Meeting in the Middle: Connecting Institutional Structures for STEM Education Change

January 23, 2019, 2:00 - 5:00 p.m.
POD Network Pre-conference Workshop at the 2019 AAC&U Annual Meeting
Atlanta, Georgia

Cassandra V. Horii  Caltech  cvh@caltech.edu
Gabriela Weaver  UMass Amherst  gweaver@umass.edu
Deborah Carlisle  UMass Amherst  dcarlisl@umass.edu
Mathew Ouellett  Cornell University  mlo59@cornell.edu
Daniel Reinholz  San Diego State U.  daniel.reinholz@sdsu.edu

INTRODUCTORY ACTIVITY:
Mapping your contexts and interests

- What main question or goal do you have for exploring middle-level institutional structures and STEM educational change?
- At what institutional level does your question or goal best fit?
  - Institution level/upper admin
  - Centers/departments/other units
  - Individuals working on change
- Does your question or goal involve:
  - Collaboration or coordination within the institution?
  - Using data?
  - Other?
1. Middle-level Institutional Structures and STEM Educational Change

a. Framework:
   What is in the “middle level” and how are these structures connected?
   How can we think about change in terms of models?

b. Key Findings at the Middle Level:

   Centers for Teaching and Learning and STEM Education Centers

   Centers have the ability to increase an institution’s responsiveness to the needs of STEM departments/faculty/students through their:
   - Ability to centralize and elevate
   - Use of data to inform reform efforts at departmental and institutional levels
   - Ability to translate research findings in ways that facilitate the implementation of best practices
   - Functions/roles that serve to horizontally and vertically integrate across STEM departments and organizational levels
   - “Networked” perspective of engagement and initiatives
   - Established partnerships with STEM Faculty

**Interpretive Model of Center Practices**

*Generic*
Department Action Teams

Six Change Principles:
1. Students are partners in the educational process.
2. Work focuses on achieving collective positive outcomes.
3. Data collection, analysis, and interpretation inform decision-making.
4. Collaboration among group members is enjoyable, productive, and rewarding.
5. Continuous improvement is an upheld practice.
6. Work is grounded in a commitment to equity, inclusion, and social justice.

c. Other Approaches to Collaboration/Coordination at the Middle Level

Active Learning Initiative (Pedagogy Focus)

Cross-departmental Change (Shared Curriculum and Students)

National Initiatives / Provost

STEM departments ↔ CTL ↔ Center for Diversity / Dean’s Office

Individual Faculty

What might this all mean for teaching?

Who are our incoming students / what are their strengths?

What are we aiming for in 1st year classes?

How do student cohorts change over their 1st year at Caltech?
ACTIVITY 1: Inventory and Analysis

Refer back to your STEM education (or other) goal/question from the introduction

On your own, work through these questions:

- What institutional “middle level” structures are or could be involved in this goal or question? Make an inventory here:

- What are the middle level structures already accomplishing or contributing with respect to your goal or question?

- What could you and/or middle level structures do more of to make progress on that same goal or question? E.g., new or enhanced actions, linkages, communication, collaborations...

Facilitators will let you know when to compare and discuss your responses with a group of 3-4 colleagues near you.
2. Leveraging Data in Middle-level Structures for STEM Education Change

Centers

Interpretive Model of Institution A
R1 Private CTL

Key/Guide: for Center at Institution A, Private_R1

This Center was founded to support faculty teaching practice, with overarching mission of enhancing teaching and learning across the University. The Center supports department level and University wide STEM initiatives. Collaborates with faculty on innovation in teaching, and strives to make teaching a community endeavor through workshops, learning communities, consultations, and scholarship in teaching and learning.

Structure:
Reports to the Provost, centrally located outside of STEM departments, 6 FTE, supported by institutional funding.

Areas of Emphasis:

Centralization: The Center serves to create community around teaching and learning, which unifies individual faculty, department, and college efforts. Acts as a “hub” to increase and facilitate dialogue.

Use of data: The center advises and assists faculty/departments in the design, and interpretation of educational interventions.
- Provides expertise to guide SoTL, DBER, and action research projects
- Partners with faculty/departments to evaluate and assess the impact and value of educational innovations and research

Translation: Translational activities are carried out in all areas to increase shared understanding.
- In research to practice to improve teaching and learning outcomes in science education
  - Offers workshops and institutes to promote and support the adoption of EBIPs
  - Organizes learning communities for faculty to explore and grow
  - Provides professional development for new faculty, grad students, TAs and post docs
- Across organizational levels and STEM departments to increase shared understanding
  - Brings cross-disciplinary faculty together to foster collaboration and community
  - The center bring faculty and administrators together around STEM education initiatives (national and local)

Network: The center’s network is used to expand the engagement of faculty and departments in student-centered teaching practices, classroom design, curricular innovations, and educational research.
- High quality professional development encourages engagement of faculty and departments, and serves to grow connections between faculty
- It seeks to promote excellence in teaching and learning through EBIP implementation
- Builds complimentary partnerships with faculty engaged in action research projects
Interpretive Model of Institution C
R1 Public SEC

Center Roles
- Educational Research & Initiatives: Primary role in research & development.
- Services: Grant Management & advise.
- Programs: Linked to funded initiatives.

Areas of Emphasis
- Centralize
  - Centralize Efforts (R&D, Networking)
- Use of data
  - Educational Research: Conduct, Analyze, Consult
  - Evaluation & Assessment
- Translation
  - Bridge Research & Practice Gap
- Network
  - Build Collaborative Partnerships

Impacts
- Establishes leadership in STEM education research nationally and internationally.
- Increases the credibility of educational research.
- Provides community for faculty involved in educational research & teaching reform.
- Increases visibility of STEM education innovations.
- Supports innovation through effective design and measurement of learning outcomes.
- Strengthens awareness of communication to local, regional community.
- Addresses faculty of external funding opportunities.
- Provides resources through external awards.
- Assets with application of published results (Outsourcing).

Center FTE = 8
Funding: 75% institutional endowment, 25% external

Key/Guide: for Center at Institution C, Public_R1

Center founded with a Research and Development mission. All functions are focused on educational research activities, and services and programs offered by the center are aligned with this mission. The center contributes to the knowledge base to improve teaching and learning in STEM education.

Structure:
Reports to the Deans, centrally located within the College of Education. 6 – 8 FTE, supported by institutional endowment (75%) and external funding (25%).

Areas of Emphasis:

Centralization: The Center acts as a "hub" for STEM education research projects, facilitates dialogue around research and teaching practices, provides community for faculty, and allows for collective problem solving.

Use of data: Use of data is directed toward educational research goals. This center sets the standard for high-quality STEM education research locally, nationally, and internationally.
- Designs, tests, and evaluates their own curricular innovations and research projects.
- Shares research findings and curricular materials with the broader community.
- Research seminars, publications, presentations.
- Assessment of gateway courses-to assimilate faculty with the measurement of learning outcomes.

Translation: Translational activities are carried out in all areas.
1) In research to practice, the center promotes the application of research to improve teaching and learning outcomes.
- The center assists faculty in understanding and applying published results of educational research studies.
- The center director organizes seminars, and provides mentoring for faculty to learn and grow in these areas.
- The center provides expertise to guide the experimental design and collection of local data.
- The center director and affiliated faculty model best practices for faculty and departments (lead by example).
2) Across organizational levels and (iii) STEM departments to increase shared understanding.
Specific activities include:
- Brings faculty together to spawn ideas and foster community.
- The center assists in understanding how efforts fit into the broader national context.

Network: The center's network is used to strengthen its role in educational research and to promote its work by strengthening engagement. The network is used to disseminate and promote the center's R & D.
- Complimentary partnerships are with cross-disciplinary faculty and with social science researchers in the College of Education.
- Connecting and linking - individuals with one another and with resources is primarily geared toward educational research opportunities (eg. curricular innovations).
Departmental Action Teams Vignettes: Curricular Impacts

Creating and Sustaining Curricular Alignment: Department A

Rationale: Course transformation had begun with the Science Education Initiative (SEI) but had languished without continued resources.

Membership: 1 tenured faculty member, 4 instructors

DAT Outcomes: The DAT developed and implemented a proposal for three Departmental Education Specialist positions. The DAT secured a one-course release for these positions. The Departmental Education Specialist role is fourfold:

1. Coordinating learning goals across courses,
2. leading professional development for TAs,
3. providing teaching support for faculty, and
4. assessing the impact of the DES positions.

“I think it helped me be more of a change agent. It certainly gave me a cohort of people where we really recognized in each other, that we had similar thoughts, similar ideas, similar motivations... it empowered us to stand up a little bit more and say, okay, we really strongly feel that this is important for our students.”

- Dept A. DAT Member

Accreditation-worthy Assessment: Department C

Rationale: An assessment plan was needed for ARPAC, as well as a need to understand majors’ disciplinary skills.

Membership: 7 tenure-track faculty, three graduate students, 1 undergraduate student

DAT Outcomes:

The DAT surveyed their department to identify the most important skills for majors. They then developed an assessment plan which includes an discipline-specific assessment of skills, a proposal for the creation of an assessment graduate position, and a tool to automatically code course materials for skills.

* Department names have been given pseudonyms for research purposes.

University of Colorado Boulder  DATinfo@colorado.edu  colorado.edu/project/dat
Departmental Action Teams Vignettes: Cultural Impacts

Educating the Community to Support Inclusion: Department B

**Rationale:** Improve recruitment and retention of people of color and women in the department.

**Membership:** 4 tenure-track faculty, 2 staff members, 1 postdoc, 1 graduate student, 2 undergraduate students

**DAT Outcomes:** The DAT gathered data about inclusion in the department. They then developed initiatives to support inclusion community through offering workshops, developing a departmental promotional campaign, producing reports on departmental inclusive excellence and diversity among majors, and hosting Welcome events. The DAT is now continuing as a standing committee in Department B.

"I definitely feel much more empowered being part of this to know that even as an undergrad that my voice is represented in the department. That's huge. It makes me feel like I want to get up, I want to get off the couch, I want to do these activities, plan, organize, execute."

- Undergraduate Dept B. DAT Member

Developing a Sense of Community: Department D

**Rationale:** Summoning had recently created an undergraduate major. This DAT focused on creating a sense of community among undergraduate students.

**Membership:** 2 tenure-track faculty, 2 instructors, 2 graduate students, 2 undergraduates

**DAT Outcomes:**

The Dept D. DAT is ongoing, but has surveyed and analyzed student data, run a welcome event, and plans to run an industry career night for the Spring Semester.

"I think having those outside facilitators is a very important part of this type of project. And so I hope that the university doesn't lose sight of that..."

- Dept. D DAT Member

* Department names have been given pseudonyms for research purposes.
ACTIVITY 2

Refer back to your STEM education (or other) goal/question from the introduction, or another goal/question you have since discovered that you would like to address.

On your own, work through these questions:

- What kind(s) of data would be useful in advancing your goal or question?

- Who needs to engage with the data, and in what ways? Think/brainstorm about the ideal result of engaging with data in new ways, and what kinds of activities could facilitate those outcomes.

- What institutional structures, especially at the middle level, need to or could be involved? How could you bring them to the table or facilitate collaboration?

Facilitators will let you know when to compare and discuss your responses with your table.
3. **Action Planning**

Based on participant interest, facilitators will suggest tables with themes/groupings. Please work on your own first, then share plans with others in your group as prompted.

Given the goal(s)/question(s) you have been thinking about during the session:

- **Rewrite / restate your specific campus goal in order to clarify the desired outcome:**

- **With respect to your goal, what is your top priority action involving faculty development connections with or between middle-level structures at your institution?**

  What do you need to do to take action on this (e.g., who do you need to talk with? what information do you need to gather? what resources are required?)

- **With respect to your goal, what is your top priority action involving leveraging data at your institution in faculty development work?**

  What do you need to do to take action on this (e.g., who do you need to talk with? what information do you need to gather? what resources are required?)

- **For your prioritized actions above, we suggest setting aside time in your calendar or task system now to address the first steps you have identified.**