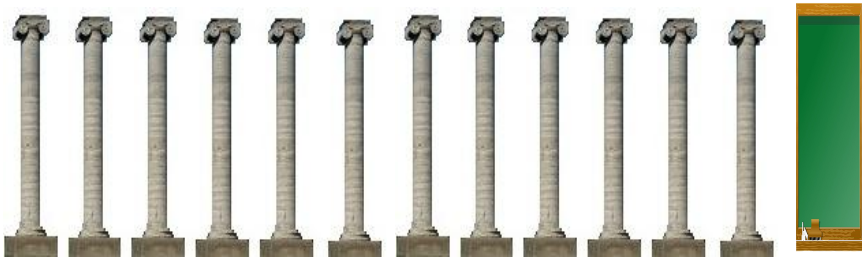
Flipped Lesson Flow - Example

HOMEWORK



INDIVIDUAL WORK

Introductions

Introduce yourself to your neighbor and then discuss the following questions:

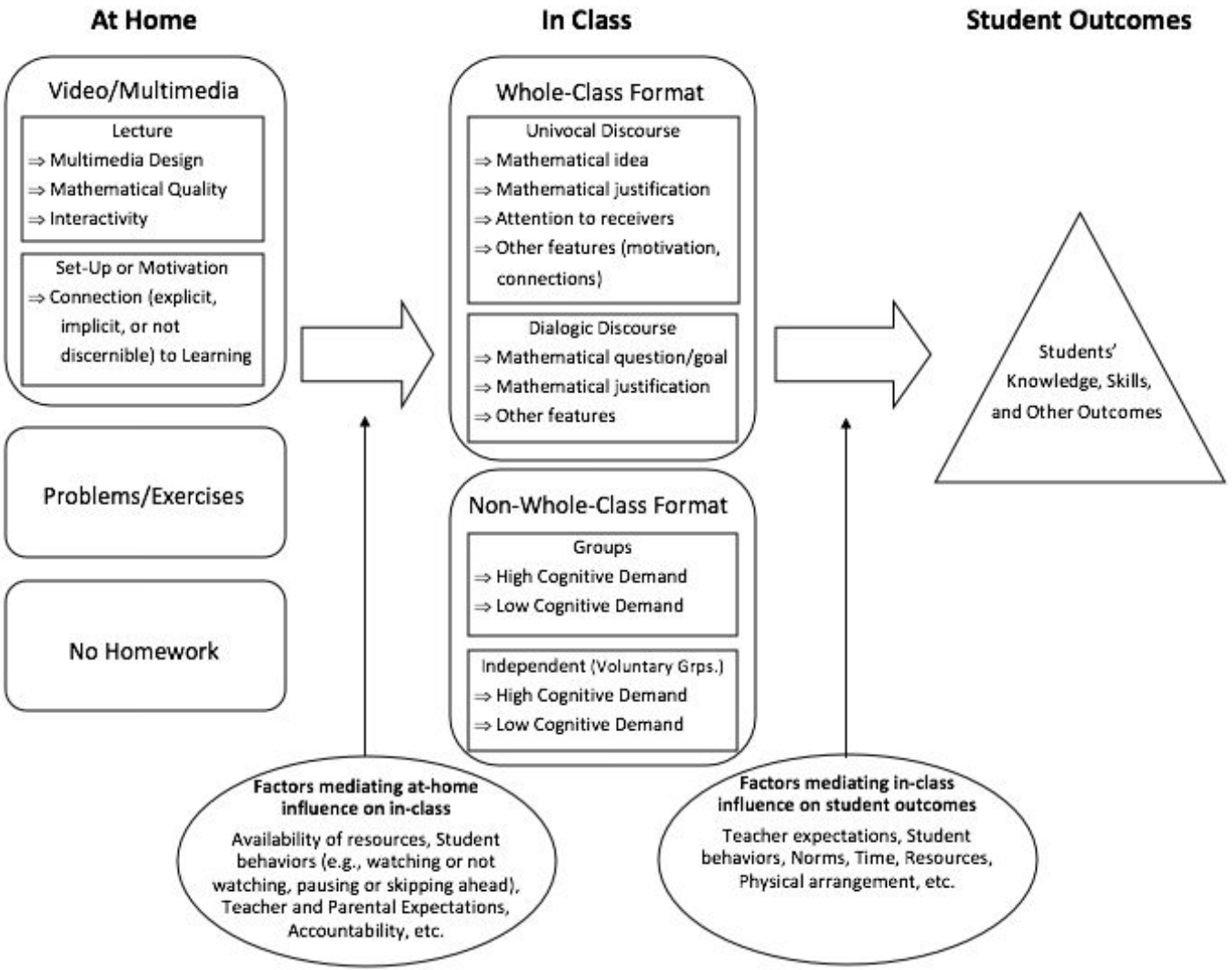
- In terms of the main activity structures, what is your typical lesson flow?
- Have you ever flipped a lesson? Was the lesson flow the same or different?

Our Study - www.FlippedMathStudy.net

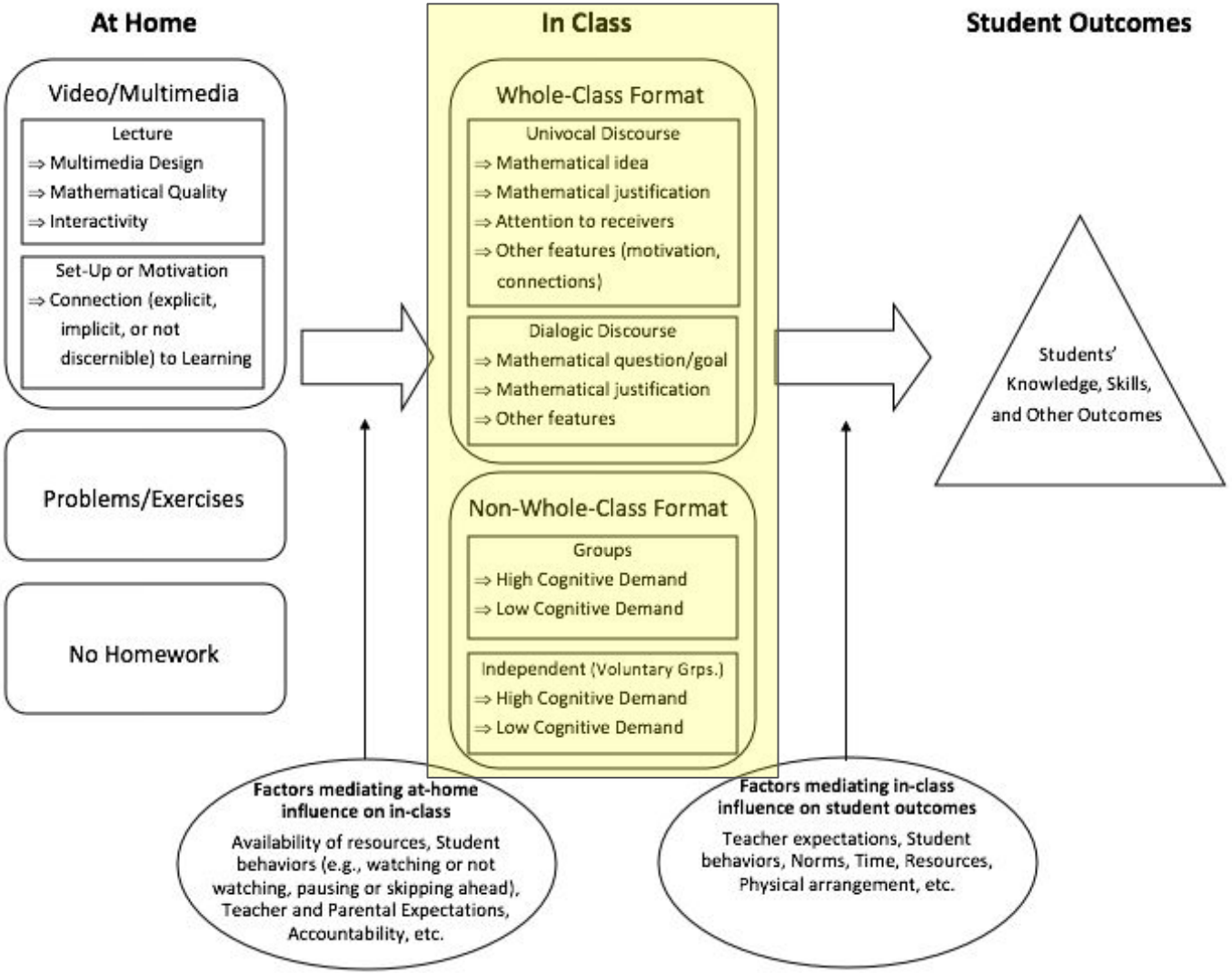
- Algebra 1 Classes: 20 flipped and 20 non-flipped
- Research Questions
  - What are salient factors entailed in teachers' implementation of flipped instruction in Algebra 1?
  - To what extent do these factors* predict students' learning of algebra as measured on a procedural inventory and on a concept-of-variable inventory?

**We're interested in instructional factors in flipped AND non-flipped classes*

Framework


At Home
In Class
Student Outcomes
Video/Multimedia
Lecture
⇒ Multimedia Design
⇒ Mathematical Quality
⇒ Interactivity
Set-Up or Motivation
⇒ Connection (explicit, implicit, or not discernible) to Learning
Problems/Exercises
No Homework
Whole-Class Format
Univocal Discourse
⇒ Mathematical idea
⇒ Mathematical justification
⇒ Attention to receivers
⇒ Other features (motivation, connections)
Dialogic Discourse
⇒ Mathematical question/goal
⇒ Mathematical justification
⇒ Other features
Non-Whole-Class Format
Groups
⇒ High Cognitive Demand
⇒ Low Cognitive Demand
Independent (Voluntary Grps.)
⇒ High Cognitive Demand
⇒ Low Cognitive Demand
Students' Knowledge, Skills, and Other Outcomes
Factors mediating at-home influence on in-class
Availability of resources, Student behaviors (e.g., watching or not watching, pausing or skipping ahead), Teacher and Parental Expectations, Accountability, etc.
Factors mediating in-class influence on student outcomes
Teacher expectations, Student behaviors, Norms, Time, Resources, Physical arrangement, etc.

Framework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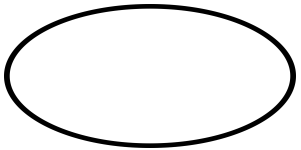
Framework: In-Class Time

- Individual Work, Small-Group Work
  - High cognitive demand tasks
  - Low cognitive demand tasks
  - On-task behavior (low, moderate, high)



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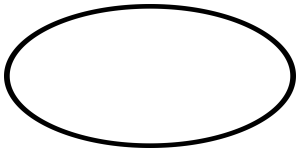
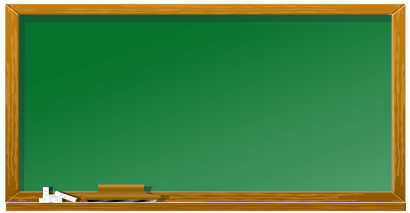
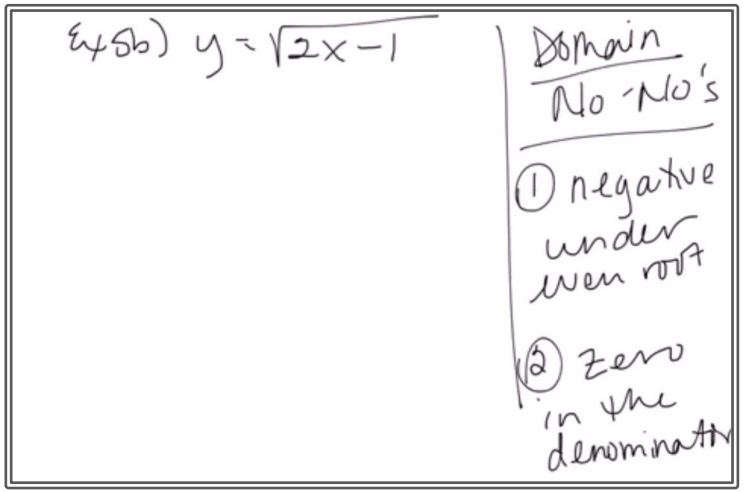


- Individual Work, Small-Group Work
  - High cognitive demand tasks
  - Low cognitive demand tasks
  - On-task behavior (low, moderate, high)
- Whole-Class Discourse
  - Clear mathematical **idea**
  - **Motivation** for the mathematical idea
  - Conceptual development and **coherence** to the flow of ideas
  - Mathematical **justifications** provided
  - Visual/tangible **representation** accompanying verbal discourse
  - Explicit **connections** to prior knowledge
  - Locus of authority (teacher/textbook ……. shared/student-led)
  - Nature of interactions (sharing ……. collaborating) [Staples & Colonis, 2007]



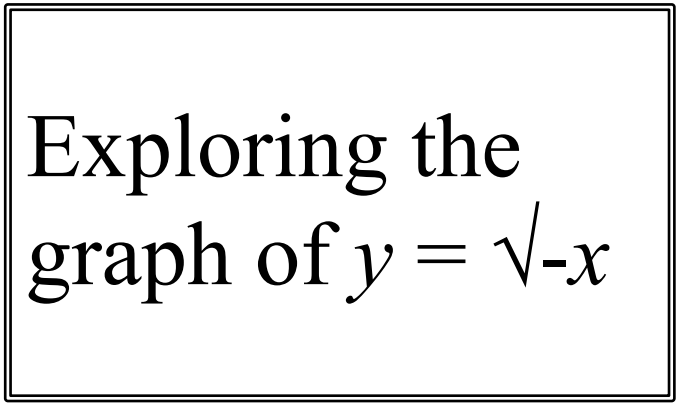
Flipped Instruction: Ms. Schaefer

- Consider the following in the lesson excerpt (recognizing that we aren't watching the whole lesson):
  - Idea
  - Justification(s)
  - Representation(s)
  - Connection(s)
  - Locus of authority



Flipped Instruction: Mr. Forrest

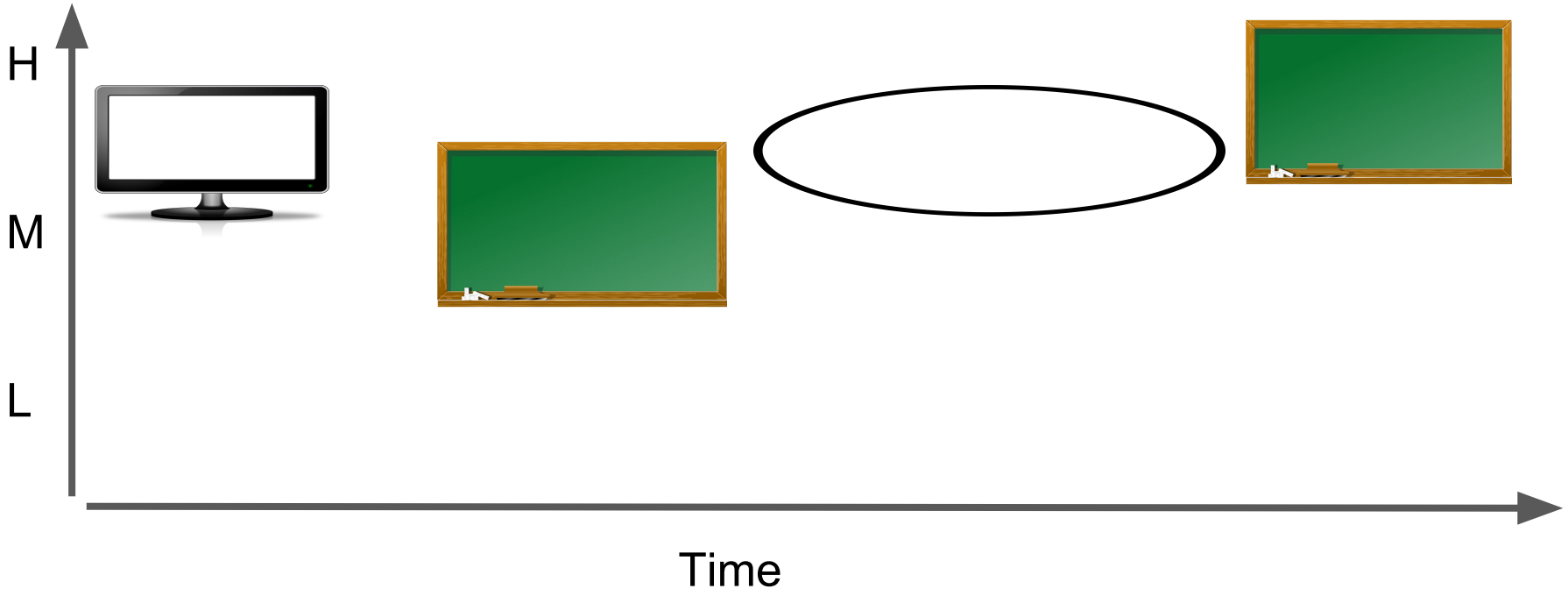
- Consider the following in the lesson excerpt (recognizing that we aren't watching the whole lesson):
  - Idea
  - Justification(s)
  - Representation(s)
  - Connection(s)
  - Locus of authority



Forrest: Tony had a question about [problem] 2B. He said, “Why is that even possible?” Tony, can you explain why you think it’s a problem?
Tony: I don’t know, I just noticed it’s [y=sqrt(-x)] undefined.
Forrest: Why would you say that it’s undefined?
Tony: Because it’s imaginary numbers.
Forrest: Okay, so Tony says, “Why is that possible,” because you think it’s imaginary. Square root of a negative should be imaginary. Can anybody explain why you still got a graph there? What do you think, Matt?
Matt: Because all the x-values are negative, it’s gonna make it positive.
Forrest: So, “Because all the x-values are negative, it’s gonna make them…”
Matt: Like, the x-values in the graph, whenever you plug them in, it’s gonna invert them into a positive number.
F: Alright, so can you give me an example? Because we got (writes on board) y equals the square-root of negative x, right?
Matt: So x is negative three.
Forrest: So if we made an xy-table (writes a table on the board with x=-3 as the first entry), plugged in negative three?
Matt: Yeah.
Forrest: We get the square root of…
Matt: Three.
Forrest: Three, right? (writes sqrt(3) in the y-column) Because, if you think of it another way, wouldn’t that be the square root of negative negative three?
Female Student: Uh huh.
Forrest: Which is the square root of negative negative 3. This is why it’s still possible. Because even though it’s the square root of negative x, what kind of values can we plug in for x? We can plug in negative values for x to give the square root of x. Does that make sense?

Lesson Profiles

Sample Lesson Profiles - Flipped Instruction



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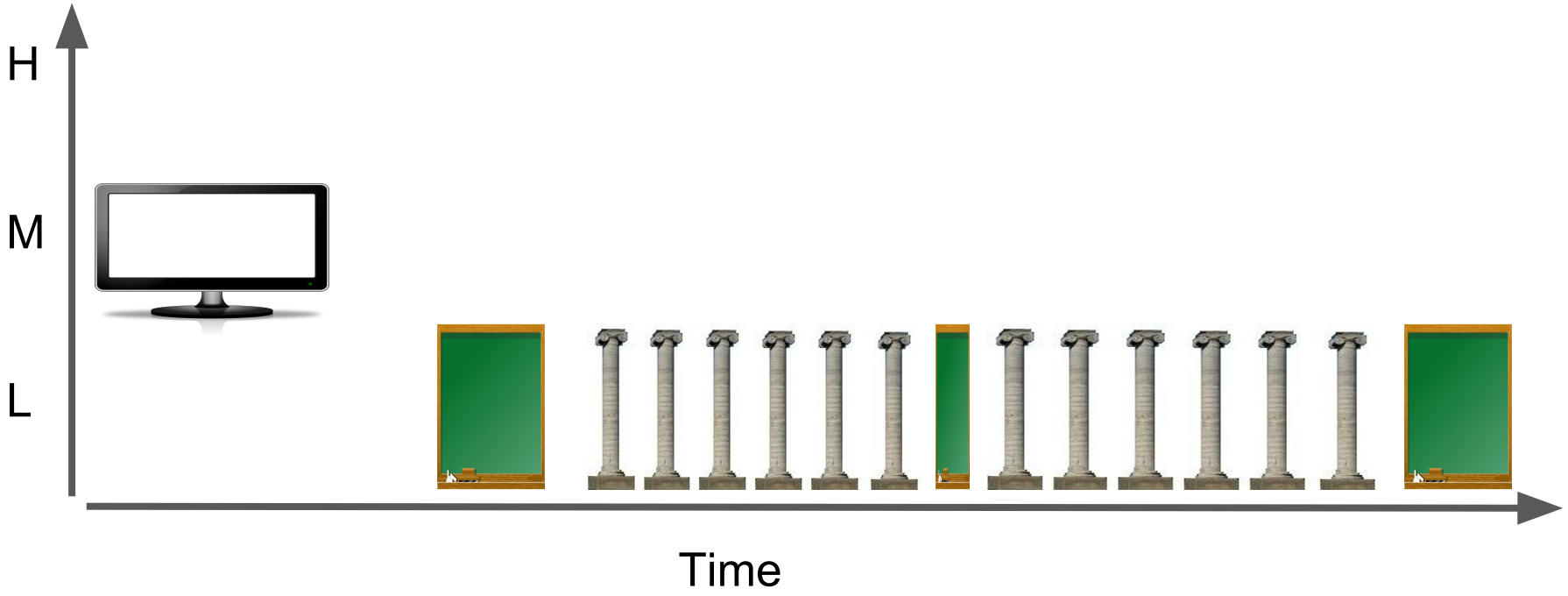

Concluding Thoughts

- Videos are the defining feature of flipped instruction but we suspect they are not the primary predictor of student learning.
- In our view, benefits are more likely to come from in-class time. For example...
  - Offload lower-level processes to the HW, emphasize higher-level processes in class.
  - Offload teacher authority to the HW, emphasize shared/student authority in class.
  - Use the extra in-class time to have more collaborative discussions or implement more open-ended tasks. (*Time is often the #1 barrier cited by teachers*)
- Think about the kind of lesson profile you want and, if you are flipping instruction, make sure that it's supporting you in achieving that profile.

Questions?

Interested in participating our study? Email ottensa@missouri.edu or visit

FlippedMathStudy.net