

# Supplemental Material

*CBE—Life Sciences Education*

Matz *et al.*

## Supplementary Material

Examining the Role of Leadership in an Undergraduate Biology Institutional Reform Initiative  
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### Data analysis guidelines

Black text indicates excerpts and guidelines derived from the Henderson *et al.* (2011) and Austin (2011) articles related to their respective descriptions of change strategies.

Blue text indicates Matz & Jardeleza Life Science Initiative (LSI) implementation study-specific rules and guidelines developed in iterative rounds of reconciling coded transcripts.

#### 1. Henderson coding categories

##### a. Q1. Disseminating curriculum and pedagogy

- i. Intersection of individual focus and prescribed outcomes.
- ii. “Communicating the change agent’s vision of good teaching to individual instructors.”
- iii. “Change agent... use[s] specialized knowledge to teach or tell others without that specialized knowledge.”
- iv. Could be “about new ways to organize (curriculum) or teach (pedagogy) a subject as well as, perhaps, new conceptions that support the new curriculum or pedagogy.”
- v. “Commonly employ workshops and talks” as typical sites for dissemination.
- vi. “Internal motivation [is] the primary mechanism for change.”

##### b. Q2. Developing reflective teachers

- i. Intersection of individual focus and emergent outcomes.
- ii. “Encouraging teachers to use their own knowledge/experience/skill to improve their instructional practices.”
- iii. “Information about various instructional strategies may be provided, but the specific resources presented are not critical to the intervention.”
- iv. “The role of the change agent is to encourage and support reflective practices.”

##### c. Q3. Enacting policy

- i. Intersection of organizational focus and prescribed outcomes.
- ii. “Developing appropriate environments (e.g., rules, reward systems, reporting requirements, investments in support structures) to facilitate instructors engaging in desired activities.”
- iii. “Change agent role is to use specialized knowledge to develop new environmental features that require or encourage new behaviors or attitudes that will lead to changes.”
- iv. “The primary mechanism[s] for change... [are] significant external incentives or requirements.”
- v. One person or a small group of decision-makers without feedback from stakeholders a) setting goals or priorities for the LSI or b) discussing/disseminating potential policies.
- vi. Discussion of why certain people were or were not appointed to the empaneled

committees is coded as Q3; however, if discussing empaneling the committees with a person from each unit for equal representation, then Q4.

- vii. Acceptable to code Q3 (and/or leadership) even if the person/group enacting that policy is not present.
- viii. If it is not explicit in the transcript that an action is being taken because of a collective decision or document created with the shared vision of multiple stakeholders, then should be coded as Q3.
  - 1. If there is discussion that a policy to be enacted will be discussed further by other stakeholders, then it should be coded as Q4.
  - 2. If the excerpt discusses data rather than policy using data, even if the data is going to be discussed further by other stakeholders, then it is coded as neither Q3 or Q4.
- ix. Discussion about not enacting a policy is not coded as Q3 and is not necessarily coded as Q4.

**d. Q4. Developing shared vision**

- i. Intersection of organizational focus and emergent outcomes.
- ii. “Developing a new collective vision for the department, institutional unit, or institution... that will support new modes of instruction.”
- iii. “The change agent role is to catalyze or empower individuals to come together and work toward collectively envisioned change.”
- iv. “Commonly draws on the organizational change literature and that of community building.”
- v. Simply acknowledging that there might be differences of opinion is not enough to qualify an excerpt as Q4.
- vi. Discussion of the work of the empaneled committees is generally coded as Q4.

**2. Austin coding categories**

**a. Reward systems**

- i. “Relative value and impact of their teaching choices, and how they assess effort spent on teaching in relationship to effort on other activities.”
- ii. “Mounting pressures for faculty members to increase their research productivity.”
- iii. “What higher education institutions value for faculty member promotion, tenure, and salary decisions.”
- iv. “Several studies show that higher education institutions value research more than teaching.”
- v. “In order to increase time for research, faculty members choose to ‘suffice’ in their teaching responsibilities.”
- vi. “Due to the reward system, faculty will choose to spend time doing research even when they are strongly committed to teaching.”
- vii. “The involvement of faculty members in change efforts related to their teaching is diminished when they perceive that such efforts give them less time to do research, which is more valued by the institution.”
- viii. “Faculty who are not yet choosing to use newer pedagogies will be more influenced toward engaging in change by rewards and work allocation than by data-based evidence about the new pedagogies” (this guideline appears in both “Reward systems” and “Work allocation”).
- ix. Rewards for LSI-related units/efforts should be coded with “reward systems”

(e.g., internally funded proposals).

**b. Work allocation**

- i. “Faculty who are not yet choosing to use newer pedagogies will be more influenced toward engaging in change by rewards and work allocation than by data-based evidence about the new pedagogies” (this guideline appears in both “Reward systems” and “Work allocation”).
- ii. “Faculty members [do] not want to spend more time on teaching than [what is] needed for traditional lecture approaches.”
- iii. “An important barrier to changing practice is the time needed to learn and implement new teaching strategies.”
- iv. “New teaching strategies must be easy to use... faculty members must see ways to adapt new strategies (relatively easily) to their own teaching situations... faculty members [need] enough time to learn and implement the strategies.”
- v. “Teaching strategies that are perceived as needing considerable time to learn and to fit into a course seem unlikely to attract many faculty members willing to try them.”
- vi. “Institutional leaders wishing to encourage reform in teaching should consider whether workload assignments can accommodate time and space for faculty to learn about and experiment new pedagogies.”
- vii. “One lever for change is to build [teaching experimentation] time into workload assignments, coupled with expectations for accountability for how the protected time is spent.”
- viii. Discourse regarding differences in work allocation based on type of position (e.g., tenure stream vs. non-tenure stream).

**c. Professional development**

- i. “Even if faculty members perceive that an activity will be rewarded, they must also feel interested in the activity and have a sense that their efforts are likely to be successful.”
- ii. “Faculty members are most likely to need support in the following areas: (1) balancing multiple roles and learning new roles; (2) supporting student learning through student-centered teaching, assessment of student outcomes, and teaching underprepared students; and (3) integrating technology strategically into teaching and learning environments.”
- iii. “Recognizing support for effective teaching as an institutional strategic priority, many universities offer faculty development programs.”
- iv. “A challenge for faculty developers is to find ways to attract busy faculty who face many competing expectations and pressures.”
- v. “Faculty developers share some common observations: 1) professional development is more attractive when it is presented as a prestigious and growth-oriented opportunity, rather than a remedial situation; 2) faculty members have different needs and interests in regard to professional development opportunities at different stages of the career; 3) offering various ways to access professional development opportunities, including through technology, appeals to the varying circumstances and preferences of an increasingly diverse faculty population.”
- vi. “Learning communities provide opportunities for faculty members to interact with others as they explore new assumptions and try out new approaches to teaching

- and learning.”
- vii. “[Faculty learning] communities provide support for individual faculty members who otherwise might feel alone in their departments with regard to their interest in teaching innovation.”
- viii. “Professional development” can refer to a person being discussed either for their background or lack of background that can affect the progress of the LSI.

**d. Leadership**

- i. “Leaders at each level of the institution are important in creating a culture that encourages, supports, and rewards teaching innovations that support student learning.”
- ii. “For example, provosts play an important role in articulating institutional commitment to student learning and teaching excellence.”
- iii. “Deans and department chairs strongly influence what is valued within their units and can provide specific support for professional development opportunities coupled with incentives for faculty members to participate.”
- iv. “Overall, institutional leaders affect tenure and promotion processes and criteria, allocate resources, and provide symbolic support for the importance of excellent teaching within institutional missions.”
- v. “Early findings [from a study of institutions that have participated in the National Science Foundation ADVANCE Program] suggest that the involvement of senior institutional leaders in explaining the importance of institutional attention to increasing the number of women STEM colleagues is an important factor in advancing change goals.”
- vi. “Elements that foster the creation of innovative and effective professional development programs include: (1) the presence of an institutional leader who serves as a champion, is committed to the overall...goals, and has sufficient institutional seniority to allocate institutional resources and time; (2) an institutional team that meets regularly, works together effectively, and includes STEM faculty as well as other institutional leaders; (3) a clear institutional vision for the goals to be accomplished; and (4) regular communication to key individuals and groups across campus.”
- vii. “Leadership development for deans and department chairs.”
- viii. Setting goals or priorities for the LSI (e.g., department chairs, committee chairs, deans, etc.).
- ix. Discussing possible goals or priorities for the initiative is coded as “Leadership” even if that person is not in a formal position of authority in the LSI.
- x. Can code leadership (and/or Q3) even if the person/group enacting that policy is not present.
- xi. Authority figures making decisions is coded as “Leadership”.

**3. General coding guidelines**

**a. Logistics for coding:**

- i. Review any associated meeting notes, documentation, and the audio recording itself prior to coding.
- ii. Coding for a given transcript occurs only between when a meeting is officially begun and adjourned.
- iii. Both coders code the transcript individually and then reconcile into one final set

of codes for that transcript. If new coding details and rules are introduced during reconciliation then previously coded meetings are recoded to align with the updated details/rules.

- iv. Codes can apply to more than just instructors. They can apply to staff, administrators, researchers, committees, and others related to the LSI.
- b. Excerpt coding counting consistency:
  - i. Agreement on the exact length of an excerpt is not necessary, rather agreement on the presence/absence of a code on overlapping excerpts from the coders is required.
  - ii. If a single idea is broken up by a non-important and relatively short conversation, then the entire idea, including the non-important conversation should be coded as one excerpt (e.g., A → b → A; single excerpt includes all three parts).
  - iii. If a single idea is broken up by a different, important, and/or long conversation, the two “bookends” of the single idea should be coded as two separate excerpts (e.g., A → B → A; three separate excerpts, one for each part).
  - iv. If an idea moves on to discussion of a new idea, but both have the exact same codes, they should be coded separately (e.g., A → B; two excerpts, one for each idea).
  - v. Sub-excerpts of larger excerpts are allowed, but the same code cannot be applied to both the sub-excerpt and the larger excerpt.
  - vi. Coding a single excerpt with more than one code is acceptable in certain instances. This typically occurs when there are two or more parties involved (e.g., Administrative Strategists, Chairs and Directors, or Natural Science College Faculty members) and two or more purposes for an idea/action (e.g., Chairs and Directors give a directive to the Administrative Strategists, Q3/Leadership; the directive is for the Administrative Strategists to provide professional development to Natural Science College Faculty, Q1 or Q2, depending on context, and Professional Development).
  - vii. Henderson vs. Austin codes: The two models of change for undergraduate STEM are inherently different because the Henderson model suggests that the change strategy categories are non-overlapping whereas the Austin model has clear instances where there is overlap between the change strategy categories. Henderson codes typically should be mutually exclusive, but can overlap in certain instances. Austin codes typically are not mutually exclusive.
  - viii. Some meetings contained virtually identical content because the same presentation was repeated for multiple stakeholder groups (i.e., committees or units). In these instances a set of codes were iteratively developed during reconciliation. Those codes were automatically marked for the repeated meetings to other stakeholder groups. However, as discussion in the meetings varied, the documentation for the repeated meetings was still analyzed as a unique meeting instance so as to ensure inclusion of any additional codes that arose that potentially varied between the meetings.
- c. Development of the emergent code “Developing Reflective Leaders”
  - i. Apply code when the discussion is describing the current state or historical background.
  - ii. Typically is not about decision-making or setting priorities (and therefore not Q3),

- but rather is detailing background information.
- iii. Is not applied to discussions of previous meetings or other “recent” history (e.g., reminder of agenda items from the previous meeting of the group). The point of the code is to understand the bigger context in which the initiative is taking place and showing leadership by reflecting upon that to reorganize the viewpoint of the meeting participants.