A STEM Reform Solar System: Academic Departments and Institutional Elements Orbiting Them

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Who is in the audience?

Role

- Undergraduate or Graduate Student
- Faculty/Instructor
- Department/Program Chair
- Academic Administrators (e.g., Deans/Provosts)
- Professional in T&L Areas (e.g., STEM Ctr., CTL)
- Other
Session Goals

- Set context for the *Leveraging Study*

- Describe the STEM Education Reform Ecosystem

- Sharing key findings from the *Leveraging Study*

- Consider the implications for advancing undergraduate STEM education reforms in your setting
1. (individually): Where would you put your department/campus on this continuum?

2. (in pairs or triads): Please introduce yourselves and explain your response to #1. What influenced your rating?
To improve the quality of undergraduate STEM education by fostering inclusive, evidence-based teaching and learning practices in STEM departments at AAU universities.
Five Year-Status Report

- Identified seven cross-cutting strategies that institutions were implementing to achieve improvements in undergraduate STEM education.

- Different universities, departments, colleges, and campus-level units were advancing multiple and varied efforts to improve STEM T&L
Impetus for the Leveraging Study

From the Status Report, more questions arose.

- On an individual campus, what does the implementation of strategies to improve undergraduate STEM T&L look like?

- What specific approaches, leadership, and resources are individual campuses putting in place to support reforms?

- To what degree are reform efforts at different levels of the institution successfully coordinated?
Aim of the Leveraging Study

- Take a more nuanced look at how individual institutions are implementing strategies to improve undergraduate STEM T&L.

- Find out if there are approaches or strategies that prove successful in one institution but not others.

- Understand the contextual elements that influence the implementation and coordination of approaches to achieve STEM education reforms.

Miller, E.R., Sorcinelli, M.D., Fairweather, J.S., & King, T., NSF IUSE Grant No. DUE-1625532, Leveraging the AAU Undergraduate STEM Education Initiative to Understand and Advance the Institutionalization of STEM Teaching & Learning Reforms (2017-2022)
Study Methodology

- Four-person research team
- Eight AAU public and private universities
- Sixteen in-person, multiple day campus visits (two visits, two years apart)
- Facilitated 222 individual and small group meetings
- Interviewed 395 unique persons
- Interviewees included faculty, instructors, department chairs, deans, PIs on grant-funded reform efforts, directors of teaching and learning centers, academic support staff, postdoc scholars, graduate and undergraduate students, and university-level administrators.

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Overarching Findings

- The academic department is the central, critical unit for improving teaching and learning and advancing undergraduate STEM teaching and learning reforms.

- Contextual elements in the larger institution are important forces that influence academic units. The influence of contextual elements varies by institution, college, and often by department.
Solar System Analogy to Describe the STEM Education Reform Ecosystem

Centrality of the Academic Department, with Institutional Elements in Orbit
Question and Reflection

Consider this STEM Reform visual:

What is the role, influence, or engagement of the academic department in your IUSE project?

In pairs or triads:
1. Introduce yourself
2. Share a bit about your IUSE project
3. Articulate what you think about the role of the academic department in your IUSE project
Strongest influence on how faculty approach their work: recruits, selects faculty; assigns faculty responsibilities & workloads; first vote on P&T and sway over relative importance placed on teaching in personnel decisions.

The original impetus for undergraduate T&L reform may occur outside the department, and individual faculty in the department may implement evidence-based teaching practices, but...

Without considerable faculty buy-in to departmental change efforts, innovations will not be long-lasting or widely spread.
Promising STEM department examples:

- Encourage collective responsibility for introductory, foundational courses
- Build consensus, strengthen cooperation within and with other departments
- Foster shared leadership, including department chair and faculty champions
- Use feedback on the student experience and evidence of learning
- Capitalize on the influence of peer departments/institutions
- Leverage new instructional roles (e.g., teaching faculty, DBER faculty, ULAs, postdocs)
**Institutional History and Identity.** Historical and aspired identity of leading research universities relative to the importance placed on undergraduate education.

**Leadership.** Degree of leadership stability and ways in which commitment of academic and faculty leaders to undergraduate education can influence improvement efforts.

**Organizational Structure.** Extent to which institutions are centralized or decentralized and impact of that organizational structure on academic departments.

**Teaching & Learning Structures.** Relationships, coordination, cooperation among university-wide T&L support structures, college-level STEM centers, and STEM academic departments.
**Co-Curricular Supports.** Intersection of co-curricular activities with curriculum, intentionality of student academic support in and outside of departments, how outside activities influence undergraduate learning.

**Faculty Rewards.** Location of power and influence in promotion, tenure, and merit decisions, which reflects how faculty members are valued, recognized, and rewarded for teaching contributions.

**Financial Models.** Effect of funding and allocations for teaching/learning, especially for instructional approaches used in foundational, introductory STEM courses.

**Undergraduate Student Trends.** Influence of demographic trends, shifts in enrollment demand, and responses to diversity, equity and inclusion in terms of access and persistence to graduation.
Individual Question:

Which contextual element most influences the successful implementation of undergraduate T&L reforms in your department, campus, or IUSE project?
1. Share the contextual element that most influences the successful implementation of undergraduate teaching and learning reforms in your department, campus, or IUSE project.

2. Share a promising strategy or approach for engaging the academic department and/or leveraging an institutional element to encourage undergraduate STEM education reform efforts.
To successfully implement, spread, and align various education reforms as well as sustain effective improvement strategies, we need to:

1. understand and engage the academic department, and

2. recognize the institutional contextual elements that influence, shape, and impact department actions and decision making.

Best outcomes occur when the goals of the department and the institution are congruent, and the department and institutional infrastructures work in partnership.
Thank you!

Questions?

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Resources


Resources


