

The Case of Flipped Algebra Instruction

Zandra de Araujo

University of Florida



The research reported was funded by the National Science Foundation Grant No. DRL-1721025. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NSF.

Flipped Math Study - Core Team



The research reported was funded by the National Science Foundation Grant No. DRL-1721025. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NSF.

Flipped Instruction on the Rise!

Two years ago, **48%** of teachers have flipped a lesson, in **2014 that is up to 78%**

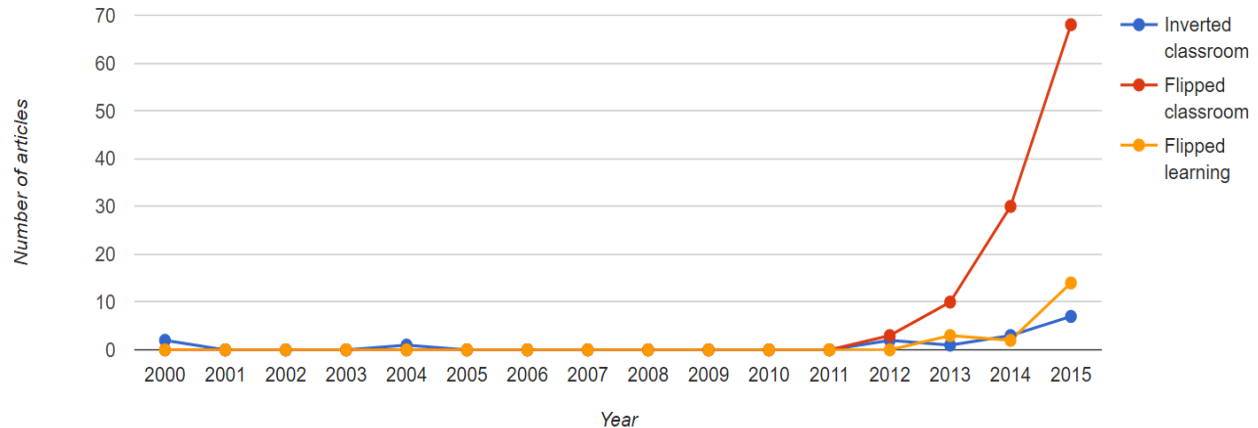
2012

48%

2014

78%

Number of peer-reviewed articles containing FL terms in title or abstract



<http://rtalbert.org/blog/2016/how-much-research>

<https://www.sophia.org/flipped-classroom-survey>

Flipped Instruction on the Rise!

Flipped instruction is characterized by teachers inverting or ‘flipping’ the settings in which lecture and homework occur—i.e., lecture at home and “homework” in class. A **flipped classroom** is a class wherein the teachers and students are frequently implementing flipped instruction.



Flipped Instruction on the Rise!

Flipped Instruction on the Rise!

Flipping will **increase the amount of in-class time available for students to work on problems or exercises** (more support from teacher, more collaboration with peers, more opportunities to engage in cognitively-demanding tasks)

Flipped Instruction on the Rise!

Flipping will **increase the amount of in-class time available for students to work on problems or exercises** (more support from teacher, more collaboration with peers, more opportunities to engage in cognitively-demanding tasks)

Flipping will **increase student engagement** in class by reducing teacher lecture

Flipped Instruction on the Rise!

Flipping will **increase the amount of in-class time available for students to work on problems or exercises** (more support from teacher, more collaboration with peers, more opportunities to engage in cognitively-demanding tasks)

Flipping will **increase student engagement** in class by reducing teacher lecture

Flipping will **increase homework completion** because it is easier to watch a finite-length video than it is to solve a set of problems (where there is a risk of getting stuck)

Flipped Instruction on the Rise!

Flipping will **increase the amount of in-class time available for students to work on problems or exercises** (more support from teacher, more collaboration with peers, more opportunities to engage in cognitively-demanding tasks)

Flipping will **increase student engagement** in class by reducing teacher lecture

Flipping will **increase homework completion** because it is easier to watch a finite-length video than it is to solve a set of problems (where there is a risk of getting stuck)

Flipping will **provide an accessible version of the lesson material** via the video recording and students can refer to the video as needed

Flipped Math Study - *Possible* Research Question

Do student learning outcomes differ in flipped and non-flipped classrooms?



Flipped Math Study - Participants

- The 34 participating teachers (some taught multiple classes in the data set) were varied in their background and experience.
- 22 Flipped classes (338 students) and teachers flipped voluntarily (we did not intervene)
- 25 Non-flipped classes (203 students)
- Most students were in the 9th grade but many were in 8th grade and a few were in 7th or 10th grade.
- Classes were located in 20 different districts ranging from rural to urban



Flipped Math Study - Data

- Student Pre and Post Tests (Procedural and Conceptual)
- Student Surveys
- Teacher Surveys
- 3 Classroom Observations for Each Class



Flipped Math Study - *Possible* Research Question

Do student learning outcomes differ in flipped and non-flipped classrooms?



Flipped Math Study - Research Questions

- RQ1. What are salient factors entailed in teachers' implementation of flipped instruction in secondary algebra?**
- RQ2. To what extent do these factors predict students' learning of algebra as measured on a state-mandated end-of-course assessment and on a concept-of-variable inventory?**

- RQ1. What are salient factors entailed in teachers' implementation of flipped instruction in secondary algebra?**
- RQ2. To what extent do these factors predict students' learning of algebra as measured on a state-mandated end-of-course assessment and on a concept-of-variable inventory?**

Teachers teaching algebra using a flipped instructional model and teachers teaching algebra using a non-flipped instructional model

- RQ1. What are salient factors entailed in teachers' implementation of flipped instruction in secondary algebra?**
- RQ2. To what extent do these factors predict students' learning of algebra as measured on a state-mandated end-of-course assessment and on a concept-of-variable inventory?**

Teachers teaching algebra using a flipped instructional model and teachers teaching algebra using a non-flipped instructional model

**Flipped Algebra Instruction
(Exploratory)**

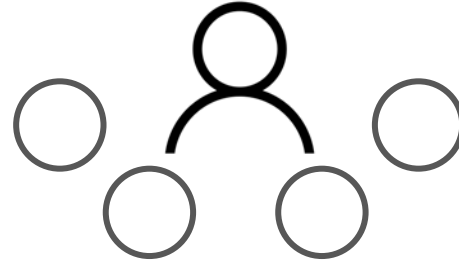
Lesson Activity Structures



HOMEWORK



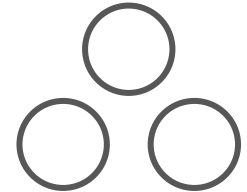
VIDEO LECTURE



WHOLE-CLASS DISCOURSE



INDEPENDENT WORK

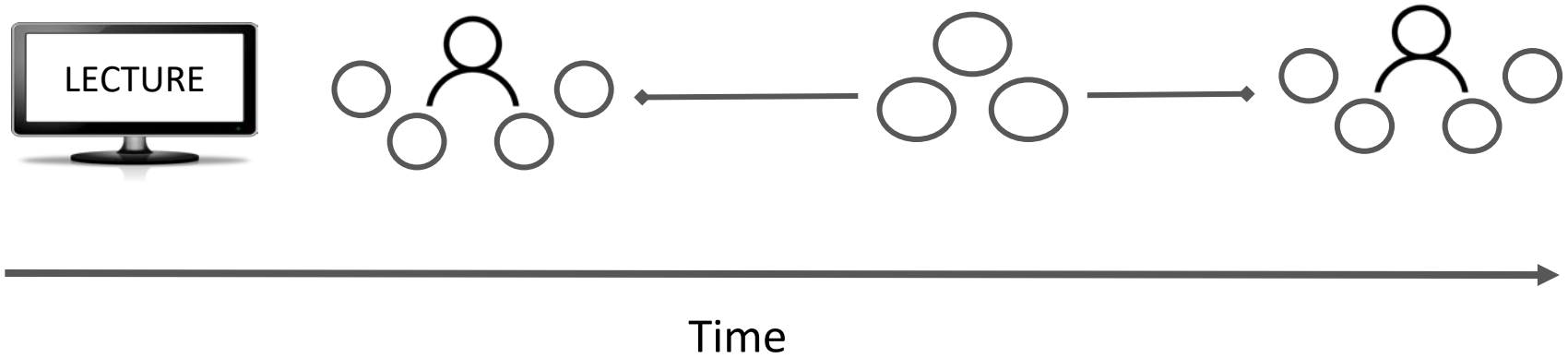


SMALL-GROUP WORK

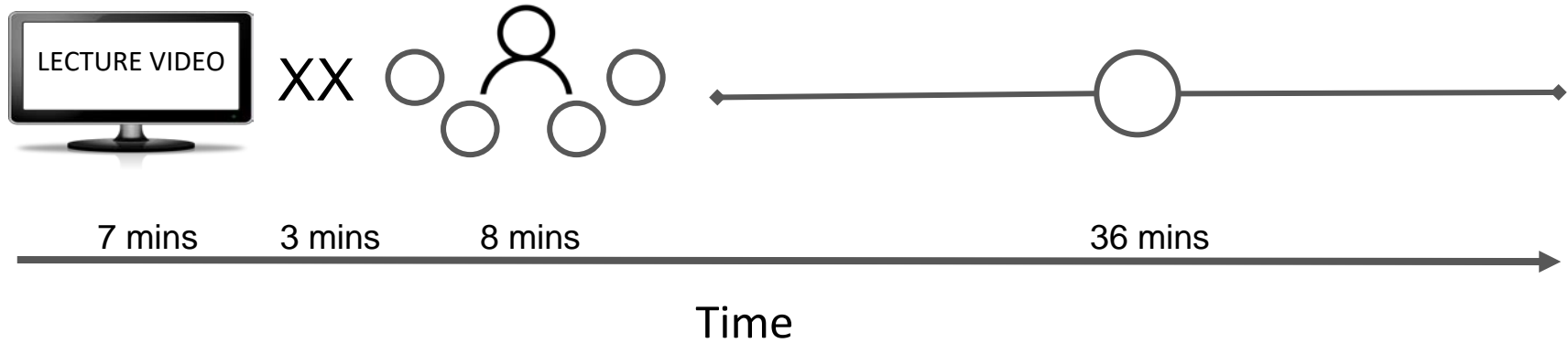
X

*Non-Instructional Time

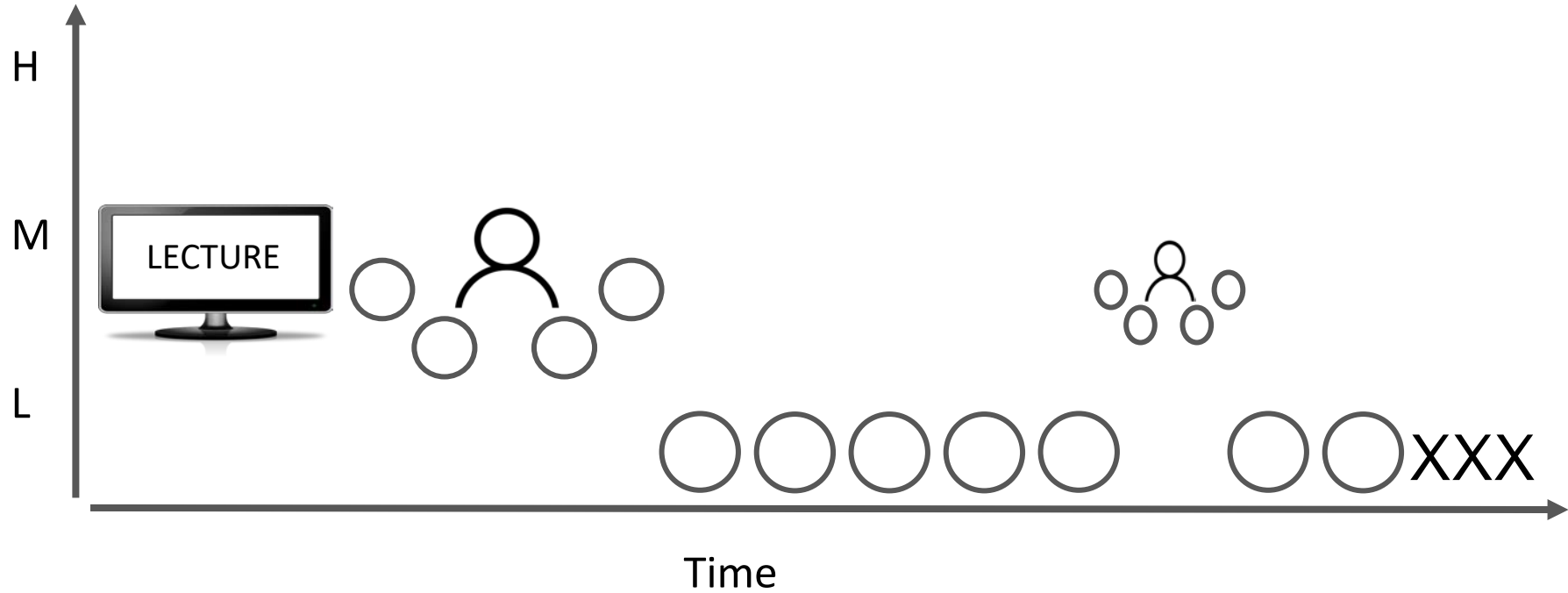
Sample Lesson Profile



Sample Lesson Profile

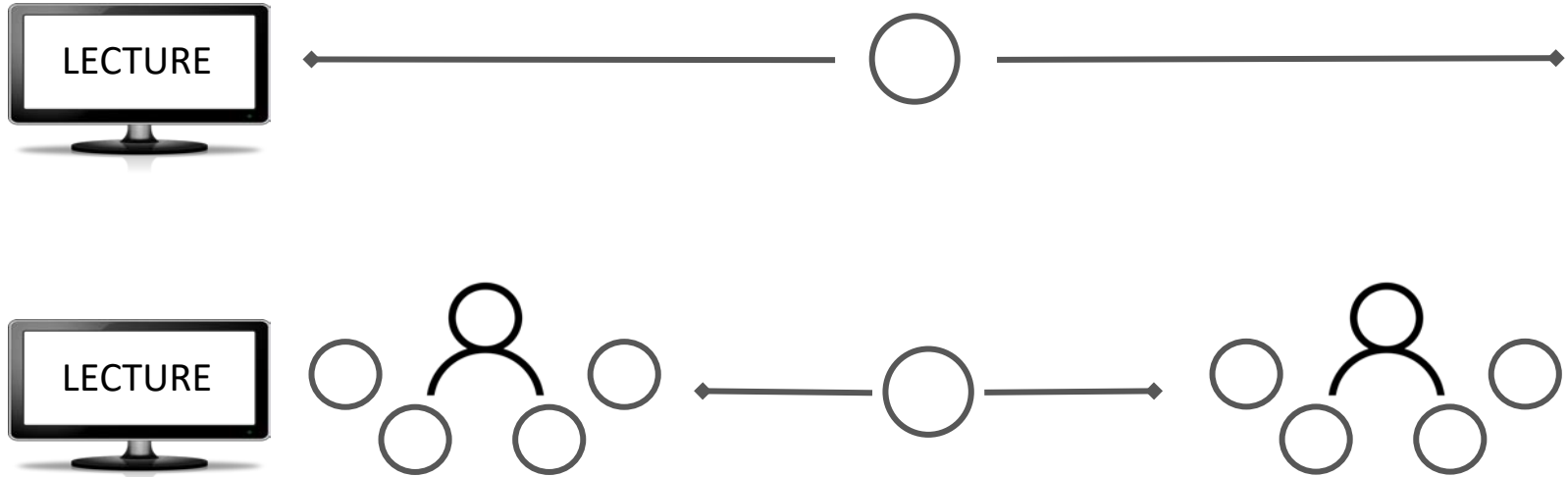


Sample Lesson Profile



Two Common Profiles of Flipped Lessons

- Flipped Instruction



Case Study Benefits to Flipped Math Study



- A deeper understanding of what it means to flip instruction in algebra
- Provided a means of categorizing teachers' instruction
- Allowed us to ask more interesting questions
- Allowed us to better define and situate our findings

Case Study - In Summary

- Allows for an in-depth exploration of a particular phenomenon
- Can allow us to humanize what we are finding and tell a more fully developed story
- Such deep understandings can allow us to develop more meaningful quantitative analyses
- Allow us to understand what the numbers are telling us

