11-1-2019

EMPOWERING SUSTAINABILITY LEADERS: VARIATIONS ON A LEARNING-BY-DOING THEME

Karen Bieluch
University of Maine

Bridie McGreavy
University of Maine

Linda Silka
University of Maine

Aaron Strong
University of Maine

David Hart
University of Maine

M LIBRARIES

CONTENTS

DEVELOPING CHANGE AGENTS

1.

EMPOWERING SUSTAINABILITY LEADERS: VARIATIONS ON A LEARNING-BY-DOING THEME

Karen Hutchins Bieluch; Bridie McGreavy; Linda Silka; Aaron Strong; and David D. Hart

Karen Bieluch, Assistant Research Professor, University of Maine; Practice-based Learning Specialist, Dartmouth College

Bridie McGreavy, Assistant Professor, Department of Communication and Journalism,

University of Maine
Linda Silka, Senior Fellow, Senator George J. Mitchell Center for Sustainability Solutions, University of Maine
Aaron Strong, Assistant Professor, School of Marine Sciences, University of Maine
David Hart, Director, Senator George J. Mitchell Center for Sustainability Solutions, Professor, School of Biology and Ecology, University of Maine

The complex character of sustainability problems calls for new forms of leadership. Traditional academic training—with its emphasis on the accomplishments of independent scholars, the advancement of individual disciplines, and the production of new knowledge—is ill-suited for addressing emerging sustainability problems that require interdisciplinary collaboration, engagement with diverse stakeholders, and an integrated focus that combines problem characterization with the development of adaptable solutions (Irwin et al., 2018). As a result, traditionally trained academics often lack the necessary skills and practical experience needed for tackling wicked problems (Kreuter, De Rosa, Howze & Baldwin, 2004; Rittel & Webber, 1973).

The Senator George J. Mitchell Center for Sustainability Solutions (at the University of Maine (UMaine)), together with partners in academia, government, the private sector, and civil society, aspires to address this leadership challenge by providing graduate students with opportunities to conduct team-based, solutions-oriented research, thereby preparing them to act as change agents in our increasingly complex world. The Mitchell Center's approach recognizes that one's ability to lead in these multifaceted partnerships depends on one's competencies (e.g., thoughtful listening, reflexive communication, boundary spanning) and state of mind (e.g., desire to learn, willingness to take risks, tolerance for ambiguity). While the authors see leadership as an individual competency that can be nurtured, we also see leadership as a condition of the organization itself, and we work to create leadership-rich organizational environments (Crona & Bodin, 2012; Marion & Uhl-Bien, 2001).

This understanding of sustainability leadership guides the Mitchell Center's graduate training approach. Graduate students are first embedded in interdisciplinary, stakeholder-engaged teams to conduct their research. Each team is part of a broader network of teams that is addressing a variety of sustainability challenges in Maine and beyond. In some ways, being embedded in a team and partnership is a more important part of training than the specific challenge being addressed. Concurrently, graduate students take part in coursework along

with formal and informal training that strengthens their leadership capacity and enhances student learning in their research teams. This is accomplished by 1) providing theoretical and practice-based information on collaboration, shared decision-making, and science communication, among other topics; 2) promoting reflection and a critical analysis of one's experiences with both interdisciplinary and transdisciplinary research (Lang et al., 2012), and 3) developing specific skills such as mixed-methods research, facilitation, communication, and participatory approaches to enhance real-world decision-making. In our experience, these are crucial skills for sustainability scientists. Further, these skills are often not taught in traditional disciplines, thus other ways to facilitate this learning are needed.

In collaboration with faculty, staff, community partners, and program alumni the Mitchell Center has developed and refined this training approach over the last decade, helping train more than 200 graduate students. The authorship team of this chapter reflects our approach to leadership development. For example, Karen Bieluch and Bridie McGreavy entered the Sustainability Solutions Initiative (SSI), a program run through what is now the Mitchell Center for Sustainability Solutions and made possible through a Track 1 grant supported by the National Science Foundation, as students and are now leading the development of a chapter that reflects our approach to leadership training. This is just one example of the synergy between the training approach and the organizational culture and how it strengthens our ability to evaluate and refine our leadership development practices. We emphasize, however, that the Mitchell Center's approach should not be viewed as a model for graduate sustainability leadership development that can be strictly replicated (i.e., applied in exactly the same form in any university setting). Instead of *adopting* the described approach as a fixed strategy, the focus should be on *adapting* the approach: taking the overarching strategies we have described and adapting the approaches to your context, your situation, your students, and your system. Although it is a complex and often ambiguous journey, doing this builds the individual and organizational attributes needed for sustainability.

At every stage of our journey, we have drawn insight and inspiration from the wisdom of visionary systems thinkers (e.g., Meadows, 2001, 2008). In that spirit, we offer an introspective and adaptive set of reflections about the Mitchell Center's journey in hope that we can help others grow their capacity to train the next generation of sustainability leaders.

Background

Developing sustainability leaders is a core component of numerous sustainability science

programs across the United States, yet, definitions of what leadership looks like in sustainability science remain relatively undeveloped (Shriberg & MacDonald, 2013). Unlike traditional notions of leadership, leadership in sustainability does not mean that one individual dictates the direction of the group by using single-person decision-making models, for example. In fact, it is nearly impossible for a traditional model of leadership to work to advance sustainability because the systems involved in the problems are so deeply intertwined and involve groups with diverse interests, knowledge, values, capacities, and power. One person trying to lead a knowledge-to-action process would likely fail because sustainability issues can only be addressed long-term through collaborative decision-making. Further, the inherent complexity of the systems in which sustainability scientists work and the problems of focus indicate that any sense of control, especially attempts to control decisions on a project, will be limited at best. Thus, effective sustainability leaders are characterized by their ability to work in teams and to value diverse forms of knowledge; by their willingness to cede control so others can take charge of various aspects of the work, such as solutions development, rather than having central control; and by their interest in learning from and listening to others. Given these essential skills and approaches, aspiring sustainability science leaders must not only learn how to collaborate but also how to advance the group, a project, or a solution.

Although focusing on leadership development in individuals is critically important – history demonstrates that individuals can have a dramatic impact across group, organizational, and geographic scales – a focus on the individual does not mean there is one right way to lead. In contrast, effective leadership training seeks to help people identify how they can hone their unique interests and skills – and those of others – and promotes a sense of agency in applying the skills to a group or to solving sustainability problems. For example, empirical research on leadership in complex organizations shows that diverse forms of leadership are essential for understanding and advancing solutions to vexing problems (Folke et al., 2002; Gunderson, Peterson, & Holling, 2008), a process that can complement and extend individual visionary leaders (McGreavy, Calhoun, Jansujwicz, & Levesque, 2016). People who are able to identify and craft workable solutions to a myriad of problems; those who can easily connect across differences in perspective, institutions, and other social constructs; those who are media savvy and effective communicators; and those who attend to intuition, emotion, and artistic expression all have vital roles to play and may all be considered leaders.

In addition to being a skill or attribute ascribed to an individual, leadership is also a condition of existence in any place, organization, institution, or culture (Marion & Uhl-Bien, 2001). For example, the work at the Mitchell Center is, in part, made possible because of the leadership

culture of Maine (see Maine Policy Review *Special Issue on Leadership*, 2018). Leadership constructs are prominently exemplified in the narrative of the state, including in the state motto, *Dirigo* ("I guide"), and in the actions of key political leaders (e.g., Senators Margaret Chase Smith, Edmund Muskie, George Mitchell) who used their skills to advance policies for equity and environmental protection. Further, the culture of home-rule, in which Maine municipalities are able to self-govern, helps foster leadership-rich communities in which citizens become actively involved in town and state government. Finally, as the only doctoral degree-granting institution, UMaine is the flagship institution for the state. As a public university and a Land and Sea Grant college, UMaine has a unique status since many citizens either graduated from UMaine, know alumni, or have benefitted from the services that the institution provides.

In an effort to align our leadership development activities with these cultural contexts, we conducted research to identify leadership characteristics that enhance the problem-solving capacity of sustainability science teams. Our organizational research revealed that teams who use a collaborative decision-making model realize outcomes such as continued progress towards identified goals and satisfaction with the collaboration, whereas teams that use a single decision-making model do not (McGreavy et al., 2015). Thus, to make sure students were ready to work in communities with strong principles of local control and in research teams with shared decision-making models, we provided communication training that focused on interactional competencies such as group decision-making. We also emphasized how our work is connected to and engages with the community, rather than solely viewing it for its scientific enterprise. This perspective was necessary for working within a land-grant institution, but it also aligned with our approach to sustainability science (Hart et al., 2015; McGreavy & Hart, 2017).

The Mitchell Center Approach and Outcomes

So, what leadership training approaches and organizational development have worked at UMaine and how are they sustained? There were several influential choices made during the early development of the Mitchell Center that created a sense of mission, especially as it relates to transforming the traditional academic culture at UMaine and beyond. These structural, programmatic, and pedagogical choices led us down a path to securing a large National Science Foundation grant which helped us build capacity for advancing and innovating graduate training in sustainability. While we have experienced setbacks and tried things we may not try again, we have learned and adapted along the way, leading to numerous successes. In this section, we discuss some of the choices, strategies, and outcomes of the

Center's approach.

Structural, Programmatic, and Pedagogical Choices

Addressing sustainability problems and developing solutions requires that academics work across disciplines and with community stakeholders and partners at the local, state, national, and international levels to ensure that the strategies developed are viable for understanding complex problems and identifying usable solutions (Clark, van Kerkhoff, Lebel, & Gallopin. 2016; Whitmer et al., 2010). The barriers that stand in the way of such an approach and the need for focused planning are significant (McCoy & Gardner, 2012). Some of these barriers include working to address issues regarding who controls which courses are offered, what courses graduate students are allowed to take, how faculty are rewarded or "punished" if they work with others outside their fields, and what happens if faculty engage in teamwork where individual responsibility is not easily discerned (McCoy & Gardner, 2012).

Many academic programs, including interdisciplinary ones, have trouble crossing such divides. Recognizing these barriers, the Mitchell Center took a different approach to mobilize broad-based institutional change in our graduate student training. Together, with a diverse array of faculty and key leaders in UMaine's senior administration, we developed a shared vision that stated that our efforts could not be successful without the participation of faculty and students from many different schools and departments in an interdisciplinary research center, rather than through individual departments or by way of an administrative edict. Nationally, research centers are exploring the role of becoming agents of institutional and academic change (Silka, 2001). Several factors contributed to the success of our center-focused strategy: 1) interdisciplinary collaboration is more common in UMaine research centers than in traditional departments; 2) UMaine centers are less likely to be viewed as competitors with academic departments, especially if departments benefit from increased recognition and expanded funding made possible by a center; 3) centers can provide significant support to faculty and students at low or no cost, including the development of major research proposals, administrative support for major grants, etc.; 4) centers can promote a risk-tolerant culture that allows for trial-and-error and learning-by-doing; and 5) centers can help raise university-wide awareness of and support for stakeholder-engaged, solutions-driven, interdisciplinary research, thereby enhancing the professional success of faculty and students.

Senior leadership at the Mitchell Center launched the program via a faculty-led, 'grassroots' initiative in which students and faculty sought to hone their skills in researcher-practitioner

collaboration and interdisciplinary teamwork. Senior leadership at the Mitchell Center and other key campus leaders supported the initiative via advocacy, convening, team building, facilitating, and grant writing roles. An interdisciplinary team of interested scholars (senior leaders, faculty, staff, and students) involved with the Mitchell Center identified and embraced a set of core values that helped shape the Mitchell Center's distinctive organizational culture (Hart, 2018). Beginning in 2007, the Mitchell Center used a peer-review process to fund small-scale, pilot projects that helped interdisciplinary research teams gain experience working with stakeholders. Some reviewers were experts in researcher-practitioner collaboration, which helped strengthen alignment between researcher interests and stakeholder needs. In 2009, we received a major grant from the National Science Foundation that helped support 20 interdisciplinary teams of students and faculty working in a wide range of sustainability partnerships including projects focused on municipal planning, forest management, climate adaptation, and renewable energy (e.g., Hart et al. 2015). The initiative was named the Sustainability Solutions Initiative (SSI) and it led to the creation of the Mitchell Center for Sustainability Solutions in 2014. This large-scale grant provided opportunities for faculty and graduate students from more than 20 different academic disciplines to become acquainted and bring their areas of expertise together to address sustainability problems.

One of the cornerstones of our approach was a 'learning-by-doing' mindset, which reflected the idea that we would be blazing new trails and that we were sure to get disoriented or completely lost along the way. Whenever possible, we framed this work as "pilot projects," projects that provided interdisciplinary research teams and their stakeholder partners room for trial and error. Many teams have expressed appreciation for the way our funding allowed them to take risks and learn from mistakes. An important way we have come to think about our program is how much it is like jazz. In jazz, you start with a plan and work together but also prepare to improvise around the plan together (Wilson, 1992). In our sustainability research, students may work on sea-run fisheries but then connect to projects related to vernal pools, clam harvesting, or dam removal. Students learn how to collaboratively plan and improvise when enacting those plans. This is not something that academics normally think about. They often think students need to be trained to be precise in following an exact set of protocols. Our experience has shown that this training does not work when it comes to solving complex sustainability problems. It is crucial that students learn how to adapt and keep the overarching goals but also how to improvise reaching those goals if needed.

Teaching for Sustainability Science Commitments

Sustainability science emphasizes that the need to develop problem-solving abilities, communicate across disciplines and forms of expertise, and think in terms of complexity (e.g., cross-scale connections between processes and patterns) are key focal points in learning (Brundiers & Weik, 2017; Clark et al., 2016). To achieve the competencies required in graduate education, the Mitchell Center and its partners have employed several innovative education approaches that step outside the traditional format of semester-based courses. For example, we have offered several 1-week intensive courses during winter and spring breaks where experts from diverse academic, governmental, and non-profit organizations taught students about new sustainability science methods such as conservation action planning and the theory and practice of boundary spanning work. We also offered one-on-one, directed research-focused courses that enabled students to work closely with faculty mentors to co-design coursework that met interdisciplinary training needs more fully. One such example was a directed readings course in applied science communication that filled gaps in the curriculum and served special program needs. Finally, we offered interdisciplinary courses that were team-taught by faculty involved in various sustainability projects. These types of innovative courses did several important things for students. First, they provided them with high-quality opportunities for learning to co-produce knowledge and projects, connect with stakeholders, and link course content with 'real-world' action. Second, these courses had built-in activities and discussions that helped develop competencies such as thoughtful listening, reflexive communication, and boundary spanning. For example, in a course focused on building community-university partnerships, students worked within teams and existing partners to develop a webinar and resource library that enabled partners to share important resources, such as templates for partnership agreements, and, at the same time, build capacity to follow best practices within their existing partnerships. To achieve these course objectives, students had to practice the above competencies rather than just learn about them as abstract theories. This fostered an understanding of the complexity of these relationships and helped them identify strategies for working through them. Finally, these courses filled a critical gap between students' disciplinary training and the interdisciplinary and sustainability science training they desired – and often needed – for their research (Meyer et al., 2016).

Perhaps one of the most powerful processes in the Mitchell Center approach is the co-production of courses among faculty and students. The act of co-production encouraged students to take ownership of their learning in ways not typically required in a traditional classroom. It also required faculty to 'let go' of their role as experts as they learned alongside students and other faculty. Unlike a traditional classroom, students were involved in conversations about how to work together and how to combine different disciplinary

approaches. They also experienced, first-hand, the challenges and uncertainties of trying to work across disciplines. These conversations happened in teams and in the classroom rather than behind closed doors in faculty offices and faculty meetings. These experiences helped students see that neither their discipline(s) nor science, as a whole, are black and white; that knowledge is socially constructed; and that there are multiple ways and opinions about how to approach a given topic. This taught certain flexibility in thinking that helped students develop the necessary state of mind needed for doing sustainability work. It also helped them develop essential skills for working in transdisciplinary teams such as collaboration, communication, and linking different forms of knowledge to conduct research and develop solutions.

Another key program feature is learning to work with stakeholders. Learning-by-doing is useful in this process and is a necessary commitment because charting a path to effective partnerships is not always a clear or simple process (Silka, 1999). This is especially true when the context is unfamiliar, or the relationships are newly forming. However, commitment to learning-by-doing also requires deep engagement, research on local histories, and a reading of the literature that provides guidance on forming partnerships in effective, ethical, and lasting ways. The literature on engagement and community-university partnerships has been especially helpful in identifying guiding commitments and practical techniques (Israel, Schulz, Parker, & Becker, 1998; Trickett & Espino, 2004; Van de Ven, 2007). For example, Israel and colleagues (1998) described a set of overarching principles for partnership formation and development. They recommended starting with the perception that a community is a unit of identity as opposed to a distinct location. This perception matters because, as researchers, if we enter into a community with preconceived notions about what or who defines the community without going through the process of generating a sense of community identity with the partners themselves, we run the risk of excluding people from the outset. Further, partnerships need to strive for collaborative research in all phases of the process, especially if partners identify this as important to them, while also accepting that not all partners may want to be engaged in the entire process (Bieluch et al., 2017). Collaborative research should seek to connect with and build upon the needs and strengths of the community in ways that promote the health and interests of the community that the work is connected to (Israel et al., 1998). These broader commitments can help guide the use and adaptation of best practices or collaborative techniques such as the development of Memorandums of Understanding (MOUs) and data management plans (Silka, Cleghorn, Grullon, & Tellez, 2008). Structured approaches can help provide specificity regarding the roles and responsibilities of key partners and what data sharing and reciprocity will mean in practice and are especially important in colonial contexts (Harding et al., 2012; Simonds & Christopher, 2013).
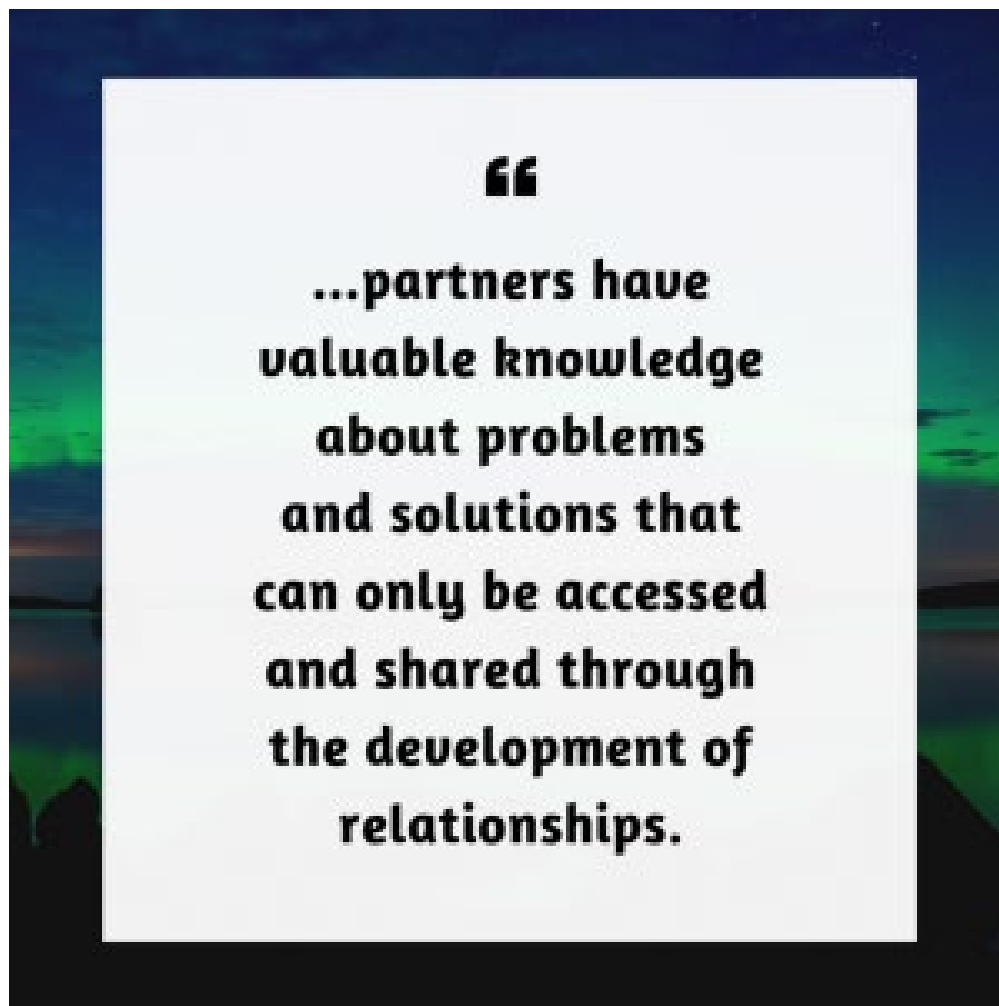
These partnership complexities and the need for directed learning regarding how to form partnerships could easily make someone steer away from wanting to work with partners. However, when students enter into these partnerships in a listening mode, leading with more questions than answers, they are likely to realize the utter necessity of forming partnerships to identify how to more meaningfully address problems that are of mutual concern. Said another way, partners have valuable knowledge about problems and solutions that can only be accessed and shared through the development of relationships. In many cases, their form of expertise, whether it be local, traditional, managerial, or governmental (Feurt, 2009), does not typically reside in libraries and computer databases. Learning to work with partners is also a process of learning the limits of our own knowledge about the world and potentially strengthening a sense of humility in light of this recognition (Newell, 1994).

In this literature, we have introduced our process, our approach, and some of our pedagogical choices for training graduate students in sustainability leadership. However, how do we know this approach works? How can other higher education institutions use parts of or all of this approach? To help answer these questions, we focus on the perspectives of early career

faculty and researchers who were either trained at the Mitchell Center and/or conducted research with them in faculty and research positions. We focus on these individuals because they are the future – they are the ones carrying this forward into the future. They are essential for shifting cultures and for transforming the ranks of the academy.

Reflections on Program Outcomes

Karen Bieluch, Bridie McGreavy, and Aaron Strong were provided with interdisciplinary sustainability graduate training during the earning of their Ph.Ds. McGreavy and Bieluch were trained at the Mitchell Center. One is now faculty at the University of Maine (McGreavy) and one is a researcher and administrator at Dartmouth College (Bieluch). Strong was trained in the Emmett Interdisciplinary Program in Environment and Resources at Stanford University. He spent two years as Assistant Professor at the University of Maine as a Faculty Fellow at the Mitchell Center and is now an Assistant Professor of Environmental Studies at Hamilton College. One of the established goals of many interdisciplinary sustainability graduate programs is to provide the next generation of workers in academia, government, and non-profit and private sectors with the leadership skills and acumen needed to bring new insights and actions to help address wicked sustainability problems. Many of the graduates of these programs are now sustainability researchers and problem-solvers in leading institutions of higher education, government, and non-profits. However, it is not necessarily a smooth road to career success. Graduate students walking the sustainability science path frequently hear variations of the following refrain, "But you'll never get a job in academia…what kind of department will hire you?," or our personal favorite, "But, *what* are you?," as if being a human being who is an interdisciplinary sustainability researcher makes them not quite as human as being a human being who is an economist or an anthropologist or an ecologist.

While these tropes are still pervasive in many institutions, the rise in the number of sustainability graduate programs over the last several decades means that graduates of programs, like the one at the Mitchell Center, increasingly find themselves in early-career, pre-tenure academic positions – including in places like the Mitchell Center. What are their experiences like? How has their interdisciplinary training in sustainability leadership prepared them to navigate the academy? Reflecting on the ways graduate training has shaped early career academics lives, we offer three key recommendations for graduate students embarking on sustainability careers:

    1. See yourself as a collaborator. First, with training that spans epistemological

boundaries, cross-departmental collaboration has been something that we are not only comfortable with but has also been something that comes naturally and is actively sought out. As an early career faculty, the feeling of being siloed while executing research in a single unit has not been our experience. Rather, from theoretical political ecology to field-based environmental monitoring to use-inspired, community-based research; our training taught us to speak academic languages of multiple disciplines that facilitate collaboration. We became faculty members sought out for masters and doctoral student committees for students in departments other than our home departments. We submit grants with a wide range of collaborators, often in fields that we had little exposure to in our training. While we never quite shake that "What *are you*?" question, or the feeling of not quite having a 'home,' collaboration creates an incredibly rewarding feeling that we all share. But, we do raise a flag of caution. Junior faculty are notoriously stretched thin for time and physical and mental energy throughout academia. Acting as boundary-spanners within their institutions, the very same activities that help break down long-derided walls between academic units create a work-life balance challenge for early career faculty who approach their work from a sustainability science perspective. Thus, we also urge graduate students and early career faculty to proactively identify potential academic obstacles and work with supportive colleagues to mitigate potential professional risks.

2. Develop a flexible toolset. Sustainability researchers come in many flavors. They work on many types of problems often using tools of disciplines ranging from atmospheric chemistry to rural sociology. Despite this diversity, there is a specific toolset that is commonly used: experience and skills in team-based science and community-engaged and participatory approaches to our work. Each of us seeks opportunities to work with communities to co-produce knowledge, from the initial problem framing to the analysis of data and information to the long-term commitment to implementing research-based and creative solutions. Each project is different, but the sustainability science emphasis, creating credible, salient, and legitimate knowledge that leads to action, has provided a common set of approaches to research that we use in our work – whether it is in forests, farmland, oceans, or cities at a global or local scale. While we have common tools, we also recognize the limits of one-size-fits-all approaches since the contexts in which we work, need for information, and structures and relationships that guide participation are inherently diverse. Though we are guided by key commitments from engaged scholarships, such as setting up adaptive agreements to ensure that research processes are equitable and mutually beneficial, we also recognize that things like equity and mutual benefit will differ from one individual to the next and across collaborations. Instead of

'canned' approaches, we use overarching questions such as: How do you understand the problems in your community? What kinds of questions do you have and how could we design a project together to address these questions? What would you need in order to participate and how do you want to be involved in this project? These types of questions help us use engagement strategies and uphold partnership commitments that have been shown to work while at the same time maintain flexibility so that our tools are tailored to a particular situation.

3. Integrate your training, teaching, and research. Teaching future citizens and the next generation of sustainability scholars and practitioners matters. We teach courses to students who come from *all disciplines*. Our training has led us to design syllabi that attract students from the humanities to the biophysical sciences. This creates unique pedagogical challenges but also means that our courses are high-enrollment, problem-solving affairs that ensure that we will continue to train future generations of sustainability leaders. For example, in graduate courses focused on Environmental Communication in the Department of Communication and Journalism at UMaine, students come to the class with an interest in connecting communication with the social and environmental problems they are most concerned about. In some cases, students have never had a communication course before, and they have particular views about what communication means based on their life experiences. Often, perceptions about communication are similar to the constrained ideologies about leadership we described above. They see communication as a simple process of information sharing, crafting effective messages, and delivering clear public presentations. Our training in leadership and sustainability science helps us see the need to start with where students are at in their perceptions, acknowledge the legitimacy of those views, and then create learning processes that open up new meaning and an enriched understanding of how communication can connect with and enhance awareness and praxis around issues that matter to students. This training also helps us accept that practical communication experience is its own form of knowledge; building from this practical knowledge base can make for a rich, interdisciplinary learning environment. In contrast to graduate students that come from applied fields such as ecology, environmental sciences, climate science, and education, students in communication may have been introduced to many theories and ways of thinking about communication while being almost completely isolated from the practical problems of the world. Finding ways to encourage mutual learning enhances the collective education experience, much as it does on interdisciplinary teams.

Sustaining Capacities for Sustainability Leadership Development

One of the most important and difficult challenges in building effective sustainability leadership programs is ensuring that they not only adapt but also endure. After all, we are nowhere close to having a sufficient leadership capacity to tackle the increasingly urgent and complex sustainability challenges we face. Moreover, efforts to solve, or at least reduce, the impact of such wicked problems will likely require decades, if not centuries, of work. If we cannot nurture sustained leadership and commitment, what is the point of starting?

Most of the sustainability programs at universities around the world are far too young to assess their potential longevity. The Mitchell Center is no exception. Nonetheless, we have tried to identify strategies for building programs that are resilient to stresses and shocks, whether from internal or external sources. Here, we briefly highlight several of the strategies in which we are actively engaged:

> **1. Support a variety of leaders and leadership roles.** We believe that effective leadership can take many forms and should subscribe to Lao Tzu's leadership philosophy, which predates the Harvard Business Review by over two thousand years: "When the best leader's work is done, the people say, 'We did it ourselves!'" In practice, this means we encourage students and faculty to take on leadership roles regardless of their discipline, rank, or prior experience. Although seasoned academic leaders warned us of the professional risks that early career researchers would face if they participated in stakeholder-engaged, solutions-driven, interdisciplinary research, we also recognized that many such researchers have a deep passion and commitment to "making a difference" (Sandmann, Saltmarsh, & O'Meara, 2016). Thus, we have worked proactively with early career researchers to identify and minimize these professional risks and are happy to report that all of our faculty have successfully navigated the promotion and tenure process. We are advocates, crisis managers, confidants, and negotiators helping faculty navigate professional passions and academic structures. We view this work as another form of sustainability's commitment to intergenerational equity. In essence, we seek to ensure that the generations of sustainability leaders who follow us are equipped to address the world's future challenges.

> **2. Plant sustainability seeds in multiple locations.** Because sustainability sometimes seems like an all-encompassing endeavor, it may be unrealistic to think it should have a

single 'home' within a university. Although the Mitchell Center has its own building, budget, mission, and vision, the UMaine students and faculty who have participated in our sustainability projects have been drawn from more than 20 academic departments and schools in which they spend most of their time. Many of the faculty are now leading other innovative sustainability projects, including an NSF Research Traineeship grant that will help a new cohort of 25 graduate students gain experience in interdisciplinary research and stakeholder collaboration. In addition to the Mitchell Center's emphasis on graduate student training, we launched a novel partnership with UMaine's Honors College that focuses on undergraduates and has become a national model (Amar et al. 2016). Graduate programs can learn multiple things from this model such as how to work across disciplines, how to work with partners, and how to take a solutions focus. We have also developed sustainability collaborations with 18 other New England colleges and universities that have fostered an "adaptive radiation" of sustainability leadership programs tailored to different organizational and geographic contexts.

3. Build the plane while you're flying it! This fanciful expression, coined in an engaging commercial for a data processing company, adds some levity to the very serious challenge of learning-by-doing, including the need to respond effectively to inevitable surprises and setbacks (Alvarado, 2017). Whether these arise due to shifting institutional priorities, reductions in funding, or getting caught in political crossfire, they have the potential to disrupt or completely derail worthwhile programs. In our experience, efforts to build resilient leadership programs must couple patience and persistence with a commitment to learning on the fly. When we began our work, we launched mixed-methods research projects to identify the factors that facilitate or impede the success of key program components (e.g., interdisciplinary teamwork, stakeholder engagement). More than 40 peer-reviewed papers have now emerged from this research, serving as an invaluable resource as we iterate our way to a more effective program. Despite this wealth of information, this body of empirical work cannot prepare us for all the twists and turns that arise in training sustainability leaders. As Dana Meadows (2001) once said, it is also important to "Stay Humble" and "Stay a Learner."
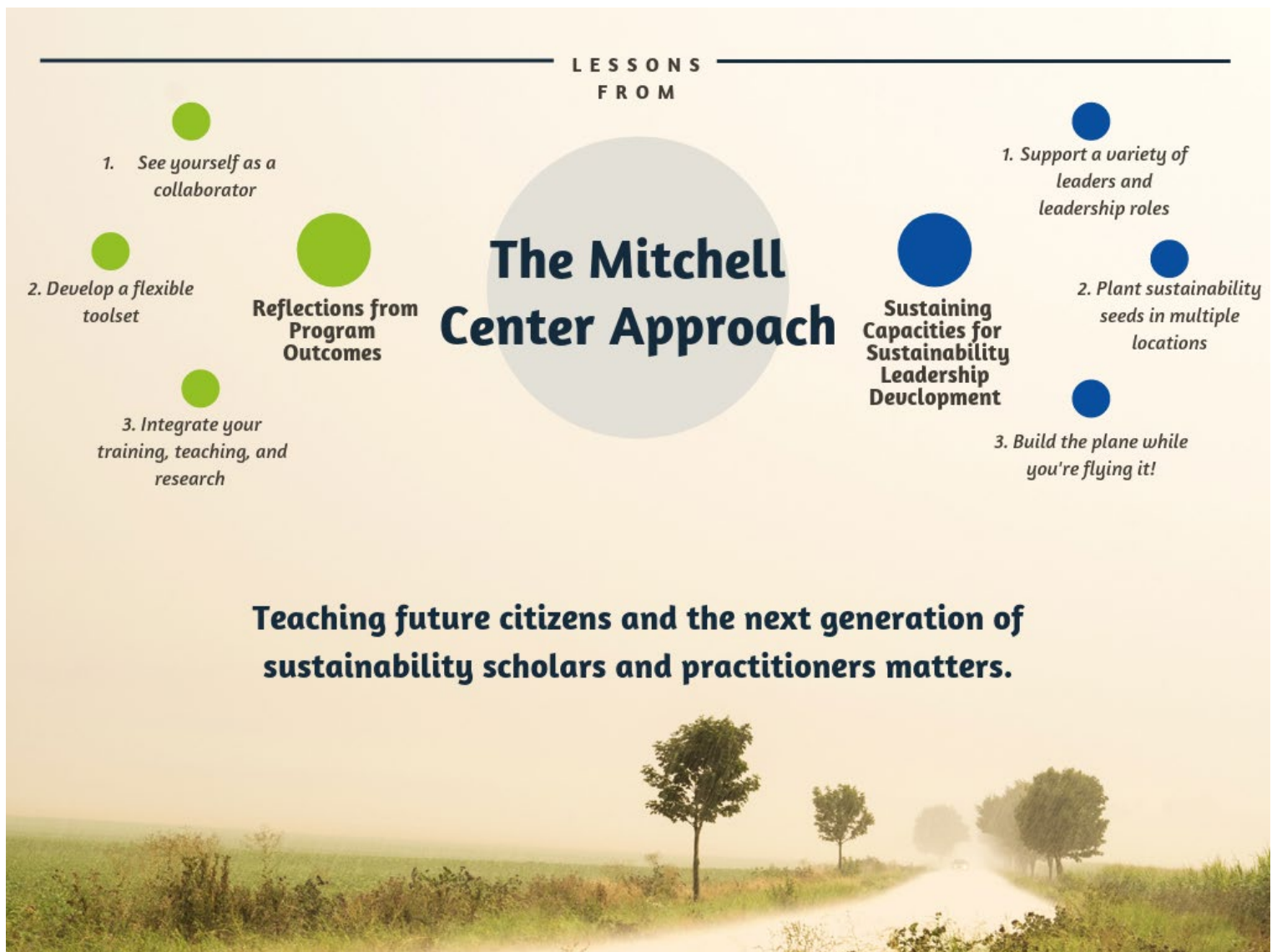
Figure 1: Lessons from the Mitchell Center's Approach

Concluding Thoughts

Universities and colleges have enormous potential to help address a wide range of sustainability challenges which, by definition, involve a tangled mix of economic, social, and environmental issues (Hart et al., 2016). This potential cannot be fully realized unless students and faculty are trained in ways that help strengthen and reinforce leadership-rich academic environments and allow them to practice and gain competency in individual leadership skills to meet the challenges. The Mitchell Center has taken steps to create an atmosphere "that emphasizes mutual respect, adaptability, and solutions," (Hart et al., 2015, p. 1) that supports organizational learning and reflection, and that provides opportunities for training in knowledge co-production with stakeholders and in interdisciplinary teams, systems thinking across scale, and solutions development (Hart et al., 2015). We offer an approach to training graduate

students in sustainability and leadership, an approach that suggests that programs need to consider not only helping develop competencies and states of mind but also a certain organizational culture that allows individuals and teams to thrive in their efforts to advance sustainability solutions.

Acknowledgements

References

Alvarado, M. (2017). Building the plane as you fly: 5 Ways educators can learn more while they innovate. *Jobs for the Future* (*JFF),* Retrieved from: https://www.jff.org/points-of-view/building-plane-you-fly-5-ways-educators-can-learn-more-while-they-innovate/.

Amar, F. G., Haggerty, M., Ladenheim, M., Silka, L., Welcomer, S., & Jemison, J. (2016). Leveraging the research capacity of the doctoral university for honors education: The "Research Collaborative" model. *HONORS in Higher Education (HHE)*, *1*(1), 1-25.

Bieluch, K. H., Bell, K. P., Teisl, M. F., Lindenfeld, L. A., Leahy, J., & Silka, L. (2017). Transdisciplinary research partnerships in sustainability science: An examination of stakeholder participation preferences. *Sustainability Science*, *12*(1), 87-104.

Brundiers, K. & Wiek, A. (2017). Beyond interpersonal competence: Teaching and learning professional skills in sustainability. *Education Sciences, 7, 39.* doi:10.3390/educsci7010039.

Clark, W. C., van Kerkhoff, L., Lebel, L., & Gallopin, G. C. (2016). Crafting usable knowledge for sustainable development. *Proceedings of the National Academy of Sciences, 113*(17), 4570-4578.

Crona, B., & Bodin, O. (2012). Knowledge, social networks and leadership: Setting the stage for the development of adaptive institutions? In E. Boyd and C. Folke (Eds.) *Adapting institutions: Governance, complexity, and social-ecological resilience (pp. 11-36)*. New York, NY: Cambridge University Press.

Feurt, C. B. (2009). Collaborative learning strategies to overcome barriers to ecosystem management in coastal watersheds of the Gulf of Maine. *American Fisheries Society Symposium, 79*, pp. 73-88.

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and sustainable development: Building adaptive capacity in a world of transformations. *AMBIO: A Journal of the Human Environment, 31*(5), 437-440. Retrieved from: http://dx.doi.org/10.1579/0044-7447-31.5.437.

Gunderson, L., Peterson, G., & Holling, C. S. (2008). Practicing adaptive management in complex social-ecological systems. In J. Norberg and G. S. Cumming (Eds.). *Complexity theory for a sustainable future* (pp. 223-245). New York, NY: Columbia University Press.

Harding, A., Harper, B., Stone, D., O'Neill, C., Berger, P., Harris, S., & Donatuto, J. (2012). Conducting research with tribal communities: Sovereignty, ethics, and data-sharing issues. *Environmental Health Perspectives, 120*(1), 6.

Hart, D. (2018). Teamwork is the new leadership. *Maine Policy Review, 27*(1), 30-33.

Hart, D. D., Buizer, J. L., Foley, J. A., Gilbert, L. E., Graumlich, L. J., Kapuscinski, A. R., … & Silka, L. (2016). Mobilizing the power of higher education to tackle the grand challenge of sustainability: Lessons from novel initiatives. *Elementa: Science of the Anthropocene, 4*. Retrieved from: https://www.elementascience.org/articles/10.12952/journal.elementa.000090/.

Hart, D. D., Bell, K. P., Lindenfeld, L. A., Jain, S., Johnson, T. R., Ranco, D., & McGill, B. (2015). Strengthening the role of universities in addressing sustainability challenges: The Mitchell Center for Sustainability Solutions as an institutional experiment. *Ecology and Society, 20*(2), 4.

Irwin, E. G., Culligan, P., Fischer-Kowalski, M., Law, K. L., Murtugudde, R., & Pfirman, S. (2018). Bridging barriers to advance global sustainability. *Nature Sustainability, 1*, 324-326.

Israel, B. A., Schulz, A. J., Parker, E. A., & Becker, A. B. (1998). Review of community-based research: Assessing partnership approaches to improve public health. *Annual Review of Public Health, 19*, 173-202.

Kreuter, M. W., De Rosa, C., Howze, E. H., & Baldwin, G. T. (2004). Understanding wicked

problems: A key to advancing environmental health promotion. *Health Education & Behavior, 31*(4), 441-454.

Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., … & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(1), 25-43. doi: 10.1007/s11625-011-0149-x.

Margaret Chase Smith Policy Center. (2018). Special issue: Leadership. *Maine Policy Review, 27* (1), 1-100, Retrieved from: https://mcspolicycenter.umaine.edu/mpr/recent-issues/maine-policy-review-vol-27-no-1/.

Marion, R., & Uhl-Bien, M. (2001). Leadership in complex organizations. *The Leadership Quarterly, 12*(4), 389-418. doi:10.1016/S1048-9843(01)00092-3

McCoy, S. K. & Gardner, S. K. (2012). Interdisciplinary collaboration on campus: Five questions. *Change: The Magazine of Higher Learning*, *44*(6), 44-49.

McGreavy, B., & Hart, D. (2017). Sustainability science and climate change communication. In M. Nisbet (Ed.). *Oxford Encyclopedia of Climate Change Communication*, New York, NY: Oxford University Press. doi: 10.1093/acrefore/9780190228620.013.563

McGreavy, B., Calhoun, A., Jansujwicz, J., & Levesque, V. (2016). Citizen science and natural resource governance: Program design for vernal pool policy innovation, *Ecology and Society, 21*(2), 48. Retrieved from: http://dx.doi.org/10.5751/ES-08437-210248

McGreavy, B., Lindenfeld, L., Bieluch, K. H., Silka, L., Leahy, J., & Zoellick, B. (2015). Communication and sustainability science teams as complex systems. *Ecology and Society*, *20*(1), 2.

Meadows, D. (2001). Dancing with systems. *Whole Earth*, *106*, 58-63.

Meadows, D. H. (2008). *Thinking in systems: A primer*. White River Junction, VT: Chelsea Green Publishing.

Meyer, S. R., Levesque, V. R., Bieluch, K. H., Johnson, M. L., McGreavy, B., Dreyer, S., & Smith, H. (2016). Sustainability science graduate students as boundary spanners. *Journal of Environmental Studies and Sciences, 6*(2), 344-353.

Newell, W. H. (1994). Designing interdisciplinary courses. In J. T. Klein & W. G. Doty (Eds.),

Interdisciplinary Studies Today: New Directions for Teaching and Learning, (Vol. 58, pp. 35-51). San Francisco, CA: Jossey-Bass.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155-169.

Sandmann, L., Saltmarsh, J., & O'Meara, K. (2016). An integrated model for advancing the scholarship of engagement: Creating academic homes for the engaged scholar. *Journal of Higher Education Outreach and Engagement, 20*(1), 157-174.

Shriberg, M., & MacDonald, L. (2013). Sustainability leadership programs: Emerging goals, methods & best practices. *Journal of Sustainability Education*, *5*(1), 1-21.

Silka, L. (1999). Paradoxes of partnerships: Reflections on university-community collaborations. In N. Kleniewski & G. Rabrenovic (Eds.), *Research in Politics and Society: Community Politics and Policies,* (Vol. 7, pp. 335-359). Stamford, CT: JAI Press.

Silka, L. (2001). Addressing the challenges of community collaborations: Centers as opportunities for interdisciplinary innovations. In R. Forrant, J. Pyle, W. Lazonick, & C. Levenstein (Eds.), *Sustainable Development for a Regional Economy* (pp. 358-382). Amherst: University of Massachusetts Press.

Silka, L., Cleghorn, G. D., Grullon, M., & Tellez, T. (2008). Creating community-based participatory research in a diverse community: A case study. *Journal of Empirical Research on Human Research Ethics*, *3*(2), 5-16.

Simonds, V. W., & Christopher, S. (2013). Adapting Western research methods to indigenous ways of knowing. *American Journal of Public Health, 103*(12), 2185-2192.

Trickett, E. J., & Espino, S. L. R. (2004). Collaboration and social inquiry: Multiple meanings of a construct and its role in creating useful and valid knowledge. *American Journal of Community Psychology, 34*, 1-69.

Whitmer, A., Ogden, L., Lawton, J., Sturner, P., Groffman, P. M., Schneider, L., . . . Killilea, M. (2010). The engaged university: Providing a platform for research that transforms society. *Frontiers in Ecology and the Environment, 8*, 314-321. doi: 10.1890/090241

Wilson, R. C. (1992). Jazz: A metaphor for high performance teams. In J. A. Heim & W. D. Compton (Eds.). *Manufacturing Systems: Foundation of World-Class Performance*. (pp. 238-

244). Washington, D.C.: National Academies Press.

Van de Ven, A. H. (2007). *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford: Oxford University Press.

LICENSE

[Empowering Sustainability Leaders: Variations on a Learning-by-Doing Theme](#) by Karen Hutchins Bieluch; Bridie McGreavy; Linda Silka; Aaron Strong; and David D. Hart is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](#), except where otherwise noted.

SHARE THIS BOOK

[Share on Twitter](#)