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Designing transdisciplinarity: Exploring institutional drivers and barriers to collaborative transdisciplinary teaching

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ABSTRACT

Employers increasingly desire new graduates to work across boundaries, in teams, and with developed soft skills, especially in public affairs. Likewise, students increasingly seek academic experiences for learning, practicing, and honing transferable, competency-based skills. This suggests instructors should explore alternative pedagogy engaging problem definition and transdisciplinary teamwork. We describe institutional drivers and barriers to collaborative transdisciplinarity in undergraduate teaching and the structure and processes involved in developing a co-taught studio-based capstone involving public affairs students and varied other unrelated majors. We describe the structure through which the "SuperStudio" (1) combines topic concentrations with a shared policy context allowing students to apply disciplinary knowledge to define transdisciplinary problems and (2) fosters collaborative teaching and strategic exploration of overarching issues like problem framing, equity, and effective communication. We then offer lessons learned regarding the drivers and barriers to such efforts, and advice from institutional decision-makers on designing such courses at other institutions.

Employers and hiring managers interviewing recent graduates report that among the most desirable employee traits are the ability to work well in teams and across boundaries with disciplinary depth and transdisciplinary capabilities to solve complex problems (Hart Research Associates, 2018; Selingo, 2019). These traits are particularly salient in the field of public affairs where soft skills (Kinsella & Waite, 2021) and emotional competencies, like the ability to manage teamwork relationally, are among the most commonly considered criteria for hiring and promoting public managers (Berman & West, 2008).

Complex sustainability challenges addressed in public affairs programs rely on disciplinary cooperation and integration of ideas among stakeholders, for which inter- and transdisciplinary research and teaching are essential (Risopoulos-Pichler et al., 2020). Based in part on Van der Waldt (2012), Uwizeyimana and Basheka (2017) note that in public administration, multiple disciplinary lenses are particularly important because the "complexity . . . of managing public affairs" (5) requires administrators to be versed in multiple viewpoints. While these scholars argue that public administration specifically is a multidisciplinary field, they note that "transdisciplinarity is about the individual's ability to master or know a lot about more than one subject or field of study" (Uwizeyimana & Basheka, 2017, p. 5). They also note that decision-making and administrative tasks related

to the public sector require multiple skills and knowledge as well as collaboration between fields and specialists (Uwizeyimana & Basheka, 2017, p. 5). Importantly, there have been calls for curricular redesign efforts in public affairs education focusing in part on competency-based learning and exploration of new learning modalities through "carefully curated" experiences that prepare graduates as "agile, entrepreneurial, and boundary-spanning" decision-makers "able to relate to and include a diverse range of . . . increasingly empowered stakeholders[s]" (Evans et al., 2019, p. 288).

Curricular change requires first understanding the need for change and envisioning the curriculum before designing both it and specific courses to meet the vision. After implementation, improvements can then be used to "anchor new approaches" within the institution (Loeser et al., 2007). The need for public affairs students to cultivate capabilities around soft skills and complex problem solving in collaborative teams is clear, and exposure to transdisciplinary studio courses as part of a capstone or other curricular work provides a mechanism for such development. However, the practicality of developing and delivering these curricula may vary across institutions depending on institutional attributes, structure, and administrative logistics, all of which can serve to create barriers or drivers for collaborative transdisciplinary teaching. It can be especially challenging in instances where institutional declarations advance transdisciplinarity values and goals, but decision-making processes and systems allow little flexibility for funding efforts to further these institutional goals and values.

Definitions for transdisciplinary learning vary and are heavily influenced by the researchers and stakeholders involved in a project. For this paper, we define transdisciplinary in the context of teaching the framework for and practices of such work. Transdisciplinarity requires practicing teamwork, including collaboration and conflict resolution, engaging across societal sectors, and considering differing disciplinary and cultural standpoints (ex. Barrett et al., 2019). This paper studies the institutional drivers and barriers to transdisciplinary collaborative teaching for undergraduates identified through our experience in teaching a course referred to as the "SuperStudio" housed in the university honors college, which acts a centralized institutional home. The paper also explores the structure and logistic considerations encountered in our efforts to reimagine undergraduate education in a transdisciplinary setting that combines public affairs values with a focus on working across disciplines.

The "SuperStudio" possesses elements of learning outcomes from studio courses, but goes beyond that to explore transdisciplinary problem spaces outside of areas typical to design and planning studios, and explicitly incorporates transdisciplinary skills (i.e., Barrett et al., 2019) as well as capstone learning outcomes. Studio pedagogy has been described as integral to developing transdisciplinarity in students (Morales, 2017), and McLaughlan and Lodge (2019) note that studio pedagogy "already incorporates many of the factors considered best practices" in higher education as it "blends problem and inquiry based learning using a cognitive apprenticeship model and requires a design-based solution to a problem that is only loosely defined for the student" who must refine the problem through further research (p. 3). The iterative process of student projects in the SuperStudio is based closely on the process employed in studio learning, which can be summarized as refining and defining a problem, seeking out necessary knowledge to solve it, putting the knowledge into practice, prototyping a solution, evaluating the prototype through presentation critiques, and refining the problem or

solution, or restarting the process when necessary (McLaughlan & Lodge, 2019). In the SuperStudio, we move beyond this to introduce students to concepts crossing disciplinary boundaries, and by encouraging them to identify and describe problems and potential solutions that move beyond disciplinary perspectives toward true integration of approaches and ideas.

The SuperStudio course arose from institutional changes geared to promote transdisciplinary collaboration. The following section describes the research methods for obtaining a perspective on institutional goals from faculty and administrators as an explanation of the academic space in which the course was developed. Next, the structure of the SuperStudio at a large land grant university in the Southeastern United States is described. The main findings including drivers and barriers are then summarized at the institutional, department/unit, and course levels, followed by strategies for faculty success in designing and implementing these types of courses for undergraduate students. The findings provide insight for other institutions that are seeking to introduce transdisciplinary learning into their curriculums.

Methods

This study combines author observations from our experience developing and delivering the SuperStudio with discussion artifacts from a summer workshop and key informant interviews to identify drivers and barriers to transdisciplinary collaborative teaching that can be applied across institutions. After an initial offering of the SuperStudio, a summer workshop was held in 2020 and designed to both further course development and to solicit input and ideas from other faculty working on team-taught or collaborative transdisciplinary courses across the university.

The semi-structured key informant virtual interviews took place between November 2020 and January 2021, and included eleven actors at different levels of university administration. Interviewees comprise five decision-makers including an undergraduate advisor, two department heads, a dean, a representative from the registrar's office, and six experts on institutional transdisciplinary initiatives. To help identify factors that influence institutional engagement in collaborative transdisciplinary teaching efforts, interviewees were asked for perspectives on how the institutional position of the Honors College as a centralized institutional home for the course influenced the creation of the SuperStudio, how the current university funding model affects innovation in class structures for integrated courses with cross-listed, concurrent, and co-taught elements, and whether they have any plans or ideas related to measuring or tracking the effects of innovatively structured courses. This initial list of questions framed perspectives on and acceptance of alternate pedagogy practices at the university. When appropriate, questions were also asked relating to faculty compensation or support for the additional work required to advance courses like the SuperStudio. In addition, the six experts were asked their perspective on the importance of transdisciplinary work to campus goals, and how transdisciplinary learning fits into undergraduate education. The additional questions provided insight regarding administrator desires to quantify student learning outcomes in transdisciplinary courses, which will be used to design a future study on this topic. Each interview was transcribed and reviewed by the authors to identify themes related to each of the question areas. These themes were then integrated with faculty-level observations and takeaways from the summer workshop

to delineate drivers and barriers with related best practices at the institutional, department/unit, and course levels for designing collaboratively co-taught undergraduate public affairs courses.

The transdisciplinary SuperStudio course

The SuperStudio developed iteratively over a number of semesters from faculty conversations about institutional goals and common elements across individual topics courses. For several semesters, the Honors College offered individual three-credit topics courses focused on instructor-guided exploration of a pre-defined problem space. Faculty delivering these courses discussed the need to provide students with common foundational material and discussion opportunities related to overarching considerations like equity, ethics, and basic public policy processes. The idea of creating a shared experience related to the Green New Deal developed through these conversations.

SuperStudio planning and learning outcomes

During the summer of 2019, the topics course instructors reached out to faculty in other university units who previously taught topics courses for the Honors College and those with similar missions to identify faculty interested in collaborating on a co-taught policy lab (which subsequently became the SuperStudio). Through this process, three additional instructors from different university units/departments joined three Honors faculty to begin planning the SuperStudio, which was first offered in Spring 2020. Pedagogy within the SuperStudio is an abbreviated hybrid of the real-world-driven and science-focused approaches to the transdisciplinary research process illustrated by Bergmann et al. (2012) (see Figure 1). The SuperStudio engages transdisciplinarity to "integrate the natural, social, and health sciences in a humanities context, and transcends their traditional boundaries" (Choi & Pak, 2006) in an approach that "seeks to assemble new approaches from scratch" (Bernstein, 2015) through challenging traditional disciplinary boundaries.

To engage in this work, students identify a social issue influenced by the SuperStudio theme, currently the Green New Deal, and construct a research goal. Next, they work in small groups to identify the root cause of the issue and strategize options for addressing it, while keeping in mind the priorities, goals, and expectations of potential stakeholders. In many cases, students must also reach out to community partners to learn about their experiences. This approach engages students in discovering and defining critical real-word problems and working through multiple iterations of problem definition and exploration to become comfortable with uncertainty, reflect on problem solving processes, and communicate results to diverse audiences.
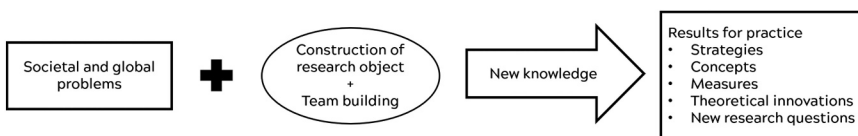
Figure 1. Adaptation of Bergmann et al. (2012) model for the Institute for Social-Ecological Research model of transdisciplinary research.

Students are asked to strategize options for addressing social and global real-world problems of a complex nature by blurring the lines between distinct disciplines as they strive to identify synergistic, adaptable, holistic, and innovative solutions (Leavy, 2011, p. 35). The concept of transdisciplinarity challenges them to think beyond their in-major applications of an idea or theory by exploring how their knowledge intersects with the knowledge of others, and how that merging of ideas produces new knowledge.

Over the course of a semester, students practice a variety of transdisciplinary skills: teamwork, collaboration, communication, and conflict resolution; understanding of disciplinary and cultural perspectives; transdisciplinary knowledge gathering and analysis; and engagement across societal sectors (Barrett et al., 2019, pp. 741–742). As a joint capstone and senior-level course, expectations are set at the higher-order level of the updated Bloom's Taxonomy (Anderson et al., 2001). Students start by analyzing key concepts in their selected topic, evaluate the relationship between their topic and all others for the course, and create an artifact of their learning process in the form of a deliverable that contextualizes their perspectives on the common theme.

SuperStudio course structure and integration

Students practice transdisciplinarity within the context of a distinct course structure combining concurrently taught sections, collaborative learning and instruction, and co-requisite course enrollment. Students pick one of five multidisciplinary three-credit topics courses: (1) environmental policy and social change, (2) data analysis for health reform, (3) innovation for the public good, (4) the future of higher education, and (5) the future of employment. They also enroll in a co-requisite transdisciplinary one-credit policy context course. In the co-requisite course, students in all sections meet concurrently to examine the challenges and potentials of the Green New Deal through shared learning experiences and discussions. Discussion of overarching concepts like problem framing, ethics, equity, and innovation that bridge individual topics and that must be interrogated in order to understand the history, purpose, and potential outcomes of the Green New Deal provide students with opportunities to develop transdisciplinary and collaborative skills needed as professionals and citizens (Lopez-Littleton et al., 2018) (see Table 1). This team-teaching approach to transdisciplinary courses, which is a valued best practice in honors education (Schuman, 2014), cultivates connections between concepts and fields of study as well as helps develop relationships between students and faculty in different sections.

In relation specifically to public affairs, the SuperStudio approach focuses largely on the "economics" core curriculum category comprising economic, policy design, and policy evaluation issues described by Miller (2019) as more prevalent in graduate public affairs degrees. However, rather than risking curricular mimicking between undergraduate and graduate public affairs education, the SuperStudio instead provides students with competency-based applied experiences that offer a foundation for grappling with more complex decisions in the workplace or graduate school.

Table 1. Mockup of SuperStudio semester agenda with cells colored to represent various levels of collaboration and goals of a given day each week. Classes are held three days a week and are represented as columns.

Week	Day 1	Day 2	Day 3	Legend	
1				▮	Common topics (all 5 sections together)
2				▮	Individual topic (solo section meetings)
3				▮	Policy theme discussions (all 5 sections)
4				▮	Collaborative topics (2 or 3 sections)
5				▮	Transdisciplinary project group work
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Results: Takeaways and lessons learned from designing the SuperStudio course

In the process of designing and implementing the SuperStudio, and engaging with university faculty/administrators through a summer workshop and key informant interviews, a number of institutional-, course-, and faculty-level observations were identified. These include drivers and barriers at each level that reveal considerations and lessons learned that can be applied across different institutional contexts (Table 2). These observations are explored in the following sections. The focus of this paper is two-fold – (1) to think about institutional drivers and barriers to this type of course and best practices (2) to provide a basic framework to structure such a course. While discussions around these areas might result in institutional change, that is not the explicit focus of this paper.

Institutional-level drivers

Curricular redesign efforts are heavily dependent on institutional supports, and as noted by Risopoulos-Pichler et al. (2020) "higher research education institutions have the opportunity here to set a good example by increasing their efforts toward interdisciplinary, transdisciplinary research and responsible teaching and education" (p. 13). In 2015, our university launched the Beyond Boundaries initiative to envision the university in 2047 on its 175th anniversary. Over a one-year period, over 90 committee members worked across the following four thematic areas: student preparedness, the campus of the future, new funding models, and our global land-grant mission (Blieszner et al., 2015). During this process, the interconnectedness of these four areas became apparent, and a new cross

Table 2. Considerations and lessons learned from teaching the SuperStudio at a large land-grant university.

Level	Drivers/Considerations	Barriers to change
Institutional	• Align with both higher-level institutional goals and initiatives • Consider budgeting models; seek exceptions when necessary • Provide internal support & seek external funding to advance course design • Recognize the contribution of highly collaborative and transdisciplinary courses/studios (FAR [faculty activity reports], P&T [promotion and tenure], etc.) • Ensure adequate and flexible physical space for course requirements • Be patient; it takes time to align higher-level goals with sub-units	• Performance budgeting models – e.g., the Partnership for Incentive Based Budgeting (PIBB) – focuses decision-making on metrics such as growing student credit hours and faculty-to-student ratios, which can undermine and devalue collaborative and co-taught initiatives • Colleges, departments, and programs may be unwilling or unable to share their flexible teaching space with other units
Course	• Ok to start small, iterate/grow integration and collaboration over time • Requires shared context lab in addition to complementary topics sections; find overarching policy context that interests all faculty • Requires identification of overarching topics like ethics and equity and explicit conceptual overlaps in topics • Class management portals (Canvas, Blackboard, etc.) should be seamless; one portal for all student access and interaction • Communicate structure clearly: explain to students up front the differences in course structure and aims; repeat during semester	• The need for faculty to work outside of the semester to design a co-taught transdisciplinary course may not be supported by the faculty or institution • Faculty may not have the skills needed to integrate multiple courses into one seemless course (portal) on an institution's learning management system or the system may not support such integration • Finding a graduate student who is able to effectively manage the complex nature of a course like the SuperStudio may be challenging, and could increase the work of the teaching faculty
Faculty	• Find good team fit; support one another • Meet weekly; communicate often and openly • Reiterate the structure, context and expectations to students often • Use mentored feedback sessions as basis for communicating with other faculty and setting common expectations for students • Seek just compensation and recognition • Capture all unique aspects of course in the FAR	• Faculty may not receive the recognition they deserve (either financially or with regards to their level of effort), which can undermine their long-term commitment to delivering a co-taught transdisciplinary course

cutting theme emerged that centered on improving the human condition through applied service. At the foundation of this theme was our institution's version of the traditional 'T-shaped' learning model (Guest, 1991; Saviano et al., 2017), which prioritizes "purpose-driven engagement with a combination of disciplinary depth and interdisciplinary capacities" (Blieszner et al., 2015, p. 10). At an institutional level, the university aims to encourage transdisciplinary efforts, providing a driver for collaborative transdisciplinary teaching. At our particular institution such efforts are encouraged in part through the "Destination Area" (DA) initiative, supporting collaboration across disciplines in both research and teaching "to address complex problems that impact the human condition" [institutional website 1]. As of spring 2021, there are nine DAs, one of which is +Policy, which supports research and teaching to better understand "complex decision making in multiple contexts and policy settings" [institutional website 2]. Faculty affiliated with the SuperStudio are active participants in the +Policy DA, and were awarded a small university-level grant to support the development of the SuperStudio, which included funding for

summer stipends, the summer workshop, and a graduate research assistant. This support was accessible specifically because of the alignment of the course design with institutional goals, underscoring the importance of such alignment as a driver of engagement.

Unit-level institutional drivers

Both the flexibility of individual units within the university and alignment of values between individual units, sub-units, and the larger institution can serve as drivers of transdisciplinary collaborative teaching efforts. As part of institutional efforts toward strengthening interdisciplinary and transdisciplinary undergraduate education, in 2016 the university converted the Honors Program to an Honors College in part to bolster infrastructure for developing curricula to help meet these broad aims. The institutional importance of Honors to SuperStudio lies in its flexibility as a unit, with faculty from multiple disciplines that have the curricular freedom to develop alternative pedagogical strategies and to develop research across units. Because the unit grants diplomas and not degrees, there are no specific disciplinary courses that faculty must teach. The result is room to explore course offerings that very often stem from conversations among faculty and students about what they have found more or less useful in their educational experiences. Other academic units sharing similar values and with similar curricular latitude within their degree structures can fit culminating experiences like capstones into the SuperStudio course structure. Faculty from different fields can deconstruct and rebuild disciplinary knowledge in the context of complex problem spaces under the shared umbrella of the team-taught policy context course. The collaborative opportunity serves as a model to help students create original work through evaluating connections between and within their disciplinary knowledge (Anderson et al., 2001, pp. 6–7).

> One thing about the honors part of all of this that is an important context I think, is that when [the university] asked ... [honors] to become a college as opposed to the old program, it was very much part of the conversation, and [it was] certainly my understanding ... that [the college will] become a Sandbox. [The college] becomes an experimental, innovative [space] that fits in the Beyond Boundaries rhetoric. – Decision-maker

Another key informant recognized the unique position of the Honors College to advance transdisciplinary learning, since students are not constrained by disciplinary course requirements.

> [Students] ... end up sorting a bit by major, which defeats the purpose because the schedules, ... the logistics drive a great deal of what kind of access you have. So, ... the way I see honors is you start with the idea and then build the program from there. Whereas the rest of the campus and world operates the other way, which is, here's our structures, and we will now work to fit these ideas within these structures. – Decision-maker

In addition to university-level organizational goals, the SuperStudio curriculum meets the missions and goals of institutional sub-units. The mission statement for the Honors College calls for "extraordinary undergraduate education" and "progressive, innovative approaches ... to provide opportunities and challenges [around] ... intellectual engagement in global contexts" [Institutional website 3]. Similarly, the mission of an academic partner of the SuperStudio is to develop students with "a global perspective, who are able to

work collaboratively with diverse people in transdisciplinary settings, engage in critical and creative thinking, and make decisions based on evidence and a deep sense of ethics" [Institutional website 4]. These overlapping missions provide both students and faculty with a foundation of common values and expectations from which to approach different ideas and class structures, especially when seeking to reconcile initiatives and goals at different administrative levels.

Institutional-level barriers

The Partnership for Incentive Based Budgeting (PIBB) performance budgeting model adopted by the university to replace incremental budgeting and allow for "more agile funding strategies" for Beyond Boundaries and other initiatives, runs counter to some of the university's stated goals as it exacerbates tensions between university units. Therefore, this type of common budgeting approach of making university units self-supporting or revenue generating creates a barrier to designing collaborative and co-taught courses because of the PIBB budgeting credit allocation. As each unit is dependent on student enrollment in their particular courses to maintain access to resources, predictable tensions arise when different units are competing for the same students or faculty are contributing to course efforts that do not increase enrollment (student credit hours) in their home unit. In addition, the allocation model seems somewhat complex and is not well understood, even among administrators.

> The PIBB is . . . guiding some decision-making without folks actually knowing what the metrics are . . . . So it seems like if we were much clearer about what are the goals of the university, what are the goals that we can all agree on, things we want to see change, things we want to see more of, then the budget would support those [metrics]. – Decision-maker

> At the heart of PIBB is that calculated credit hour. . . . Unless the provost's office was willing to look at these courses in a different way and divide them up, I think PIBB does . . . throw up a roadblock. . . . I think the challenge in doing it in one course is going to be the owner of that course. Because that's where the lion's share of those dollars will go for that credit hour output. – Expert

Based in part on an experience with another unit becoming territorial about a course, one key informant noted:

> So, I think [PIBB] hampers [innovation in class structures because] . . . you're fighting . . . for the little beads that our students have become. . . . Going forward . . . collaborations are going to happen in spite of that, the budgeting model, not because of it. – Decision-maker

When speaking about advancing transdisciplinary education, another expert commented that "if [the university] cares . . . about being a global land-grant . . ., [i.e.,] solving these world problems or answering these world questions," this cannot "be done . . . [by] any individual department and yet our budget is set up to have people compete against each other, the disciplines, the buildings, . . . the infrastructure."

Because of the unique context of honors as a diploma-granting rather than a degree-granting unit, the PIBB model cannot be applied as it can in disciplinary units focused on degrees. This creates a level of flexibility in curricular offerings not available to all units. Honors administrators noted:

> Well, it's not something that we have to directly pay attention to because it doesn't make sense for an outfit like ours, which is predicated on small groups of students who by definition are from all kinds of majors anyway. It's just not set up, so it's very, very difficult to make it relevant to us and so that was another reason ... why the honors environment helps to make it work. – Decision-maker

> I get why [the Honors] College is a good place to work it out in the sense that ... there doesn't seem to be any financial competitiveness in terms of the assignments and when folks work with us, when we work with them, it seems to be a win-win situation. At least since I've been on board, there hasn't been one of these collaborations we've done ... with other units or individual faculty members that's ended up hurting anybody. And so it's simply not on my radar. It's nothing I ever have to worry about. – Decision-maker

However, they also made the point that this could incur additional costs for honors as the "host unit" in the future:

> [For our own faculty,] it's kind of baked in ... to our expectations that there should be time spent doing these things. They should be collaborative workers, et cetera. But it doesn't fit the model elsewhere on campus ... very well. ... I know that some of our resources in the future may have to go somehow to sweetening the pot for faculty [from other units to contribute to these courses]. – Decision-maker

Adequate and flexible teaching space

The need for access to appropriate spaces to deliver these types of courses is a potential barrier to implementation. Innovative course designs often require physical spaces that differ from typical university classroom spaces both in capacity and in programming flexibility. Individual units may very well need university level support in securing, preparing, and maintaining such space for use as an innovative classroom environment. With institutional considerations met, it still takes time, dedication, and patience to support new ways of delivering public affairs courses.

In our case, the modular and flexible nature of the SuperStudio requires physical teaching space that is also modular and flexible, with mobile dividers and furniture on casters. For the SuperStudio, the Honors College relied on a combination of internal funding and university support to secure and renovate an old ballroom in a student center into a classroom space that not only serves the SuperStudio course, but several other transdisciplinary initiatives involving honors and academic disciplinary units across campus. This flexibility allows instructors to create unique spaces for their individual sections, and subsequently combine spaces when pairs of sections collaborate. Students are also able to set up spaces for group work during the final portion of the course.

It is important to note that the openness of the space also creates a problem: noise. The discussion and collaborative critical thinking aspects of the SuperStudio mean that all sections are actively engaged in conversation at the same time in the same large room.

Noise created by fully engaged students is a good problem to have in this type of community of practice. However, this can be distracting. One means of addressing this issue was the use of noise reduction barriers between the instructional areas. Additionally, reserving alternate teaching spaces where students can meet in small groups has helped to promote focus and community building in the class.

Institutional supports for transdisciplinary initiatives

Institutional considerations relating to course-planning include ensuring a fit with both higher-level institutional goals and initiatives, avoiding running afoul of budgeting models, and seeking funding and recognition for new course designs. At the institutional level, administrators and decision-makers should consider carefully the potential tensions being set up by competing initiatives and decisions, especially around budgeting models, and should be prepared to carve out exceptions for individual units and courses where appropriate in meeting higher-level educational and vision-oriented goals.

Even with necessary institutional supports, a strong course design, and suitable space, long-term investment in these types of initiatives is key, as are patience and perseverance. As one key informant noted:

> With institutional efforts, it works this way, with faculty as the boots on the ground, the ones who are implementing the work, and then the higher administration gung-ho and seeing the vision. The real supports and structures have to come into play in the middle [for real institutional change], with the college and department heads, often the least powerful, constrained by the system. Once that levels out [and there are supports at the middle level] then the process will be smoother—it is just the nature of how institutions change. – Expert

Another commented:

> I think one starting place [for incentivizing such work] is certainly conversations with the department heads and examples from other department heads about how they've been able to change the culture in their department where these things are valued to signal how other departments could do it. But I would love to see the university leadership stand behind some of those department heads and actually draw . . . positive attention to the hard work that they've done. I definitely think it is something that from my perspective, I struggle with a great deal because we've not [cracked] the code on that. – Expert

Course-level drivers

Alignment with values and goals of outside influences such as accreditation bodies and professional associations, many of which have overlapping values across disciplines and practices, can act as an additional driver for innovative transdisciplinary course design. While designing such courses can be time and effort intensive, the SuperStudio structure provides a venue for students to learn how to better share their values and viewpoints with peers and mentors from across disciplines and across institutional levels and units. An additional advantage of a course like the SuperStudio that comprises undergraduate students from a number of disciplines and years is that it allows educators to identify important concepts and skills that need to be introduced earlier in the curriculum so

students can more effectively apply them in a capstone experience. While the courses are designed for undergraduates, it also curates basic tenets of graduate public affairs education around public service values put forth by NASPAA such as considering "the public interest with accountability and transparency; serving professionally with competence, efficiency, and objectivity; acting ethically . . . cultivating global, regional, and local awareness; and . . . demonstrating respect, equity, and fairness" for students in other disciplines (Commission on Peer Review and Accreditation, 2019, p. 2). This matches the Commission's focus on developing competency-based skills in graduate students to prepare them the job market, so developing these skills earlier on in their educational journeys allows students time and space for iterative practice. In addition, the SuperStudio is especially impactful for students in other disciplines that may not have been asked to think explicitly about relationships between sectors, stakeholders, equity, ethics, and representation.

Key to the success of such courses from a faculty viewpoint is finding allies across the university that are supportive of different approaches to course delivery. As one department head noted,

> project-based, interdisciplinary . . . research . . . is really what 21st century education is supposed to be. . . . I considered this type of course . . . as a high impact practice . . . Just like [when a] student goes . . . [on] a study abroad or does an internship, . . . [or] they do a mutual research [experience] with the faculty member. Those things leave their indelible mark right on the students, and I think the same thing applies for a course like this. – Decision-maker

Course-level barriers

Relatedly, it is important for both faculty engaging in such work and for those evaluating their work to understand the amount of time and effort that goes into design and implementation. Failure to do so presents a substantive barrier to course innovation. In our case, implementation of the SuperStudio begins approximately three months before the semester starts with weekly meetings between the collaborative faculty team focused on outlining the structure and logistics for the course. This work includes setting up the online course management system, which connects the multiple sections and the co-requisite one-credit course for the students. The planning time additionally allows topics instructors to talk about overlapping discussion and reading subject matter in pairs. Shared assignments and rubrics are developed and set by the instructors as a group, with some assignments reserved as specific to a section so that students have the space to learn key concepts in their selected topic before collaborating with students in other sections. All the assignments are mapped to the academic semester calendar where due dates, milestones, and final deliverables can be considered within the context of what others have planned.

Additionally, finding a shared context co-requisite, in our case understanding public policy and the GND, can take a certain amount of time and negotiation. This shared context should be of interest to all involved faculty, tying together their experience and interests, and must be decided prior to beginning course planning. The course must then be laid out in a way that provides a clear relationship between the topic sections and the context corequisite so that students have a foundation on which to build their inquiries and further exploration of the related ideas. This shared knowledge foundation enables students to interrogate ideas and relationships. It also sets the stage for shared interaction between all

students and faculty, with students getting grades and feedback from each faculty member. Students can seek out specific advice based on instructor experience and expertise, and the inclusion of scheduled mentored feedback sessions during regular class times as a means to connect with other instructors is key to allowing students to explore, consider questions from multiple viewpoints, and justify their position to those with varied values and disciplinary stances.

Another potential barrier to implementation relates to course management portals. Because of the complexity of the course design and the departure from student expectations about course structure, it is particularly important to develop one shared class management portal that appears seamless to students. This signals that the topics course and co-requisite context lab are designed as one experience and should be treated as such, and it provides a platform for communication for students and faculty from various sections to engage in conversation about interests and motivations surrounding the theme. Failure to carefully design such a portal can mean a far less successful course.

Finding a graduate teaching assistant able to manage the relatively complex course structure and the breadth of materials and student interest areas presents another challenge for this type of course. We were fortunate to have a TA for the early iterations of the course who had strong program coordination and multidisciplinary content knowledge.

This type of course takes time and experience to develop. As noted above in regard to our process, it might not be possible to deliver a fully integrated course in one go. It is fine to iterate, finding overlaps between existing courses, and making it more integrated as faculty develop more connections between courses and develop closer working relationships.

Faculty-level drivers

At the individual faculty level, there are numerous considerations for whether teaching this type of course may be tenable based not only on institutional- and unit-level considerations, but on faculty fit and available individual resources. Desire to design courses collaboratively and teach collaboratively as well as good relationships with other faculty are key drivers of such transdisciplinary efforts.

In addition to teaching credit, the ability to engage in this type of teaching varies substantially based on experience, background, and teaching style. It is also dependent on relationships and trust, so even in contexts where it might be desirable it likely cannot be dictated from above, and supervisors and individual administrators must have a long-term commitment to the teaching faculty's efforts. Despite the clear challenges in this type of teaching arrangement and potential barriers to transdisciplinary efforts at both the faculty and institutional levels the presence of strong relationships and respect among faculty, as well as long-term commitment can act as drivers to overcome these issues.

> I think what you're doing [with multiple collaborative faculty that all interact with students] is the ideal but ... you run up against that it is also incredibly challenging. It takes strong relationships and a lot of respect and collaborative spirit with faculty that I ... think has to develop over time .... It's ... rare [that] ... three faculty from three disciplines ... drop into a room and immediately are able to manage their different styles, different backgrounds, different experiences that have to come together in ways that truly makes it a team. ... I've

done some professional development, team teaching, and it's best when … the person I'm working with, I know well enough that they can … interrupt me and I can interrupt them. We can almost finish each other's sentences. – Expert

We know that collaboration in anything makes nothing easier and everything more complicated. We know that, despite all its values. … [One hope] for any sort of course prep is that there's a lot of front loading, and then over the long term, of course, that prep time goes down. All of which suggests that long-term commitments to things presents the only cost-benefit ratio … that's going to work. … So should we be looking at other partners in the future and say look, this works really, really well, but you gotta be in here for the long haul. – Decision-maker

Faculty-level barriers

One of the main challenges of this type of class is the hidden labor that goes into co-teaching efforts. This is particularly salient in regard to something like the one-credit team-taught policy context course that requires one faculty member each semester as faculty of record, but requires input and participation in weekly meetings and grading by all involved faculty members.

In our particular case with five topics sections, this effort is worth one-fifth of one credit hour per faculty member and is therefore negligible, or perhaps even an active waste of time, from an institutional credit-units tracking and budgeting perspective. It is not, however, negligible in relation to faculty input or to student outcomes, with students anecdotally noting that it provides them opportunities to gain insight from different professional perspectives on a contextual theme or their projects. Students see and internalize the care and consideration put into the learning experience and exhibit motivation to engage with the faculty through actions like seeking additional feedback outside of milestone assignments and sharing of tangentially related readings discovered during their research process.

In addition to drivers and barriers, it is important to consider measurable outcomes from such courses. One university-level administrator noted "Now you've got group work with multiple perspectives and expertise coming into the same space. And I think students find it challenging, invigorating. … And so when done well, I think it taps into everything we know about learning, motivation, commitment, persistence, excitement, all those things that really bring students into authentic work." While student evaluations rate the course overall as above 5.5 on a six-point scale indicating overall student satisfaction with course outcomes, we have recently begun collecting data on specific transdisciplinary learning outcomes for evaluation by the university. Such data are likely to be critical when making the case for transdisciplinary co-taught courses, and will be explicated in another study once data collection is complete.

Considerations across institutions for faculty engaging in co-taught transdisciplinary public affairs courses

Faculty interested in teaching this type of course should only consider doing so if truly interested in developing it over time and have a desire to team teach. Course goals should be clearly aligned with subunit and institutional goals. In a course such as SuperStudio, there

are many learning outcomes beyond transdisciplinarity, so in a different institutional context the course might be very similar, but described in terms of different pedagogical and institutional aims. Consider those that resonate with your institution as you work toward course design and communicate with your curriculum committee. Alternative subunit or institutional goals might include competency-based skills and work preparedness, experiential learning, or community engagement and service.

Instructors must prepare to meet weekly as a group, and to have numerous pairwise conversations about how to best communicate an expectation or concern to a student working across sections. It is important to remember in delivering this type of course that students are generally used to a particular type of course structure, and easily revert to familiar expectations of a course. This necessitates reiterating the structure, context, expectations, and reasons for each several times during the semester. We have noticed that doing so in detail at the beginning and after the first third of the course is particularly important, accompanied by brief reminders at other points in the semester. We recommend using mentored feedback sessions as the basis for students to communicate with all members of the teaching team and setting common expectations for students during the last part of the semester as they concentrate on projects. To help coordinate between sections and manage the shared online portal, it is imperative to identify a strong teaching assistant with professional experience and a collaborative mind-set. Masters students are often excellent for this type of work as they may be more likely to have more applied administrative and program management experience than PhD students.

Lastly, but perhaps most importantly, faculty engaging in such collaborative transdisciplinary co-teaching efforts should make every effort to seek just compensation and recognition for their work. This may mean ability to secure summer funding for preparatory activities, course buyouts once every several years to make up for uncompensated teaching overages taken on as part of collaborative co-teaching, monetary compensation for overages, or reductions in service expectations. Seeking both internal and external grants and internal and external recognition for such efforts is also important, as it signals the value of your efforts to those who may not fully understand the value of the course itself. Finally, directly aligning teaching expectations from institutional units with annual reporting requirements is another way for faculty to demonstrate their commitment to transformative pedagogy. As one administrator commented, "I think you need to incentivize this kind of work which we have with our [Faculty Activity Report system] that is specifically written to foreground transdisciplinary and trans-sector work." This might require additional funding be made available to support faculty in co-teaching and for the institution to spearhead efforts to identify, recognize, and reward innovative transdisciplinary teaching activities rather than relying only on faculty advocacy.

Overall, we have identified a number of drivers and barriers to collaborative transdisciplinary teaching efforts designed to expose a range of students to principles of public affairs education. Considered in relation to one another, these drivers and barriers suggest a number of considerations from the institutional to the faculty level to help encourage the development and implementation of such courses at varied institutions by aligning systems, considerations, and compensation in such a manner that efforts will be sustained long-term (see Table 2). Combined with findings on how to structure interactions (Table 1) and manage collaboration between faculty, these lessons learned provide scaffolding for those seeking to develop similar courses at other institutions.

Discussion

While collaborative and co-teaching efforts depend on specific institutional contexts, resources, goals, and expectations, there are a number of takeaways identified here that apply across institutions. Designing transdisciplinary courses for undergraduate students is particularly impactful because so many of them are mired in disciplinary silos, and while they may seek experiences outside their majors, they rarely get a chance to combine their disciplinary knowledge with new learning in ways that allow them to define and address problems outside the bounds of pre-set faculty expectations. Creating more transdisciplinary and collaborative experiences for students, where they see faculty modeling the same competencies and ideals they are being asked to develop, will better set up public affairs and other students for success beyond their degree programs whether as professionals or graduate students. To reach these types of goals, it is important for institutions to consider alignment of systems, goals, and resources across sub-units, as well as avoiding path-dependency and overly strict loyalty to existing systems that stymie innovative teaching efforts and attempts to provide rewards and recognition for such efforts.

By capturing the experience of creating a collaborative, co-taught, and transdisciplinary SuperStudio, this paper identifies a broad range of considerations and lessons that others can apply when embarking on a similar activity. Although the considerations covered here will not address all concerns or issues encountered at institutions different from a large, research-focused land-grant institution, the tips and perspectives shared may spark interest and promote conversations that will add to the discourse about best practices for transdisciplinary skill development in higher education.

Disclosure statement

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