



# Systemic Efforts for Promoting Cultural Change to Improve STEM Education



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**OVERALL GOAL** Sustainably shift the culture of STEM departments to be more student- and learning-centered.

## FACULTY PRACTICES AND BELIEFS

**GOAL** Faculty that make evidence-based decisions about individual courses and department-wide education questions.

**FIRST ITERATION** Work with individuals teaching large-enrollment courses to identify learning goals and implement measures of student learning.

**SECOND ITERATION** Work with teams of faculty to identify and address common problems, with a focus on collecting data and building teamwork/community.

## DEPARTMENTAL CULTURE

**GOAL** Departmental integration of evidence-based, student-centered education with research and service activities.

### ORGANIZATIONAL CHANGE PROCESS

- ▶ Develop a department vision.
- ▶ Revise assumptions about teaching and learning
- ▶ Develop capacity to meet learning goals.
- ▶ Integrate teaching and learning goals systematically with research and other departmental functions
- ▶ Develop a collaborative process for continuous assessment and innovating.

## LAYERS OF CHANGE



## ADMINISTRATIVE POLICIES

**GOAL** Administration that prioritizes and rewards a culture of educational excellence.

### FACULTY SENATE

- ▶ Shift its calls in its campus-wide Teaching Awards to focus on evidence-based practices and measures of student learning.
- ▶ Develop a framework for teaching excellence that can be adopted and contextualized by departments in promotion and tenure guidelines.

### SENIOR ADMINISTRATION

- ▶ Require evidence of student learning in tenure and promotion decisions.

## INSTITUTIONAL CONTEXT

R1 public university  
 26,000 undergraduates  
 6,000 graduate students  
 Working in 3 departments:  
**Integrative Physiology** (1700 majors)  
**Mechanical Engineering** (800 majors)  
**Physics** (200 majors, 2500 students per year in service courses) with more (2-4) to come.

## BACKGROUND INFRASTRUCTURE

**GOAL** Infrastructure supportive of student learning and decision-making based on institutional data.

### OFFICE OF INFORMATION TECHNOLOGY

- ▶ Develop tools for institutional data visualization.
- ▶ Develop tool kits to implement and share measures of student learning.
- ▶ Develop instructional tools (e.g. calibrated peer review).

## CHANGE MODELS AND PRINCIPLES

### SQUEEZE MODEL

Enacting Policy

### MIDDLE-OUT MODEL

ADMINISTRATION

DEPARTMENT

FACULTY

Developing Shared Vision

Developing Reflective Teachers

Disseminating Curriculum and Pedagogy

### EFFECTIVE CHANGE EFFORTS

1. align with or focus on changing the beliefs of the individuals involved
2. involve long-term interventions (a semester or more)
3. require design that is compatible with the complex nature of the university ecosystem.
4. have an emergent component, giving individuals or groups agency in the change process.
5. take the department as the key unit of change.
6. leverage and create community centered on teaching and learning
7. lead to difficult-to-revert structural changes aligned with the change effort
8. are maintained by internally-driven processes that lead to continuous refinement.

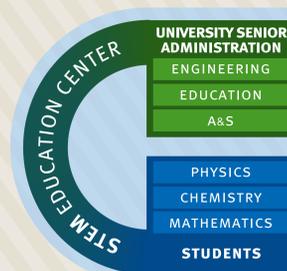
## PARTICIPATION IN NETWORKS



BAY VIEW ALLIANCE



NATIONAL NETWORK OF STEM EDUCATION CENTERS



Center for STEM Learning  
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