



Oregon State  
University

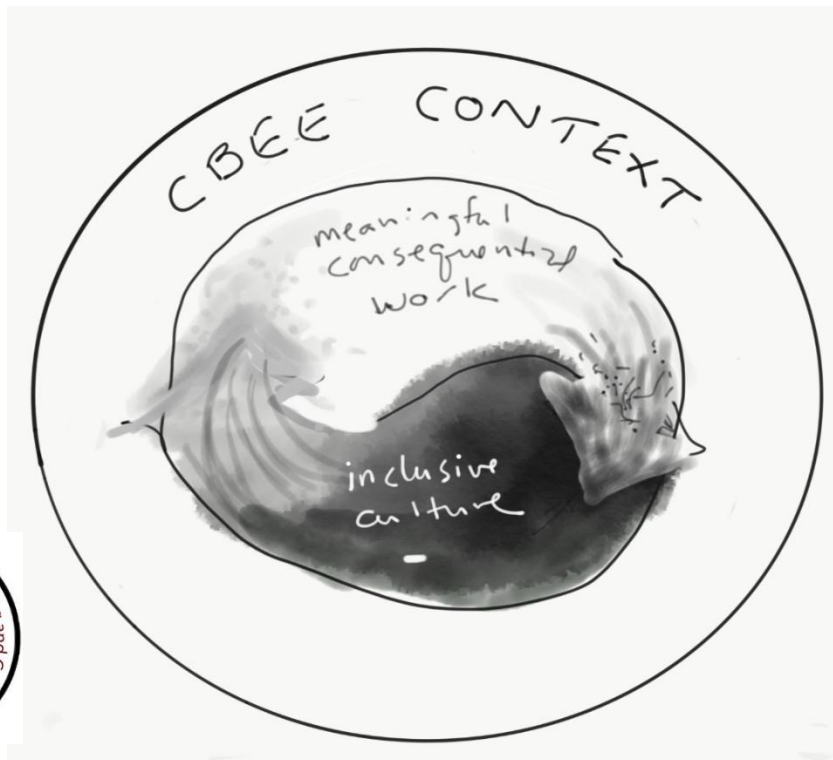
# Shifting Department Culture to Re-Situate Learning

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UNIVERSITY of  
WASHINGTON

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## Project Goal:

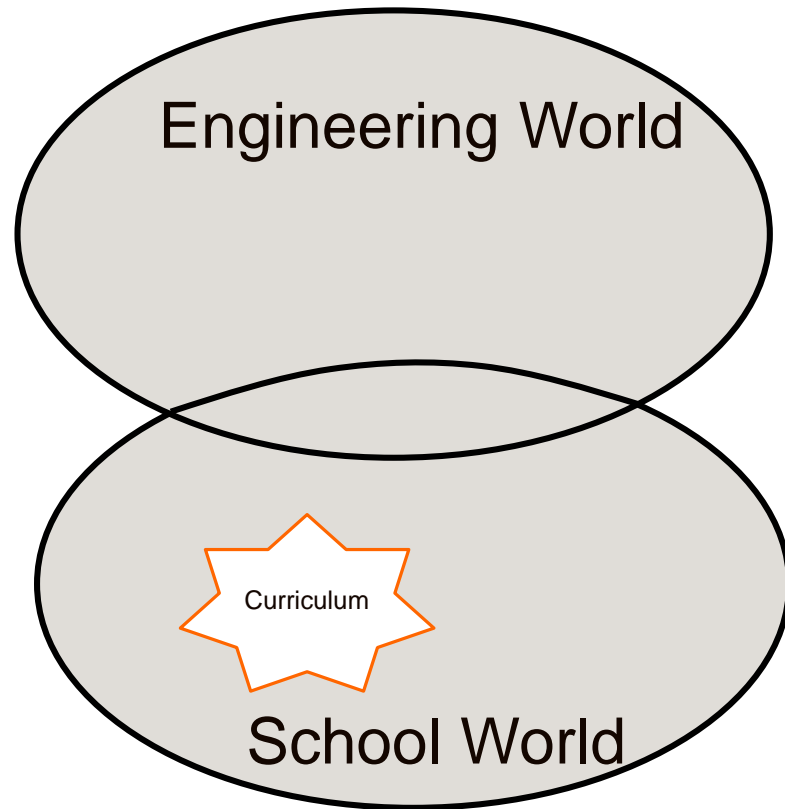
We seek revolutionary change in the CBEE School through construction of a culture of inclusion and a shift in our learning environments from sequestered activities to realistic, consequential work.



# Overview



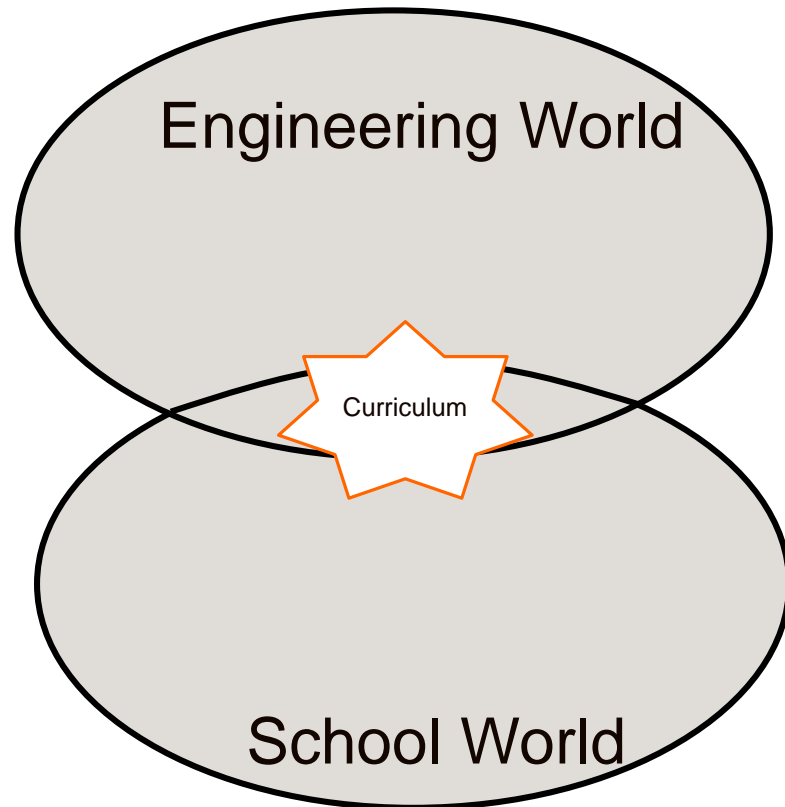
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# Overview



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**Re-situate** the curriculum

- Thinking & acting like engineers is more likely if students are immersed in professional contexts (engineering world) rather than thinking like engineering students (school world)

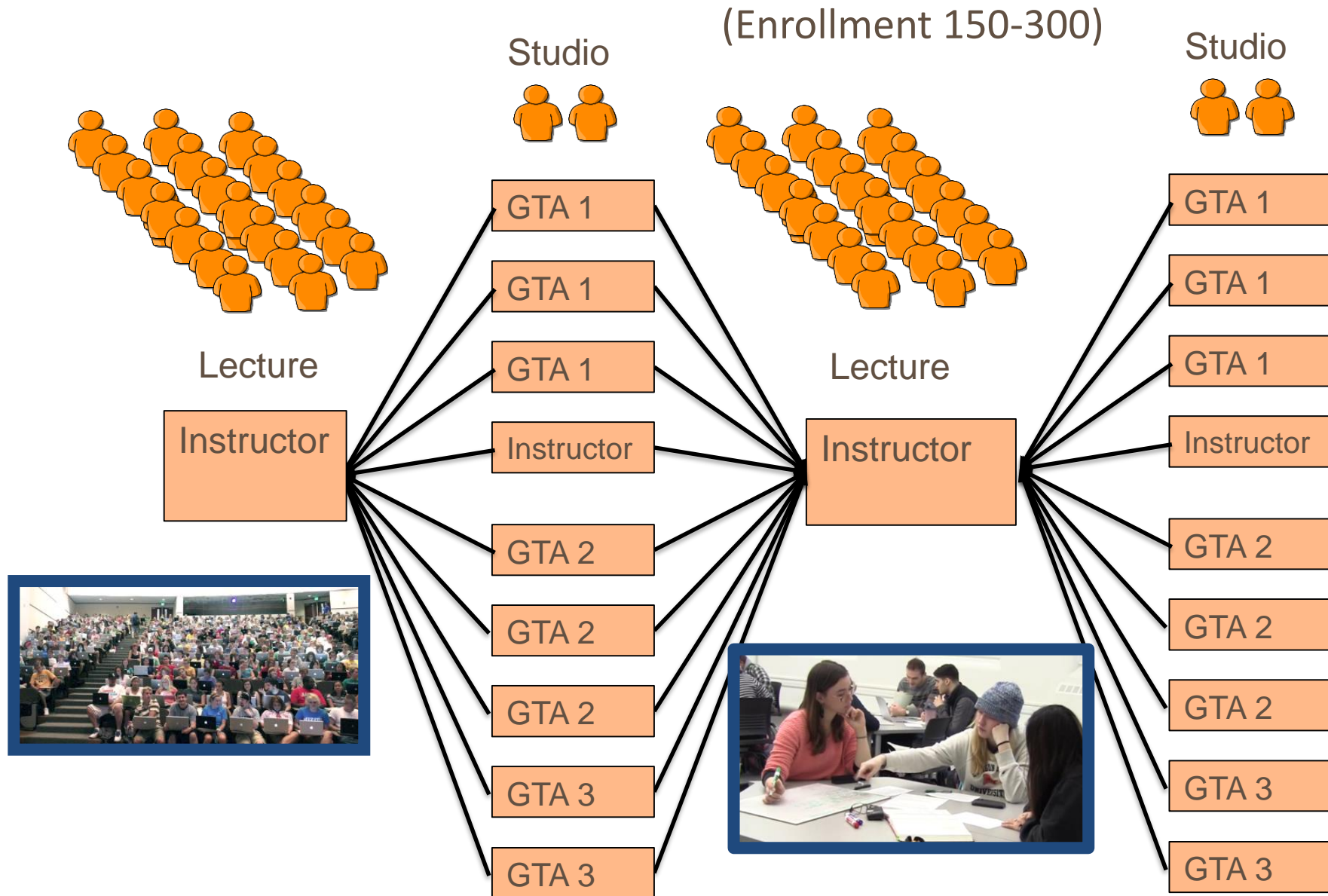
# Studio Courses: Enabling Small Group Learning

(Enrollment 150-300)

- Studio instruction is intended to be “facilitative” with a GTA or instructor circulating around the room and interacting with students and student teams
- Designed to engage all students; help them learn that it is ok to be “stuck” and help them develop strategies to get “unstuck.”



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# Studio 1.0 vs Studio 2.0 Design



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Studio "2.0" reform in eleven core courses from “work sheeting” to “group-worthy” problems complex enough to benefit from multiple perspectives and understanding

## Studio 1.0

## Studio 2.0

### Description

Steer learners to follow a specific path to get to a “final answer.” Learners have limited opportunity to express their creativity and problem solving skills

Learners are presented with professionally contextualized problems. Activities are more open ended. Learners are encouraged to work with their group to come up with their own path

### Framing

Bounded

Expansive

### Moves Involved

Mostly forced

Free and forced

# Studio 2.0 Community of Practice



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→ way to share/fdbk/reflect on different approaches

Open-ended problems.  
GTA/LA prep important

Assigning + switching groups  
(once, perhaps)  
(leads to learning skills)

Benefits to Int'l students  
(culture > language)

Want to NOT work with same people as HW  
↑  
Fixation

↓ just doing calculations  
(+ recipe studios)

Time pressure leads to rushing through

Get comfy/work with friends go into auto

♀ experiences with studio (+ honors)?

Reminders of teaming norms

GTA - Reflections (GTA Panel)

Support for LAs so that they are engaged

Pre-studio meetings - working on problem + post studio to communicate "problems of practice"

1 event meet the day after the studio to reflect + plan

0' instructor attends only 1 meeting if 2

# Quad Design Tool

Context

Engineer's Role / Task

Concepts (Conceptual Tools)

Engineering Practices

## Components of Disciplinary Knowledge

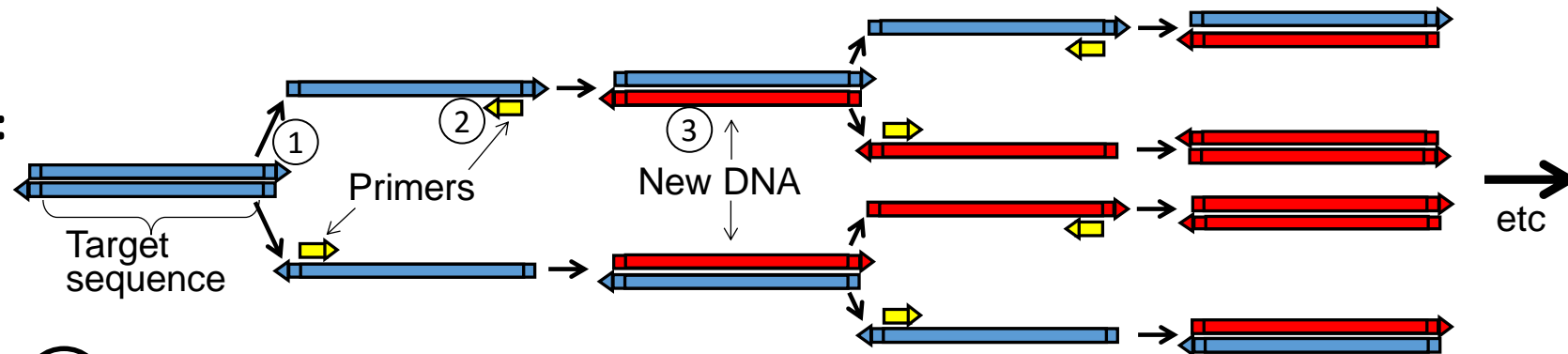
	Open-ended design	Conceptual tools	Computational tools	Communication and writing	Inclusive teamwork	Industrial (Professional) relevance /	Hands-on experience



# Energy Balance Studio 2.0 (Adam Higgins)

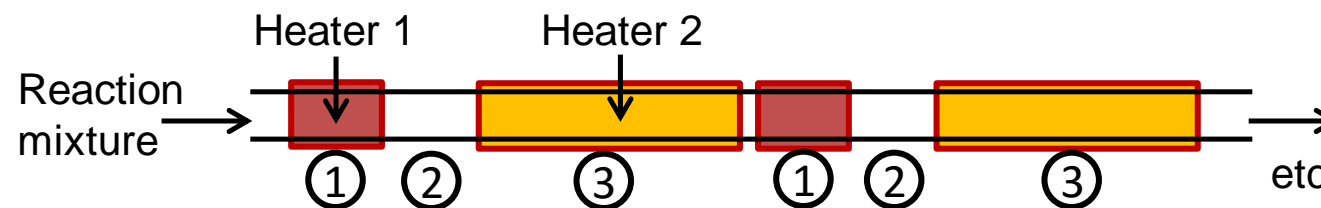
- Development of Microfluidic Device for Diagnostic Testing Using Polymerase Chain Reaction (PCR)
- Point of care device
- Design Heater length / microchannel configuration (flow rates; max temp; ...)

PCR  
Reaction:



- ① Heat to  $\sim 95^{\circ}\text{C}$  to melt double stranded DNA
- ② Cool to  $\sim 68^{\circ}\text{C}$  to anneal primer
- ③ Heat to  $\sim 72^{\circ}\text{C}$  for growth of new DNA strand

Heaters  
(2 cycles)



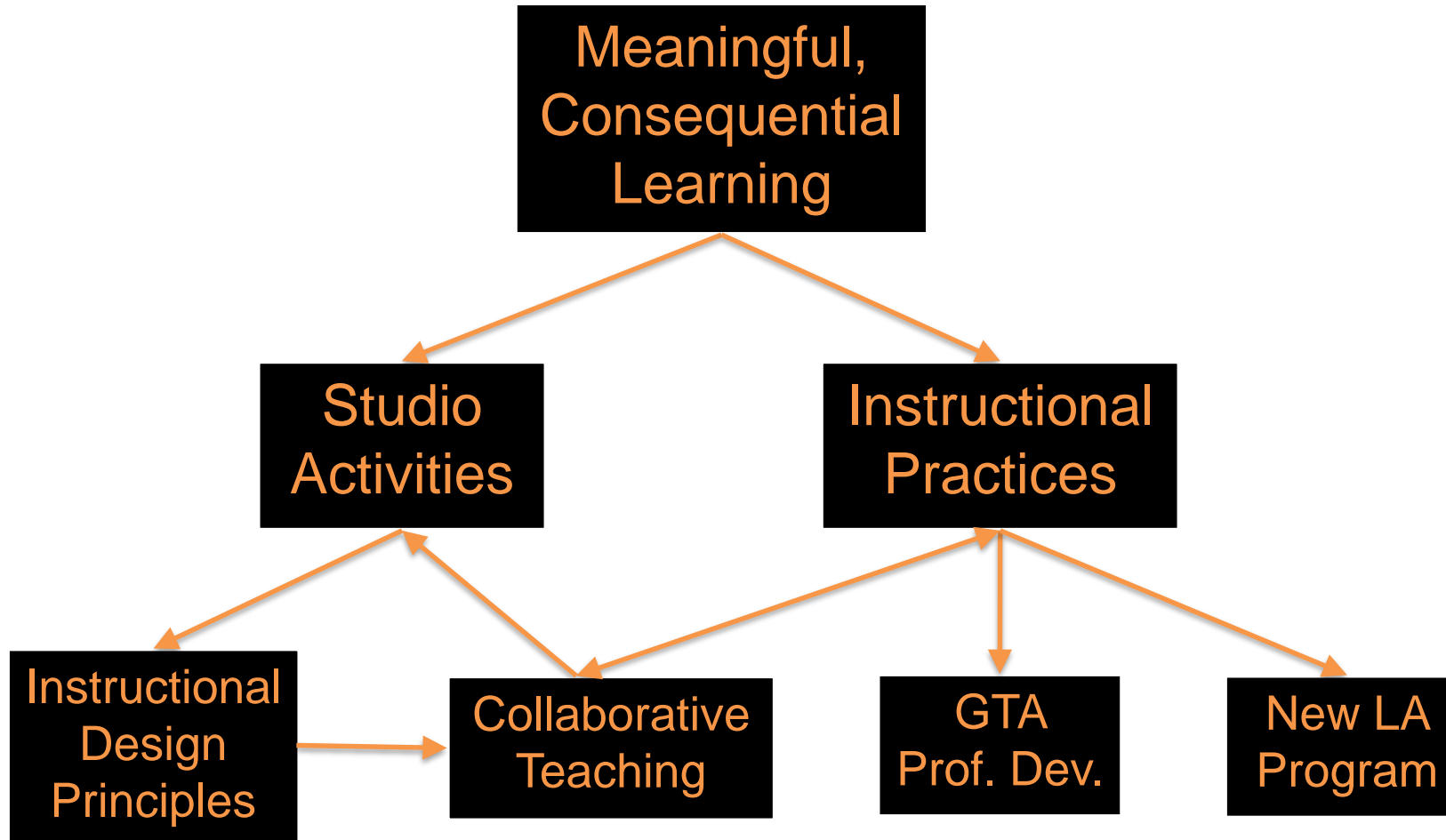
Reactions to sequentially copy the original DNA sequence

# ALT-Studio 2.0

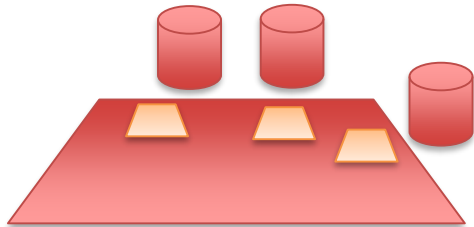
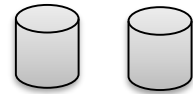
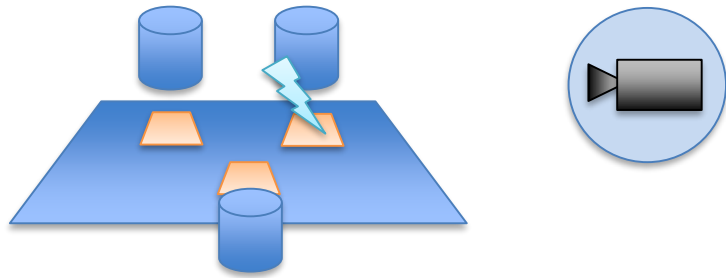
## Alternate Leads (ALT) Studio Model

- Assign pairs of faculty to each major studio course.
- Each faculty member takes the lead in alternative years with the other working on activity development, student support, and being available when the lead travels. The alternative will also be available to contribute to longitudinal curricular.
- While this structure would apply to each course, individual pairs have autonomy to work out detail as appropriate for their course and teaching practices.
- We recommend a four-year match period with potential renewal so that each pair can lead twice during each rotation period.
- Part of the annual performance reviews will contain a meeting between the School Head and the faculty pair where the activity and accomplishments of each member will be assessed and evaluated.
- New faculty will be paired with more experienced instructors. There will be documented development plans for new faculty that can become part of their teaching portfolio for P&T.
- There will be 1-2 optional meetings per term for studio faculty to share innovative practices and work through persistent problems.

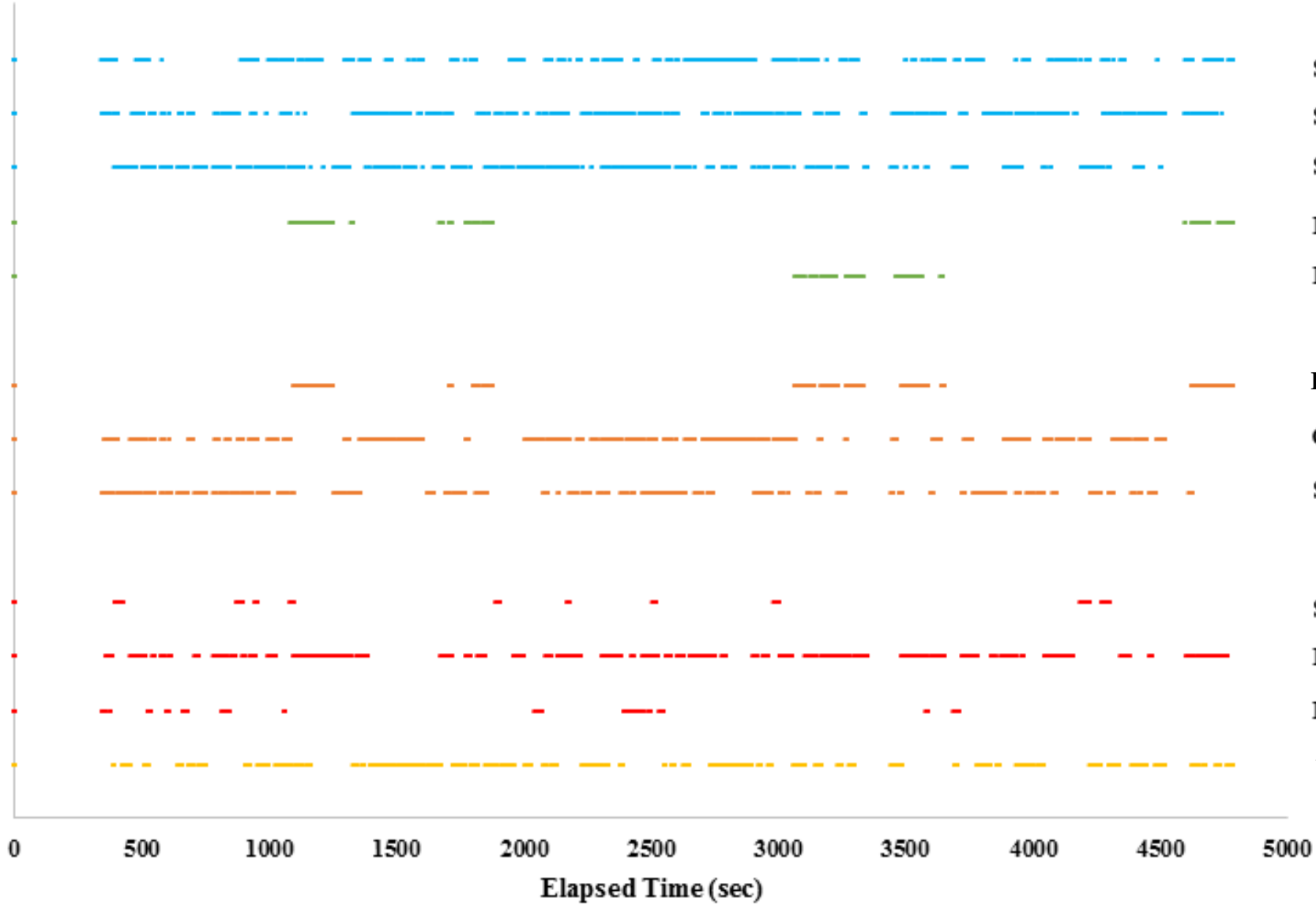
# ALT Studio 2.0 Development



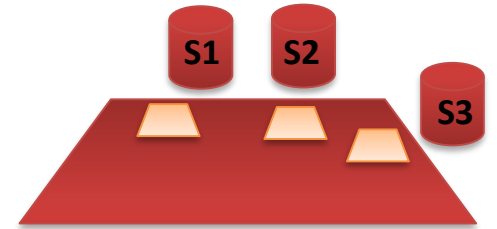
# Video Data Collection – Team Interactions



# Team Interaction Data



## Team 2

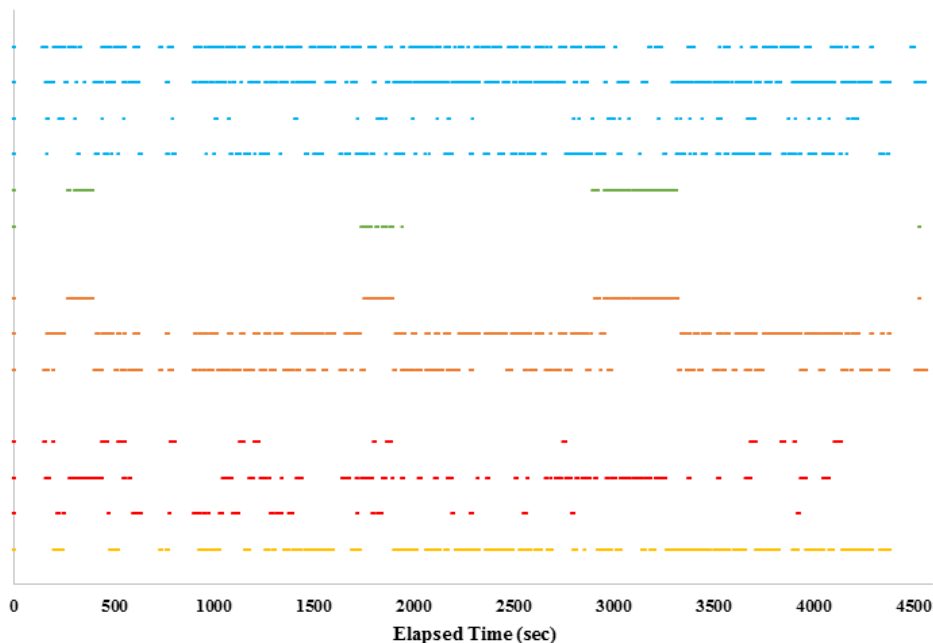
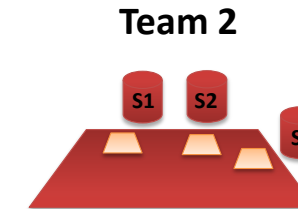
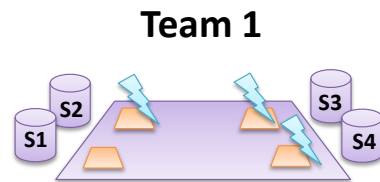


Engagement

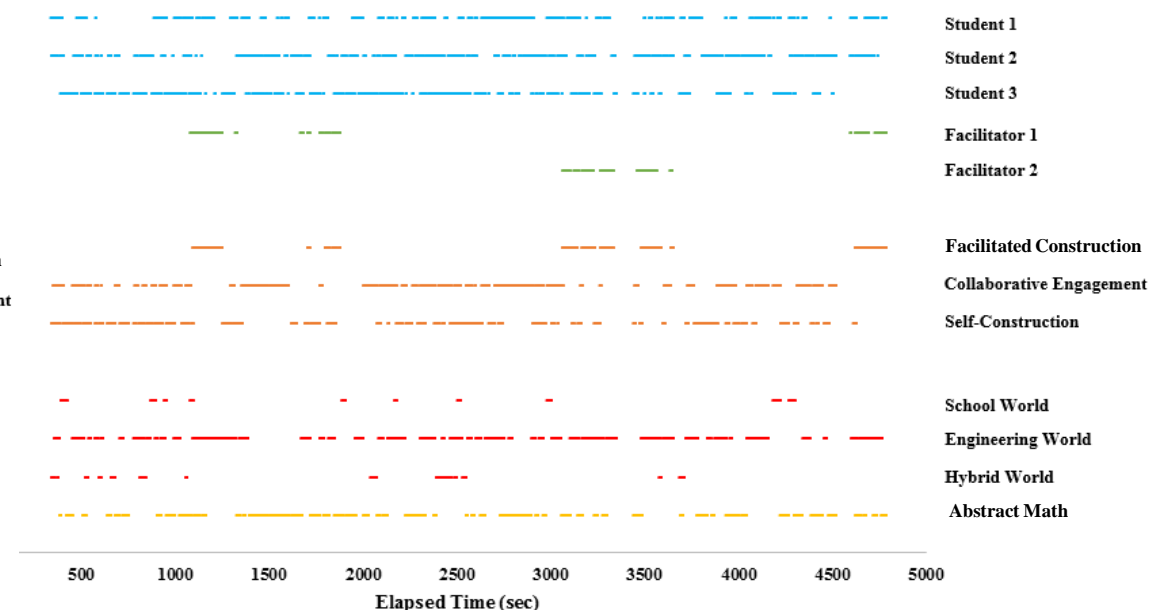
Figured World

# Analysis of Team Interactions

- Collaborative engagement in engineering world almost always represents desired talk where team members are arguing, defending, explaining, and elaborating using reasoning based in engineering norms and practices
- For Team 1, key opportunities to collaborative engage in engineering world were rebuked



Student 1  
 Student 2  
 Student 3  
 Student 4  
 Facilitator 1  
 Facilitator 2  
 Facilitated Construction  
 Collaborative Engagement  
 Self-Construction  
 School World  
 Engineering World  
 Hybrid World  
 Abstract Math



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# Model of Team Interactions

Collaborative Engagement Talk Time (sec)				
	School World	Engineering World	Hybrid World	Abstract Math
Team 1	159 (11%)	<b>190</b> <b>(13%)</b>	76 (5%)	878 (62%)
Team 2	106 (8%)	<b>562</b> <b>(42%)</b>	109 (8%)	519 (39%)

