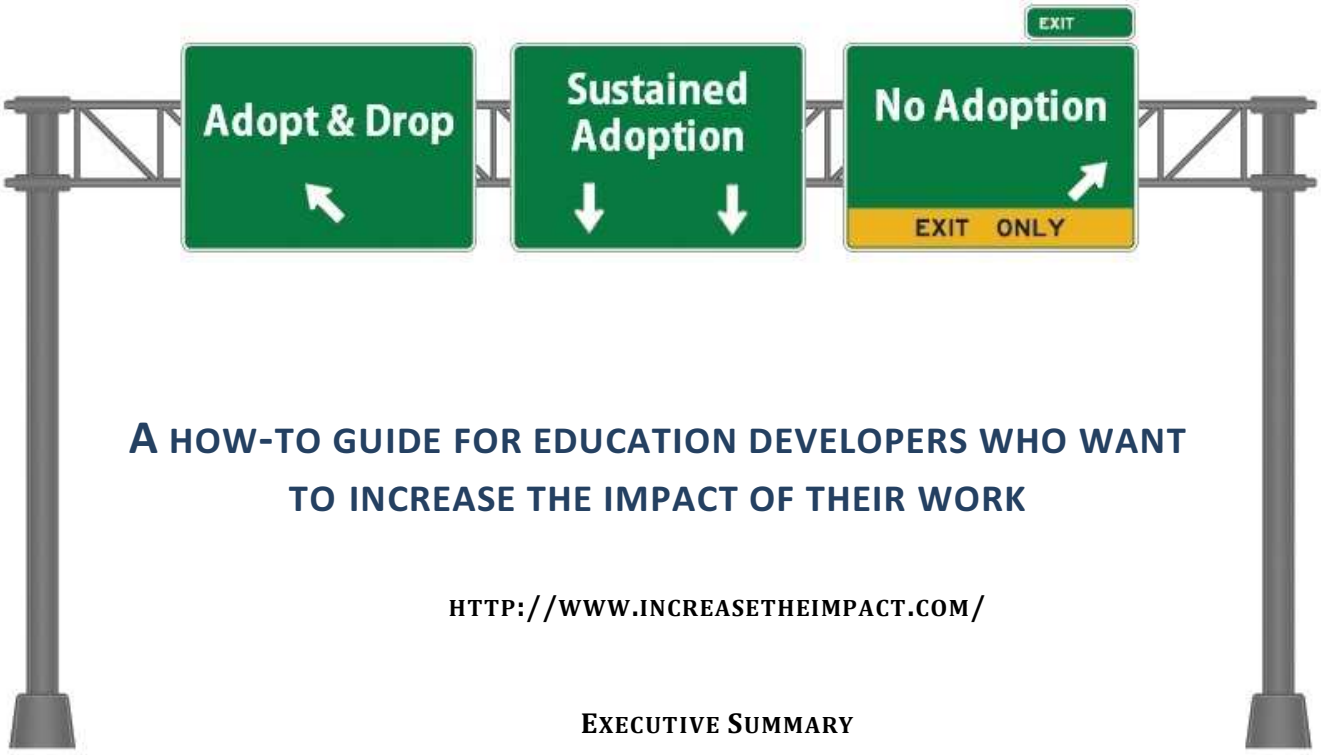
DESIGNING EDUCATIONAL INNOVATIONS FOR SUSTAINED ADOPTION



A HOW-TO GUIDE FOR EDUCATION DEVELOPERS WHO WANT TO INCREASE THE IMPACT OF THEIR WORK

HTTP://WWW.INCREASETHEIMPACT.COM/

EXECUTIVE SUMMARY

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(CONTAINS FINAL TEXT, BUT PRELIMINARY LAYOUT AND IMAGES)

Charles Henderson

Renee Cole

Jeff Froyd

Debra Gilbuena

Raina Khatri

Courtney Stanford

Once upon a time

There were three physics faculty members who received a grant from the National Science Foundation (NSF) to develop an innovative approach to teaching introductory physics. They spent two years developing and refining materials and then taught the new course several times at their institution. Evaluation of this course convincingly demonstrated that more students pass and that these students learn the subject substantially better than comparable students in the traditionally-taught course at their institution. The developers set up a web site with the course materials, presented their approach and positive results at three national physics conferences, and published a paper in a prominent physics education journal. They got good feedback on the presentations and were excited to think that their hard work would have a positive impact on the teaching of physics nationwide.

Several years later the three developers were still teaching introductory physics using their new approach and were curious about how widely their approach had spread to physics faculty at other institutions. At the next national physics conference they decided to ask faculty from other institutions about their method. One colleague responded, "Oh, I read the journal article, and thought the approach was interesting, but there was no textbook with lots of problems, so I did not try it." "I don't teach in sections of 60 students. I teach physics in 300-person classrooms, so even though someone mentioned the conference presentation to me, I could see right away the approach would not work for my situation," responded another colleague. Yet another colleague told them, "I read the journal article, but the students at your institution are so different from my students that I never considered trying it." One response was encouraging, "I read the article and thought it was so effective that I decided to try it. But, after the first week of class things were not going well and I gradually faded back to my former teaching methods." Many of the people at the conference had never heard of this new approach for teaching physics. The three developers left the conference discouraged, "Why, when the results were so promising, is nobody else using our approach?"

The story is hypothetical (and you can substitute any discipline for physics), but it was constructed to reflect the experiences of many educational developers that we know or learned about. It illustrates why we wrote this Guide.

Designing for Sustained Adoption

As illustrated by the story above, efforts to improve undergraduate STEM teaching methods have generated many great ideas and materials, but few have caught on. To address this critical problem, the 2014 NSF IUSE Program Solicitation (http://www.nsf.gov/pubs/2015/nsf15585/nsf15585.htm) states that "transferability and propagation are critical aspects for IUSE-supported efforts and should be addressed throughout a project's lifetime by ensuring attention to designing for use in a large variety of institutions." Very few developers currently do this in their proposals, because, in large part, they aren't sure how.

As a team we have worked with a variety of education developers in different stages of their projects and analyzed many grant proposals. Through our work, we have identified a few common mistakes we repeatedly see project teams make:

- Mistake No. 1: **Concentrate on dissemination by telling** and ignore other key elements of a propagation plan to promote adoption.
- Mistake No. 2: **Ignore the literature** on change and adoption of innovations.
- Mistake No. 3: **Focus on product development** and ignore multiple factors that will hinder adoption of products.
- Mistake No. 4: **Wait until near the end of the project** to begin work on promoting adoption.

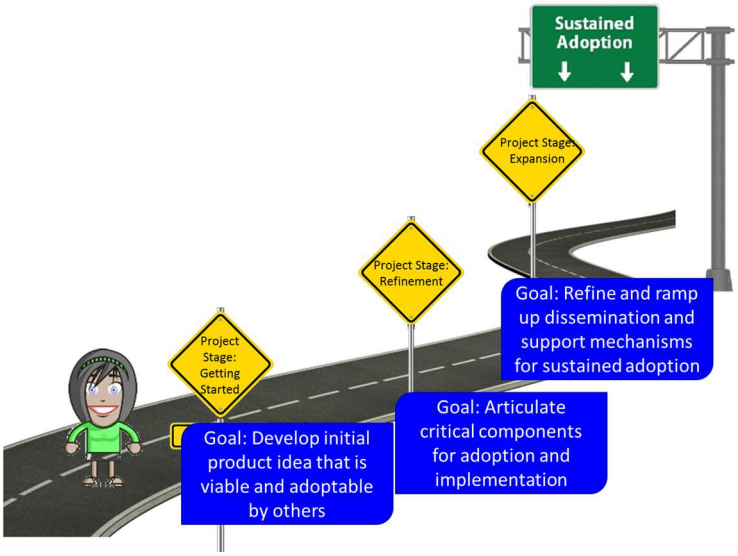
To help education developers focus on sustained adoption and avoid these common mistakes, we wrote a How-To Guide, based on our collective experiences studying and attempting to create educational change. We also draw heavily on literature on change from a variety of perspectives, including studies on educational change, organizational change, social psychology, and diffusion of innovations. Whether you are only beginning to consider developing an educational innovation, planning a grant proposal, or already working on an educational innovation, the How-To Guide will help you focus your ideas and create concrete strategies to support the success of your project.

This pamphlet summarizes core ideas from the How-To Guide. The complete Guide also provides a framework, details, explanations, and examples to help you plan and implement your own project. In addition, the Guide has activities at the end of each chapter to help readers apply the concepts. Participants in our workshops sometimes say that the chapter content seems pretty common sense, but when they attempt the activities, they discover that translating common sense into concrete propagation plans requires more thought than they anticipated.

Propagation planning begins at the very start of any project!

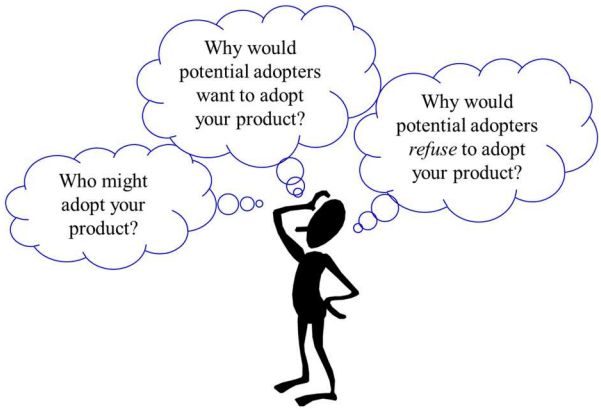
Are you planning to succeed or fail?

Writing journal articles and making conference presentations at the end of the project does not, by itself, lead to propagation and sustained adoption. Propagation activities are important throughout a project, even at the very beginning. However, the focus of propagation activities will shift as the project matures. Thus, developers must have the big picture in mind, but they must also select appropriate propagation activities at each stage of the project. As shown in the figure, we break education development projects into three basic stages, each with a different goal.



The core ideas for successful propagation from the How-To Guide can be grouped into two categories; and each category has three parts:

1) Understand changes required for sustained adoption
    - Understand your product
    - Identify potential adopters
    - Understand the instructional system
2) Develop a comprehensive action plan
    - Develop interactively
    - Disseminate interactively
    - Support adopters

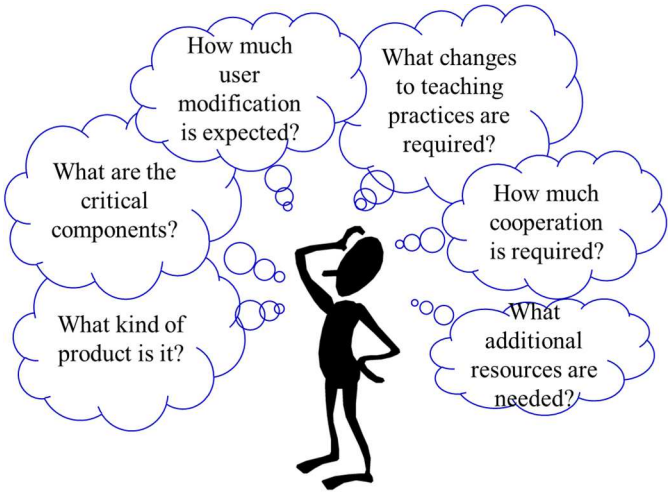


Understand Changes Required for Sustained Adoption

Most educational developers focus on their innovation (or product), and do not think about the changes required for someone to adopt their product. Communicating your product – and what is required for its use by others – is the first challenge. To address this challenge, you must be able to describe your product, potential adopters, and what changes in instructional system(s) would be required for adoption.

Understand Your Product

You should be able to answer six questions if you have a clear idea of your product:



1. What kind of product is it? Does adoption require a change in content, a change in pedagogy, neither, or both?
2. Most adopters will customize their use of an educational innovation. What are the critical components that should remain so it is truly your innovation that is being implemented?
3. How much change can the adopter make to your product – none, some, a lot, or everything can change?
4. Every potential adopter has an established teaching practice. How much do they have to change to adopt your product?
5. Who makes the adoption decision – an individual, a department, or a college? How many people need to be involved in order for your product to be adopted: one, two, or many?
6. What financial resources will be required, at a minimum, to adopt your product?

Identify Potential Adopters

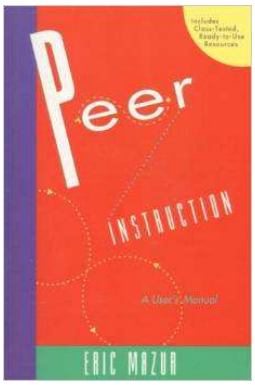
Education development proposals rarely show evidence that the authors have adequately considered who will adopt their product.

You should be able to answer at least three questions if you understand potential adopters:

1. Who might adopt your product? For example, are they faculty members at specific types of institutions? Are they in specific departments?
2. Why would potential adopters want to adopt your product? What is the value of your educational innovation? – saving instructor time, helping students learn more effectively, helping students learn new concepts, helping students think differently about existing concepts, etc.
3. Why might potential adopters decide *not* to adopt your product, either initially or after one or more trials?

Understand the Instructional System

Once you can accurately describe your product and potential adopters, you are prepared to think about the more abstract issue of what changes to the instructional system would be required for your product to be adopted.



Peer Instruction is well propagated and has wide appeal because its developer, Eric Mazur, understood instructional systems in physics. Mazur knew that his lectures weren't working. Students could recite back equations and Newton's laws, but could not qualitatively reason with these concepts. He discovered this thanks to a test he administered, as he tells the story, only out of curiosity. Now, alarmed at the majestic failure of his Harvard students to understand physics concepts, he knew something had to change.

First, he thought about teaching students in smaller groups – quickly nixed. While he might have been able to pull that off with Harvard's resources, he wanted to have an *impact on college physics teaching as a whole*. Any systemic change would need to be cheap and not require significant extra time on the part of instructors or TAs. Peer Instruction was his answer: having students teach each other, but in a lecture setting. In other words, a lecture-based instructional strategy in which the instructor intersperses brief presentations with conceptual questions (i.e., ConcepTests), and asks students to respond, first individually, and then in pairs.

Peer Instruction was successful in part because Mazur understood the instructional systems in physics, and what was likely to be adopted widely. Understanding the system into which your product will be adopted is important both for compatibility with the *current* system and to help you find the process likely to help bridge the gap to the *desired* instructional system. Any instructional system can be thought of in terms of four structural levels: *individual*, *departmental*, *institutional*, and *extra-institutional*. Details on these four levels can be found in the complete How-To Guide.

What is most important to realize: Adoption of your product likely requires changes in instructional systems. Understanding what will need to change, what elements aid adoption (enablers), and what elements hinder adoption (barriers) can help you improve the product and increase adoption. Several features of your product influence adoption, including 1) how much user modification the innovation requires, 2) what amount of change to teaching practices will be necessary, and 3) how much cooperation and resources are required. Thinking about the degree to which instructional systems will need to change in order for your product to be adopted should influence how you conceptualize, develop, disseminate, and support your product.

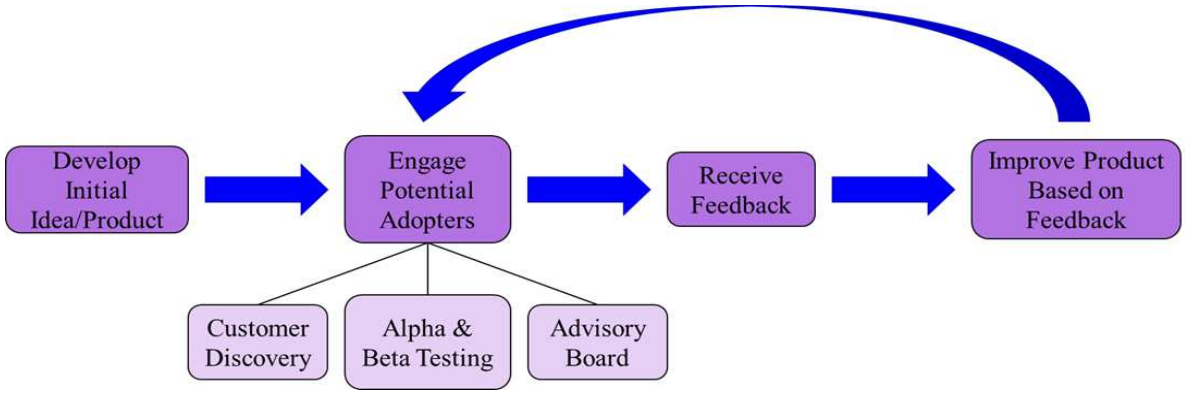
Develop a Comprehensive Action Plan

A propagation action plan has three core elements: Interactive Development, Interactive Dissemination, and Support. Throughout your entire action plan, focus on how you can interact with adopters to refine your ideas while retaining the features of your product that you think are key to its functionality. As part of our work to understand typical action plans, we collected and studied 76 education development grant proposals funded in 2009 by the NSF Course Curriculum and Laboratory Improvement (CCLI) program. Below, we discuss common weaknesses in these action plans and identify how the plans can be improved.

Develop Interactively

It is tempting to develop and refine a strong product, put it out there, and then wait for the onslaught of adopters. Most of the 2009 NSF CCLI education development proposals planned to do just this; only 8% of the proposals had definitive plans to engage users from the beginning to obtain feedback from potential adopters about implementation needs and barriers to adoption. This is a big mistake. Without input from potential adopters throughout the development process, developers often create something that works perfectly in their context, but may not work for anyone else. The NSF funding database is full of such projects that have not spread well.

Interactive development means starting with a basic idea and then refining the idea through interactions with potential adopters. Customer discovery, alpha and beta testing, and advisory boards (elaborated in the Guide) are proven ways to engage potential adopters in the development process. The primary goal of all of these methods is to get feedback on your ideas while it is still easy to make changes to your product.



The amount and type of interactivity you will be able to engage in depends to a large extent on the size and novelty of your project. For a small project, such as development of a short unit for an existing course that you know is not much of a departure from typical teaching practices, it will probably work to have only a few people provide feedback throughout the development process. For a more ambitious project, such as creating a course to introduce new content and/or pedagogy, the likelihood of adoption will be increased by engaging multiple people from different instructional systems throughout the development process.

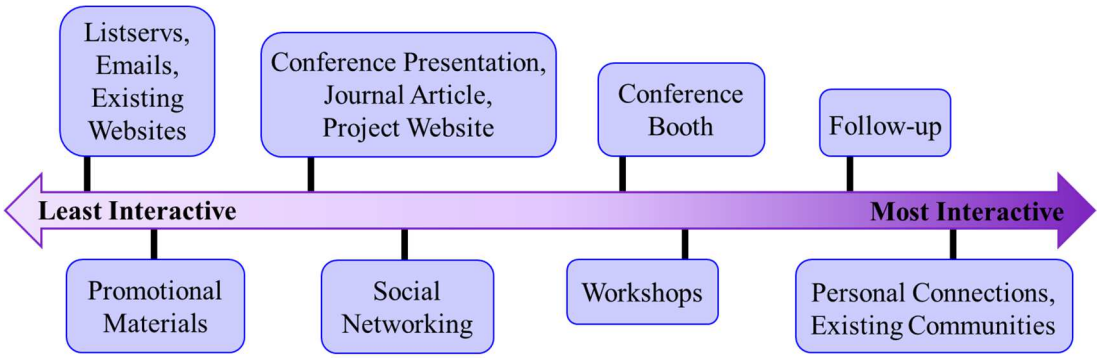
Disseminate Interactively

In our review of 2009 NSF CCLI proposals we found that many (45%) told potential users about their product only through passive means such as journal articles, conference presentations, and

websites. Of the remaining proposals, most (74%) included only one form of interactive dissemination, commonly a short, 2-4 hour workshop. Thus, over 80% of these proposals provided no evidence that they had thought about or developed a plan for how they would actively engage, attract, support, and follow up with potential adopters.

Dissemination can and should happen throughout the project, not just at the end. It has three purposes: raise awareness, inform, and persuade your audience to try your product. Traditional, dissemination by telling, strategies of publishing papers and giving presentations are necessary but not sufficient to raise awareness and inform your potential audience about your project. More engagement with adopters is often required to facilitate adoption. The figure below shows different dissemination approaches, ranging from almost no interaction to considerable interaction.

We found that the vast majority of NSF funded projects expected a big change from their audience – in teaching behavior, course content, or both. However, their propagation plans consisted of little more than posting work on a website and publishing a paper. You can be different (and more successful) – armed with the knowledge that your audience is going to need more direct engagement to get informed about your product and be persuaded to try it.



What specific dissemination activities will you use to get the word out to your intended audience and motivate them to try the product? When during the project will you do these activities?

Support Adopters

More than one-third of faculty who try a new instructional strategy end up dropping it. Without support, some instructors may think that it is too risky to try your innovation. Others may try it and then stop because they thought it didn't work the first time. Dissemination can inform potential adopters about your product and might motivate some of them to try it; however, sustained adoption requires support during and after initial adoption.

Your support plan is your solution to an optimization problem: Consider aspects of your product, the stage of adoption your users are in, the resources you have available, and the stage of your project (getting started, refinement, expansion). Keep in mind that strategies you initially choose may change over time depending on these factors and the feedback you receive from users. After initially optimizing your support plan, you might think you know how to support adopters. However, one of the best ways to really understand what adopters need is to ask them. Contact some potential adopters and get feedback on your initial support plan.

Adopter support can be provided by the project team, by external sources, or both. What kind of support should be determined by the nature of the innovation, how people learn about and interact with the innovation, the scale of adoption, alignment with other projects or networks, and the connections that the project team has with external sources.

Check Your Alignment

The nature of resources for your propagation plan should match the degree of change required by adopters. In general, if you expect adopters to make a significant change, then your propagation plan should engage adopters early and often in the development process, provide for extensive dissemination, and provide substantive support throughout the adoption process.

Does your product require cooperation with other faculty or administrators, technical support, new equipment, or restructuring of the classroom environment? If so, you need to consider how your development, dissemination, and support activities align with these system factors. The propagation plan should be designed to influence instructional systems that must change if your product is to be adopted.

The propagation plan should be consistent with the resources available. Important resources include not only time and money, but also the power and influence that the project team has in the system (both formally and informally).

Six Components of a Strong Propagation Plan

We leave you with a checklist based on our research showing that a propagation plan containing these six components is more likely to be successful. We suggest that you ask yourself how well your plan aligns with these components. The Guide can help you develop concrete strategies to improve any or all of these aspects of your project.

1. Potential adopters are identified with a clear rationale for their selection and an estimate of the number of potential adopters.
2. There is an extensive plan for attracting, training, supporting and/or following up with potential adopters.
3. The project begins to address issues of propagation from the very beginning. There are plans for formative feedback from potential adopters during all phases of development, dissemination, and support.
4. The project plan has identified the instructional system elements that are likely to influence adoption. These include decision makers, local factors, and interpersonal networks, as well as departmental and institutional cultures.
5. Propagation plans are clearly articulated – including a detailed rationale for the strategies chosen and outlining how the plan will be accomplished.
6. The developer has considered potential adopters and features that will influence adoption, and used this information to design propagation strategies.

We hope that both this summary and the entire How-To Guide will provide you with ideas, tools, and strategies for creating, improving, and evaluating your propagation plans.