# What Would It Take to Achieve Convergence Education? Insights from Transdisciplinary Education Projects

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Rebecca's current work represents a synthesis of her broad interests, all oriented toward the exploration of the possibilities within institution such as higher education. Her commitment to addressing barriers and fostering innovation for social change shines through in her professional journey.

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## Abstract

The shift towards convergence education, which integrates knowledge across disciplines to address complex societal challenges, has gained momentum. Transdisciplinary approaches play a key role in this shift by fostering innovation, enhancing job readiness, and preparing students for real-world problem-solving. The National Science Foundation has emphasized the need for higher education to adopt more transformative practices, in STEM fields and beyond, since transdisciplinary education has become increasingly important. While convergence education focuses on merging different fields to tackle global challenges, transdisciplinary teaching is a way to do that by engaging multiple disciplines in collaborative learning across traditional academic boundaries. Despite the benefits of such approaches, including enthusiasm from faculty, implementing transdisciplinary teaching and learning at large research universities remains difficult due to rigid institutional structures. This paper offers insights from qualitative research on five transdisciplinary instructional planning grants at a STEM-focused university. These pilot grants supported projects that spanned 10 academic units and reached over 750 students, underscoring the growing importance of transdisciplinary initiatives. The first author is a PhD candidate in cultural anthropology and thereby brought a distinctive anthropological lens to this study. Through in-depth interviews with principal investigators (PIs), a focus group dialogue session, and a document review, the first author analyzed both the barriers and successes of these projects. Preliminary findings revealed persistent challenges such as institutional silos, the misalignment of cross-disciplinary goals with traditional tenure and promotion structures, difficulty securing discipline-specific funding for transdisciplinary courses, and a lack of long-term administrative support for sustaining these initiatives. However, there were many successes to make transdisciplinary teaching possible such as reworking existing courses, utilizing institutional structures such as research centers and institutes, and connecting research initiatives to the courses. These findings showed that passion and motivations for transdisciplinary teaching can challenge institutional barriers, but without long-term strategies and institutional support the pathways for sustainable convergence education are unclear. Through an anthropological approach, the first author examined how these barriers are not just logistical or administrative but are deeply rooted in the social and cultural practices of academia. By grounding these insights in both anthropological theory and empirical data, this work contributes to ongoing conversations about designing academic structures that better support collaborative teaching and learning, with a view towards making education more inclusive across disciplines.


## Introduction

The landscape of higher education is undergoing profound changes. Fueled by concerns about affordability, rising student debt, and a growing skepticism about the value of traditional degrees in a rapidly changing world, institutions are facing increasing scrutiny. Employers are explicitly demanding graduates who possess not just specialized knowledge, but also the ability to synthesize information from diverse fields, solve complex problems collaboratively, and adapt to

continuous learning. Convergence education (CE)—an approach that integrates knowledge across disciplines to address complex sociotechnical challenges[1]—offers a transformative response, promising to cultivate the adaptability and interdisciplinary skills essential for navigating the uncertainties of the 21st century. Convergence Education (CE) is a distinct approach to learning that goes beyond traditional integrated STEM or problem-based learning [2]. It focuses on tackling compelling, student-relevant problems by actively bringing together instructors and students from different disciplines to combine their expertise and develop impactful solutions to current socio-technical problems. Unlike simpler integration efforts, CE prioritizes real-world problem-solving and meaningful learning experiences over prescribed disciplinary topics.

Convergence research was developed initially as a research imperative to work across disciplinary silos to solve growing complex and intersecting global challenges [3], [4]. This sparked a need and investment in facilities, funding, and program support for convergence research to be implemented across units. While convergence research has established a model for tackling global intersecting challenges by removing organizational barriers for interdisciplinary collaboration, its translation into convergence education is only just beginning. Despite advances in convergence thinking and its applications in research and industry[5], students need opportunities to bridge their academic training with the demands of an evolving workforce, the global challenges they will face, and the critical thinking that goes beyond traditional disciplinary boundaries.

To maintain commitments to science and technology and address pressing sociotechnical challenges, a paradigm shift may be underway in STEM education. The National Science and Technology Council (NSTC) has identified *convergence*—the integration of disciplines around real-world problems—as a critical strategy for inspiring students and fostering innovation in the classroom and beyond. While convergence education extends beyond STEM fields, this paper focuses on how convergence is being conceptualized and implemented at a STEM-focused institution. This national emphasis on convergence aligns closely with the principles of transdisciplinary teaching—an approach that emphasizes collaborative instruction and learning across disciplinary boundaries to cultivate creative problem-solving skills. However, realizing this vision within the traditional structures of large research universities—characterized by departmental silos and incentives often misaligned with cross-disciplinary collaboration—presents significant hurdles.

This paper presents insights from a transdisciplinary teaching and learning initiative at a STEM-focused research-intensive university, funded by the university's Innovation Hub. The Innovation Hub is part of a broader strategic effort to advance innovations in teaching and learning, with a significant focus on supporting transdisciplinary programming. As part of this initiative, five instructional planning grants were awarded to revamp, extend, or design transdisciplinary courses and curricula. By analyzing the successes and barriers encountered across these projects, this research contributes valuable insights into the evolving landscape of higher education and the integration of convergence principles into undergraduate education. Building on previous ethnographic research on models of transdisciplinary teaching and learning, the researcher collecting the data brought deep contextual understanding of the persistent challenges and

opportunities facing transdisciplinary initiatives at a large research-intensive university. Using an anthropological lens, the analysis highlights that these barriers are not merely logistical or administrative, but deeply rooted in the social and cultural structures of academia. Addressing these challenges is essential for advancing convergence education and fostering a higher education system that is more inclusive of diverse forms of expertise, impactful for students and faculty, and responsive to the needs of today's students and society.

## Background Literature

### Convergence Education: Bridging Disciplines for Complex Problem-Solving

Convergence education is part of a broader movement to advance thinking and training in higher education by integrating knowledge from diverse disciplines to tackle complex societal and global challenges. The concept of convergence is widely applied across research areas, including industry, media and communications, markets, and regulatory frameworks[5]. While convergence research has become well-established in fields such as biotechnology, nanotechnology, and disaster management to name some, its application as an educational framework is still emerging [3], [4], [6]. Government agencies, such as the National Science & Technological Council and the National Science Foundation (NSF), have identified convergence as a key part of innovation in higher education [7] to teach students and bring in faculty to address persistent, emergent, and future global grand challenges. Furthermore, the evolution of convergence research highlights the critical need for educational programs that train diverse researchers capable of advancing forward-thinking research agendas [4].

Convergence education is particularly relevant for traditional disciplines, such as STEM fields, as educational systems evolve to meet students' needs for problem-solving, critical thinking, and real-world application skills. While undergraduate and graduate-level convergence education programs have emerged and found success [8], application in education remains limited, with many examples scattered across STEM fields for example. Moreover, there is a limited understanding of the relationship between convergence principles and educational systems [5]. Greater attention is needed to understand how educational development of courses, programs, and curricula influence convergence processes, and how these processes, in turn, impact educational systems. STEM disciplines increasingly address complex challenges—such as climate change, health disparities, and human-technological innovation—that demand collaboration across fields, importantly with the social sciences, arts, and humanities. By integrating diverse disciplinary perspectives, convergence education has the potential to equip students with advanced and necessary problem-solving abilities, foster cross-disciplinary partnerships and collaboration skills, and prepare them for their futures.

### Transdisciplinary Teaching: A Pathway to Convergence

One way to realize the aspirations and potential of convergence education is through transdisciplinary teaching and learning[6]. Compared to convergence education, there is a more robust body of literature and practice dedicated to the design, purpose, and implementations of transdisciplinary courses and programs[9], [10], [11], [12]. Broadly speaking, transdisciplinary teaching and learning is a collaborative approach that transcends traditional disciplinary

boundaries. Transdisciplinary teaching approaches integrate arts and sciences or the social sciences with the natural sciences and can be organized into thematic fields such as sustainability or developed into minors [9].

While there are multiple approaches of transdisciplinarity, by integrating diverse perspectives, it fosters innovation, encourages critical thinking, and equips students with the skills they need. Research on the impacts of transdisciplinary teaching reveals that these approaches can lead to transformative student learning experiences. Students engaged in transdisciplinary courses often report a deeper sense of relevance and connection between their studies and real-world challenges, particularly in courses organized around themes such as sustainability, public health, or social justice. These learning environments foster critical thinking and the ability to synthesize diverse perspectives—skills that are essential for navigating complexity[9]. Transdisciplinary classes also tend to cultivate collaboration skills, as students must negotiate disciplinary lexicon, values, and assumptions while working in diverse teams, however more is needed to expand these experiences into real-world applications[9]. While many students find this process intellectually demanding, it often results in meaningful shifts in how they understand problems [9], [13], their roles as learners, and their professional identities. However, without intentional design and facilitation, transdisciplinary courses can risk fragmentation or reinforce disciplinary hierarchies.

Configurations of transdisciplinary instruction vary widely. Some programs feature co-teaching models, where faculty from different fields jointly design and lead courses, fostering an integrated perspective. Others incorporate guest lectures to introduce other disciplinary expertise or organize team-based practicums that bring together students from varied disciplines to tackle societal challenges. Additionally, some institutions have developed transdisciplinary degree programs, such as the Bachelor of Arts and Sciences (BASc) at University College London, which allows students to tailor their studies across multiple disciplines[14]. These varied configurations illustrate the spectrum of what people often call transdisciplinarity, from courses that merely juxtapose disciplines to programs that deeply integrate methodologies and epistemologies, aiming to equip students with the skills necessary for addressing complex global issues. True transdisciplinarity is deeply integrated but as one can see the term is often used more flexibly.

Despite its potential, implementing transdisciplinary teaching and learning in higher education faces significant challenges [15] especially at large research universities. Structural issues, such as siloed academic units and administrative systems (i.e. enrollment, course registration), hinder collaboration and integration [16], [17], [18], [19]. Cultural barriers, including the constraints of traditional promotion and tenure systems, discourage faculty from engaging in cross-disciplinary initiatives. Moreover, sustainable funding models are often lacking, making it difficult to support the long-term viability of transdisciplinary programs[20]. Understanding and addressing these challenges is crucial for unlocking the full potential of transdisciplinary teaching and learning as a tool for convergence and innovation in higher education.

**Anthropological Perspectives: Understanding Education and Institutions**

Anthropology offers a critical lens for examining the culture of academic institutions and the social systems—such as teaching and learning structures, governance, and administrative

systems—that shape higher education. This makes it especially well-suited for studying convergence education. Universities are dynamic cultural institutions where knowledge is produced, rituals and language are used, power is negotiated, and societal values are shaped and contested. Within this context, systems like curriculum design, assessment frameworks, promotion and tenure policies—as well as administrative structures like enrollment, the registrar's office, and strategic planning processes—play a central role. These systems are essential to understanding the what makes convergence education possible or not.

The anthropology of education has a longstanding tradition of exploring how educational systems function as cultural and social systems, investigating the transmission of knowledge and the reproduction of institutional norms within academic settings[21]. While a number of anthropologists have focused on higher education [22], there is also a growing body of work in adjacent fields has utilized ethnographic methods to study universities as institutions [23], [24], [25]. These studies explore specific locations within higher education, such as laboratories[26], classrooms [27], disciplines [28], and administrative settings, offering insights into the lived experiences and practices that define academic life.

Certain concepts from the social sciences can help illuminate what convergence education is and how it functions. One useful anthropological concept is liminality, which refers to a transitional or transformative state of being—an "in-between" phase where structures are loosened, identities are reconfigured, and new possibilities emerge. Liminality has been used to study intermediary roles in higher education, such as students who navigate between peers and professors as they prepare for and move towards the next stage of their professional lives [29]. In the context of transdisciplinary education, liminality captures the experiences of students, faculty, and staff as they move between established disciplinary norms and emerging cross-disciplinary practices or spaces. This state of in-betweenness can generate uncertainty, discomfort, and negotiation around expertise and authority. Yet it also holds transformative potential, offering room for creative thinking, experimentation, and the reimagining of roles, knowledge, and relationships within academic settings. Closely related is the notion of "third space"[30] , a conceptual area where traditional boundaries are blurred, allowing for the creation of new, hybrid forms of knowledge and practice. It has been used to understand sociocultural and political dynamics of student learning languages [30] and could be applied in transdisciplinary teaching to explore the alternative ways students and faculty engage with new paradigms in classrooms. The concept of boundary work is often used in Science and Technology Studies (STS)—the processes of creating, maintaining, or challenging boundaries between disciplines [31]—is particularly pertinent to transdisciplinary and convergence education. These educational approaches inherently seek to disrupt traditional academic boundaries. Boundary work provides a lens to analyze where these boundaries are upheld or rendered permeable, and by whom. In the realm of transdisciplinary education, these frameworks elucidate how initiatives can serve as both sites of contestation and innovation, highlighting the dynamic interplay between established structures and emergent collaborative practices.

Anthropologists are particularly well-positioned to investigate the social, cultural, and structural implications of emerging educational frameworks, including convergence education.

The discipline's methodological tools, ethnographic research, participant observations, and theoretical approaches make it ideally suited to understanding their impacts and telling stories of often untold in higher education [32]. Transdisciplinary programs, by design, challenge traditional academic boundaries and necessitate collaboration across diverse disciplines—processes deeply intertwined with cultural and structural dynamics.

Furthermore, the approach of institutional ethnography in higher education [33], [34] enables researchers to explore how institutional policies and structures shape, and are shaped by, the daily activities and interactions of individuals within the university. By focusing on the experiences of those engaged in transdisciplinary programs, anthropologists can uncover how institutional norms and power relations influence the development and implementation of such initiatives. This perspective also highlights the importance of reflexivity and positionality in research, acknowledging how researchers' backgrounds and roles within the institution affect their interpretations and interactions.

Through ethnographic studies, anthropologists can reveal how convergence and transdisciplinary education reshape institutional cultures, influence power dynamics, and impact stakeholders at all levels. For instance, research could examine the effects of co-teaching models, collaborative practicums, and collaborative projects on both students and faculty. Anthropology's holistic focus offers valuable perspectives on the challenges these initiatives face, such as siloed academic units, entrenched tenure and promotion systems, and the need for sustainable funding models. By studying these educational innovations, anthropologists contribute to broader discussions about how higher education can evolve to meet societal challenges, ultimately enriching our understanding of academic institutions and highlighting opportunities for creating more inclusive, collaborative, and transformative educational spaces.

**Research**

To better understand the five transdisciplinary instruction projects supported by the planning grants, we employed multiple rapid research methods, including document review and semi-structured interviews. A graduate researcher and lead author of this paper—an anthropology PhD student affiliated with the University's Innovation Hub—led the analysis of key documents, such as the Hub's Request for Proposal (RFP), grantee project proposals, and progress reports. This researcher had previously collaborated with the co-authors on an earlier transdisciplinary education and research initiative at the same institution. That earlier project, which involved the design and implementation of a cross-college, transdisciplinary model of instruction, provided valuable experiential and analytical grounding for this study. Drawing from that shared foundation, this analysis gained a deeper understanding of the complexities of convergence education, enabling us to identify recurring themes related to course design, team formation, and the broader implications for transdisciplinary pedagogy. As before, this collaborative team was able to have rich discussion about transdisciplinary teaching and learning and educational transformation together accordingly. This thinking is reflected in the current paper.

The researcher also conducted semi-structured interviews with Principal Investigators (PIs). These interviews focused on understanding project development, implementation, available support, resources, and sustainability strategies. This approach provided in-depth qualitative data

that complemented the findings from the document review. All interviews were recorded with participants' consent and transcribed using transcription software. Transcripts were coded systematically in Excel using a thematic coding structure developed to capture key patterns and insights. The themes were iteratively refined to ensure they accurately reflected the data.

Initially, the interviews and coding were undertaken to inform transdisciplinary initiatives at the Innovation Hub and to identify successes and challenges for internal sharing. Following this phase, members of the planning grant teams were invited to a dialogue session. During this session, findings were presented, and participants discussed their experiences, adding another layer of validation and richness to the data. Recognizing the depth and value of the learnings, a secondary analysis of the data was conducted following the institutional IRB guidelines and approval. Key identifying details of the projects and names of the courses were changed to maintain confidentiality. This analysis aimed to synthesize broader insights and findings, which are summarized in the following section.

## Findings

The findings show a seemingly widespread interest in transdisciplinary teaching and learning by the varied group of instructors and course developers. Ten different academic units from five different colleges were engaged in these projects in both undergraduate and graduate level courses. Approaches to designing and implementing these courses varied significantly, influenced by factors such as familiarity with institutional systems, academic structures (i.e. course scheduling, classrooms, evaluations), and the level of support provided by departments and administrative units. These strategies reflect both the creativity and adaptability of course developers in navigating institutional contexts. Key themes emerging from the analysis highlight the various ways courses were designed and implemented, offering valuable insights into the processes, challenges, and opportunities involved in fostering transdisciplinary teaching and learning. These findings also underscore the broad appeal and learning potential of convergence education from the perspective of interested faculty. However, this is a small sample size more needs to be known from faculty, representing different units and colleges, who do not engage in transdisciplinary courses.

## Overview of Projects

### *The Designs*

The projects took several different course design approaches: building on existing courses, creating new courses, and combining existing course elements. Some projects enhanced or adapted current courses, integrating new content, projects, or methodologies, taking advantage of what was already there. While other projects involved designing entirely new courses, incorporating diverse disciplines and teaching strategies. A third group of projects merged components from different courses or expertise, creating cohesive transdisciplinary offerings.

### *Cross-Listing and Academic Homes of Transdisciplinary Projects*

Three of the projects, *Technology and Health*, *Interdisciplinary Research Design*, and *Game Design for Education*, were cross-listed with, or offered by, one or more different academic

units, while the others were single-listed but feature co-instructors or a series of guest instructors. One project originated from an institutional center, and another was a part of an advance certificate program, highlighting the broader institutional commitment to transdisciplinary programming.

*Stages of Course Development and Implementation Across Projects*

In addition to employing diverse approaches and being housed in various departments across the university, the grantees were at different stages of course development and implementation. Some were actively teaching their courses, others were piloting them during the summer, and a few were planning to launch them in the upcoming academic year. These timelines varied based on each project's approach to transdisciplinarity and whether the course was newly developed or an adaptation of an existing one. Additionally, scheduling constraints, including when faculty had availability in their teaching loads to align and co-teach, played a significant role in determining the course timeline.

*Strategies in Developing and Implementing Courses*

For those choosing to build a new course, such as *Using Computers to Understand Biology and Designing with Nature's Solution*, their approach to course design was to conduct research with students and faculty to understand more deeply the educational needs and possibilities of collaboration, while those who started right away, such as *Technology and Health*, revamped a currently taught course based on their learnings as instructors of the course. Newly co-taught courses required, such as *Interdisciplinary Research Design and Designing with Nature's Solution*, department and faculty alignment of when these courses could be taught which meant some had to wait multiple semesters for this alignment. These different approaches and stages not only showcase strategies for developing courses but also highlight institutional barriers that impact developing and implementing transdisciplinary projects such as scheduling difficulties, departmental teaching needs, and faculty availability.

*Diversity of Disciplines and Reach*

Instructors and project developers were from a variety of colleges, units, and subunits, reflecting the diverse, cross-disciplinary nature of these initiatives. The projects took some similar but mostly different approaches to transdisciplinary teaching and were at various implementing phases showing the complexities of offering transdisciplinary instruction. Over 733 students from 10 academic units claimed to have benefited from these courses over 5 semesters, highlighting the reach of these courses thus far.

**Successes and Challenges**

In the development phase, a key success was the student-driven nature of course creation. Faculty identified educational needs through classroom interactions and evaluations, which not only informed their decisions to develop transdisciplinary content but also highly motivated them to undertake this approach. As one faculty member reflected, *"It's interesting to see how the knowledge students attain in class helps them work better on things they already know or experiences they've had. Hearing that they're still thinking about these topics is rewarding."* These motivations were across the board, wanting students to gain real-world experience or connect their

learnings to their lived experiences. Leveraging previous institutional knowledge also provided a foundation for these projects. One PI who had been at the institution if various roles and capacities, both as an instructor and an administrator shared:

*[My experience] really helped give me a really good footing ... to see the opportunities. Learning about the Innovation Hub was like, oh, there's this amazing opportunity for us to support this kind of work. And so that, I think, helped me right away see that and jump on top of that opportunity rather than it taking three or four years of hearing students grapple with trying to ask for what they're not quite sure they need.*

However, challenges such as conflicting requirements within academic plans of study and logistical hurdles like scheduling across departments created significant barriers. *"It's trickier than I would have thought to do that coordinating across scheduling. So some departments would want to do it only in the Fall. Others could only do it in the Spring."* Faculty mitigated these obstacles by engaging scheduling deputies and advisors, fostering collaboration through preplanning workshops and meetings. Unfortunately, some courses could not get up off the ground by the time of the interviews due largely to scheduling conflicts and course loads.

During the implementation phase, project management played a critical role in ensuring the timely completion of tasks and clear communication across departments as well as with students. Engaging students to inform course objectives and see how it worked for their plans of study proved beneficial in tailoring content to their needs and finding ways to work these course into their plans of study. One faculty saw that, "*By making these classes they can take for the ethical component or the design component, that will make [it easier for them to take the course]. Even though they are willing to take them, they have to decide on a lot of things before taking a class with a different curricula. It is important for classes like this to try to make them more appealing or more easily available to students."* Nonetheless, rigidity within existing academic plans of study and competing priorities related to tenure and promotion complicated the integration of these innovative courses. Cross-listed courses also posed coordination challenges, particularly in evaluations and instructor recognition. As one faculty member noted, *"What's been key for success is someone like me with the managerial chops and time to navigate logistical hurdles faculty don't have time for."*

Continued motivation among faculty was driven by their passion for transdisciplinary teaching and the support of collaborative nature of their project teams. External funding, such as grants from the Innovation Hub, provided the time and resources needed to plan and execute these projects. However, faculty faced competing demands on their time, and limited resources for transdisciplinary teaching posed long-term sustainability concerns. One faculty member highlighted the challenge of funding*: "It's so challenging to secure federal or state funding for this type of work. Diversifying funding sources is crucial."* Additionally, faculty saw how transdisciplinary was supported through research but not through education. "*My space is pretty transdisciplinary in nature, but it's always been around grant work. It's not really been around student learning at all."* The pressures for promotion and tenure especially weigh on junior faculty who may want to do this type of teaching but have other pressures to advance their research agenda by applying for grants and publishing papers. However, faculty who were already tenured or those

who were not on the tenure and promotion track had more time and flexibility to design and implement these courses.

Scheduling difficulties, and workloads, were another significant challenge not just for faculty but for administrators, as highlighted by one faculty member who had an administrative role for their department: *Everybody agrees conceptually- if they take off the administrator hat… everybody understands it and gets the value, but then that hat has to stay on.* These fundamental challenges of working in a large institution highlighted the need for robust attention to the barriers and the realities of their institution to problem-solving to sustain transdisciplinary efforts.

**Future Plans for the Courses**

Despite obstacles, faculty we talked to remain committed to advancing transdisciplinary education. They believed in the mission of transdisciplinarity and the value it offered students but were unsure of the future of their courses. Ensuring long-term sustainability involves addressing personnel continuity, integrating these courses into departmental plans and curriculum, and advocating for institutional support, financial as well as structural, to get transdisciplinary courses embedded into the course registration system. Faculty are optimistic about leveraging their experiences to continue improving and expanding these innovative educational offerings and felt motivated by the supplemental grant to support their time and energy to develop these courses.

**Discussion**

The findings from this study reveal several critical points about the potential and challenges of transdisciplinary teaching initiatives in the pursuit of convergence education. This discussion highlights three key insights derived from the analysis and proposes directions for further exploration and action.

**Supporting Faculty with Time and Resources**

The findings demonstrate that transdisciplinary teaching is achievable when motivated faculty are provided with adequate time (planning time and time in their teaching schedule) and resources (grants, connection to registrar's offices) to collaborate effectively. Faculty engagement is driven by their commitment to innovative teaching for their students and their interest in working across disciplines. However, institutional barriers often complicate the process and make it difficult if not impossible with current technological (course registration and evaluation platforms) and structural systems (siloed disciplines and plans of studies for degrees)[18]. Administrative challenges such as cross-listing courses, linking course evaluations to all instructors, and coordinating classroom scheduling require significant navigation that is not clear for new faculty who have the training and or attention on transdisciplinary work. Faculty with institutional knowledge or access to knowledgeable administrative support are better equipped to overcome these hurdles. Institutions aiming to promote transdisciplinary programming should consider developing dedicated support systems, including specialized administrative roles or clearing houses for transdisciplinary courses, to streamline these processes and reduce the burden on faculty and administrators.

**Embedding Research in Transdisciplinary Courses**

Integrating research agendas into transdisciplinary courses offers a potential compelling strategy for deepening faculty engagement and amplifying convergence education. When faculty bring their research into the classroom, courses become more generative spaces—not only for student learning but also for scholarly exploration. This alignment can support the development of new collaborations, advance research goals, and contribute to the scholarship of teaching and learning [35], particularly in areas where disciplinary boundaries are actively being crossed or reimagined. As noted in the findings, faculty—especially those in early career stages—often face competing pressures related to tenure and promotion, with institutional reward structures privileging disciplinary research and grant acquisition over teaching innovations. Embedding research in teaching could serve as a bridge between these demands, offering a way to make convergence education more legible and valuable within prevailing academic structures.

Moreover, this dual focus on teaching and research may offer a pathway to navigate some of the institutional misalignments identified in transdisciplinary course development—such as scheduling constraints, faculty availability, and difficulty fitting new courses into existing plans of study. When research and teaching are mutually reinforcing, faculty may be more motivated to sustain this work over time, and institutions may begin to see these courses as vital sites of both educational and scholarly endeavors. To better support this integration, institutions might consider creating formal incentives—such as seed funding, course release, or recognition in promotion criteria—for faculty who successfully embed research into transdisciplinary teaching. Doing so not only legitimizes the labor of convergence education, but also builds the kind of institutional infrastructure needed to sustain these efforts long-term.

**Varied Approaches and Research Needs**

The grantees in this study were at different stages of course development and implementation, employing a range of strategies tailored to their specific contexts. These variations highlight the need for further research to better understand the factors that influence the success of transdisciplinary courses. For instance, some academic units may be more conducive to supporting or housing such courses due to their culture, resources, or existing structures. Additionally, exploring the incentive structures that encourage faculty to sustain transdisciplinary efforts beyond initial stages is essential. Identifying courses that have transitioned from experimental offerings to embedded curriculum elements can provide valuable insights into long-term success factors.

This study's learning-focused approach provided a foundational understanding of the successes and barriers within transdisciplinary teaching and learning and what that could mean for the future of convergence education. However, the findings were constrained by the nature of the methodology, and limited data collection. While interviews and focus groups gave a good picture of the barriers, a deeper anthropological exploration of the social and cultural nuances of higher education could illuminate additional layers of complexity in implementing transdisciplinary initiatives. For instance, examining administrative support mechanisms such as advising, scheduling and the registrar through an anthropological lens could reveal how institutional structures and practices shape the feasibility and sustainability of these courses. Future research involving anthropologists could delve into the interplay between institutional policies, cultural

norms, and faculty collaboration, offering a more comprehensive understanding of the systemic challenges and opportunities in fostering transdisciplinary education.

**Future Explorations of Transdisciplinary Teaching towards Convergence Education**

The findings highlighted a complex set of motivations and constraints shaping faculty engagement in transdisciplinary teaching. Many instructors were driven by a deep commitment to collaboration and innovation, even as they faced structural disincentives—particularly junior faculty navigating promotion and tenure pressures that prioritize disciplinary research and publication. Future research could further explore how faculty at different career stages weigh the risks and rewards of participating in convergence-oriented teaching and course development.

Collaboration across disciplinary boundaries emerged as both a source of strength and a challenge. Faculty teams, composed of members from diverse colleges and subunits, had to bridge different pedagogical styles, institutional norms, and scheduling demands. While the collaborative nature of these teams was energizing and supportive, sustaining these efforts over time will likely require more formal supports—or may shift as roles and leadership within the university evolve. Understanding what enables effective cross-college collaboration—beyond initial enthusiasm or grant funding—is a key area for continued exploration.

The process of developing these courses also varied: some were built from scratch, while others adapted existing content. These decisions often hinged on practical concerns like course approval timelines, scheduling, and departmental teaching loads. Exploring how transdisciplinary course planning unfolds over time, and how institutions might better support this complexity, remains a critical area of inquiry. Additionally, the variety of subject combinations across projects raises questions about what kinds of disciplinary pairings foster the most engaging and transformative student experiences.

Several institutional barriers consistently surfaced, including scheduling constraints, faculty availability, and difficulty integrating courses into existing plans of study. These challenges reflect broader misalignments between institutional structures and the goals of convergence education. Finally, the role of institutional knowledge was significant—faculty with prior experience in transdisciplinary initiatives often leveraged that background to move their projects forward. Future research should consider how institutions can better retain and apply this knowledge, and what policy shifts are needed to make transdisciplinary teaching more sustainable and scalable.

Anthropological approaches are especially well-suited to illuminate the "in-between" spaces where this work happens—between departments, disciplines, and institutional roles. Ethnographic inquiry could help surface the boundary work that faculty and staff undertake to sustain these collaborations, the informal infrastructures that enable or hinder progress, and the alternative pedagogical and institutional imaginaries that transdisciplinary teaching makes possible. By attending to the everyday practices, negotiations, and frictions with in higher education that shape convergence education, anthropology can offer a critical lens on how transformation unfolds not only through structures and policies, but also through relationships, values, and place-based practices within the university.

## Conclusion

This study highlights the potential of transdisciplinary courses as a mode of convergence education to enrich teaching and learning when faculty are supported by institutional resources and collaboration opportunities. By addressing the administrative barriers, fostering research integration, and conducting further research into structural and cultural factors, institutions can create a more supportive environment for transdisciplinary teaching towards the future of convergence education. These efforts can ultimately lead to more sustainable and impactful educational innovations that align with the evolving needs of students and society.

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