

**How Students Are Oriented Toward a
Mathematical Task and Their Peers:
Access to Content, Agency, Authority, and Identity**

PSC Project - Stanford University

AERA Annual Meeting

Monday, April 8, 2019

Research-Practice Partnership Team

Stanford Team

Hilda Borko & Janet Carlson (PIs)

Kelly L. Boles

Rebecca Deutscher

Alissa Fong

Florencia Gomez Zaccarelli

Michael Jarry-Shore

Susan Million

Suki Jones Mozenter

Anthony Muro Villa III

University/District Partnership Coordinator

Urban Unified School District (USSD) Team

- USFED Director
- Program Administrator for Mathematics
- Mathematics Project Manager
- Math Content Specialists (2)
- Math Coaches (8)
- Math Teacher Leaders (30)



This work is supported by the National Science Foundation under Grant No. DRL 1417261.
Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.

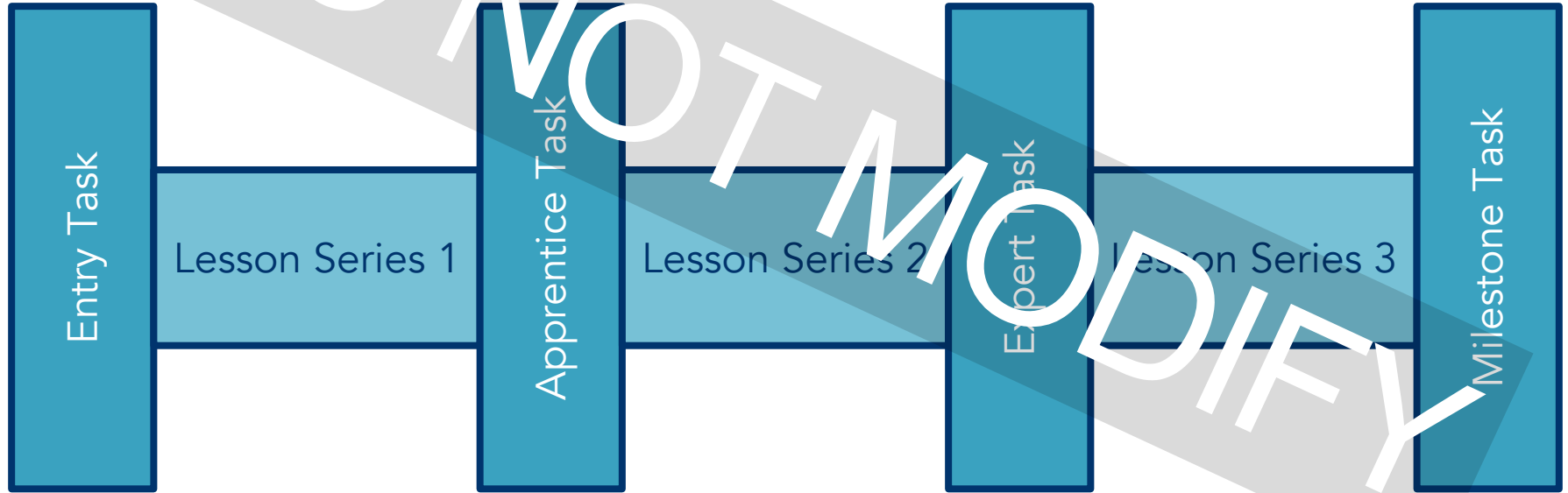
University-District Partnership

DO NOT MODIFY

Research

Practice

UUSD's Task-Based Curriculum



CSET

UUSD's Dimensions of Teaching and Learning

DIMENSIONS OF TEACHING AND LEARNING

Agency, Authority and Identity

Students ...

- Routinely ask questions and make comments that reveal deep engagement with the learning objectives
- Are productively engaged at all times, show ability to analyze, evaluate and synthesize content
- Hold one another accountable for justifying their answers by citing evidence and/or elaborating on their thought processes, when needed
- Build on the contributions of others, assume considerable responsibility for the success of academic conversations, initiate topics and make unsolicited contributions
- Take charge of their learning and construct new knowledge by defining tasks, planning, monitoring, changing course of action, and dealing with specific obstacles
- Have opportunities to show and apply their understanding in multiple ways
- Marshal willpower and regulate their attention when encountering complex tasks and in the face of distractions
- Assume responsibility for seamless transitions

Teachers ...

- Effectively use a wide variety of questioning techniques to encourage student-to-student discussions and to move student thinking forward
- Provide adequate time for students to engage in productive struggle and formulate
- Ask uniformly high quality question students to cite evidence, analyze and synthesize information, explain their thought processes in language
- Scan the room making note of who is not engaged and take action as an extent to which students re-engage
- Consistently use instructional techniques that facilitate equitable, active student learning including opportunities for hands-on
- Encourage student independence facilitating seamless transitions from

Uses of Assessment

Students ...

- Express their thinking, justify their findings, and apply new concepts from the new learning so far
- Identify and correct errors and/or misconceptions in a real-world or creative context
- Make use of formative information for new learning
- Engage in productive struggle and formulate

Teachers ...

- Actively and systematically elicit diagnostic and formative information from individual students and monitor the progress of their learning

Access to Content

Students ...

- Articulate the purpose of the lesson and its connection to their knowledge
- Have opportunities to make their own sense of content-specific ideas
- Demonstrate what they are learning through ability to explain, interpret, apply, shift perspective, empathize and self-assess their thought processes
- Demonstrate strategic thinking by reasoning, developing a plan or sequence of steps to arrive at more than one possible response to the content under study
- Contribute to explaining concepts to their peers
- Independently seek new sources to expand their knowledge of the content being taught
- Persevere to accomplish long-term or higher-order goals in the face of challenges and setbacks by engaging their academic mindsets, effortful control, strategies and tactics

Teachers ...

- Make the purpose of the lesson clear, including where it connects with prior learning, linking that purpose to student interests
- Facilitate opportunities for students to construct new knowledge and to make connections to their prior knowledge and experience
- Consistently use students' learning styles, interests, and needs to plan diverse learning activities (including hands-on learning), group students, and differentiate the content, process or product
- Ensure all student groups and/or pairings are strategic, purposeful and flexible, based on student characteristics
- Frequently anticipate typical student understanding or misconceptions and are prepared with alternative and differentiated lesson activities and materials
- Provide ample opportunities for supportive interventions and challenging extension activities

Who does and does not participate in the work of the class? How can more opportunities for each student to participate be created?

Research Questions

1. Are there patterns between different small groups' engagement with the Access to Content and AAI practices while working on a collective mathematics tasks in the classroom?
2. What are the conditions of teaching and learning associated with the patterns of presence or non-presence of indicators of Access to Content and AAI?

Video Data Selection

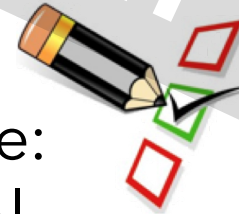


35 Classrooms

2-3 small groups

1 small group video
per classroom, 4 omitted

31 videos analyzed for
presence and non-presence:
Access to Content and AAI



CSET

Video-Observation Instrument

Access to Content	Authority, Agency, and Identity (AAI)
Procedural Explanation	Productive Struggle
Use of Multiple Solution Strategies	Ownership of Learning
Conceptual Explanation	Building on the Contribution of Others
Use of Multiple Representations	Critiquing Ideas and Justifying Answers

High Presence
(Mr. Gary's small group)

		Group Number															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Access to Content	Procedural Explanation																
	Use of Multiple Solution Strategies																
	Conceptual Explanation																
	Use of Multiple Representations																
Authority, Agency, and Identity	Productive Struggle																
	Ownership of Learning																
	Building on the Contributions of Others																
	Critiquing Ideas and Justifying Answers																

		Group Number																Totals
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Access to Content	Procedural Explanation																25	
	Use of Multiple Solution Strategies																16	
	Conceptual Explanation																13	
	Use of Multiple Representations																15	
Authority, Agency, and Identity	Productive Struggle																19	
	Ownership of Learning																30	
	Building on the Contributions of Others																23	
	Critiquing Ideas and Justifying Answers																14	

Low Presence
(Mr. Shelly's small group)

Context



Same School

Same Day

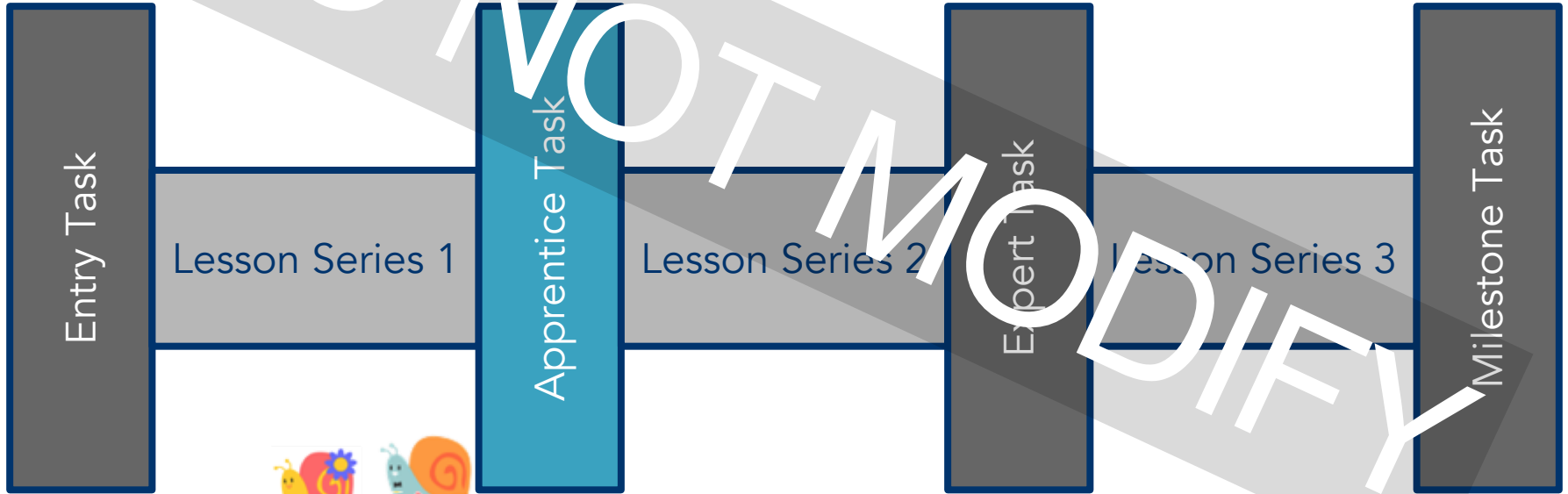


Same Grade



Same Task

Context: Unit on Unit Rate



Context: 6th Grade Task

Snail Pace

These snails move very slowly. Here are their speeds.

Snail A
5 inches in 10 minutes

Snail B
3 inches in 20 minutes

Snail C
1 inch in 15 minutes

Snail D
6 inches in 30 minutes



Your team's task:

If these snails were in a race, in what order would they finish?

Use tables, double number lines, proportions, or other representations to figure it out.

Your team's products:

- Everyone should have at least two different representations of the problem in their notes.
- Get your team's thinking ready to present under the document camera.

Facilitator: Make sure the task card gets read aloud and remind our students to attend to all parts of the task.

- *Who wants to read?*
- *Look here, we need to remember to _____.*

Team Captain: Make sure your team uses the **middle space** to share and build on ideas.

- *Can you put what you are writing in the middle space to build on _____'s idea.*
- *Let's talk about _____'s idea.*

Recorder/Reporter: Make sure that everyone is recording the team's ideas in their own notebooks.

- *Let's put that idea in our notebooks.*

Recorder/Reporter: Help your team decide when you need to call the teacher over.

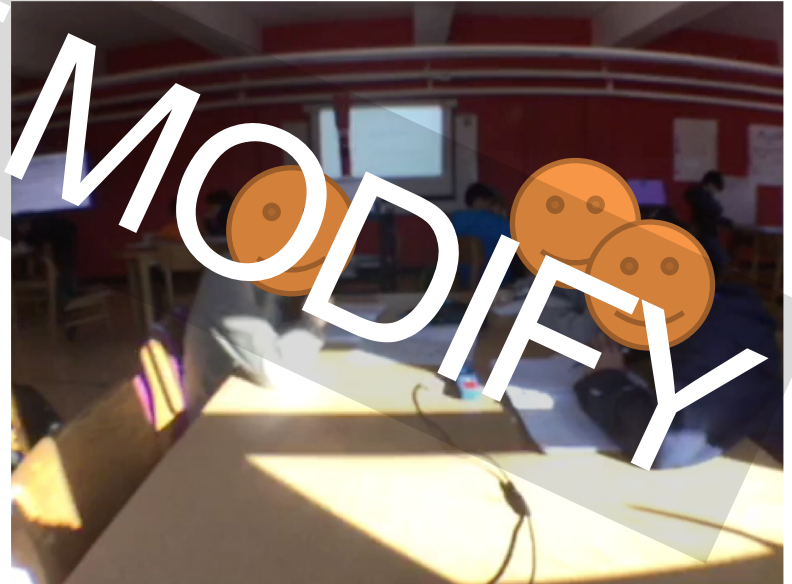
- *Good question. Why does everyone think? Do we need to ask the teacher?*

Student Orientation

Ms. Shelly's small group



Mr. Gary's small group



Student Orientation to the Task

Performance ←  Learning

Characterized by focus on:

- appearing competent
- avoiding looking incompetent
- themselves and comparison to peers
- getting the answer

Characterized by focus on:

- developing skills
- increasing understanding
- achieving mastery
- achieving a sense of improvement

(Ames, 1992; Blumenfeld, 1992; Bunderson & Sutcliffe, 2003; Dweck, 1986; Kazemi & Stipek, 2001; Meece, 1991; Nicholls, 1993; Pintrich, 2000; Eccles & Wigfield, 2002; Pintrich, Conley & Kempler, 2003)

Findings: Student Orientation

Low Presence (Ms. Shelly)

- Focus on individual student roles
- Incongruent role descriptions with teacher expectations
- Division of labor
- Unequal access to shared poster paper

High Presence (Mr. Gary)

- Focus on representation and meaning of rates
- No clear roles established
- Reassessed answers and meanings
- Collective/shared work
- Connections across representations (decimals, fractions, number lines)

Teacher Orientation to the Task

Form

- Characterized by focus on:
- limiting use of materials
 - providing but not supporting conceptually challenging problems
 - students presenting final solutions

Function

- Characterized by focus on:
- roles played by materials, tasks, & methods in the teaching system
 - creating conditions to engage with challenging problems
 - features working together to facilitate students' achievement of particular learning goals

Findings: Teacher Orientation

Low presence (Ms. Shelly)

- Launch focused on student behaviors and mathematical practices
- One paper in middle of group (shared materials)
- Notebooks put away
- Focus on student self-selected roles

High Presence (Mr. Gary)

- Launched asked students for 'noticings' and 'wonderings'
- Focus on multiple representations
- Notebooks for individual work before sharing
- No mention of roles

Discussion & Conclusion

- Video-observation instrument pointed to contrasting cases
- Groups were differently oriented to each other and the math
- Indicators helped surface connections between Access to Content and AAI orientations
- Implication of connections between teacher orientation and student orientation during groupwork
 - e.g. form orientation set stage for performance orientation