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Facilitating Interdisciplinary Learning: Lessons from Project Kaleidoscope

by Adrianna Kezar and Susan Elrod

Many major funding organizations, policymakers, government agencies, and other higher education stakeholders want higher education to encourage interdisciplinary learning so that students graduate with the requisite skills to take on complex jobs in science, policy, business, and industry. Calls for this kind of change have been most urgent within the science, technology, engineering, and mathematics (STEM) fields; they are key to America's capacity to maintain its global economic position, yet their enrollments have been shrinking in recent years. Studies have demonstrated that students with exposure to interdisciplinary learning experiences tend to be retained as majors, as well as gaining preparation for successful careers and life in the 21st century.

Moreover, two reports from the National Academies of Science (*Facilitating Interdisciplinary Research*, 2004 and *New Biology for the 21st Century*, 2009) note that research in many scientific disciplines is becoming more interdisciplinary, requiring graduates who are capable of working across boundaries.

The National Academies' *Facilitating Interdisciplinary Research* (2005) was produced to help institutions understand how to systematically encourage interdisciplinary research by changing academic organization and culture. The report examined various institutional structures and practices that hamper interdisciplinary work, such as reward systems, funding protocols, and competition among departments. It also identified the necessary conditions of progress, such as a vision for interdisciplinary work, startup resources, cross-campus dialogues, collaborative research facilities, and incentives. The report casts the lack of progress in doing interdisciplinary research and learning as an institutional challenge, not as the issue of individual competency or motivation it is sometimes thought to be.

Project Kaleidoscope (PKAL) too has been looking at systemic ways to create interdisciplinary teaching and learning environments. Like the National Academies report, PKAL thinks that campuses across the country have not created environments hospitable to interdisciplinarity. In this article, we highlight research conducted on one of the major projects facilitated by PKAL: Facilitating Interdisciplinary Learning (FIDL), funded by the W.M. Keck foundation (at <http://www.aacu.org/pkal/interdisciplinarylearning/index.cfm>). The central premise of the project's leaders was that higher education institutions will not create the innovative and complex thinkers of the future unless campuses reshape their processes and policies.

For three years (2007–2010) the FIDL initiative brought together teams from 28 institutions of diverse types in order to foster more intentional interdisciplinary learning; connect various interdisciplinary initiatives; and learn about successful strategies for planning, evaluating, and institutionalizing interdisciplinary programs. Two hundred and fifty faculty and campus leaders participated in four national meetings, including two roundtables focused on assessment and leadership.

The campuses concentrated on the creation of integrative learners, faculty and students with the skills and confidence to work at the interfaces between disciplines to address both research questions and complex societal problems. One-third of campus teams worked on programs in the sciences and mathematics disciplines; two-thirds created programs that incorporated a broader range of disciplines.

This project was unique in that it focused on what campuses can do to support interdisciplinary learning (rather than simply research) and provided five practical strategies (see box below) for launching such efforts in ways that lead to broader campus support and longevity.

Five Strategies from the PKAL Facilitating Interdisciplinary Learning (FIDL) Initiative

- Start by articulating a common understanding of interdisciplinary learning goals that will drive the cycle of curricular innovation, development, assessment, and improvement.
- Use assessment to connect those goals with program structure, content, and pedagogy, paying attention to students as individual learners who come with diverse backgrounds, experiences, expectations, career aspirations, and goals.
- From within and with new hires, build a critical mass of faculty and staff who assume leadership responsibility in the iterative process of shaping interdisciplinary curricular and co-curricular approaches and in assessing the impact of those approaches on undergraduate learners.
- Incorporate interdisciplinary program needs into the processes of campus governance and the distribution of resources: money, personnel, equipment, and spaces.
- Align interdisciplinary learning with the institutional vision, mission, and identity, and include it in strategic planning at all levels.

This project is among the largest to examine the facilitation of interdisciplinary learning. The project researcher (Adrianna Kezar) and the project leaders (Jeanne Narum, then the director of Project Kaleidoscope; Michael Kerchner, associate professor at Washington College; and Susan Elrod) surveyed the teams at the beginning and end of the project, received annual reports from the campuses, and conducted interviews after the projects were completed. We also had documentation along the way from meetings, roundtables, workshops, and conference calls. (For additional details on the project, see the summary report—Project Kaleidoscope, 2011—in Resources).

Participating FIDL Campuses

Agnes Scott College

Beloit College

Bradley University

Canisius College

College of St. Benedict and St. John's University

Davidson College

DePauw University

Florida A&M University

George Mason University

Grinnell College

Indiana University at Bloomington

Jacksonville University

James Madison University

Lafayette College

Moravian College

Nazareth College of Rochester

New York City College of Technology

St. Lawrence University

SUNY Oneonta

The Ohio State University

Union College

United States Military Academy

University of Richmond

Wabash College

West Virginia University

Whittier College

Willamette University

In this article, we report on the lessons learned from this initiative in how to bring interdisciplinary learning to scale. But first, we briefly review the institutionalization theory that we used to frame our findings.

Institutionalization Theory

Kezar and Lester's (2009) research on facilitating collaboration in higher education informed both the project administration and the research we conducted on the 28 campuses. Their work identified institutionalization as crucial in institutions' capacity to create and sustain a campus culture that supports interdisciplinarity.

A three-stage model of institutionalization emerged from the literature and from Kezar and Lester's study: mobilization—"the system is prepared for change"; implementation—"the change is introduced"; and institutionalization—"the system is stabilized in its changed state." In the *mobilization* stage, the organization begins to prepare for change. This preparation ranges from developing an awareness of the need for change, creating vision, galvanizing support through intensive and extensive discussion, and mobilizing leadership and collective action. At this stage, change agents begin to challenge the status quo (i.e., practices and policies that characterize the current institutional culture).

Implementation, the second stage, focuses on creating infrastructure and support for the reform, which may take the form of revised rewards and incentives, new facilities, additional resources, altered teaching loads, and the like. During this stage, initiatives begin to materialize, and support for the innovation is developed to maintain momentum.

Institutionalization is the final stage of the process, in which the innovations are incorporated into the value systems, culture, and day-to-day norms of the institution. Members come to a new consensus, accept the value of the innovation, and see it as normative for the institution. Core understandings are altered. Also, people are held accountable for enacting the new norms in the institution's evaluation systems. Thus, discussion about interdisciplinarity is no longer necessary; people automatically create supportive structures for it, since it is now everyday practice.

Few campuses have institutionalized interdisciplinary learning.

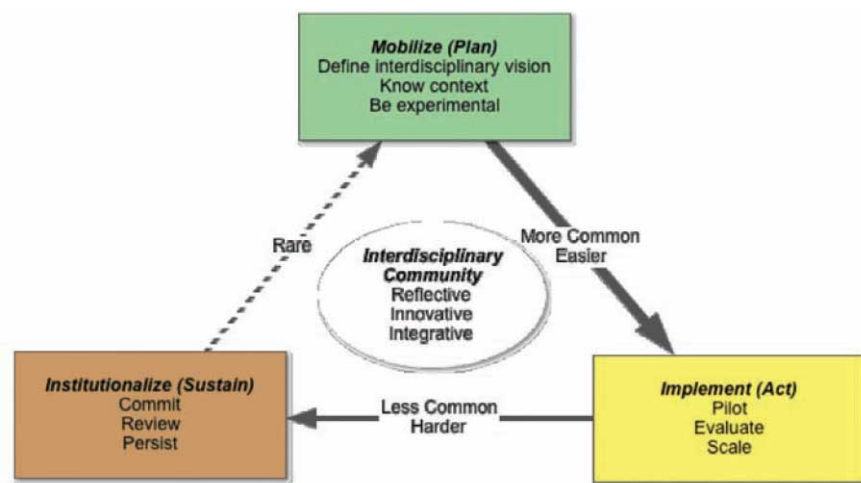


FIGURE 1. PROJECT KALEIDOSCOPE THREE-STAGE MODEL FOR CHANGE

MOBILIZATION

Understanding

Risk aversion was a real barrier to reform on the PKAL campuses, according to three-quarters of the participants at both the beginning and end of the project. [Editor's note: See the John Tagg article in this issue for a discussion of faculty resistance to change.] But mobilizing faculty for any type of curricular reform is virtually impossible if there is no understanding of it. *Interdisciplinarity* is a much-used, yet mostly misunderstood concept. Even on campuses that have a history of doing interdisciplinary work, there is generally little shared understanding of the term.

Many faculty see interdisciplinarity as a threat to disciplinary work. Campuses need to address this threat by differentiating among the terms *interdisciplinary*, *multidisciplinary* and *transdisciplinary* and examining how these concepts complement—and can support rather than replace—disciplinary work.

Faculty are unlikely to create coherent interdisciplinary learning goals or environments unless they have in-depth discussions with colleagues from different fields about what interdisciplinary teaching, learning, and scholarship mean to them as individuals, departments, and schools and how interdisciplinary learning outcomes differ from disciplinary ones. As a member of one of the project teams said about the importance of these dialogues, “I cannot imagine how we would have made progress without coming to a common understanding about what interdisciplinary work is and what type of learning environments we were trying to create.”

Teams found that by participating in the FIDL project, they learned the language of interdisciplinary work and ways to frame productive discussions on campus: “The framing and language provided by PKAL was essential for advancing our interdisciplinary work and helping us communicate with other colleagues on campus. We had failed in earlier attempts to

get more broad buy-in,” said one participant.

One aspect of framing is to make clear that people on campus are already doing interdisciplinary work. It is easier to get cooperation if you are not asking everyone to do something new. A faculty member at one college put it this way: “One of the key lessons that came out of some of the project roundtables and meetings was that people realize they need to amplify and focus on existing interdisciplinary work rather than frame it as being new.”

Concretization

If faculty do not advance to concrete discussions of the curriculum and their day-to-day pedagogical practices, the effort is likely to get caught up in more abstract discussions and falter. Furthermore, it is important that faculty leaders make the case for interdisciplinary learning in the context of the way scientific research is actually done in the 21st century: It is more interdisciplinary and focused on real-world problems, as well as workforce-development needs, than prior work.

Then discussions can move to what students should know and be able to do as a result of their interdisciplinary learning experiences. These conversations can take time, since members need to navigate different disciplinary perspectives and cultures, but those teams that had had these discussions moved forward faster and experienced fewer barriers than ones that had not.

At one of the project meetings, campus leaders came up with a list of overarching interdisciplinary learning goals (see the box below).

PKAL Undergraduate Learning Goals

As a result of intentional interdisciplinary learning experiences, students will be able to:

- Recognize disciplinary strengths, processes, limitations, and perspectives.
- Purposefully connect and integrate knowledge and skills from across disciplines to solve problems.
- Synthesize and transfer knowledge across disciplinary boundaries in the context of novel situations.
- Be agile, flexible, reflective thinkers who are comfortable with complexity and uncertainty and can apply their knowledge to respond appropriately and positively.
- Understand that a host of factors— cultural, political, ethical, historical, and economic— must be considered when addressing the complex problems of this century.
- Understand the universal nature and deep structure of science, as well as the relationship of the disciplines to each other.
- Be prepared for future learning as lifelong learners in their careers and as citizens.
- Apply their capacity as integrative thinkers to solve problems in ethically and social responsible ways.
- Think critically, communicate effectively, and work collaboratively within diverse cultures and communities.

Campuses undertaking this process can use the list as a starting point. Once they develop interdisciplinary learning goals particular to their campus and that they can own, faculty should distribute them widely to different stakeholders, both

within and outside of the institution (e.g., alumni and employers). The broader the support for the goals, the more likely it is that there will be backing for the programs and curricula designed to produce interdisciplinary learning. As one team leader commented,

Interdisciplinary learning, because it is new, needs a broad-based buy-in just in case a set of individuals starts to question our learning goals. When a set of faculty start questioning, it is a lot harder for them to challenge our goals if there is broad buy-in by students, alumni, and other campus colleagues.

It also helps if faculty change agents connect the goals to the institutional vision, mission, and strategic plan. For example, faculty at one institution knew that its strategic plan focused on connecting more to the local and regional area. Thus they emphasized how interdisciplinary learning could support community engagement through efforts to clean up the environment, understand and address poverty, encourage organic farming, forge better human services, enable economic development, and protect endangered animals.

Faculty leaders also need to mobilize people around the concrete changes that are needed in order to facilitate interdisciplinary learning. Most important, they should examine current curricula and pedagogical approaches to assess their capacity to do so, then explore what might replace the less successful ones. For example, co-teaching might be encouraged or faculty development programs initiated to help faculty engage students in problem-based learning. In that process, learning goals should be linked to assessment measures to ensure that the new teaching and learning strategies are effective.

Recruitment

A final step in mobilizing faculty and staff to create interdisciplinary learning experiences for students is to develop a critical mass of faculty who support the change. Many early interdisciplinary learning initiatives were built on the interest of a few faculty members who created an environmental studies program or a minor in poverty studies. While these efforts led some faculty to teach in new ways, they did not engage the large numbers necessary to reach many students with interdisciplinary learning experiences.

While not all faculty need to participate, having a critical mass of individuals across multiple departments who are supportive of interdisciplinary learning makes it easier to get curricular changes through curriculum committees, gain support for hiring interdisciplinary faculty, and obtain funding to support pilot initiatives. Having faculty who understand and are willing to support such initiatives is necessary groundwork for the implementation phase.

PKAL was able to foster the development of that critical mass of faculty by suggesting that campuses inventory existing interdisciplinary efforts, create an informal network of the faculty involved, and provide them with mentoring and development opportunities. A faculty member at one participating university described the importance of networks:

In the past, isolated interdisciplinary efforts had some success; some are even still on campus, but others waned over time. As we talked about bringing interdisciplinary work to a broader scale, we recognized that it was important to connect different faculty across campus that were doing interdisciplinary work, and this would begin to create a critical mass. Next we used dialogue to bring in other people.

Our survey of campuses found that a strong campus team was the number-one strategy for moving forward. One leader described how they built such a team: "Part of it is that we strategically choose people from different areas and with different expertise and background. But the leadership development and support from PKAL was instrumental helping these members to understand vision development, team building, and leadership and change strategies."

High-functioning teams had similar characteristics: They had regular interactions, documented their progress, created an

open and experimental mindset that fostered innovation, and had a fluid and interdisciplinary membership. In several cases, campus teams added members after the learning goals of the program were established because they realized they needed additional disciplinary expertise.

IMPLEMENTATION

Once faculty have been mobilized through cross-campus dialogues regarding interdisciplinary learning goals, curricula, pedagogy, and assessment; a strong campus team is in place to drive the initiative; and a critical mass of faculty support interdisciplinary learning, then faculty can move to implementation by obtaining resources, adjusting campus processes and policies, developing incentives, creating pilot courses and programs, and assessing student learning.

Resources

The PKAL participants recognized that departments could feel threatened by interdisciplinarity: “In these lean times, there is competition for funding, and any initiative that threatens to take resources is a threat to the mainstream curriculum and is typically viewed with suspicion. This is one challenge we knew we would face,” said one. Departments vie among themselves for resources (money, faculty time, facilities, etc.), and they may see interdisciplinary programs as just another competitor.

And indeed, in the post-project survey, “competition with department interests/needs – disciplinary turf” was still seen as a significant barrier to interdisciplinary work, albeit a less significant one than originally anticipated (81.3 of participants agreed with the statement at the beginning of the project; 62.5 percent did so at the end). Departmental teaching obligations were a major impediment to freeing up the time for interdisciplinary teaching (84 percent of participants thought that release from those obligations was “difficult” or “very difficult” to negotiate, both at the beginning and the end of the project).

But campus leaders recognized that there were ways to address this issue. In order to reduce the expense and amount of faculty time devoted to team teaching, for instance, some campuses created policies that within three years one faculty member should have developed the expertise to teach the course. Another approach was hiring faculty with interdisciplinary backgrounds who could do that from the beginning.

But there is no doubt that a lack of resources can constrain new initiatives: Three-quarters of the participants identified that lack as a major barrier both at the beginning and end of the project (although, interestingly, the 56.2 percent of faculty who, at the beginning of the project, thought that “inadequate facilities” would hamper their efforts had dropped to 37.5 percent by the end). Interdisciplinary efforts may have to create at least some resource-neutral approaches in order not to jeopardize their chances of moving forward in these resource-constrained times.

However, the survey data and interviews also confirmed that departmental competition can be addressed, both by aligning interdisciplinary learning with institutional goals and through campus dialogue. One team member said, “While competition between departments is a significant issue in bringing interdisciplinary efforts to scale, the work we did with campus dialogues really helped diffuse the departmental resistance we felt in the past.” When they entered the project, three-quarters of the participants did not feel sanguine about such campus-wide discussions occurring; that percentage had dropped to 31.3 by the end.

And there was some external funding available to support pilot programs and courses or for research to analyze learning outcomes. A member of one university team discussed this issue: “We knew that if we wanted to get this project off the ground that leveraging some outside funding would be extremely helpful. Funding isn't as important at all campuses, but at a large research university we found it was critical to implement our initiative.” External funding not only enables the work—it also sends signals about its importance in the larger higher education universe.

Policies and Processes

Implementation of interdisciplinary programs requires an amount and kind of attention to campus policy and infrastructure issues that most project teams did not anticipate. For instance, some participants talked about their initiatives stalling within curriculum committees:

Interdisciplinary efforts may have to create at least some resource-neutral approaches in order not to jeopardize their chances of moving forward in these resource-constrained times.

We submitted our new ID learning courses to the campuswide committee. We didn't hear anything for a year, and when we inquired we were told that they didn't have any templates or tools to evaluate our courses as submitted. They said they been working to create different guidelines and just hadn't been able to get support from anyone. We should have anticipated that this could be a dilemma and we could have developed guidelines. Our task force got extremely frustrated and after year and a half of sitting around waiting for a response, people dropped out of the group. We were worried we might not move anything forward.

One group of faculty described the difficulty in hiring some interdisciplinary colleagues because the search committees did not know how to evaluate their credentials. The next year they developed a set of guidelines for interdisciplinary hires, and the process went more smoothly.

Incentives

At both the beginning and the end of the project, two-thirds of the participants considered an absence of incentives and rewards to be a significant impediment to change. Most campuses focused especially on the need to revise their guidelines for tenure and promotion in order to make lasting progress; many used the recommendations of the Council for Environmental Deans and Directors as a starting point (<http://ncseonline.org/CEDD/cms.cfm?id=2042>; Also, see Pfirman, Collins, Lowes and Michaels [2005]).

Incentives for continued involvement in interdisciplinary initiatives were key to the success of those initiatives. A faculty member at one university talked about this issue on her campus:

While you can get an interdisciplinary initiative off the ground with the passion and inspiration of a set of faculty, you can't sustain it on their passion. Lots of the senior faculty talk about interdisciplinary initiatives that have come and gone, and many do not recognize that a lack of incentives is part of the issue. Over time, people burn out if there is no support for the work. So we're really grappling with how to make this much broader interdisciplinary initiative have the type of incentives behind it that will maintain people over the long run. This is even more important for junior faculty members who are still going through the process of tenure and promotion.

Beyond acknowledgment in annual reviews or promotion and tenure decisions, project participants named as important incentives course release, additional money for course creation, full credit for team teaching, and recognition at annual events and in campus publicity. Since monetary incentives can be challenging to come by in these tight budget times, others mentioned non-cost strategies. In order to relieve any one person of too much work, on one campus they came up with another solution: to “involve people through short-term task forces where they feel their time is being well spent.”

Assessment

A critical implementation step on many campuses was the creation and study of an experimental course to fine-tune practices. Such a course creates the opportunity to demonstrate what interdisciplinary learning looks like from week to week

and throughout the semester, demonstrate new types of assignments, allow faculty to observe different pedagogical styles, and assess (for purposes of comparison) learning outcomes in both interdisciplinary and traditional courses.

Several faculty were able to demonstrate that students learned more on a variety of measures in their interdisciplinary courses, which legitimated them. Ongoing assessment can provide data that demonstrates how interdisciplinary courses can foster the kinds of learning that complement disciplinary objectives.

But assessment is a major challenge in the implementation process, since it does not come easily to many faculty members. One participant described the problem and how the faculty network helped solve it:

As higher education faculty we're not good about measuring student outcomes in general, and measuring interdisciplinary learning objectives becomes even more complex. It really helped to be part of this network so that we could exchange ideas about how to measure interdisciplinary learning goals, as well as familiarize ourselves with existing instruments that might be used.

Other outcomes may also come out of the pilot course. One faculty member spoke about the value of creating pilot courses in terms of recruitment into the major:

I think one of the best strategies we used was the creation of a course that was a laboratory for us to try out the ideas that came up our campus team. Also, several students in our course were non-science majors but changed to be science majors after our interdisciplinary course. When we compare this to the other courses, they were not having the same effect of getting students to change their majors to science. We disseminated those results widely, and this data has been one of the best supporters for implementing interdisciplinary work. We are really actively trying to get more students into STEM majors, and this seems to be one way to do it.

Assessment Instruments

National Survey of Student Engagement (NSSE)

Faculty Survey of Student Engagement (FSSE)

Collegiate Learning Assessment (CLA)

Biology Self-Efficacy Scale

Science Literacy Scale

Self-Determination Scale

Views about Science Survey (VASS)

Summer Undergraduate Research Experiences (SURE)

Classroom Undergraduate Research Experiences (CURE)

Research on an Integrated Science Curriculum (RISC)

Student Assessment of Learning Gains (SALG)

Field-Tested Assessment Guide (FLAG)

Course evaluations/student evaluations of faculty

Embedded exam questions

Higher Education Data Sharing (HEDS) and other institutional data (e.g., course/program retention)

Association of American Colleges & Universities (AAC&U) VALUE rubrics

INSTITUTIONALIZATION

As of this writing, most of the project teams are implementing their interdisciplinary learning initiatives; few have reached the phase of institutionalization. That process takes five to ten years, and most projects have only been going for three. Yet some of the campuses have made strides towards institutionalization, and the lessons they have learned may be helpful to other institutions.

Integration

If interdisciplinary work is to become part of the regular work of campuses, then it needs to be integrated into day-to-day processes besides promotion and tenure review, mentoring, faculty development, and the like. Fundraising, facilities planning, budgeting, program review, strategic planning, and accreditation are all areas in which the PKAL campuses encountered barriers that stalled their efforts.

Campus teams in the post-program survey cited a lack of appropriate administrative processes as one of the most important barriers. Some used strategic planning or accreditation as opportunities to bring up problems that they were encountering in realizing the promise of interdisciplinary learning. As one faculty member said,

The self study process allows us the opportunity to more fundamentally rethink our functioning, and that is a very hard awareness to penetrate. You have to capitalize on these few opportunities where the institution is consciously thinking about its functioning.

As alluded to in the implementation section, campuses that made the most progress had evaluated various departmental and institutional policies and noted where they were unsupportive of interdisciplinary work so they could be modified to facilitate it. Changing campus processes is one of the most difficult aspects of interdisciplinary work, and many campuses are still in the process of making those changes.

Legitimization

Another critical step towards institutionalization is transforming departmental cultures so that they value interdisciplinarity and do not see it as a threat to disciplinary learning. The early conversations about interdisciplinarity begin to foster respect for the work, yet much more is needed to demonstrate its legitimacy.

One strategy is to bring in high-prestige outside speakers. As one PKAL participant commented, “We had a series of outside speakers come to our campus and that made all the difference; suddenly we (the interdisciplinary initiative) were more legitimate. They were also very inspirational to people in a way, we (on campus) were not able to be.” Some guest speakers that PKAL brought in to reshape campus attitudes were James Collins (Arizona State University), Jay Labov (the National Academy of Sciences), Wanda Ward (the National Science Foundation), Stephanie Pfirman (Barnard College), Jose Mestre (University of Illinois, Urbana Champaign), and Karen Kashmanian Oates (Worcester Polytechnic Institute). (See the PKAL project website at <http://www.aacu.org/pkal/interdisciplinarylearning/index.cfm> for other suggestions.)

The experimental courses and learning outcomes assessment created further evidence about the value of interdisciplinary work, especially when linked to institutional goals. Thus, all the earlier strategies culminate to create institutionalization over time.

KEY LESSONS

Leadership

Recently, *interdisciplinary* has become a term that can be seen in the strategic plans of a host of campuses, so campus leaders are increasingly acknowledging its importance, at least in theory. But most interdisciplinary efforts originate when a few faculty members coalesce to create a course, minor, or program of study. Many project teams bemoaned the lack of support from their campus administrations as they tried to initiate interdisciplinary work.

Few colleges have worked from both the bottom up (capitalizing on faculty interests) and the top down (providing support from the administration) in promoting such efforts. For interdisciplinary work to come to scale, we need both kinds of leadership. While top-down support can make interdisciplinary work happen more quickly, teams cautioned that unless there is buy-in from the faculty, interdisciplinary work is not likely to be sustained.

Many PKAL teams described the importance of allowing faculty to initiate conversations and experimental courses so that interdisciplinary work does not seem imposed. One campus team credited its success to an initial buy-in from faculty that was followed by support from the administration.

It is significant that half of project participants anticipated that a “lack of coherent leadership vision” would impede their progress, whereas by the end of the project, none said that it had. Nevertheless, senior administrative turnover became a problem on campuses that experienced a shift in deans, provosts, and presidents. However, sharing leadership widely was a way to ensure that there were enough players to continue the effort. One participant commented on the importance of this leadership model and how to create it:

Distributed leadership really accounts for how we successfully created change. All units involved in the interdisciplinary general education project are part of a network of individuals working to transform the curriculum. The reason it helps so much is that the distributed leadership spreads out the workload of such a massive project and creates a representative group of people that can ensure that the various cultures and language of different disciplines are respected in the change process. We built the network over time because we had worked on many earlier interdisciplinary initiatives and so there was an existing group of natural champions and leaders for interdisciplinary work. While we had that network, it can also be built on campuses that do not have it.

Barriers

An important lesson from this project is that institutions tend to overestimate barriers and that this overestimation can be a deterrent to action. When we interviewed campus teams at the end of the project, they noted that they had become better judges of the real barriers (perhaps as a result of the discussions within PKAL-sponsored meetings) and less anxious about ones that did not exist or were not as high as expected. A faculty member commented on this issue:

There is a propensity to think that the resistance will be stronger, but really people are so busy in many different directions that it is less than expected. Each campus in the project also got better at recognizing and anticipating what the barriers would be for their campus. I guess the lesson is to not firmly believe you know what the barriers or resistance might be; the administration might make it a priority even if you think they will not. You do need to manage challenges, but you have to realize you may not know

exactly what they are at the outset.

We have mentioned the most significant barriers in the course of this article: departmental resistance and competition, a risk-averse culture, a lack of resources, and an absence of incentives. But with deliberate attention and persistence, most campuses found ways to overcome them.

Surmounting Barriers

- Ensure that interdisciplinary programs have the same rights and responsibilities as disciplinary programs, from program approval to program review.
- Ensure that interdisciplinary faculty and/or program directors are present at budget and other institutional planning and governance meetings.
- Create transparent financial policies, including criteria for how budgets are established and reviewed; align program aims with needed resources.
- Create governance documents or memoranda of understanding to make explicit the structural support and resources that interdisciplinary programs have.
- Visibly support interdisciplinary projects with travel funds, meeting space, and course release/reassignment; ensure that administrative leaders attend interdisciplinary project planning meetings.
- Funnel indirect costs recoveries from interdisciplinary grants to interdisciplinary faculty development or interdisciplinary team teaching.

Networks

Campuses capitalized on both on and off-campus networks to create support for interdisciplinarity. Earlier we noted that successful change agents map other interdisciplinary efforts and connect to related work. Beyond the ones on campus, national networks can inspire and inform change. Through participation in the PKAL network, the project campuses learned about change strategies, leadership approaches, and barriers to avoid or surmount. While the formal project has come to a close, the PKAL network is still here to support these campuses and others developing interdisciplinary programs, as well as programs that significantly improve the learning and achievement in undergraduate STEM fields.

In the words of one faculty member, “The network kept us focused on key strategies, made us attuned to ways to overcome barriers and not to get overwhelmed. Hearing other people were able to do it, made you believe you could as well.” We invite you to visit the PKAL website for additional details on this project, including a summary report of key strategies and campus case studies, and to take advantage of its on-going events and resources

RESOURCES

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