

Special Session: Developing an Effective Propagation Plan for Educational Innovations

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Abstract—The special session offers resources for developing effective propagation plans for educational innovations and opportunities to apply these resources. Organizations supporting development of innovations in engineering education are placing more emphasis now than previously on plans for propagating the innovation beyond the original developers. The goal of the special session is to help participants prepare effective propagation plans for proposals for innovative approaches for engineering education. The special session is organized using a framework that was generated from an evaluation of funded educational innovation development projects, a study of well-propagated innovations in undergraduate STEM education and review of the relevant literature on organizational change and diffusion of innovations.

Keywords—*propagation, dissemination, adoption, research to practice*

I. GOAL

The goal of the special session is to help participants prepare effective propagation plans for proposals for innovative approaches for engineering education. A propagation plan, sometimes inaccurately referred to as a dissemination plan, is an element expected in most funding proposals to develop an innovative approach to engineering education. The special session is intended for people who are intending to write a proposal to develop an innovative educational intervention or study one or more research questions. Proposal writers are often familiar with approaches to disseminating educational innovations, e.g., journal article, conference papers, and websites. However, they are less familiar with approaches to develop propagation plans that are intended to promote sustained adoption of engineering innovations or applications of research findings. The special session is intended to improve abilities of educational innovators to apply resources offered in the special session to develop an effective propagation plan.

II. BACKGROUND AND MOTIVATION

A. Support is Needed to Develop Effective Propagation Plans

Numerous initiatives, e.g., courses, curricula, co-curricular learning activities, and instructional approaches, have been developed and implemented to support student learning across multiple science, technology, engineering, and mathematics (STEM) disciplines. Many of these innovative approaches have been supported by compelling evidence supporting their efficacy with respect to student learning compared with

traditional approaches, e.g., lecture. However, only a small percentage of these initiatives have propagated beyond the individuals who originated these innovations. Sometimes developers created the innovations to satisfy their own aspirations, and propagation was not one of their major goals. In other cases, e.g., NSF-supported projects, propagation was an explicit goal of the developers and the funding agency, but even in these situations propagation often does not occur. One major reason is the traditional propagation plans, e.g., conference presentations, journal articles, and websites, are designed to disseminate information, not to support innovation propagation.

B. Dissemination and Propagation

The goal of dissemination for an educational innovation is to raise awareness of the innovation among potential adopters by sharing information about the innovation. In engineering education, dissemination approaches include journal articles, conference presentations, websites, and, in some cases, short workshops. The rationale for dissemination is that potential adopters who learn about the innovation will use the information to make decisions about adopting the innovation. In one sentence, dissemination is based on the premise that having sufficient information about the innovation is necessary and sufficient to adopt the innovation.

The goal of propagation for an educational innovation is to promote adoption of the innovation. Approaches to propagating educational innovations include dissemination approaches, but also include: (i) clearly describing the innovation that potential adopters can consider adopting, (ii) potential adopter discovery, (iii) advisory boards, (iv) co-development, (v) alpha and beta testing, and (vi) support following initial adoption. The rationale for propagation is to promote adoption of the innovation beyond developers of the innovation. In one sentence, propagation is based on the premise that both fit and efficacy are necessary and sufficient to adopt the innovation. While efficacy can be demonstrated by developers without interaction with potential adopters, fit can be developed only through interactions with potential adopters.

C. Framework is Supported by Empirical Evidence

The framework on which the special session is based was developed through: (i) analysis of typical dissemination plans, specifically evaluation of 71 education development proposals funded by NSF in 2009; (ii) study of 44 well-propagated innovations in undergraduate STEM education, including in-depth case studies of three innovations; and (iii) review of the

relevant literature on organizational change and diffusion of innovations across a wide variety of disciplines [1]-[6].

D. Special Session Resources

Participants who attend the special session will be able to apply two resources: (i) a Designing for Sustained Adoption Assessment Instrument (DSAAI) and (ii) a how-to guide. The DSAAI is used to assess the likelihood that a propagation plan for an education development project will influence adoption decisions. Also, it has been used to help project teams improve their propagation plans. DSAAI scores have been shown to correlate with project success in propagating [1]. The published guide is intended to introduce readers to the framework for thinking about and planning for effective propagation plans [6]. The guide is written in informal and accessible language and includes examples as well as workbook activities.

III. DESCRIPTION OF THE SPECIAL SESSION

The special session is organized as shown in Table I. Since the goal of the special session is to help participants prepare effective propagation plans for proposals for innovative approaches for engineering education, the agenda is designed so that participants can spend as much time as possible working on propagation plans with resources introduced in the special session. Time is allocated to familiarize participants with the resources, but the focus of the special session is working on developing effective propagation plans.

TABLE I. SPECIAL SESSION AGENDA

Element	Time	Description
Introduction	15 minutes	Special session participants will introduce themselves and the facilitator will provide an overview of the special session. The facilitator will also introduce the Designing for Sustained Adoption Assessment Instrument (DSAAI).
Evaluation of a Propagation Plan (small group activity)	20 minutes	Participants who bring a propagation plan for their educational innovation and/or research project can evaluate their propagation plan in small groups using the Designing for Sustained Adoption Assessment Instrument (DSAAI). Participants without a propagation plan can analyze one provided by the workshop facilitator.
Framework for Developing an Effective Propagation Plan (presentation)	15 minutes	The facilitator will describe a framework for developing an effective propagation plan, based on the work described in the preceding section on justification.
Improving a Propagation Plan (small group activity)	20 minutes	Participants will work in small groups to improve a propagation plan selected by the members of the small group. They will have opportunity to apply the framework introduced in the preceding part of the session.
Questions and Wrap Up	10 minutes	Participant questions will be addressed and opportunities to further apply the assessment instrument and the framework will be explored.

IV. INCREASE THE IMPACT FRAMEWORK

Both the Designing for Sustained Adoption Assessment Instrument (DSAAI) and how-to guide were built around a six-part framework organized into two categories.

- Describe Changes Required for Sustained Adoption
 - Describe your innovation
 - Describe potential adopters
 - Describe the instructional system
- Develop a Comprehensive Action Plan
 - Develop interactively
 - Disseminate interactively
 - Support Adopters

Efforts to propagate an educational innovation begin, or should begin, when efforts to develop the innovation begin.

This is the most important tenet of developing an action plan for propagation of an educational innovation. Unfortunately, most educational innovators postpone work to propagate their innovation until development is complete or nearly complete and evidence from testing the innovation has been collected, analyzed, and shown to support assertions that the innovation is effective. As a result, important propagation issues are deferred until development is nearly complete and little time, energy, and resources can be invested in developing a propagation plan. Further, if propagation efforts are postponed until development and testing are complete, or nearly complete, many opportunities to promote propagation are forfeited.

A. Describe Changes Required for Sustained Adoption

The first step in preparing a propagation plan is to describe the nature and scope of change expected by adopters of the educational innovation. If adopters will be expected to make significant and complex changes that would be considerable departures from their current instructional practice, then extensive, meticulous propagation activities will need to be planned and implemented to support such substantial changes. On the other hand, if potential adopters can implement the educational innovation without relatively minor adjustments to their current instructional practice, then massive, complex, and sustained propagation activities may not be needed to promote adoption. Given the pivotal consequences of describing the nature and scope of change expected by potential adopters for developing propagation plans, estimating adjustments expected will provide the foundation for developing propagation plans.

Therefore, the goal of this category is to describe what potential adopters would be expected to do to adopt the educational innovation. To reinforce the preceding observations, the greater change that a potential adopter would need to make to adopt the innovation, then the action plan to promote adoption must encourage more in-depth engagement with potential users. Consequently, the first category (describe changes required for adoption of the innovation) should be completed before development of the comprehensive action plan (the second

category) begins. Describing expectations for change by potential adopters requires at least three tasks:

- **Describe the Education Innovation from the Perspective of Potential Adopters:** Developers must be clear about the nature of the innovation in terms of what potential adopters will be asked to adopt. This can be a challenging task for developers who thought about and worked with the educational innovation for extended periods time. They may have forgotten the thought and work that was required for them to consider how much they changed their instructional practice. As a result, developers should be encouraged to revisit the essence of their innovation, what will be expected for adoption, and how much adopters can modify the education innovation and the result still considered to be adoption of the innovation. What elements of the innovation can be modified and what elements are expected to be retained in their original form?
- **Describe Potential Adopters:** Lean startup methodologies emphasize considerable work to describe value propositions and customer segments for the products startups intend to market. Following analogous reasoning, educational developers would be expected to describe in detail who would be expected to adopt their educational innovations. Will potential adopters work at large or small educational institutions? How experienced are potential adopters expected to be? Will they have been teaching for a long time or are they just getting started? Do they regularly attend conferences on engineering education or will they know little about developments in engineering education? Clarifying descriptions about potential adopters will inform development of propagation plans.
- **Describe the Instructional System:** Although decisions about instructional practice may be made by individual faculty members, these decisions are made in the context of instructional systems in which these faculty members work. Will adoption require support from a few colleagues, from the entire department, or the college? What is the likelihood that peers, the department, or the college will be supportive? Thinking about instructional systems that influence adoption of the innovation will shape development of the propagation plan.

All these issues should be considered before innovation development and development of an action plan for propagation commence.

B. Develop a Comprehensive Action Plan

The goal of this category is to develop a propagation plan intended to encourage adoption behaviors that were described in the previous category. The Increase the Impact framework for a propagation plan organizes propagation activities into three steps: (i) develop interactively, (ii) disseminate interactively, and (iii) support adopters [6].

Activities in the first step, develop interactively, offer the most effective opportunities to develop an innovation that will fit the instructional systems of potential adopters without

surrendering the essence of the innovation. Interactive development activities should be structured so developers can learn about aspirations, needs, constraints, barriers to adoption, affordances for adoption, etc. from potential adopters. The primary purpose of interactive development activities is learning not selling. Examples of activities for this step include:

- **Minimal Viable Product:** Developing a minimal viable product [7] and engaging with potential adopters to learn how well the minimal viable product fits and does fit into instructional systems of these adopters. Engaging with potential adopters in early in the process of innovation development is often referred to as customer discovery in the learn startup literature [8].
- **Advisory Board:** Organizing an advisory board with representatives from different potential adopter populations. Deciding who should be invited to serve on an advisory board depends on describing potential adopters, which was discussed earlier.
- **Alpha and Beta Testing:** Organizing alpha and best testing that can be used to gain more information about fit with different instructional systems as well as obtain information about efficacy in different contexts.

Activities for the disseminate interactively step range from least interactive (e.g., project websites, listservs, and emails) to most interactive (e.g., using personal connections, follow-ups with potential adopters who participate in conference presentations or workshops, and leveraging existing communities). Our analysis of NSF-funded educational innovation projects found that many expected significant changes from potential adopters based on evaluation of changes required for sustained adoption (first category) but used dissemination activities that offered little interaction with potential adopters (e.g., project websites, conference presentations, and journal articles) [6]. This frequently occurring scenario may be one of the reasons that engineering education innovations are not adopted beyond the original developers.

Prospects for support influence adoption decisions. Adopters may be more likely to try an educational innovation if they know they can find support. Further, about one third of the people who adopt a research-based instructional strategy discontinue use [9], which indicates the importance of support following initial adoption. Support for adopters can be provided by the project team, by external sources (e.g., existing community), or some combination of the two. In general, adopter support begins by anticipating types of questions and/or problems for which adopters may seek support and devising strategies to address these questions. Then, as adopters make requests for support, the project team learns more about questions and/or problems for which adopters may seek support. Over time, the project team may wish to consider a plan to transition support to external sources.

V. CONCLUSIONS

Propagation plans, like assessment plans, can be developed and implemented by building on relevant literature on change in higher education, organizational change, diffusion of innovations, lean startup, etc. Often educational developers are

unfamiliar with propagation-relevant literature and how it can be applied for their innovation. Therefore, resources have been developed to support educational innovator increase the impact of their innovations. The special session offers developers opportunities to explore these resources and apply them to their innovations.

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