Five Claims about Effective Propagation

From the TUES Project, "Increasing the Impact of TUES Projects through Effective Propagation Strategies: A How-To Guide for PIs"

Although more empirical and theoretical work is needed to provide strong guidance for educational change agents, we do know some general things about effective propagation of educational innovations. Following Fullan [1], we think of educational innovations as new *materials*, *teaching approaches*, and/or *beliefs*. Each claim and its lesson for TUES PIs is summarized below and then explained in more detail.

1. Change takes time – it is a process, not an event. **Lesson**: TUES PIs must invest energy and creativity over time to propagate innovations and influence instructional strategies. One-time events like conference presentations alone are insufficient to influence adoption.
2. Developing awareness of an innovation is only the first stage in adoption decisions. **Lesson**: TUES PIs must design elements of their dissemination plans to influence decisions in later stages of the adoption process, in addition to increasing awareness.
3. Different types of changes likely require different strategies. **Lesson**: TUES PIs must identify types of changes they seek to foster and design elements of their propagation strategies to foster these types of changes.
4. Faculty beliefs and values may need to be modified in order for them to properly adopt/adapt the innovation. **Lesson**: TUES PIs must be prepared to design elements of their propagation strategies so they reflect understanding of existing faculty beliefs and values and then seek to modify these effectively.
5. Creating change requires taking a systems perspective. **Lesson**: TUES PIs must explicitly identify the elements of the instructional system they are seeking to change and understand how these elements are influenced by other elements in the system.

1. Change takes time – it is a process, not an event

The most important claim that we make about how faculty change their instructional practices is that change is a process [2, 3]. Adapters do not move from knowing nothing about an innovation to adapting it in one step. While there are many different descriptions of the stages through which an adapter reaches the point of using an innovation, the five-stage description offered by Rogers [4] provides a useful framework:

1. Awareness—Awareness of the innovation, but lacking complete information about it.
2. Interest—Growing interest and information seeking.
3. Evaluation—Decision whether or not to try innovation based on present and future situation (process may end here if negative decision).
4. Trial—Making use of the innovation. (If use does not continue, this is called "reneging" on adoption.)
5. Adoption—Continued use of the innovation.

One result from a comprehensive literature review of 191 journal articles describing change strategies relevant to undergraduate STEM instructional practices [5] is that successful strategies include coordinated and focused efforts lasting over an extended period of time – typically one semester or longer. This result is consistent with a previous review from the faculty development community that suggests successful faculty development programs benefit from interventions that last a full semester, year, or more [6].

2. Developing awareness of an innovation is only the first stage in adoption decisions.

TUES project teams face decisions about which communication channels to select for their dissemination plans. Mass market channels such as web sites, conference presentations, and journal publications are most important in facilitating transitions of potential adapters from a stage in which they know little or nothing about an innovation to a stage in which they are aware of an innovation [4]. The use of mass market channels is prominent in the common change strategy of developing and testing 'best practice'

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curricular materials and then making these materials available to other faculty [e.g., 7-10]. This is the strategy Seymour describes as being based on the unproven theory that "good ideas, supported by convincing evidence of efficacy, will spread 'naturally'—that, on learning about the success of particular initiatives, others will become convinced enough to try them." [11, p. 92] It is also a strategy that has been shown to be ineffective in change efforts within college [5] and K-12 educational settings [12]. Mass-market channels may raise awareness, but awareness does not imply adoption, or even more serious consideration.

Transition from awareness to adoption requires more interaction between innovators and potential adopters. For these transitions, interpersonal channels, "such as having an informal conversation with someone describing his or her positive experience with an engineering education innovation" [13], appear to be more influential than mass market channels [4, 13]. For example, preliminary results of an interview study with physics faculty suggest that written materials do not generally develop sufficient interest in faculty to lead to adoption. Rather, faculty members turn to these materials as a source of additional information after they have encountered the ideas and developed interest through a more social mechanism [14]. However, unlike promoting awareness, propagators do not have resources to initiate or sustain levels of interaction required to promote transitions from awareness to interest and adoption with potential adopters nationwide. Instead, propagators must thoughtfully select audiences for which they want to facilitate transitions to adoption. Propagators must focus their limited resources on chosen audiences. Audiences could be selected by geographic proximity (What are institutions close to you?), professional affiliation proximity (Who are potential adopters with whom you can have interactions at professional conferences?), or individuals who have already indicated some interest in the innovation (Who has contacted you or can you survey a large group to identify individuals who might be more interested?).

3. Different types of changes require different change strategies

Much of the discourse surrounding propagation of new ideas and practices in undergraduate STEM instruction does not take into account the degree to which the new ideas diverge from standard practice. As Cuban [15] suggests, there are different types of changes: some changes seek to make the current structure more efficient (incremental changes) while others seek to alter core beliefs, behaviors, and structures (fundamental changes).

Thus, when planning a propagation strategy or evaluating the success of an implemented strategy, it is important to understand the types of changes that are targeted. For example, one exception to the finding that one-shot workshops are not particularly effective at propagating instructional change is when the goal is to bring about very localized (i.e., incremental) changes in instruction, such as the incorporation of new technology [5]. In such cases, it appears that one-time workshops can be successful [e.g., 16, 17].

Most innovative teaching ideas, though, seek to produce fundamental changes (e.g., transforming classrooms from passive to active learning). When seeking the implementation of a fundamental instructional change, successful propagation strategies need to provide substantial support [5]. This is often accomplished through the provision of consultation and feedback. The importance of consultation and feedback in dissemination efforts is a strong finding noted in a review of the implementation research [18]. This review found that information dissemination and training by themselves, no matter how well done, are not highly effective, but that dissemination can be effective when it is more comprehensive, often involving such components as performance evaluation and coaching [18].

4. Faculty beliefs and values may need to be modified in order for them to properly adopt/adapt the new instruction

Just like faculty members need to understand the initial conceptions of their students, TUES PIs must have better understanding of how STEM faculty members initially view teaching and learning. Because of conflicts between faculty members' beliefs and values (i.e., their conceptions) and conceptions behind innovative curricula, successful propagation strategies often deliberately focus on changing faculty conceptions [5]. Although changes in conceptions can occur through self-initiated reflection on the part of participants in a change initiative [e.g., 19], lack of such reflection and conceptual change can limit success of change strategies [20]. Strategies that deliberately focus on conceptual change appear to have high levels of success in creating meaningful conceptual change in faculty that result in changes in practice [21, 22]. Changes in beliefs are difficult because new beliefs often challenge core values and many beliefs are held implicitly [1, p. 44].

The importance of beliefs and values arises because instructors typically do not use new materials "as is". They recognize that no set of instructional materials, no matter how carefully developed, will match the constraints of their specific classroom situation and their personal preferences and skills. Therefore, instructors must customize the new instructional strategy to their own situation; "there is no way to avoid the local reconstruction of the practice [instructional strategy], as local staff make sense of it in their own context" [12, p. 33]. This customization requires that instructors have the appropriate knowledge about how the innovation works as well as beliefs and values that are consistent with the innovation.

Because of conflicts with existing beliefs and values (as well as conflicts with situational factors), implementation of innovations may keep some surface features of an innovation, but remain essentially traditional instruction. For example, instructors may implement Peer Instruction [23], without the peer interaction component [24, 25]. This allows them to streamline their lecture and maintain a passive classroom, while appearing on the surface to have implemented a research-based innovation. Innovations requiring fundamental changes appear to be quite susceptible to superficial adoption [12, 25-29]. One unfortunate result is that instructors who superficially adopt a research-based instructional strategy, may conclude that the strategy itself is ineffective.

5. Creating change requires taking a systems perspective.

As suggested by Lattuca and Stark [30], developing an effective propagation strategy requires looking beyond individual faculty adopters to the systems in which they work. Important system features include:

- **Who has the authority to make the decision to adopt?:** "The type of adoption decision can be optional, collective, or authority. Many STEM education innovation adoption decisions are optional among faculty members, particularly those that take place in one course in one department. Adoption of more complex innovations, in this case those requiring coordination across academic units, may need to be a combination of collective and authority decisions. Authority decisions can be made more rapidly than collective decisions, but may be undermined in actual implementation, while collective decisions may lead to embodiments of an innovation that may be sustained" [13].
- **Local Factors:** Henderson and Dancy [31], through interviews with physics faculty, some of whom had beliefs that were aligned with theories emerging from physics education research, but had not adopted research-supported pedagogies, found several structural barriers to adoption of research-supported pedagogies. These included anticipated resistance from students, the one-size-fits-all schedule of courses that meet three fixed-length times a week for a semester, amount of material that is expected to be covered in a single course, department norms that support traditional approaches, and lack of time. Similar local factors have been found in other studies of STEM faculty [e.g., 32, 33, 34] and are also implied by the Lattuca and Stark [30] instructional system framework.
- **Interpersonal Networks:** "When two individuals share common meanings, beliefs, and mutual understandings, communication between them is more likely to be effective" [4, p. 306]. This explains why many STEM faculty are skeptical of innovations developed in different contexts (e.g., different types of institutions, different STEM disciplines) or by people who they feel are different from them [13, 35, 36]. Thus, part of understanding the system is understanding the interpersonal networks that exist within the system.
- **Institutional Culture:** The culture of an institution influences success or failure of change initiatives [37, 38]. Schein [39] portrays culture in three levels: artifacts and actions that could be observed; values and behavioral norms that are frequently mentioned by organizational leaders; and shared, underlying assumptions that are rarely mentioned, but direct decisions because they were influential in the early success of the organization. Bergquist and Pawlak [40] assert that cultures of institutions fit into one of six types: collegial, managerial, developmental, advocacy, virtual, and tangible. These typologies may be useful for change agents in understanding the culture for a change initiative and how the initiative can be formed to align with the culture.
- **Department Climate:** Department climate includes attitudes of peers in the department and willingness of the department chair to support faculty in trying new instructional approaches. Curricular changes, changes affecting multiple courses in a departmental curriculum, must also address tension between the perspective of a curriculum as a unified whole and the perspective of the curriculum as a collection of individual courses for which individual faculty members accept responsibility. Fisher, Fairweather, and Amey described this as "the tension between collective responsibility and the boundaries of academic freedom" [41].

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