Integrated Elements of an Action Plan Leading to Institutional Change

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How do you implement a successful physics teacher preparation program at your institution?

Key Components
Successful physics teacher preparation programs share certain key elements, and exist within a supportive institutional context. These contextual and programmatic components build on one another to provide teachers with a complete educational experience, from recruitment through training in pedagogy and content to induction and mentoring.

Follow the links below to learn more about the individual components, as well as strategies that specific institutions have used to build and improve their programs.

- Champion
- Teacher-in-Residence
- Collaboration
- Institutional Commitment
- Assessment
- Recruitment
- Early Teaching Experiences
- Pedagogical Content Knowledge
- Learning Assistants
- Induction & Mentoring

https://www.phystec.org/keycomponents/
How do you expand your successful physics teacher preparation program to other disciplines?
You probably have a change strategy whether you know it or not

- **Change strategy**: Coherent plan of action that guides a change agent’s choice of tactics (e.g., provide tested, ready-to-use materials for teaching a specific course).

- **Change tactics**: The specific activities that change agents use to promote instructional change (e.g., dissemination of textbooks or other materials, or the specific nature, duration, and content of workshops, etc.).

The purpose of a change strategy is to guide your development of change tactics (specific actions) that will take your institution from the current situation to your desired situation.
Step 1: Understand the Gap

Current
- Institution
- Colleges
- Units/Departments
- Individuals

Desired
- Institution
- Colleges
- Units/Departments
- Individuals
What levels of the institution you want to change?

- What parts of your institution will need to be different in order for the desired situation to be sustainably implemented?
What do you want to change at each level?

**Structures**
- curriculum (e.g., types of knowledge presented through the curriculum, organization of the curriculum)
- pedagogies (e.g., use of particular teaching methods or new technologies)
- student learning and assessment practices
- policies (key institutional policies such as those regarding scheduling)
- budgets
- non-financial resources (e.g., allocation of space or equipment towards particular projects)
- departments and institutional structures (e.g., organizational hierarchy, relevant centers)
- decision-making structures (e.g., formal governance processes, ad hoc structures such as task forces)

**Cultures**
- ways groups or individuals interact with one another
- the language the campus used to talk about itself
- the types of conversations (e.g., topics and priorities discussed at formal and informal conversations)
- relationships with stakeholders

Step 2: Develop a strategy and tactics to bridge the Gap

- **Institution**
- **Colleges**
- **Units/Departments**
- **Individuals**

**Current**

**Desired**

- **Change Strategy**
  - Change tactic
  - Change tactic
  - Change tactic
  - Change tactic
To select an appropriate change strategy and tactics you not only need to consider the gap, but also the resources and constraints that will help or hinder your success.

- What aspects (structures and cultures) of the institution will serve as barriers?
- What aspects (structures and cultures) of the institution will serve as facilitators?
Four Categories of Change Strategies

**Focus on Changing Individuals**

- Disseminating Curriculum & Pedagogy
- Developing Reflective Teachers

**Focus on Changing Environment/Structures**

- Developing Policy
- Developing Shared Vision

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Prescribed Final Condition

Emergent Final Condition

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How they Work

A. Provide opportunities within your institution for faculty to share good ideas and strategies related to the project goals

B. Form a team at your institution that has sufficient power to change degree requirements

C. Promote project ideas/products to departmental and institutional leadership

D. Create department or institutional teams to develop new practices related to project goals
How Would You Categorize these Change Tactics?

A. Provide opportunities within your institution for faculty to share good ideas and strategies related to the project goals

B. Form a team at your institution that has sufficient power to change degree requirements

C. Promote project ideas/products to departmental and institutional leadership

D. Create department or institutional teams to develop new practices related to project goals
1. Create cross-departmental teams to develop collective ideas related to project goals

2. Provide opportunities for targeted faculty to learn from one-another

3. Promote project ideas/products to instructors

4. Provide departments with rewards for making changes consistent with project goals
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Environment strategies are most appropriate for **institutional** change

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Prescribed vs. emergent strategies depends on how pre-determined your final vision is

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More Prescribed

Less Prescribed
Since you are focused on implementing something based on PhysTEC components, reinvention is probably the most emergent you will be.

- **Adoption**: Implement pre-determined vision
- **Adaptation**: Change some details
- **Reinvention**: Change some principles
- **Invention**: Implement something else

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Turpen, Henderson & Dancy 2016; Dancy, Henderson & Turpen 2016
Environment strategies are most appropriate for **institutional** change

Prescribed - Environment strategies

Eight-Stage Leadership Process

1. Establishing a sense of urgency
2. Creating the guiding coalition
3. Developing a vision and strategy
4. Communicating the change vision
5. Empowering broad-based action
6. Generating short-term wins
7. Consolidating gains and producing still more change
8. Anchoring new approaches in the culture
Emergent - Environment strategies

Complexity Leadership Theory’s Enabling Leadership
(Uhl-Bien et al., 2007)

1. Disrupting patterns to encourage interactions between individuals
2. Developing rules that create interdependence to encourage teamwork
3. Encouraging dissenting opinions to increase tension
4. Avoiding stifling regulations
5. Articulating the vision
6. Identifying emerging knowledge from interactions
7. Communicating emerging knowledge to formal leadership
8. Implementing knowledge

Interpret Emerging Events (6-8)
Disrupt Existing Patterns (1-2)
Encourage Novelty (3-5)


There are many other change strategies

<table>
<thead>
<tr>
<th>Change Strategy</th>
<th>Summary</th>
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<tbody>
<tr>
<td>Diffusion (Curriculum &amp; Pedagogy)</td>
<td>Innovations are created in one location, then adopted or adapted by others. Multi-stage adoption process.</td>
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<tr>
<td>Implementation (Curriculum &amp; Pedagogy)</td>
<td>A set of purposeful activities are designed to put proven innovations into practice in a new setting.</td>
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<td>Scholarly Teaching (Reflective Teachers)</td>
<td>Individual faculty reflect critically on their teaching in an effort to improve.</td>
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<td>Faculty Learning Communities (Reflective Teachers)</td>
<td>A group of faculty supports each other in improving teaching.</td>
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<tr>
<td>Quality Assurance (Policy)</td>
<td>Measurable target outcomes are identified and progress towards them is assessed and tracked.</td>
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<tr>
<td>Organizational Development (Policy)</td>
<td>Leader develops new vision and plans a strategy for aligning employee attitudes and behaviors with this vision.</td>
</tr>
<tr>
<td>Learning Organizations (Shared Vision)</td>
<td>Leader works to develop an organizational culture that supports knowledge creation.</td>
</tr>
<tr>
<td>Complexity Leadership (Shared Vision)</td>
<td>In a complex system, results are not easily predicted. Change agents can create conditions that increase the likelihood of productive change.</td>
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Aligning tactics with strategy

Current

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<tr>
<td>Change tactic</td>
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Desired

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What does it mean to have a well-aligned change plan?

Which of these change initiatives could be well aligned?

A

B

C
What does it mean to have a well-aligned change plan?

• Alignment does not mean that all change tactics need to be in the same category as the overall strategy.
• Balance is important. All change initiatives (especially large ones) have emergent and prescribed aspects as well as individual and environmental aspects. The key is to use each type strategically.
• The foursquare can help to identify change tactics that may not have been previously considered.
Prescribed - Environment strategies

Enabling and challenging factors in institutional reform: The case of SCALE-UP

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While many innovative teaching strategies exist, integration into undergraduate science teaching has been frustratingly slow. This study aims to understand the low uptake of research-based instructional innovations by studying 21 successful implementations of the Student Centered Active Learning with Upside-down Pedagogies (SCALE-UP) instructional reform. SCALE-UP significantly restructures the classroom environment and pedagogy to promote highly active and interactive instruction. Although originally designed for university introductory physics courses, SCALE-UP has spread to many other disciplines at hundreds of departments around the world. This study reports findings from in-depth, open-ended interviews with 21 key contact people involved with successful secondary implementations of SCALE-UP throughout the United States. We defined successful implementations as those who restructured their pedagogy and classroom and sustained and/or spread the change. Interviews were coded to identify the most common enabling and challenging factors during reform implementation and compared to the theoretical framework of Kotter’s 8-step Change Model. The most common enabling influences that emerged are documenting and leveraging evidence of local success, administrative support, interaction with outside SCALE-UP user(s), and funding. Many challenges are linked to the lack of these enabling factors including difficulty finding funding, space, and administrative and/or faculty support for reform. Our focus on successful secondary implementations meant that most interviewees were able to overcome challenges. Presentation of results is illuminated with case studies, quotes, and examples that can help secondary implementers with SCALE-UP reform efforts specifically. We also discuss the implications for policy makers, researchers, and the higher education community concerned with initiating structural change.

Case Study of 21 Institutions where SCALE-UP has been institutionalized

SCALE-UP
(Student Centered Active Learning Environments with Upside-down Pedagogies)

• Developed by Bob Beichner in 1993 for Physics
• Influenced teaching practice in a minimum of 314 departments at 189 higher education institutions*

SCALE-UP Involves redesigning the classroom and pedagogy
# Example: Midwest U

| Create Vision | ▪ Top-down from upper administration  
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<th>▪ Led by Provost-level “guiding coalition”</th>
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| **Opportunity and Sense of Urgency** | ▪ A major flood resulted in the need to reconstruct many classrooms  
|               | ▪ Federal funding was available |
| Implement Change | ▪ Began with 2 classrooms in 2009 (seating 54 and 81), design followed UMN/NCSU models |
| **Build momentum** | ▪ The Center for Teaching and instructional services ran a mandatory training program before instructors could use rooms  
|               | ▪ Room assignments were centrally controlled so members of all departments could use  
|               | ▪ Some department chairs specifically encouraged their faculty  
|               | ▪ Faculty and student excitement about successful courses helped motivate other faculty |
| Institutionalize | ▪ 7 SCALE-UP classrooms used by 60 departments  
|               | ▪ From 2010 to 2013, trained 214 staff who taught 542 course sections, with a total enrollment of 10898 students |

Example: Midwest U

Focus on Changing Individuals

Focus on Changing Environment/Structures

Tactic: Room assignments centrally controlled.

Tactic: Require training for instructors who want to teach in new spaces.

Tactic: Provide funding for new classroom space.

Tactic: Create conditions that allow/encourage faculty and students to express excitement about new classroom space.

Tactic: Encouragement from department chairs.

Strategy: Kotter 8-stage
### Example: Southern U

| **Create Vision** | • Bottom-up  
|                  | • Led by two faculty members in different departments. |
| **Opportunity and Sense of Urgency** | • High failure rates in gatekeeper courses were a concern of upper administration. |
| **Implement Change** | • Administration provided funds for two SU classrooms, one in each department. |
| **Build momentum** | • Results of initial use were successful.  
|                  | • One of the department heads decided all intro classes in the department should be taught SCALE-UP style.  
|                  | • Instructors invited visitors to observe classes  
|                  | • SCALE-UP spread to other disciplines |
| **Institutionalize** | • 10 SCALE-UP classrooms used by 10 departments |
Example: Southern U

Focus on Changing Individuals

Focus on Changing Environment/Structures

Tactic: Two faculty members persuade an administrator to provide funds for new classrooms.

Tactic: Instructors invited visitors to observe classes.

Tactic: Evidence of success used to persuade department chairs.

Tactic: Provide funding for new classroom space.

Tactic: One department chair decided all intro classes should be taught in SCALE-UP style.

Strategy: Kotter 8-stage
Eight-Stage Leadership Process
Change is episodic, with a clear beginning and end

Create Vision
- Multimember initiation team (N=14)
- Interaction with SCALE-UP users outside of the institution (N=15)

Implement Change
- Administrative support (N=20)
  - Funding (N=17)
  - Enthusiastic champion (N=11)
  - Document and leverage evidence of local success (N=10)

Institutionalize Change
- Professional development and faculty support (N=11)
- Culture supports active teaching (N=13)
Developing policy strategies can work when they are done thoughtfully and the conditions are right

- Can start bottom-up or top-down, but guiding coalition needs to include faculty and administrators
- History is important – in almost all cases, SCALE-UP implementation was built on prior work and prior relationships.
- Redesigned classrooms add visibility and stability that help sustain SCALE-UP.

Emergent - Environment strategies

Wieman Course Transformation Model

• Disrupt existing patterns
  • Start with focus on upper-division E&M course. 13 instructors met 7 times to set goals. Significant support by post doc.
  • Developed an assessment instrument

• Encourage Novelty
  • Core Question: “What is junior E&M about? How is it different from the introductory E&M course?”

• Interpret Emerging Events
  • Significant “behind the scenes” work by post docs and others to synthesize ideas and report back to larger group
  • Course level led to broader program level goals (and shared language in the department)

Course Level Led to Broader Program Level Goals

Broad Learning Goals for Upper-Level Physics
1. Math/Physics Connection
2. Visualization
3. Knowledge Organization
4. Communication
5. Problem-Solving Techniques
6. Problem-Solving Strategies
7. Expecting and Checking Solution
8. Intellectual Maturity

Electricity and Magnetism 1
Classical Mechanics/Math Methods 1
Quantum Mechanics 1

http://www.colorado.edu/sei/departments/physics_learning.htm
Changing Teaching Practices from a Complexity Leadership Perspective

Key Features

• Disrupt existing patterns:
  • **Support**: Working groups need support (e.g., post doc or grad student)
  • **Interdependence**: Individuals have a reason to work together on the issue (e.g., shared product, new course assignment)

• Encourage Novelty
  • **Simple rule**: Work framed by compelling, simple rule or question (e.g., “students should do science in their first two years”)
  • **Moderate Diversity**: Groups have some diversity of ideas/experiences, but not so much that it is a barrier

• Interpret Emerging Events
  • **Facilitation**: work within groups
    • post doc or grad student played an important role
    • Additional one-on-one interaction outside of group meetings
  • **Communication**: Spreading ideas outside of groups
    • Shared Language: extracting principles from details
Focus on Changing Individuals

- **Strategic – Complexity Leadership Theory**

Focus on Changing Environment

- Tactic: Faculty group meets regularly to discuss course.
- Tactic: Post doc provides support to group.

Prescribed Final Condition

- Tactic: Funding for project requires support and buy-in from department.

Emergent Final Condition

- Tactic: Post doc interacts significantly with individuals outside of group meeting time.
- Tactic: Group responsible for developing a shared product (assessment instrument).

**Example: Wieman Course Transformation Model**
Freedom is irrelevant. Constitution is irrelevant. Your culture will adapt to service us. Surrender your weapons.
Assumption: People and systems always resist change

Reality: Resistance is a symptom of 1) lack of alignment between strategies and tactic, 2) inappropriate change strategy, or 3) attempting to bridge too large of a gap.

Some Common Types of Resistance:
1. Difficulty getting buy-in from individuals
2. Difficulty getting buy-in from units
3. Difficulty achieving alignment of vision and collaboration across multiple individuals or units
Difficulty getting buy-in from individuals

Focus on Changing Individuals

- Inappropriate Strategy – Diffusion of Innovations
- Insufficient Tactic: Tell people about your great idea and expect participation.

Problem: Change strategy only focused on individuals

Focus on Changing Environment/Structures

- Appropriate Strategy – Kotter 8-stage
- Tactic: modify systems and structures that conflict with your great idea.
Difficulty getting buy-in from departments/units

Focus on Changing Individuals

Problem: Making a requirement without appropriate support and encouragement

Strategy: Kotter 8-stage

Tactic: Identify required project components and tell people about these.

Tactic: Offer workshops related to your initiative.

Insufficient Tactic: Require that departments participate in your initiative.

Tactic: Provide some autonomy -> Support departments in customizing your initiative to their situation.

Tactic: Provide opportunities for individuals to share ideas with others.

Tactic: Recognize accomplishments of successful departments.

Tactic: Offer workshops related to your initiative.

Focus on Changing Environment/Structures

Emergent Final Condition

Insufficient Final Condition
Difficulty getting buy-in from departments/units

Focus on Changing Individuals

Problem: Pretending to value emergent outcomes when you really do not

Inappropriate Strategy – Complexity Leadership Theory

Tactic: Create project teams that meet and develop good ideas.

Prescribed Final Condition

Tactic: Offer workshops related to your initiative.

Tactic: Set constraints on teams by articulating required project components.

Tactic: Develop metrics to track progress towards project goals.

Strategy: Kotter 8-stage

Tactic: Provide opportunities for individuals to share ideas with others.

Tactic: Recognize accomplishments of successful teams.

Emergent Final Condition

Environment/Structures
Difficulty achieving alignment of vision and collaboration across multiple individuals or units

Focus on Changing Individuals

Problem: Expecting groups to be productive without providing necessary structure.

Tactic: Develop a simple message to guide action.

Tactic: Provide compelling reasons for individuals to get involved.

Tactic: Identify required project components and tell people about these.

Tactic: Have groups responsible for developing a shared product.

Tactic: Insufficient Tactic: Groups meet and good ideas will emerge.

Strategy – Complexity Leadership Theory
Take-Away Messages

1. There is no ‘best’ change strategy. Depends on your project goals, institutional context, and resources.
2. It is important for change tactics to align with change strategies. The foursquare can help to think about options.
3. Resistance is not inevitable. It is a symptom of lack of alignment.