Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC · June 22–25, 2025   ◆ASEE

Paper ID #46560

BOARD # 360: EDU Core—Engineering Systems Change for Equity: A Focus on Change Processes

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EDU Core—Engineering Systems Change for Equity: A Focus on Change Processes

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Abstract

This ongoing funded research study examines the "scaffolding" processes that take place "behind the scenes" in large, complex, institutional change projects in higher education, especially those seeking to make institutions more diverse, inclusive, and equitable institutions. Such processes connect and strengthen change interventions and strategies.

Purposes of the Inquiry

This paper and the related poster describe the purpose, methods, and emerging findings of a funded research study that examines the processes of organizational change that take place "behind the scenes" in large, complex, institutional change projects in higher education. Such organizational change processes include those designed to increase the participation of women at all levels of engineering education and the profession. Previous work, including our own, documents the types of interventions that have been used to promote equity in faculty career trajectories and outcomes [1]–[6].

Building on this body of empirical and applied knowledge, the purpose of the current project is to identify often overlooked processes associated with system-wide change initiatives, and to describe how they work. These processes are not the specific interventions or strategies used in the change initiative to directly address an organizational issue. Rather, they are often-invisible activities that link the interventions being used, facilitate and amplify the leverage they create, and heighten the likelihood of reaching the change goal. Examples include identifying allies and developing communication plans. In brief, these processes support, strengthen, connect, and synergize individual change interventions, increasing their net success and impact. We call these "scaffolding processes" to emphasize their connective and supportive effects. Change agents who attend to them are better able to "engineer" successful system-wide transformation.

The guiding research questions ask what scaffolding processes are important in complex organizational change processes, how these processes work to advance change initiatives, and whether and how they vary across organizational contexts. While this study includes examples of the scaffolding processes used in a range of complex institutional change projects, it particularly emphasizes organizational change projects whose goals are to create more equitable, inclusive higher education institutions, including increasing the participation of women in engineering.

Theoretical Background

Research studies have shown that effecting transformational organizational change in complex institutions such as universities and colleges necessitates a systemic approach that recognizes their multiple organizational levels and multiple cultures [4], [7]–[12]. Such an approach requires the use of interlinked interventions that play out across multiple levels of the institution. In addition to situating our work in organizational systems theory, we are informed by the work of scholars such as Acker [13], [14], Bird [15], and Ely and Myerson [16], who show how institutional structures and arrangements, including policies, procedures, and practices, foster gender inequality, as well as other intersectional oppressions. Additionally, the work of Gonzales, Kanhai, and Hall [17] emphasizes the usefulness of applying a critical perspective to

"reimagine" organizational theories. Thus, we are aware that the scaffolding processes we are studying may be oppressive or liberating, possibly reproducing traditional power structures or helping to transform them. Finally, we also recognize that resistance is inevitable in change endeavors [11], [18]–[20]. These scaffolding processes may help to mitigate or manage typical forms of resistance. Thus, informed by theories and research about change in higher education, we believe further work is needed to understand the internal, scaffolding processes that support change interventions and strategies to reach equity change goals.

Data Sources and Analytical Plan

This five-year study, funded by the National Science Foundation, includes the use of well-recognized qualitative data gathering and analysis methods. The data pertain to institutions that have engaged in equity-directed change projects, and the relevant institutional leaders and participants in the change work at those institutions. One set of data includes documents providing background about institutions' specific change goals and projects, as well as the strategies and processes they used to advance their change goals. A second set of data includes individual interviews and focus groups with three kinds of people:

a) leaders at universities and colleges that have been recipients of NSF grants designed to foster significant organizational change to create a more diverse faculty;

b) leaders of projects that have implemented change initiatives to achieve greater equity in other areas, such as instruction, STEM teaching and learning, and students' experiences, and retention; and

c) other individuals with expertise in organizational change (e.g., funders, evaluators, researchers, leaders from higher education professional societies).

Our method of collecting data from focus groups was developed and refined for this study. Our Structured Expert Enquiry Dialogues (SEEDs) enable structured and generative dialogue among "experts" from the groups above who are knowledgeable about change processes. Guided by the researchers, SEEDs use carefully formulated questions that invite participants to reflect on and share insights about change processes and collaboratively examine the responses offered. We use two types of SEEDs:

a) Campus SEEDs, each with 3-7 participants and focused on a single institution; and

b) Focused Topical SEEDs, with 3-5 participants from several institutions focusing in depth on the details and variations pertaining to one scaffolding process.

Individual interviews fill in gaps in our data and to include people who can speak to the broader landscape of organized change rather than about a specific change project. While the study is ongoing, we have conducted document analysis for some two dozen institutions, 16 Campus SEEDs, 13 Topical SEEDs, and two individual interviews. In all, over 120 people representing some 60 institutions have participated in the study to date.

Ongoing data analysis includes NVivo coding to catalog specific issues of interest, analytical memos by each of the three researchers on each SEED to identify emerging themes, extensive reflective conversations among the researchers, and further analytical memos to refine emergent findings. Our research team is attentive to fostering consistency in data interpretation, developing credible evidence-based conclusions, and clarifying how context is relevant to conclusions.

Findings

Illuminating scaffolding processes, how they work in different contexts, and the options available to change leaders provides deeper knowledge about organizational change in higher education and offers practical tools for change agents. These scaffolding processes, which are often not foregrounded in discussions of change efforts, function as a sort of "glue" that connects and strengthens the collective impacts of the interventions. Our emerging findings emphasize a set of important scaffolding processes, which include

- cultivating a change project leadership team,
- weathering change among institutional senior leaders,
- creating relationships and working with allies across the institution,
- developing robust communication plans,
- collecting, managing, and deploying data, and
- planning for sustainability.

We are learning, for example, that change leaders can use different processes, depending on the context, to advance the change goal, manage resistance, and elevate equity and inclusion within the organization. Awareness of change processes and how to use them strategically can strengthen the effectiveness of change leaders as they work to advance organizational change projects aimed at creating more inclusive, diverse, and equitable higher education organizations.

We offer an illustrative example of one such process, strategic use of data, which we have come to understand as the intentional and deliberate use of data to advance an institutional change goal. Our analyses of the use of data as a scaffolding process have provided insights about the types of data change leaders often use, the purposes of data use as a strategic process, and the role and relevance of the speaker and the audience in communicating data.

The change leaders in our research identified a wide range of types of data that can be used strategically: qualitative and quantitative data, formal and informal data, longitudinal and "snapshot" data, and formative as well as summative data. Data can be used for several strategic purposes:

- to identify and diagnose problems;
- to signify urgency in addressing a problem;
- to guide decision making about possible change interventions and strategies;
- to increase stakeholder understanding, ownership, and accountability in addressing an organizational problem or change goals; and
- to provide benchmarks for assessing progress and accomplishments.

To use data effectively for such purposes, leaders must consider the audience and how to most effectively engage them in making meaning from the data. Consideration of the speaker and the audience, along with the content of a message (here informed by data), is sometimes called the "Rhetorical Triangle." Who is conveying the message—the role and positionality of the speaker—may determine how the audience receives the message. The audience—their roles, expectations, and orientation to the issue—is another important consideration in using data to guide and advance change. The content, including the form in which data are conveyed (e.g.,

briefs, reports, presentations, dashboards), is another key element for leaders to take into account as they design ways to use data as a strategic, scaffolding process. This kind of analysis—considering the use of data as a scaffolding process to serve the change initiative's goals—can be an effective element in a change leader's toolkit. As the study progresses, we will develop similar analyses of the other scaffolding processes.

Importance of the Study for Higher Education

Considerable literature focuses on theories of organizational change and examples of specific interventions and strategies for enhancing equity and inclusion in higher education. This work

   a) deepens theoretical perspectives on organizational change by identifying and explaining the often-invisible scaffolding processes that can be critically important in affecting the overall impact of a change project, and

   b) provides examples of ways change leaders can integrate such processes in practical ways that are adaptable in different institutional contexts.

The research aims to make new theoretical contributions about systems change projects in higher education. It also seeks to provide change agents who lead complex, systems change projects with ideas and practical resources for conceptualizing, organizing, and implementing their work. In this way, the study offers useful insights to systems change projects in engineering programs and the profession, especially those that focus on increasing the participation of women and other groups who have been historically marginalized in engineering higher education and on engineering faculties.

Acknowledgments

References Cited

[1] D. Bilimoria & X. Liang. *Gender equity in science and engineering: Advancing change in higher education*. New York, NY: Routledge, 2012.

[2] K. De Welde, & A. Stepnick. *Disrupting the culture of silence: Confronting gender inequality and making change in higher education*. New York, NY: Routledge, 2014.

[3] S. L. Laursen & A. E. Austin. "The StratEGIC Toolkit: Strategies for Effecting Gender Equity and Institutional Change," 2014. Accessed January 11, 2025. [Online]. Available: www.strategictoolkit.org

[4] S. L. Laursen & A. E. Austin. *Building gender equity in the academy: Institutional strategies for change*. Baltimore, MD: Johns Hopkins University Press, 2020.

[5] A. J. Stewart, J. E. Malley, & D. LaVaque-Manty (Eds.). *Transforming science and engineering: Advancing academic women*. Ann Arbor, MI: University of Michigan Press, 2007.

[6] A. J. Stewart & V. Valian. *An inclusive academy: Achieving diversity and excellence*. Cambridge, MA: The MIT Press, 2018.

[7] A. E. Austin. *Promoting Evidence-Based Change in Undergraduate Science Education*. Commissioned by the Board on Science Education of the National Academies National Research Council. Washington, DC: The National Academies, 2011.

[8] Association of American Universities (AAU). *Progress toward achieving systemic change: A five-year status report on the AAU Undergraduate STEM Education Initiative*. Washington, DC: AAU. 2017. https://www.aau.edu/sites/default/files/AAU-Files/STEM-Education-Initiative/STEM-Status-Report.pdf Accessed April 21, 2024.

[9] D. L. Bess & J. P. Dee. *Understanding college and university organization: Dynamics of the system (Vol. 2)*. Sterling, VA: Stylus Publishing LLC, 2008.

[10] R. Birnbaum. *How colleges work: The cybernetics of academic organization and leadership*. 2nd ed. San Francisco, CA: Jossey-Bass, 1999.

[11] A. Kezar. *Understanding and facilitating organizational change in the 21st century: Recent research and conceptualizations.* ASHE-ERIC Higher Education Report, *28*(4), 4. Hoboken, NJ: John Wiley & Sons, 2001.

[12] A. Kezar. *How colleges change: Understanding, leading, and enacting change*. New York, NY: Routledge, 2012.

[13] J. Acker. "Hierarchies, jobs, bodies: A theory of gendered organizations." *Gender & Society*, *4*(2), 139-158, 1990.

[14] J. Acker. "The future of 'gender and organizations': Connections and boundaries." *Gender, Work & Organization*, *5*(4), 195-206, 1998.

[15] S. Bird. "Unsettling universities' incongruous, gendered bureaucratic structures: A case-study approach." *Gender, Work and Organization, 18*(2), 202-230, 2011.

[16] R. J. Ely & D. E. Meyerson. "Theories of gender in organizations: A new approach to organizational analysis and change." *Research in Organizational Behavior*, *22*, 103-151, 2000.

[17] L. D. Gonzales, D. Kanhai, & K. Hall. "Reimagining organizational theory for the critical study of higher education." in *Higher education: Handbook of theory and research.* M. B. Paulsen, Ed., Cham, Switzerland: Springer, 2018. vol. 33, pp. 505-559.

[18] B. Rosenberg. *"Whatever it is, I'm against it": Resistance to change in higher education*. Cambridge, MA: Harvard Education Press, 2023.

[19] J. Tagg. "Why does the faculty resist change?" *Change: The Magazine of Higher Learning*, *44*(1), 6-15, 2012.

[20] R. Thomas & C. Hardy. "Reframing resistance to organizational change." *Scandinavian Journal of Management*, *27*(3), 322-331, 2011.