Engineering Change

Center for the Advancement of Engineering Education

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What is your "Theory of Change?"

- Raise your hand if you've been asked this question.
- What leads you to think that what you're doing will result in change?
- CAEE was asked this question and, in part, that's why this paper was written.
- The phrase "theory of change" yielded 17,500 'hits' on Google
- Hundreds of articles, tens of books on change

URL taken – theoryofchange.org

Pressures for Change

- Legislators (in public institutions)
- National Science Foundation
  (Career Development Award, Shaping the Future)
- Professional Accreditation
  (ABET: Assessment, Synthesis & Design)
- Financial (growing gap: falling public support and the rising costs)
- Employers and Workforce Development Agencies
  (Workplace Basics, Global Engineer)
- University Administration Professional Organizations
  (Renewing the Covenant, Greater Expectations)
- Boyer Commission Reports (Educating Undergraduates in the Research Universities, Scholarship Reconsidered)
- Educational Research (Active, Interactive & Cooperative Learning, Inquiry & Problem-Based Learning)
- Others? Technology?

Theories of Change: Categories

(Kezar, 2001)

1. Evolutionary
2. Teleological
3. Life Cycle
4. Dialectical
5. Social Cognition
6. Cultural

Stage Theories

Lewin (1952) three-stage model:

- unfreezing
- changing
- refreezing

Lewin “nothing is so practical as a good theory” inspired model (White, 2001):

Change = D x M x P

- D = dissatisfaction with the status quo
- M = a clear, accepted model for the future
- P = a well-designed plan of implementation

Diffusion of Innovation

Rogers' (2003)

Diffusion is a process by which:

a) an innovation
b) is communicated through certain channels
c) over time
d) among the members of a social system

Five steps in the process:

1) Knowledge
2) Persuasion
3) Decision
4) implementation
5) confirmation

Complexity Models of Change

(Mintzberg, Ahlstrand, & Lampel 1998)

Ten management schools of thought on change:

- Design
- Planning
- Positioning
- Entrepreneurial
- Cognitive
- Learning
- Power
- Cultural
- Environmental
- Configuration

Conclusion: "The best way to 'manage' change is to allow it to happen" (p. 324), "to be pulled by the concerns out there rather than being pushed by the concerns in here."

Selected Models of Change

- Palmer's Movement Approach
- Johnson & Johnson's Cooperative Learning Implementation Approach
- Seymour's Tracking Change Synthesis

Movement Approach to Educational Reform

(Palmer, 1998)

Stage 1. Isolated individuals make an inward decision to live "divided no more," finding a center for their lives outside of institutions.

Stage 2. Individuals discover one another and form communities of congruence that offer mutual support and opportunities to develop a shared vision.

Stage 3. Communities of congruence start going public, learning to convert their private concerns into the public issues, and receiving vital critiques in the process.

Stage 4. A system of alternative rewards emerges to sustain the movement's vision and put pressure for change on the standard institutional reward system.

Cooperative Learning Implementation

(Johnson & Johnson, 1994, 1995)

Three Key Conditions

- **Promote an attitude of experimentation**. Change requires an atmosphere in which there is a willingness to try things and learn from what is attempted.
- **Synthesize common goals**. Meaningful change requires everyone pulling together to achieve a common goal.
- **Create collegial networks** of faculty, students, and administrators. Change is hard and typically does not occur without a group of colleagues who care and provide support and encouragement for one another.

Effective Faculty Development

1. Focus on teams.
2. Have the participating faculty actively use the procedures through micro-teaching and guided practice.
3. Distribute training across a number of sessions.
4. Emphasize conceptual understanding and the basic elements that make it work.
5. Have faculty overlearn a basic set of procedures.
6. Make the training challenging.

National Research Council (NRC) synthesis projects on enhancing human performance (Druckman & Bjork, 1999; 1994).

Theories Held by STEM People and/or Embodied in Artifacts

(Seymour, 2001)

- Bottom Up & Top Down (grassroots theories, network theories, and value-driven institutional leadership)
- Blueprint Model (progress depends on accessibility of proven models, practices, & assessment tools)
- Alignment at All Levels for Effective System Change
- Departmental Values are Key
- Rebalancing Faculty Rewards System
- Evidence is Necessary (if not Sufficient) for Reform
- Leverage from External Agencies

Change & CAEE

CAEE Goals:

- Promote effective teaching for current and future faculty
- Integrate the needs of diverse faculty and diverse students into engineering education
- Strengthen the engineering education research base
- Understand and enhance the engineering student experience
- Expand the the community of leaders in engineering education.

CAEE – Elements for Success

- Scholarship on Learning Engineering (SoL)
  Learn about the engineering student experience
- Scholarship on Teaching Engineering (SoT)
  Help faculty improve student learning
- Scholarship on Engineering Education Institutes (SEEI)
  Cultivate future leaders in engineering education

Engineering Change: Case Study

- Academic Pathways Study in the Center for the Advancement of Engineering Education
  - Studying the Educational Experience: Design of a Longitudinal Study

Research on Change & Development: Criteria

(Poole, Van de Ven, Dooley and Holmes, 2000)

- Explanations of change and development should:
  - incorporate all types of forces that influence these processes.
  - incorporate generative mechanisms suitable for organizational contexts.
- Research designs should capture data directly from the processes of development and change.
- Analytical methods should be able to:
  a) discover patterns in complex data and
  b) evaluate process explanations

Change as a Scholarly Act

(Ramaley, 2000)

Achieving transformational change is a scholarly challenge best dealt with by practicing public scholarship, which is modeled by the leader and encouraged in other members of the campus community.

Like all good scholarly work, good decision making by campus leadership begins with a base of scholarly knowledge generated and validated by higher education researchers.