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Transdisciplinary Innovation Pedagogy as a Catalyst for Institutional Transformation in Higher Education

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Cite as: Ludwig, P.M., Hough, T.L., & Lewis, E.J. (2026). Transdisciplinary Innovation Pedagogy as a Catalyst for Institutional Transformation in Higher Education. *Metropolitan Universities*, 37(1), 13-30. DOI: 10.18060/29182

Guest Editor: Susan Elrod, Ph.D. Editor: Patrick M. Green, Ed.D.

Abstract

This article examines James Madison University's X-Labs as a model of institutional innovation through transdisciplinary, experiential learning. Grounded in theory and sustained through strategic partnerships, X-Labs supports student leadership, faculty renewal, and institutional learning. The initiative illustrates how relationship-centered practices—rooted in trust, collaboration, and autonomy—can foster systemic change. Drawing from literature on organizational change, leadership, and innovation, the paper explores how X-Labs contributes to institutional resilience and offers replicable insights for higher education leaders navigating complexity and transformation.

Keywords: institutional innovation, experiential education, organizational change, leadership development, adaptive leadership

Introduction and Thesis

Higher education institutions face ongoing pressures to adapt and evolve in response to multifaceted external challenges, including shifts in enrollment, demands for workforce alignment, technological disruptions, and increasing scrutiny around institutional value and return on investment (Tierney & Lanford, 2016). These challenges compel colleges and universities to rethink not only what they teach, but how they operate and prepare students to engage with the complexities of the modern world. At JMU, the innovative X-Labs initiative has emerged as a model supporting institutional transformation driven by transdisciplinary education. The experiential and problem-based pedagogies of X-Labs serve as catalysts for leadership growth. Faculty experience professional renewal and expanded research opportunities, while students gain practical leadership skills through meaningful engagement with complex, real-world issues. University leaders, in turn, benefit from a living laboratory that supports strategic priorities, surfaces scalable innovations, and generates institutional learning. This mutual development of faculty, students, and leadership, embedded within a highly adaptive learning environment, enhances organizational resilience and fosters a broader institutional capacity for innovation. Such structural behaviors are critical, as organizational characteristics and informal social networks are often the primary drivers of innovation diffusion (Erlichman, 2021).

The JMU X-Labs is an innovation space located within a public university in the southeastern United States. Though grounded in a physical location, it operates through relationships, partnerships, and pedagogical frameworks. In this paper, we describe the structure and function of JMU X-labs and examine its role in fostering institutional change. These relationships are at the heart of how X-Labs acts as a change agent at our university. A key element of the JMU X-Labs model is the learner-focused Learning Partnership Model (LPM), which emphasizes collaboration between students and faculty as equal partners (Baxter Magolda, 2004; Heinrich et al., 2022; Selznick et al., 2023). This model encourages students to connect their learning to their lives and prior experiences, enabling them to leverage that background to enhance their current learning and meaning-making. In this partnership, both learners and educators share not only knowledge but also authority, co-creating the conditions for inquiry, discovery, and mutual growth. The following literature review examines the frameworks and evidence that inform and contextualize the X-Labs approach.

Literature Review

Innovation and institutional change in higher education have been widely examined across disciplines, including organizational theory, educational leadership, and curriculum studies. Rather than attempting a comprehensive review, we focus on selected theoretical frameworks and empirical research that directly inform the structure, function, and broader significance of

JMU X-Labs. These strands of literature include scholarship on leadership development, organizational change, and transdisciplinary innovation—each offering insight into how institutional transformation is initiated, supported, and sustained. This review begins by examining how innovation is conceptualized in postsecondary education, particularly in relation to traditional academic structures and evolving institutional demands. It then explores leadership practices that support change, followed by organizational theories that explain how innovations take root and scale within complex systems. Finally, research on transdisciplinary collaboration and experiential learning is introduced to illuminate the pedagogical foundations of the JMU X-Labs model.

Defining Innovation

The term "innovation" is often misunderstood and confused with other similar ideas. Various processes, such as research, the innovation process, entrepreneurship, trial and error, creativity, and even luck, can lead to the emergence of a new idea, product, or method- essentially, something innovative (Lewis et al., in review). Tierney and Lanford (2016) summarize the literature to demonstrate that different disciplines define innovation differently, often incorporating aspects of their respective professional ideas and processes into their definitions. They assert that the flexibility of innovation is part of its appeal and suggest that viewing innovation as a concept allows it to be defined while preserving that flexibility. Singh and Aggarwal (2021) completed a qualitative analysis of 208 definitions of innovation, looking at the associations among themes and concluded with a definition of innovation as, “as the operationalization of creative potential with a commercial and/or social motive by implementing new adaptive solutions that create value, harness new technology or invention, contribute to competitive advantage and economic growth” (p. 185). Tierney and Lanford’s points about flexibility and concepts align with our view. We build upon Singh and Aggarwal’s rigorously derived innovation definition and incorporate nuanced ideas about conceptualizing innovation in higher education in the paragraphs that follow.

A key characteristic that distinguishes an innovation process from other working methods is the consistent, iterative, and intentional use of divergent thinking. Singh and Aggarwal’s (2021) definition mentions “creative potential,” which requires divergent thinking; however, we expand upon this concept and its meaning in the context of higher education. Diverse perspectives and mindsets facilitate this divergent thinking (Binks, 2014). In higher education, leveraging academic diversity, especially by collaborating with non-adjacent disciplines, can help cultivate diverse mindsets and achieve transformative, creative outcomes and sustained student outcomes (Lawrence, 2015; Lewis et al., 2023; Liu et al., 2005). This method is particularly effective given that most higher education institutions educate students across a range of disciplines (Binks, 2014). Moreover, it is more controllable than other aspects of diversity, which may be limited by institutional characteristics. Most disciplines focus on teaching disciplinary content, leaving

university students with little exposure to interdisciplinary approaches that develop divergent thinking and innovation (Binks, 2014). Student work is considered transdisciplinary when multiple disciplinary groups collaborate and apply their collective disciplinary knowledge to create solutions that could not be achieved individually (Heinrich et al., 2022). Transdisciplinary student collaboration is a hallmark of the JMU X-labs experience. It is central to the JMU X-Labs experience, and, as we argue in the sections that follow, contributes to both innovation learning and institutional change.

Innovation and Higher Education: A Dynamic Relationship

Scholars have long explored how innovation both drives and is driven by change in higher education. Binks (2014) argues that universities serve a crucial role in promoting innovation by acting as hubs of creativity and must embrace institutional innovation to become these hubs. He distinguishes between *radical innovations*, which are transformative and must begin "with something different," from *incremental innovations,* which improve over time with iteration (pg. 93). Binks further asserts that radical innovation requires divergent thinking. Moreover, through teaching, learning, and research activities, institutions cultivate environments that support opportunity and discovery, but must first create space for a discontinuous process. Rapid technological advancements and shifting societal needs underscore the importance of institutions embracing innovation as a strategic priority. However, as Selznick et al. (2019) argue, universities need to be "innovatively respons-able", going beyond profit-focused approaches in this prioritization. Universities are not only capable of adapting to these demands but are uniquely positioned to lead innovation (Tierney & Lanford, 2016), a claim Cai's (2017) application of Etzkowitz and Leydesdorff's (1995) Triple Helix Model makes concrete.

Cai (2017) extends the Triple Helix Model into a multifaceted global context, describing universities as "key engine[s] for industrial and social innovation" and "key components of knowledge-based societies" (p. 5, 7). To operationalize this vision, Cai proposes a five-step framework for how innovation can drive institutional change: identifying key actors and challenges; defining the innovation's goals and metrics; examining implementation learning curves; determining the innovation's current stage; and evaluating factors affecting institutional acceptance. Key elements of Cai's work highlight the importance of understanding the context in which innovation occurs and recognizing that while innovations may benefit certain groups, they can also pose threats to others and to established traditions. While innovation is often framed in aspirational terms, many institutions struggle to move beyond experimentation toward durable, systemic change. As Cai (2017) and others note, the success of innovation and change initiatives in higher education ultimately depends on their ability to improve student outcomes.

Student Outcomes

Berger and Milem's (2000) influential work examines how organizational theory and behaviors in higher education influence student outcomes across five key dimensions: systemic, bureaucratic, collegial, symbolic, and political. Using these concepts, they develop a conceptual model that illustrates how colleges, as organizations, impact student learning outcomes. In this model, students' entry characteristics influence their outcomes both directly and indirectly through their peers' characteristics, and organizational behaviors shape students' experiences at every level.

Selznick et al. (2019) extend Berger and Milem's model, recognizing the importance of faculty characteristics and outcomes, as well as the recursive nature of the relationships among the model's aspects. Selznick and Mayhew (2019) define innovation capacities as "a set of self-perceptions, skills, and abilities that individuals can acquire in order to better engage in innovation" (p. 1609). This definition aligns with the epistemological, intrapersonal, and interpersonal dimensions that underpin Baxter Magolda's (2004) LPM for fostering self-authorship; however, the two frameworks are not structurally equivalent. In a survey of more than 500 first-year university students, Selznick and Mayhew (2019) found that completing an innovation course significantly increased students' innovation capacities.

This connection between the organization's behavior and student outcomes reinforces the importance of leadership practices and intentional change efforts within institutions. If individual and structural behaviors influence student learning, then leadership development and change management are important levers for institutional change. In the next section, we examine leadership development theories and change management practices that support innovation.

Leadership Development and Change Management

Higher education leaders require specific support to navigate the complexity of ongoing institutional change. Elrod et al. (2024) define systemic change as that which alters policies, norms, cultures, and structures across multiple units simultaneously. Effective leadership development involves building capacity to implement these moves thoughtfully and consistently while guiding an institution through change.

In tandem, research on social networks provides insights into how change occurs and spreads (Kezar, 2014). Kezar uses social network analysis to show that informal relationships transcend traditional boundaries, diffusing innovation through communication, learning, and knowledge transfer. In addition to diffusion, social networks create and maintain various forms of capital, such as social capital, and are most effective when they have "wide bridges," or multiple ways of sustaining themselves, resulting in healthier and more resilient efforts across stakeholder groups (Ehrlichman, 2021).

The relationships demonstrated in social networks also underpin shared leadership models. Bolden et al. (2015) describe shared leadership as a process implemented by a group rather than a decision made by a single individual. During high-stakes transformations, such as implementing an innovation that could transform the university, this relationship-driven approach becomes particularly critical. Heifetz and Linsky (2002) describe "adaptive changes" as challenging transformations that alter an organization, labeling them as high-stakes that require not just new strategies but also shifts in values, relationships, and roles to appropriately adapt to this type of transformation. Leaders must assess the environment for hostility and rely upon relationships to understand the disruption and loss people feel when the status quo is challenged. Navigating these tough challenges requires maintaining perspective amidst others' (and perhaps your own) frustrations and understanding how they perceive the change. Supporters can be recruited as partners to facilitate the change process. It is also essential to identify who is resisting the change and understand their reasons for doing so.

While change is challenging for many, Heifetz and Linsky (2002) also argue that change leaders must resist the urge to solve every problem themselves and emphasize that the undecided individuals "in the middle" will ultimately determine the success of the change. Similar to Bolden et al. (2015), they recommend a shared leadership approach that "places the work where it belongs," and distributes the responsibility throughout the organization so that individuals can become co-owners of the change process.

Taken together, these frameworks suggest that effective change leadership is not a matter of authority or strategy alone, but of relationships, shared ownership, and the capacity to navigate complexity with clarity and empathy. The following section examines how these dynamics come to life through JMU X-Labs, a transdisciplinary hub where leadership, collaboration, and institutional change intersect in practice.

Application

Mounting pressures to align learning with real-world complexity led to the development of JMU X-Labs as a dynamic innovation space, creating a new mechanism for institutional change. JMU X-Labs cultivates leadership development, professional renewal, and organizational resilience through problem-based, experiential, and transdisciplinary learning. This section describes how JMU X-Labs enacts these principles in practice.

Defining Innovation: Theory Meets Practice

Tierney and Lanford (2016) frame innovation as a multifaceted, iterative process that thrives on diversity, autonomy, and intrinsic motivation. JMU X-Labs implements this framework by forming transdisciplinary teams to tackle real, complex problems. Bringing together faculty and

students from diverse fields (e.g., biology, physics, public administration, nursing, engineering, justice studies, and writing) promotes divergent thinking to explore complex problems and develop innovative solutions. Students and faculty form diverse teams apply design thinking and lean startup methods to develop responses to evolving, real-world challenges posed by community partners (McCarthy et al., 2018). This disciplinary diversity fuels collaboration and insight, as participants bring varied analytical tools, epistemologies, and values, enabling novel solutions and fostering mutual learning. This intentional heterogeneity supports the divergent thinking that Binks (2014) views as central to true innovation, yet is rare in university education.

Tierney and Lanford's (2016) emphasis on autonomy is reflected in JMU X-Labs innovation model. Faculty coach and support rather than prescribe action. Students direct their learning, shape their projects, and propose interventions. This mirrors Baxter Magolda's (2004) LPM, in which students co-construct knowledge and author their development (discussed further below). This is often a new experience for students (and instructors) and requires significant coaching to help them become more comfortable owning their learning pathway.

In the *Chronicle of Higher Education's* JMU X-Labs feature, McMurtrie (2019) describes how students face complex problems without clear solutions. She observes that X-Labs students' frustration gives way to agency as they work through iterative design with faculty support. Faculty, too, navigate the shift from directing to collaborating, a transition explored further in the Leadership Development section below. These experiences support our thesis that experiential, problem-based learning drives leadership growth across institutional levels. Students build leadership through collaboration, ambiguity, and community engagement. These students begin demanding this level of autonomy in their other classes, and we see the model spreading as faculty respond. When the innovation is intrapreneurial, addressing a problem or issue that the university faces, the university, the students, and the instructors are all transformed by the innovation and the process.

Tierney and Lanford's (2016) suggestion for the need for intrinsic motivation in their framework is met through relevance and urgency in JMU X-Labs courses. Students address real challenges offered by community organizations, industry partners, and government agencies (Selznick et al., 2023). Seeing tangible outcomes from their work encourages students to invest deeply, persist through ambiguity, and take ownership. Throughout their experience, they move from "performing for a grade" to "focusing on solving the problem" without concern for a grade. This shift signals the development of a changemaker mentality, which students carry beyond the course into their disciplines, future classrooms, and professional communities where they model and inspire innovation-driven mindsets in others.

Tierney and Lanford (2016) emphasize the tension between time, efficiency, and trust in institutional change. Often, students have experienced an education system in which instructors

deliver content and students are tested on recall and sometimes application. In a JMU X-Labs class, students confront a challenge-based model that runs counter to prior experience: they must develop an innovation while simultaneously learning new content and new ways of learning. This is not an efficient process, and students become acutely aware of time. X-Labs embraces this tension by valuing depth over speed. Participants cannot be expected to immediately adopt the innovation process; they need to build trust in the process. Students spend several weeks developing empathy and ideating before prototyping. While this may seem inefficient, it prioritizes trust and relational depth; conditions that Tierney and Lanford argue are essential for lasting innovation. Through this process, both students and instructors come to understand firsthand the tension of diffusing innovation in a complex context, setting the stage for innovation at scale across the university.

JMU X-Labs deliberately prioritizes depth over speed, building the trust and iterative skill that conventional instruction often discourages. Tools like design thinking, lean, and the Learning Record (Lewis et al., 2024) support structured yet flexible processes that encourage exploration. This focus and these tools encourage participants toward becoming change agents by solving real-world problems, which, in our observation, leads them to identify and work on the next problem they encounter because they have built the skills and confidence to do so.

Trust plays a central role in the entire process. Students trust their teams, faculty trust students to lead, and the institution trusts that nonlinear processes will produce meaningful results. Feedback loops, shared decision-making, and safe team environments build this trust. Faculty development, open communication with partners, and institutional support reinforce it. Innovation moves at the speed of trust (Ehrlichman, 2021); participants in these experiences improve their ability to build trust quickly, thereby accelerating their problem-solving and enhancing the quality of their solutions. As more university members learn to do this, we change the institution's culture.

Institutional Change and Organizational Learning

We use Eckel and Kezar's (2002) characteristics of transformational change as our primary analytical lens (transformation is deep and pervasive, is intentional, occurs over time (duration), and changes the culture of the institution). We provide support for how each characteristic is developed through Cai's (2017) stages (reviewed above) and is illustrated by observable evidence at JMU. To make our claims, we use grounded pattern analysis: the changes observable at JMU are consistent with what the literature predicts would follow from a functioning innovation hub operating over time, and the timeline and relationships suggest JMU X-Labs as a contributing condition. We do not attribute institutional change directly to X-Labs.
Eckel and Kezar (2002) define depth of change as an alteration that reaches core assumptions and values rather than surface-level practices. Cai's (2017) first two stages explain how this

depth develops in an innovation hub: by identifying the challenges driving the innovation and defining its goals in ways that require participants to engage differently with their work, not just add new tools to existing practice. X-Labs emerged in response to pressing challenges facing higher education, including preparing students for complex interdisciplinary work, addressing societal needs, and closing workforce skills gaps. Faculty participants, administrators, and partners set explicit goals centered on cross-disciplinary collaboration, real-world problem-solving, and community engagement. These goals asked faculty to reorient their relationship to knowledge, students, and disciplinary authority, sharing expertise with colleagues from non-adjacent fields and ceding content authority to students working on real problems, going beyond simply asking faculty to adopt new pedagogical methods.

JMU X-Labs encountered some resistance from faculty whose professional identities were anchored in disciplinary expertise. The gradual negotiation of those tensions over time confirms that the change reached something real. That some faculty participated once and did not return, finding the model incompatible with their professional identity and practice, is itself evidence of depth rather than a mark of failure. Heifetz and Linsky (2002) observe that adaptive change produces resistance in proportion to the loss it requires. The resistance X-Labs encountered is consistent with that prediction, and the sustained engagement of those who stayed confirms that the reorientation went beyond method to reach the level of values and identity.
Eckel and Kezar (2002) identify intentionality as a characteristic that distinguishes transformational change from drift or accidental evolution. Cai's (2017) second stage, defining the nature, goals, and metrics of an innovation, is where intentionality is built into design. Intentionality is structurally visible in JMU X-Labs' requirement that every teaching team include at least two instructors from non-adjacent disciplines. This is not a preference or a guideline. It is a design constraint that encodes cross-disciplinary values into every course. This requirement has expanded participation in the innovation network, building capacity for cross-disciplinary strategy and leadership that pushes against traditional structures, a result of deliberate institutional design rather than accident.

The institution did not stumble into cross-disciplinary collaboration. It built those conditions deliberately, starting with the Integrated Science and Technology program innovation in the 1990s, sustained them over more than a decade, through programs like the Institute for Visual Studies and JMU X-Labs, and eventually encoded them into faculty hiring expectations. This structural move signals intentionality at the institutional rather than programmatic level.
Eckel and Kezar (2002) define pervasiveness as change that spans multiple units and levels of the institution rather than remaining isolated in one program. Cai's (2017) third stage, the learning curve associated with implementing innovation, is where pervasiveness either develops or stalls. JMU X-Labs embraced iterative learning by redesigning courses annually, adapting pedagogical strategies based on assessment data, and piloting new methods such as the Learning Record. Students and faculty internalized this iterative approach and carried it into other

university activities. Faculty diffused X-Labs frameworks into their home departments without central coordination. For example, a nursing faculty member added innovation training to an undergraduate informatics course and developed an innovation-focused graduate elective after teaching in X-Labs. This case suggests diffusion across units, though it is worth noting that the faculty involved remain largely identifiable as X-Labs-connected, and the pervasiveness across the institution is still developing.

A second example of JMU X-Labs' pervasiveness can be found in the evolution of faculty-cohort hiring at JMU. Between 2020 and 2023, the university engaged in three separate cohort hires, each reflecting a progressively deeper integration of cross-disciplinary values into JMU's faculty recruitment and hiring processes. (https://www.jmu.edu/news/cal/2021/03/15-cohort-hire-complete.shtml, https://www.jmu.edu/news/arts/2023/08-21-integrative-arts-cohort-hire.shtml, https://www.jmu.edu/csm/people/all-people/edscohort/index.shtml). The first of these cohort hires was organized without a disciplinary focus or collaborative mandate and did not coalesce as a cross-disciplinary intellectual collaborative. However, the planning and hiring process (and in the case of one of the last two cohorts, post-hire facilitation) involved X-Labs faculty alums. Even today, these cohorts remain active in cross-disciplinary research and teaching. The third cohort codified cross-disciplinary teaching into the hiring requirements, thereby institutionalizing an innovation-facilitating transformation. The evolution of JMU's cohort hiring practices highlights a structural move consistent with the values X-Labs had been building into faculty culture over the same period.

Duration, from Eckel and Kezar (2002), argues that genuine transformation is evidenced not by initial enthusiasm but by lasting structural change that persists over time. Cai's (2017) fourth and fifth stages, the accumulation of institutional knowledge and the factors influencing institutional acceptance, are where duration is either confirmed or undermined. At JMU, faculty and students involved in JMU X-Labs have contributed to a growing body of published scholarship on implementing and sustaining experiential interdisciplinary education. Publishing on the impact of X-Labs helps build institutional acceptance because scholarly activity is a known way to demonstrate credibility, accumulate institutional knowledge, and build institutional acceptance. Contributing to the scholarly literature has set the stage for the university's inclusion of X-Labs in the strategic plan, sustained investment from Academic Affairs leadership, and encoding cross-disciplinary values into faculty employment expectations.

The evidence presented across these characteristics points to a transformation underway rather than one completed. The last characteristic that Eckel and Kezar (2002) suggest regarding transformational change is that it results in change in the institutional culture. Providing evidence for this characteristic is the most difficult. One anecdotal piece of support for a changed culture of transdisciplinarity is that, now, when one tries to highlight this as a unique feature of JMU X-Labs, it is often met with the response, "Everyone at JMU does transdisciplinarity." This was

certainly not the case when JMU X-Labs started eleven years ago. However, transdisciplinarity has become a cultural norm, with promotion and tenure counting transdisciplinary scholarly activity, cross-disciplinary teaching in regular teaching loads, and even institutional support for a pilot cross-disciplinary general education experience. Whether JMU X-Labs was the named source of that learning in each case is difficult to fully document. Taken together, however, these cases are consistent with Kezar's (2014) description of a network hub: an initiative that creates relational infrastructure, demonstrates proof of concept, and builds faculty capacity in ways that make structural changes thinkable, proposable, and approvable, even when the hub is not formally credited as the source. JMU X-Labs did not mandate these changes. Rather, it created the conditions that made them imaginable, and the institution's willingness to act on those conditions suggests that the process of transformation, while not complete, is genuinely underway.

Leadership Development Through Learning Partnerships

JMU X-Labs fosters leadership development through the Learning Partnership Model (Baxter Magolda, 2004), where students and faculty share authority, co-inquire, and exchange feedback (Selznick et al., 2023). This important shift from faculty as experts to co-learners is not pedagogical; it models distributed responsibility in the classroom in ways that extend outward into the institution.

Faculty also report a renewed sense of purpose and broader professional identities as their leadership skills and habits of mind expand. They collaborate across disciplines and embrace new pedagogical roles. As co-learners and facilitators, they model adaptive, relational leadership (Heifetz & Linsky, 2002). Selznick et al. (2023) argue that these partnerships expand the institution’s leadership capacity by enabling faculty and students to continually test new ways of collaborating. The team-teaching, cross-college collaborations, and engaged scholarship all lead to an expanded view of their faculty role and new models of leadership that privilege innovation from the “middle” of the university.

X-Labs serves as more than a course hub; it functions as an incubator for distributed leadership and renewal. Its relational, recursive design cultivates personal agency and strengthens the institution. Faculty and student reports of their experiences support our thesis that experiential, problem-based learning drives leadership growth across institutional levels. These dual outcomes support our central claim: learning partnerships that promote mutual growth and shared inquiry drive leadership and institutional transformation.

Student Outcomes: Social Innovation and Self-Authorship

Selznick et al. (2023) describe social innovation as arising from the intersection of person, problem, and pathway. X-Labs students encounter this intersection, resulting in the development of practical skills and social innovation capacities. Students engage deeply with community issues by connecting disciplinary knowledge, personal experience, and ethical reasoning, through human-centered design, to real-world problems (Lewis et al., 2019; Ludwig et al., 2017).

Qualitative data show that students gain confidence, improve communication, and develop interdisciplinary collaboration skills (Ludwig et al., 2017). Quantitative data collected before and after an X-Labs course demonstrate that students significantly improve their confidence in their ability to ethically reason (Lewis et al., 2019), a crucial subset of critical thinking and a necessary skill for innovation. The Learning Record captures growth in empathy, ethical decision-making, and iterative problem-solving—areas often overlooked in traditional assessments (Lewis et al., 2024). Post-graduation interviews with students who complete an innovation course in the JMU X-Labs or a sister course at another university demonstrate that they bring important skills from their innovation course into the workplace (Lewis et al., 2023). The graduates were able to clearly articulate the differences between the transdisciplinary teamwork in their innovation course and in their disciplinary and general education courses. Their distinction between the innovation course and other courses was similar to those described by Binks (2014). They perceived that they brought higher levels of confidence when working with other disciplines and an openness to technology and problem-solving because of the innovation course (Lewis et al., 2023).

We can point to students' perceptions of their gains in their discussions of the dimensions of learning and each course objective, through personal accounts presented in their Learning Record. It is also important to highlight that students are using their experience in X-Labs to secure jobs after graduation. They report to us through conversations that employers ask about their X-Labs experience, and that it helps them secure their jobs. Students are also starting jobs in fields they might not have considered before the class, such as writing, as they enter the tech workforce. Lastly, students are gaining internships through intentional collaboration with industry partners– and these partners are thrilled with them. For example, one global education technology company initially hosted 10 interns from the X-Labs Reimagined Internship. It was so impressed that it not only rehired several of them but also doubled the cohort the following summer. In two short years, the company went from having no JMU interns to having JMU students make up more than half of their intern cohort. The success of this model has prompted the company to expand the internship to other universities, signaling how innovation at X-Labs is diffusing beyond the institution.

Institutional and Faculty Outcomes

Tracing how that transformation developed requires attending to the specific leadership moves JMU X-Labs catalyzed at multiple levels of the institution over more than a decade. The outcomes resulting from these moves represent what Elrod et al. (2024) define as systemic change: change that alters policies, norms, cultures, and structures across multiple units simultaneously. The following examples illustrate how X-Labs functioned as a lever within JMU's institutional ecosystem, activating these moves across three distinct transformation efforts.

The diffusion of JMU X-Labs practices across departments, described in the previous section, also illustrates the leadership moves that Elrod et al. (2024) identify as essential to systemic change. Faculty who returned from X-Labs did not simply adopt new methods — they recruited colleagues, modeled new approaches, and in some cases drew peers into X-Labs itself. These informal acts of advocacy and mentorship represent grassroots leadership that extended the innovation without top-down direction.

As an example, a health care faculty member heard about JMU X-Labs, got excited, and taught an X-Labs course in partnership with an engineering faculty member and community members from her hometown in South Africa. She then organized a group of students to travel to her hometown to advance the partnership, engage in a collaborative design process, and study student learning outcomes from the experience. This faculty member has since become a faculty fellow in X-Labs.

This type of innovation model spreads beyond the university system when leaders move to other institutions and bring their experience with them. For example, the initial director was selected through a national search to become a community college President, where he recently launched a replica of JMU X-Labs. Similarly, a second faculty member transitioned into a cross-disciplinary role spanning science and writing disciplines, where he is integrating innovation education and the Learning Record assessment into the general education curriculum.

X-Labs also works to change the type of faculty and students entering the university system, reinforcing the culture and increasing the demand for these experiences. For example, X-Labs staff often hear from parents of prospective students that X-Labs is one of the reasons they are encouraging their potential students to attend, and students tell us that it was a factor in their choice to attend JMU. One of the authors has served on search committees where prospective faculty members have specifically asked to visit X-Labs because they are interested in participating, demonstrating that X-Labs is influencing the types of faculty interested in joining the university.

Limitations

Before turning to implications, a note on positionality and limitations is warranted. One author was appointed as facilitation support for one of the faculty cohorts described above and directed X-Labs during part of the period under examination. We consider this insider position a source of interpretive access rather than a source of disqualifying bias, but acknowledge the obligation to distinguish among direct observation, institutional documentation, and analytical inference. The cases presented throughout this paper are offered as structured illustrations of a theoretical argument, not as proof of causation. Additionally, several contextual factors may limit direct replication. JMU is a regional, public, non-urban R2 institution with an institutional culture that values the scholarship of teaching and learning and high-impact practices, and X-Labs launched with $850,000 in unrestricted funds that provided rare early-stage flexibility. Institutions with different missions, incentive structures, or funding constraints may encounter different challenges. Readers should weigh the evidence accordingly.

Implications for Practice

The insights drawn from the literature review on institutional innovation, leadership development, and transdisciplinary collaboration, combined with the exploration of the JMU X-Labs program, offer important implications for higher education leaders and practitioners seeking to catalyze change on their own campuses.

As colleges and universities continue to navigate increasing complexity and shifting expectations, initiatives like X-Labs provide a concrete example of how strategic, relationship-centered innovation can be designed, implemented, and sustained. This section outlines key practices and considerations that institutional leaders, faculty, and organizational change agents can adopt to foster innovation, develop leadership capacity, and create conditions for lasting, student-centered transformation.

- **Start with a pilot, then build strategically.** The evolution of X-Labs from a one-off initiative to a widely adopted institutional model underscores the power of starting small, demonstrating value, and building momentum. For example, one X-Labs course helped catalyze institutional change by embedding innovation practices into JMU's general education program, a model now being adapted by peer institutions. By demonstrating success at a small scale, practitioners can mitigate perceived threats to establish traditions, drawing on Cai's (2017) five-step framework.
- **Look to other models and adapt them to your context.** While X-Labs reflects JMU's specific identity and culture, similar efforts are taking root at universities across the country. Institutions should seek out and learn from peer models, then tailor their approach based on local needs, strengths, and stakeholder priorities.
- **Recognize that institutional change often precedes disciplinary innovation.** Broad, structural transformation, such as rethinking general education, revising reward systems, or promoting cross-college collaboration, can lay the groundwork for innovative,

discipline-specific change. Innovation is not only pedagogical; it is also procedural and political. Further, the X-Labs model suggests that radical innovation, which Binks (2014) argues must begin with "something different," is effectively catalyzed by the intentional use of diverse thinking across non-adjacent disciplines.

- **Support innovation diffusion through networked leadership.** As the literature on social networks and innovation suggests, diffusion occurs not only through formal structures but also through informal influence and relationships. X-Labs benefitted from a web of faculty champions, supportive administrators, and iterative, peer-informed expansion. This reliance on "wide bridges" extends Ehrlichman's (2021) and Kezar's (2014) work by demonstrating that informal, cross-unit relationships are the primary drivers for cascading an innovation mindset. Change agents should invest in wide bridges across departments and roles to accelerate this kind of diffusion.

Conclusion

The JMU X-Labs initiative offers a documented case of how a transdisciplinary innovation hub can create the relational infrastructure, faculty capacity, and institutional proof of concept necessary for adaptive organizational change, even when that change is not formally attributed to its source. Grounded in a rich theoretical foundation, supported by intentional structures, and sustained through recursive partnerships, X-Labs demonstrates that innovation in higher education need not be episodic or isolated. Instead, it can become embedded in institutional processes, shaping student learning, faculty development, institutional policy, and regional engagement.

As this paper has argued, effective innovation requires more than creative programming. It depends on enabling conditions, distributed leadership, shared purpose, and a sustained commitment to cultural change. The evidence presented here suggests that JMU X-Lab's influence extends beyond individual student outcomes to the institutional structures of JMU and, in early form, to other institutions. The relational and recursive nature of the model appears to be a key factor not only in shaping student and faculty experiences but also in building the social capital and trust that the literature identifies as necessary for lasting institutional change.

While some enabling factors at JMU may be unique, the principles underlying JMU X-Labs' model—collaboration across differences, meaningful engagement with real-world challenges, and a willingness to reimagine traditional roles—are transferable. Further research is needed to examine how these principles operate in different institutional contexts and to assess more rigorously the causal pathways between innovation hubs and institutional transformation. The work of transformation is slow, relational, and often uncredited, but the JMU X-Labs case suggests it is also cumulative, and that institutions willing to sustain it may find they have changed more than they realized.

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