Overview of the Model

Improving student success in STEM requires culture change – change in values and underlying beliefs. This change is often best achieved by the convergence of Bottom-Up ("grass-roots" initiatives; likely faculty in higher education) and Top-Down (individuals in positions of power; administration) efforts. This model outlines three phases of culture change, which are not necessarily linear (as depicted in the figure above):

Mobilize - develop initial awareness of the need for change (data); create vision; galvanize support for change through discussion; mobilize leadership and collective action

Implement - choose strategies; pilot; change polices, process and structures; professional development; evaluate results and reorient; celebrate successes; scale-up or down

Institutionalize – disseminate results; review; commit; persist
Culture change generated by these phases requires sensemaking, organizational learning, and leadership at multiple levels

**Sensemaking - understanding how change reshapes work/identity, values**

- Learning communities
- Reading groups around new STEM reform reports
- Outside speakers to discuss STEM reform in gateway courses
- Add gateway reform to public speeches by department chairs and deans
- Professional development workshops on factors we know improve teaching

**Organizational learning**

- Use data to prompt learning – shift behaviors and beliefs
- Improve campus data infrastructure and consider new data needed
- Collect data related to courses and provide to a team
- Team reviews data and determines problems and interventions
- Team shares data and findings with faculty to develop awareness and get others on board
- Set up process to monitor results of interventions
- Periodic team review of interventions to adjust strategies

**Leadership at multiple levels**

- **Leaders at the top** - provide support to hire, change policies, adjust priorities, provide incentives, alter rewards, create urgency, reinforce goals thru plans and communication
- **Leaders in the middle** - e.g., directors of centers for teaching and learning – identify faculty needs, connect faculty to networks and community, describe needs for institutional changes to administrators, help with sensemaking
- **Bottom up leaders** – motivate their colleagues, identify problems on the ground related to teaching/learning, hold intellectual forums to engage colleagues, help inform and create professional development, harness existing networks, implement in day to day practice, identify and communicate problems

**Developing Leadership for Change**

- A planning team with representatives from all groups
- Create a compelling vision with all stakeholders – flexible vision – spend time on vision
• Create communities of practice and networks to partner people to learn from each other and save time related to reforms
• Communicate with and involve senior administration so they will be informed when asked for support
• Manage up – informing key administrators and influencing them
• Department chairs can discuss reforms in annual meetings with faculty and encourage involvement
• Create incentives and alter rewards to support
• Communicate with faculty and brainstorm obstacles and help them overcome challenges they face
• Make it fun – people join networks and efforts that are enjoyable

**Challenges**

Top and bottom may not necessarily have entirely overlapping interests, frequent direct interactions, or common language. Convergence between top and bottom must be encouraged by taking advantage of timing and opportunities, translators, learning the language of those in authority, managing up, membership on committees, sensitizing those in power, negotiation, coalition with other initiatives, and outside grants and support.

**References**

Overview of the Model

This model represents a university as consisting of three “levels”: faculty, department, and administration. The internal arrows represent the influence that one level can have on the others, while the external arrows represent the influence of external change agents. Finkelstein developed two complementary change strategies: the outside-in strategy (blue) and the middle-out strategy (orange). The outside-in strategy targets the faculty and administration levels directly in such a way as to affect the departments. The middle-out strategy works directly with departments, indirectly influencing the faculty and administration. These strategies are viewed as synergistic in that they can both operate simultaneously to impact the same department. One important feature is that there are no arrows directly connecting the administration and the faculty; the department acts as mediator between individual faculty members and the administration. Because of this mediating function, the department is the key locus for change in the university.

Example: This model was used at the University of Colorado where the goal of the change effort was to shift the culture of STEM departments in order to achieve the widespread use of sustainable, student-centered, evidence-based, active learning pedagogy in STEM classes. Because they recognized the complex nature of the university, they focused on cultural change at the department level.
Outside-In Strategy

The outside-in strategy combines efforts at the faculty and administration levels to shift departmental culture towards alignment with core commitments.

Example of six core commitments identified by CU:

1. Students are viewed as partners in the education process
2. Educational experiences are designed around clear learning outcomes
3. Educational decisions are evidence-based
4. Active collaboration and positive communication exist within the department and with external stakeholders
5. The department is a “learning organization” that is focused on continuous improvement
6. The department values inclusiveness, diversity, and difference

Faculty Level Example:

Because individual consultations were unsuccessful, a team approach was used. They created the Departmental Action Teams (DATs) consisting of about six participants who worked collaboratively to address an educational issue relevant to the department as a whole. DAT participants self-selected into their group and chose the educational issue they addressed. DATs met every other week for an hour together and had the explicit goal of creating a deliverable product or improvement by the end of the academic year. DATs were a way to create local cultural change among a subset of a department’s faculty that could then spread beyond that subset.

Administration Level Example:

At the administration level, the outside-in strategy focuses on shifting university incentive structures and resources. Efforts at this level align with core commitments in a weaker fashion than at the faculty level. Nevertheless, the changes that administrators create affect individual faculty and can provide them with the time and incentives to contribute to the development of the core commitments in their departments.

Activities include (1) working with the Boulder Faculty Assembly (BFA) to create a framework for teaching excellence, (2) working with the provost and other senior administrators to require evidence of teaching effectiveness in tenure and promotion (T&P) cases, and (3) working with the Office of Information Technology (OIT) to create visualization tools for analyzing data on student progress through CU (student “pathways” through the curriculum).
Middle-Out Strategy

The focus of this strategy is to directly shift the culture of a department through a systemic, long-term change process. For a change process like this to work, the target department must be open to innovation and ready to change. Departmental buy-in is essential; a meaningful change process cannot be forced upon members of an unwilling department.

The CU change process had five components:

*Developing a department vision:* A set of purposes to which faculty are willing to commit.

*Revising assumptions about teaching and learning:* Through individual faculty interviews, they created mental maps of their beliefs about teaching and learning. The maps helped identify what could be changed and also barriers to faculty embracing their shared vision. By sharing these mental maps with the faculty, they revealed assumptions and incongruities of which faculty were not previously aware, thus spurring learning.

*Developing capacity to meet learning goals:* Capacity-building first required the identification of key barriers to meeting learning goals. These barriers could then be overcome either by redistributing existing resources or seeking out additional support where it was required.

*Integrating teaching and learning goals systematically with research and other departmental functions:* This step required a shift in how teaching is viewed: not simply as an “add on” but as equally important to other departmental activities and a meaningful part of the scholarly practice of faculty members. Capacity-building and revising mental maps helped with this process.

*Developing a collaborative process for continuous assessment and innovation:* Issues of teaching and learning are never simply “solved;” thus, improvement had to become an ongoing departmental function. Developing such a function provided opportunities for continued faculty development and continually-improving educational assessments and practices.

The process involved a one-to-two day departmental retreat to develop a vision, mental maps, assessment criteria, and a process for moving forward that would include 30-day, 90-day, and one-year goals. The retreat established working groups to complete different tasks (e.g., establishing learning goals for the major, creating a more supportive environment for innovations and positive relationships, and revising reward systems). At regular intervals, the department met to assess progress, reflect on successes and lessons learned, and adjust its plans.
References

Rogers Diffusion of Innovation and Gartner Hype Cycle

Overview of the Model

According to Rogers, diffusion is the process by which an innovation is communicated over time among the participants in a social system. He proposes that four main elements influence the spread of a new idea: the innovation itself, communication channels, time, and a social system. This process relies heavily on human capital. The innovation must be widely adopted in order to self-sustain. Within the rate of adoption, there is a point at which an innovation reaches critical mass. Organizations face more complex adoption possibilities because organizations are both the aggregate of their individuals and their own system with a set of procedures and norms.
Three organizational characteristics match well with the individual characteristics: tension for change (motivation and ability), innovation-system fit (compatibility), and assessment of implications (observability). Tension for change can cause organizations to feel pressured. If the organization's situation is untenable, it will be motivated to adopt an innovation to change its direction. Innovations that match the organization's pre-existing system require fewer coincidental changes and are thus more likely to be adopted. The wider environment of the organization, often an industry, community, or economy, exerts pressures on the organization too. Where an innovation is diffusing through the organization's environment for any reason, the organization is more likely to adopt it. Innovations that are intentionally spread, including by political mandate or directive, are also likely to diffuse quickly.

**Key Elements**

**Innovation** - Innovations are a broad category, relative to the current knowledge of the analyzed unit. Any idea, practice, or object that is perceived as new by an individual or other unit of adoption could be considered an innovation available for study.

**Adopters** - Adopters are the minimal unit of analysis. In most studies, adopters are individuals, but can also be organizations (businesses, schools, hospitals, etc.), clusters within social networks, or countries.

**Communication channels** - Diffusion, by definition, takes place among people or organizations. Communication channels allow the transfer of information from one unit to the other. Communication patterns or capabilities must be established between parties as a minimum for diffusion to occur.

**Time** - The passage of time is necessary for innovations to be adopted; they are rarely adopted instantaneously. In fact, in the Ryan and Gross (1943) study on hybrid corn adoption, adoption occurred over more than ten years, and most farmers only dedicated a fraction on their fields to the new corn in the first years after adoption.

**Social system** - The social system is the combination of external influences (mass media, organizational or governmental mandates) and internal influences (strong and weak social relationships, distance from opinion leaders). There are many roles in a social system, and their combination represents the total influences on a potential adopter.
Adoption Process

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>The individual is first exposed to an innovation, but lacks information about the innovation. During this stage the individual has not yet been inspired to find out more information about the innovation.</td>
</tr>
<tr>
<td>Persuasion</td>
<td>The individual is interested in the innovation and actively seeks related information/details.</td>
</tr>
<tr>
<td>Decision</td>
<td>The individual takes the concept of the change and weighs the advantages/disadvantages of using the innovation and decides whether to adopt or reject the innovation. Due to the individualistic nature of this stage, Rogers notes that it is the most difficult stage on which to acquire empirical evidence.</td>
</tr>
<tr>
<td>Implementation</td>
<td>The individual employs the innovation to a varying degree depending on the situation. During this stage the individual also determines the usefulness of the innovation and may search for further information about it.</td>
</tr>
<tr>
<td>Confirmation</td>
<td>The individual finalizes his/her decision to continue using the innovation. This stage is both intrapersonal (may cause cognitive dissonance) and interpersonal, confirmation the group has made the right decision.</td>
</tr>
</tbody>
</table>

Adopter Categories

**Innovators (2.5%)** – Innovators are the first individuals to adopt an innovation. Innovators are willing to take risks, typically youngest in age, have financial lucidity, very social and have closest contact to scientific sources and interaction with other innovators. Risk tolerance has them adopting technologies which may ultimately fail. Financial resources help absorb these failures.

**Early Adopters (13.5%)** – This is the second fastest category of individuals who adopt an innovation. These individuals have the highest degree of opinion leadership among the other adopter categories. Early adopters are typically younger in age, have a higher social status, have more financial lucidity, advanced education, and are more socially forward than late adopters. More discrete in adoption choices than innovators. Realize judicious choice of adoption will help them maintain central communication position.
**Early Majority (34%)** – Individuals in this category adopt an innovation after a varying degree of time. This time of adoption is significantly longer than the innovators and early adopters. Early Majority tend to be slower in the adoption process, have above average social status, contact with early adopters, and seldom hold positions of opinion leadership in a system.

**Late Majority (34%)** – Individuals in this category will adopt an innovation after the average member of the society. These individuals approach an innovation with a high degree of skepticism and after the majority of society has adopted the innovation. Late Majority are typically skeptical about an innovation, have below average social status, very little financial lucidity, in contact with others in late majority and early majority, very little opinion leadership.

**Laggards (16%)** – Individuals in this category are the last to adopt an innovation. Unlike some of the previous categories, individuals in this category show little to no opinion leadership. These individuals typically have an aversion to change-agents and tend to be advanced in age. Laggards typically tend to be focused on “traditions”, likely to have lowest social status, lowest financial fluidity, be oldest of all other adopters, in contact with only family and close friends, very little to no opinion leadership.

**References**


Kotter’s 8-Step Process for Leading Change

Overview of the Model

Kotter has published several books on business and organizational change. This change management theory is divided into eight stages, each one of them focuses on a key principle that is associated with the response of people to change. It borrows heavily from social cognitive models and is generally implemented in a top-down manner, but stresses the importance of developing buy-in and encouraging agency at all levels.

Stages

1. **Increase urgency** – This step involves creating a sense of urgency among the people so as to motivate them to move forward towards objectives.
2. **Build the team** – This step of Kotter’s change management theory is associated with getting the right people on the team by selecting a mix of skills, knowledge and commitment.

3. **Get the vision correct** – This stage is related to creating the correct vision by taking into account, not the just strategy but also creativity, emotional connect and objectives.

4. **Communicate** – Communication with people regarding change and its need is also an important part of the change management theory by Kotter.

5. **Get things moving** – In order to get things moving or empower action, one needs to get support, remove the roadblocks and implement feedback in a constructive way.

6. **Focus on short term goals** – Focusing on short term goals and dividing the ultimate goal into small and achievable parts is a good way to achieve success without too much pressure.

7. **Don’t give up** – Persistence is the key to success, and it is important not to give up while the process of change management is going on, no matter how tough things may seem.

8. **Incorporate change** – Besides managing change effectively, it is also important to reinforce it and make it a part of the workplace culture.

**References**