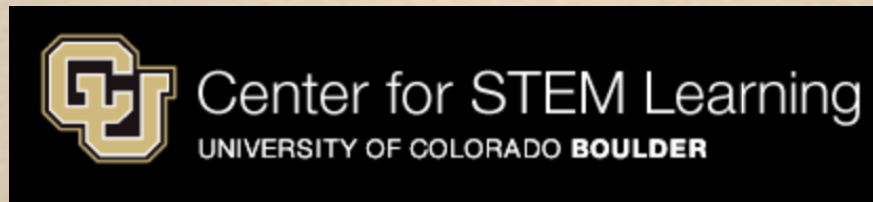


# Towards a Model of Systemic Change in University STEM Education



Daniel Reinholz, Joel C. Corbo  
Melissa Dancy, Stanley Deetz, Noah Finkelstein

# Overall Project Goal

“To influence the culture of STEM departments at AAU universities so that they will use **sustainable**, student-centered, evidence-based, active learning pedagogy in their classes, particularly at the first-year and sophomore levels.”

— Association of American Universities

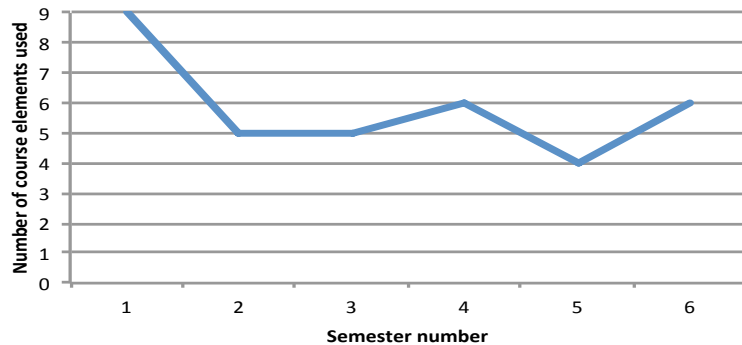




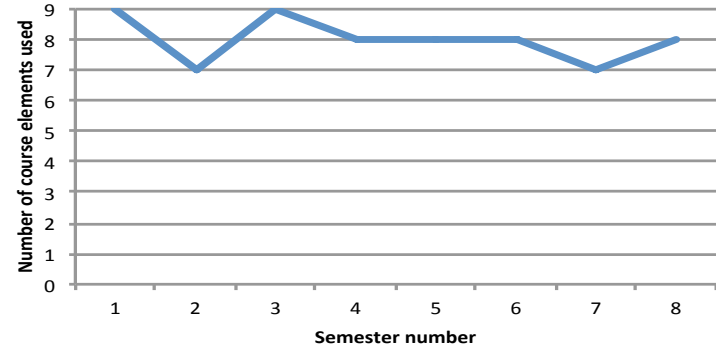
# Why a model of change?

## Goal: Sustainability and Scalability

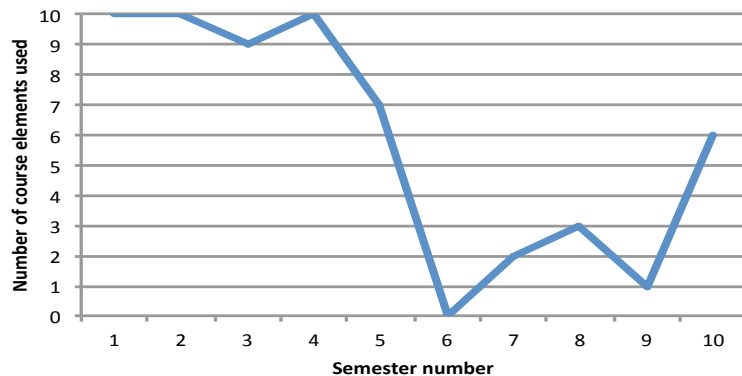
**a) Course 1**



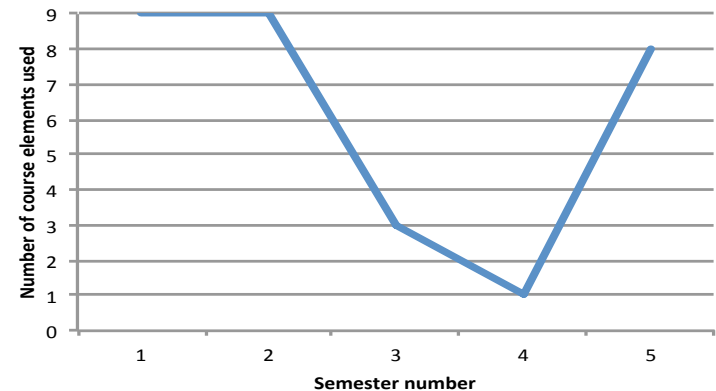
**b) Course 2**



**c) Course 3**



**d) Course 4**



Chasteen et al (in review)

# Practices vs. Culture

## Practices and Cultures



# Drawing from Change Literature

		INTENDED OUTCOME	
		PRESCRIBED	EMERGENT
ASPECT TO BE CHANGED	INDIVIDUALS	Disseminating Curriculum & Pedagogy 30.4%	Developing Reflective Teachers 33.5%
	ENVIRONMENTS	Enacting Policy 30.4%	Developing Shared Vision 8.4%

Henderson, Beach, and Finkelstein, *J. Res. Sci. Teach.* **48**, 952–984 (2011)

# Drawing from Change Literature

INTENDED OUTCOME			
		PRESCRIBED	EMERGENT
ASPECTS OF CHANGE	INDIVIDUALS		
	ENVIRONMENT	30.4%	8.4%

**Key Findings:**

- Focus on the department
- Balance prescriptive and emergent
- Holistic / Ecosystem Approach
- Need for Maintenance

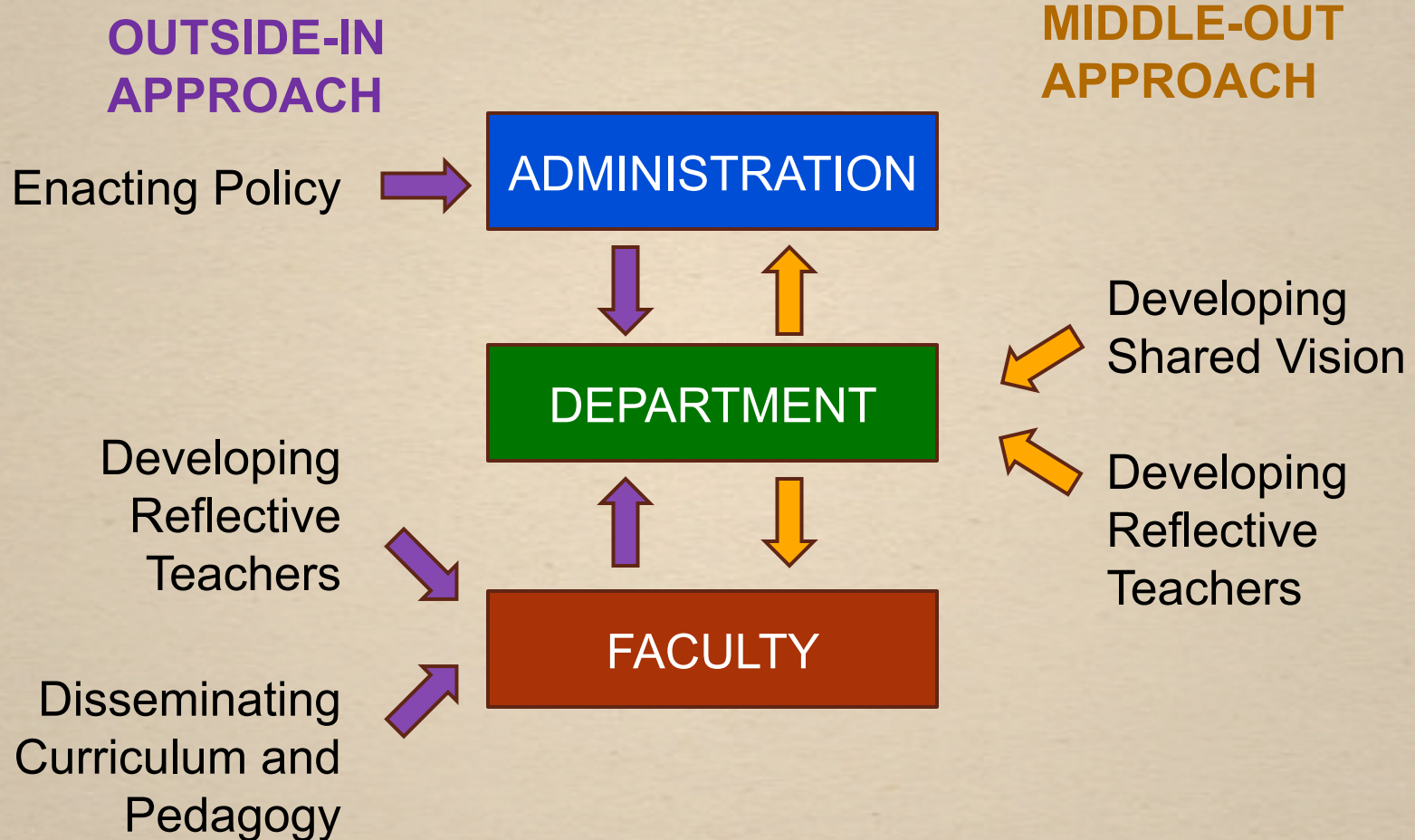
Henderson, Beach, and Finkelstein, *J. Res. Sci. Teach.* **48**, 952–984 (2011)



# Departmental Cultural Commitments

- Students as partners in the education process.
- Education designed around learning outcomes.
- Decisions are evidence-based.
- Active collaboration & positive communication
- Department as a “learning organization.”
- Value inclusiveness, diversity and difference.

# Two Approaches to Change





# Outside-In Implementation

Encourage student-centered shifts  
in **faculty** beliefs & practices

## Assessments: (Formative)

- Assessment as a lever
- Encourage reflective practice

## Departmental Action Teams (DATs):

- Address departmental issue
- Achieve long-term stability
- Draw from SoTL, FLC, SEI

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# Outside-In Implementation

Encourage development of **administrative** structures that value student-centered education

Encourage student-centered shifts in **faculty** beliefs & practices

Faculty Senate/ Taskforce:

- (Re)Define teaching excellence

Senior Administration:

- Require evidence of educational impacts

Centralized Tools/ Resources:

- Accessible Tools
- Inform Educational Practices

# Outside-In

Encourage development of **administrative** structures that value student-centered education

Encourage **departmental** shifts from “above” and “below”

Encourage student-centered shifts in **faculty** beliefs & practices

Faculty Senate/ Taskforce:

- (Re)Define teaching excellence

Senior Administration:

- Require evidence of educational impacts

Centralized Tools/ Resources:

- Accessible Tools
- Inform Educational Practices

Assessments: (Formative)

- Assessment as a lever
- Encourage reflective practice

Departmental Action Teams (DATs):

- Address departmental issue
- Achieve long-term stability
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# Departmental Action Teams

## Goals:

1. Opportunity for faculty to work collaboratively to improve education in their department
2. Learn about the departmental culture / context
3. Deliverable product/improvement by the end of the year
4. Develop a mechanism for sustained improvement  
(e.g., integrate into department governance)
5. Reach key and sizable #'s of faculty

# DATs in Action

## ■ Logistics

- 4-6 faculty meet bi-weekly for semester/ year
- AAU team members facilitate
- Faculty led
- Focus on single area
- Sanctioned: Counts as Service and/or Funded

## ■ *Transfiguration Department*

- 6 meetings to date
- Building on SEI influence
- Focused on coherence across curriculum

## ■ *Potions Department*

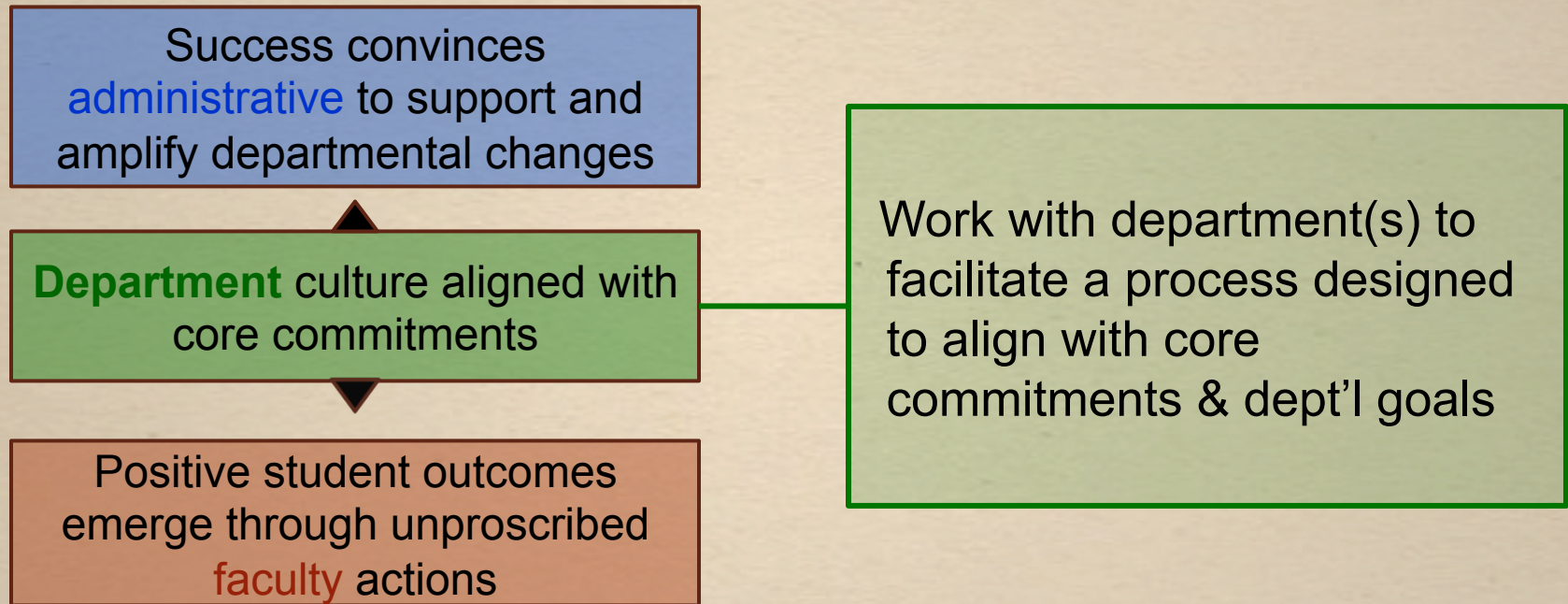
- 2 meetings to date
- Focused on gender and access



# Institutional Efforts

- Academic Affairs recs to the Provost:
  - *Enhance efforts to upgrade the prestige, respect and reward structure for excellence in the scholarship of teaching...*
  - *Develop user-friendly software especially designed for departmental chairs so that they may query central data base information ...*
- Faculty senate
  - Awards for Excellence in Teaching, 2013
    - *Evidence of the candidate's teaching effectiveness or innovation*
    - *Evidence of student engagement*
- Office of Info Technology
  - *TDOP – COPUS / Observational protocols*
  - *Analytics on student pathways*

# Middle-Out Implementation





# Change Process (To Date)

1. Discussion and get exploratory approval key personnel
2. “Guiding coalition” : depth of understanding & support.
3. Two hour meeting with department faculty:  
goals and processes, ideally ending with approval.
4. Data collection:  
values, concerns, and ways of thinking present ;  
establish culture baseline.

# Change Process (Future)

5. One - two day retreat:
  - i. Create a vision
  - ii. Explore mental maps and internal operations
  - iii. Develop criteria and processes of continuous assessment.
  - iv. Invent process of going forward:  
goals, assignment of responsibility, decision processes, etc
6. Support working groups refining timeline & assessments.
  - i. Establishing learning goals program, & courses
  - ii. Making supportive environment & relationships
  - iii. Revising reward systems
7. Reflect on successes, lessons, and adjust:
  - i. one month, three months, and one year
8. Build a sustainability plan (at outset)



# Herbology Department

- Faculty survey
  - 12 of 13 faculty expressed interest
- Faculty vote
  - Unanimous agreement to engage
- Change process will begin in spring

# Measuring Change

- A need for (some) new kinds of evidence  
Measure alignment with core commitments
- Key tools to draw from:
  - PULSE Vision and Change
    - Existing rubrics measure practices
    - Adapt to measure culture
  - Henderson & Beach
  - Elrod & Kezar
- Functions evaluation
  - Measuring change pre/post
  - Formative conversations with curriculum committees



# Thank you

<http://www.colorado.edu/csl/aau/>