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# Interconnected and Distributed Professional Growth and Development: Exploring the Potential for Faculty Development via Design for Impact, an Intercollegiate, Interdisciplinary Human-centered Design Program*

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While much focus has been placed on the student learning outcomes of interdisciplinary and human-centered design programs, there has been less investigation into the experiences and developmental outcomes of the instructors who deliver these programs. Specifically, important questions exist in relation to the potential of such experiences to foster instructor professional growth and meaningful development. Building off a model of instructor professional development that emphasizes the interconnectedness of growth mechanisms in courses led by a single instructor in a single program, this community analytic autoethnography explores instructor growth and development in an intercollegiate, interdisciplinary human-centered design program co-instructed by faculty from four institutions of higher education. Our qualitative study shows that in addition to interconnected instructor growth mechanisms within each faculty member involved, distributed growth mechanisms mediated by cross-instructor reflection open up additional multi directional pathways for professional growth and career development. Moreover, our group successfully fostered a culture and mindset of interdisciplinary appreciation and respect among the participating faculty, contributing to our own collective growth, enriching both individual experiences and the overall Design for Impact (DFI) program dynamics. This interdisciplinary culture and mindset not only enhanced the learning environment for participating students across multiple academic and professional majors at four universities, but also contributed to ongoing development of the DFI core faculty, as well as, faculty adjacent to those directly involved in DFI. However, despite this culture, growth mindset, and reflective practices employed, the basic limitations of time set aside for intentional, mutual reflection were inadequate to completely resolve reflective pathways for learning and growth. These incomplete collective reflection pathways underscore the ongoing need for dedicated time and embedded, structured processes to support comprehensive growth networks among instructors, especially in co-teaching contexts.

**Keywords:** interdisciplinary design; faculty development; interinstitutional; human-centered design

## 1. Background

There are mounting calls for students at various levels to participate in experiential and project-based learning, to develop professional skills that will transfer to the workplace, into career pathways and towards interdisciplinary dexterity and competence. Interdisciplinary, project-based learning has been demonstrated to have desirable outcomes for students, including developing different ways of knowing, learning how to understand, navigate, and employ multiple and often contrary ways of knowing, and inspiring creativity [1–4]. Similar work has focused on the need for interdisciplinary programs to address the challenges and uncertainties facing the construction of professional identities in tomorrow's society [5] through the lens of interdisciplinary scholarly research.

In addition to the benefits of interdisciplinary, project-based curricula on student outcomes, the literature also examines how interdisciplinary work plays out in the complicated space of academic professional identity [6, 7]. To date there has been limited research on the effects of interdisciplinary teaching and co-teaching on instructor professional growth and meaningful career development trajectories, leaving significant gaps in the nomological network [8]. There is some evidence that it may improve academic career trajectory and collaborative behaviors, as well as enhance university level organizational benefits and outcomes [9, 10].

Historically, higher education has existed as a highly siloed environment where students are taught within a strict hierarchy of academic units – Department, College, University [11]. Truly interdisciplinary programs are rare given the obstacles that disincentivize faculty collaboration that is critical to establishing effective spaces for interdisciplinary project-centric learning [3, 12–15].

Originating through the Atlantic Coast Confer-



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ence Academic Leadership Network (ACC-ALN), the Design for Impact (DFI) program brings together students from disparate disciplines at different institutions within the Atlantic Coast Conference (ACC) in a spirit of social impact inspired, transdisciplinary project, design collaborations to help solve complex challenges for people and our planet.

The purpose of this qualitative community autoethnography is to add to the literature of instructor professional growth and career meaning and development discourse in interdisciplinary, intercollegiate project-based learning courses. The study is centered on this question: what are some mechanisms of lasting growth that faculty experience particularly in relation to improved self-concept and professional identity [16, 17] when co-teaching and project-based learning across the boundaries of traditional academic units?

## 2. Situation in Current Literature

### *2.1 Instructor Professional Growth*

Guichard's theory on the psychological construction of identity in the 21st century (2014), and Blustein, Kenna, Gill & DeVoy's [18] framework on the psychology of working provide a general backdrop to challenges faced by professionals and the core importance of supporting faculty growth and career development in the context of today's unstable world. Our work is specifically informed by Clarke and Hollingsworth's model of instructor professional growth [19]. Clarke and Hollingsworth propose an interconnected model for instructor professional growth and development that expands upon historical literature that considered instructor change as a specific category of professional development [20–22]. Clarke and Hollingsworth independently focused on many of the limitations in proposed instructor growth models, building on linear foundations to evolve interconnected and nonlinear relations between the elements of the model [23, 24].

Clarke and Hollingsworth propose an interconnected model of instructor professional growth, where the various domains associated with the change environment are linked through enactment and reflection (Fig. 1). Unlike previous models, this model provides for multi-step nonlinear change sequences and growth networks. Both change sequences and growth networks represent causal relationships between multiple domains. The distinction is made that growth networks result in lasting changes rather than fleeting change [19]. For example, a change sequence could be thought of as an instructor attending a workshop where they are introduced to a pedagogical technique of pair and share. Subsequently, the instructor experiments through implementation of pair and share in a classroom. Here, change in the external domain (the workshop) resulted in change in the domain of practice (implementation in the classroom). By extension, if the instructor then reflects on the outcomes of the professional experimentation and changes her personal beliefs, the situation would be considered a growth network, as by integrating the practice into her beliefs and knowledge, she has grown as a professional.

### *2.2 Context*

The Design for Impact (DFI) program brings together students from a host of universities within the Atlantic Coast Conference (ACC) to work together on interdisciplinary, intercollegiate teams to complete a design challenge. Each participating institution represents a different discipline

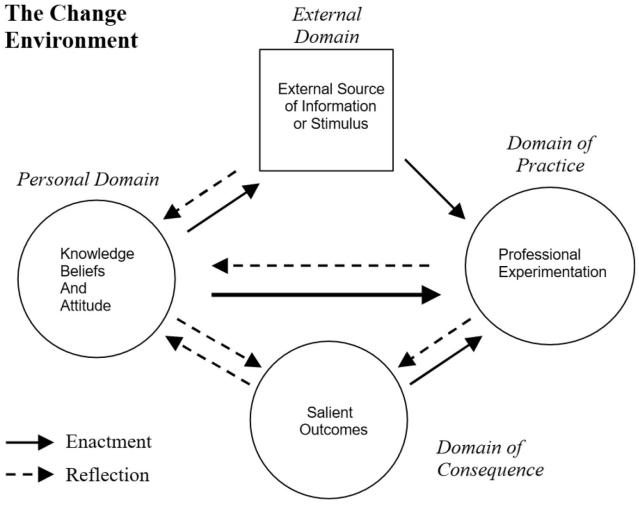


**Fig. 1.** Interconnected model of professional growth [19].

and brings to the program its own institutional culture and disciplinary identity. When forming teams, faculty work to balance students such that each team has at least one student from each university, and therefore each discipline.

Students spend the semester working together to complete a design challenge. We have historically led students through discovery and selection of their own design challenges, and have evolved the process to where faculty will identify a group of publicly available challenges, such as the Royal Society for the Encouragement of Arts, Manufactures and Commerce (RSA) competitions, and have students select from a smaller set of design prompts (https://www.thersa.org/student-design-awards). Providing the students with a curated set of design prompts allows students to effectively use their time to begin researching and solving problems, rather than narrowing down the multitude of possible challenges available.

One of the unique aspects of our program is the hybrid collaboration that we have developed (as illustrated schematically in Fig. 2). Each semester begins with an in-person, on-site visit to one of the participating universities for a program kick-off and team building event. Student design teams then develop remote working relationships, meeting periodically as teams via zoom, and weekly with faculty for instruction or design critique as an intercollegiate group. Towards the middle of the semester, students again travel to a different host university for a mid-semester in-person work session and project progress presentation in the form of a studio critique. Finally, after completing designs together remotely, teams are brought together at the end of the semester for a final in-person project summit.

In Fall 2022, for example, we had 5 students from the VT College of Engineering, 13 students from the Boston College Lynch School of Education and Human Development, 21 students from the Clemson University School of Architecture, and 3 students from the NCSU Design School. In September, all 42 students traveled to Clemson University for the program kick-off. At the kick-off, students were placed into teams, participated in ice-breaking and team building exercises, and were introduced to the portfolio of design challenges to choose their semester topic. Between September and October, students worked collaboratively over zoom, meeting as needed with teams, and weekly with all students and faculty involved in the program for group critique sessions. In late October, all 42 students traveled to Virginia Tech for a mid-semester workshop. Here students had the opportunity to interact face to face with team members again and developed initial prototypes for a mid-semester in-person presentation to the DFI group. Between October and November, students continued to polish their solutions working remotely again. The final Design for Impact 2022 summit was held at Boston College as a collaborative celebration of the application of a design thinking and innovation mindset to explore, analyze, and help address complex real-world problems using human-centered, multi-perspective approaches. 105 attendees for our DFI fall 2022 summit gathered in 2022, including our students and faculty cohort from NC State, Virginia Tech, Clemson, and Boston College as well as numerous guests from across campus departments and the city of Boston with its many universities for the final workshop, keynote speaker and DFI team project presentations symposia. Participants learned and watched how DFI students and faculty utilized an interdisciplinary lens – including architecture, applied psychology, engineering, transformative education, industrial design, environmental studies and computer science to collaborate and innovate new approaches to real-world challenges and issues.

Our program therefore echoes many of the emerging aspects of the future workplace – human centered design achieved through a blended in-person/virtual modality. Unlike other facets of the ACC, our academic program does not pit universities against one another, but develops experiential learning environments where students bring the best of their institutional culture and disciplinary knowledge to solve aspects of humanity's most difficult problems.

## 3. Research Methods

### *3.1 Autoethnography*

We have chosen to explore the case of professional instructor development of a group of faculty work-

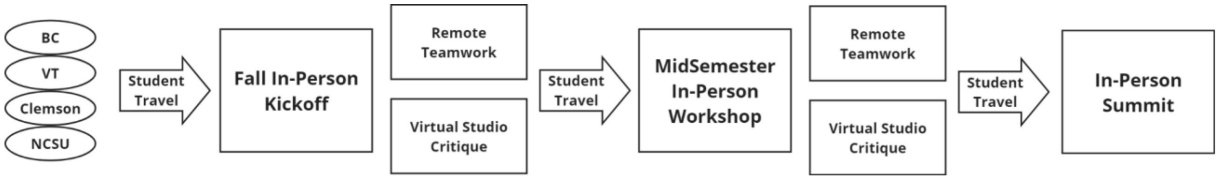


**Fig. 2.** Schematic representation of structure of the Design for Impact course. Students from each university travel to one of the participating universities for a kickoff, around the midpoint for a work session, and at the end for a summit. Between in-person sessions, students collaborate remotely on team designs.

ing together in an intercollegiate, interdisciplinary program using an autoethnographic methodology. While autoethnographies are often identified with a descriptive literary or evocative approach, we have chosen an analytic autoethnography method following Anderson to explore the microculture developed in our program [25]. Autoethnography has been used effectively to explore topics of reflective practices in teaching and learning from a faulty point of view [26]. Strict ethnographies have come under criticism recently as they are often regarded as relics of exhibitionist views of colonized or subjugated populations [27]. Autoethnography, and more specifically community autoethnographies where multiple authors work to co-construct narratives, are structured to overcome some of the ethical concerns of both ethnographic and autoethnographies. One of the potential limitations of classical autoethnography is that relational ethics become more manageable when multiple voices from the culture are included [28]. Community autoethnography has been used as a method of exploring instructor professional development during collaborative course development [29]. We have selected autoethnography as a methodology to address some of the concerns inherent in ethnographic or case study research, and a community autoethnography to enable a means for all participants to co-create the narrative of the growth we experience both individually and collectively.

### *3.2 Positionality Statements*

Massoud notes statements of positionality have the potential to improve validity of empirical data and theoretical contributions [30]. The ways a researcher's gender, class, racial or other various individual and intersectional identities, as well as lived-experiences may influence the research is valuable to address for possible biases at onset. We have worked to ensure that participants in this analytics community autoethnography are (1) full members of the group, (2) are explicitly shown as members in the published text, and (3) are fully committed to the research questions and methodology of the research [25, 29]. We have not explicitly explored how our inherent identities have influenced our reflections in this work. Such identities are rather implicit in the reflective mediation between the various domains of the change environments study.

The five faculty participating in this study include three Full Professors, a Collegiate Assistant Professor, and an Assistant Teaching Professor. The three Full Professors (Dan, Julia, and Lu) were all serving in academic leadership positions prior to implementation of the Design for Impact program. These three met and conceived of the concept for the program at an Atlantic Coast Conference Academic Leadership Network (ACC-ALN) workshop. In the first year of implementation, David was brought into the program, and Kathryn was brought during the second year. Our authorship team comprises individuals with diverse backgrounds and extensive experience in a diverse range of disciplines. Julia, with over 20 years of teaching experience and a background in Applied Developmental Psychology, brings a deep understanding of human behavior and learning to our research. Dan, a seasoned practitioner with over 20 years of experience in architecture and 14 years of teaching, including programmatic administration, offers valuable insights into design and architectural pedagogy. Lu, with 13 years of industry experience and nearly two decades of teaching design in research universities, brings a wealth of knowledge in design education and administration to our study. David, with a background in engineering and significant industry experience, coupled with his roles in departmental administration, provides a unique perspective on engineering education and program management. Kathryn, with over a decade of industry experience and expertise in design, adds a practitioner's viewpoint to our research, complementing her two years of teaching experience.

### *3.3 Data Collection and Analysis*

Data collection was accomplished through an online qualitative survey distributed to faculty at the end of the semester via Google Forms (see Appendix). Our survey instrument was informed by Clarke and Hollingsworth's model of instructor professional growth with questions designed to elicit reflection about the domains of change described in the change environment of Clarke and Hollingworth's model [19]. As discussed in our background section, structuring our instrument to elicit reflection on our own professional growth provided a framework for initiating our reflection, and facilitated development of a codebook centered on the domains mentioned in the model. Using the model of instructor professional growth as a basis for our data collection allowed us to explore the DFI program through a personal lens that was appropriate for where the program is situated in its evolution. At this point we have completed a pilot year and two subsequent regular implementations of the course and are at a point where we are examining our own motivations and outcomes for further developing the program and exploring student and programmatic outcomes.

Responses to the survey were collected in a Google Doc and organized by question with the response of each instructor represented by a different font color. While autoethnographic methods

preclude anonymity in data analysis, we did not explicitly associate a color with an individual faculty. Our goal in this was to draw focus from carrying our bias with respect to each other into the data analysis. We individually reviewed and reflected on the composite survey responses, using the Google Doc comment feature to highlight salient points related to the various domains of the model of instructor professional growth. Finally, we held multiple collaborative reflection sessions to analyze the data. In these sessions we discussed alignment of various excerpts of collective reflections with instructor growth models and elaborated on our own responses to the survey where needed.

### *3.4 Quality*

Ascertaining the quality of autoethnography has been a contested venture [31]. Autoethnography is sometimes slotted in with narrative analysis on the 'artsy' end of the research spectrum. One of the quality concerns noted with this type of scholarship lies with the ethical questions that arise when deciding which 'characters' of the story to include within the work, as noted by Schroeder [31]. One of the strengths of the community autoethnography is that characters are co-authors and co-creators of the narrative [28]. This is particularly the case in our autoethnography, where all of the instructors involved in the program have participated in co-creation of the scholarship.

Our protocol, while not necessarily validated, was informed by accepted theory that allowed for relevant reflection and subsequent analysis of the collected data. All authors contributed to the data collection and analysis process, responding to results as they emerged from the data. The study also received clearance from the Institutional Review Boards of the participating institutions.

### *3.5 Limitations*

While community autoethnography allows for multiple voices and collaborative co-creation of the narrative, we acknowledge that interpersonal relationships can influence how the stories are told and influence the psychological safety of those involved in creating the narrative [27]. So, although most of us are separated by certain power dynamics as we are generally working in different institutions, there might be effects of interpersonal relationships that can color what thoughts and feelings are shared with the group and how these individual thoughts are collected and united.

We also acknowledge that our data collection instrument was informed by the interconnected model of instructor professional growth. While this lens facilitated data analysis founded on a theoretical model, other aspects of the experience were either not included in the individual reflections of the instructors, or might not have been brought to focus in the subsequent analysis of the data.

## 4. Results

Our analysis of the data revealed several prominent themes. Firstly, we observed numerous instances of instructor growth mechanisms aligning with the framework presented by Clarke and Hollingsworth. Additionally, we identified a novel pathway for instructor growth – the interconnectedness of participating domains leading to distributed instructor growth. Lastly, we recognized several instances where individual reflections on the relationships between domains were inadequate to realize permanent change in instructors. In these instances, a collective reflection mechanism was necessary to support growth, especially among newer faculty members.

### *4.1 Illustrative Examples of Basic Change Networks*

We saw evidence supportive of elements of Clarke and Hollingsworth's model. Growth networks arose where the nature of the program resulted in certain pedagogical practices. Reflection on the outcomes of these practices informs how faculty will craft future implementations of the DFI program.

For example, Kathryn noted the importance of the in-person component of the program in student outcomes,

> "I received feedback from students about how traveling to each other's institutions helped strengthen their team collaboration and understand how other's lives and college experiences are different from their own . . . In-person visits and 'getting to know you' time seemed to help with task allocation on teams because the students understood what each person could contribute and trusted each other. Building trust in a short time is the important takeaway."

Kathryn displays a textbook example of reflecting on the salient outcomes of the in-person collaborative aspect of the program, as illustrated in Fig. 3. The structure of the DFI program (marked E in Fig. 3) led to a pedagogical structure where students traveled to each other's institution (labeled P in Fig. 3). Kathryn noted an increased collaboration as an outcome of this practice (labeled S in Fig. 3). Upon reflection (dashed line from S to K), Kathryn reflected that an increased empathy resulted from the in-person working sessions. This reinforces Kathryn's belief that face-to-face work has important and tangible results on student learning and coworking (labeled K in Fig. 3).

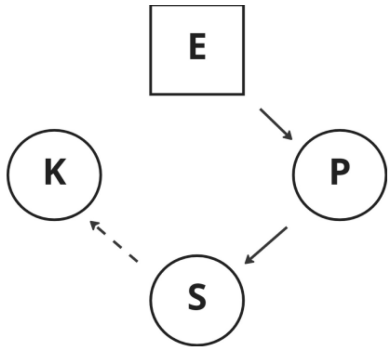


**Fig. 3.** Example of basic change network. Symbols here are simplified from Clarke and Hollingsworth (see Fig. 1). where E represents the External Domain, P the Professional Domain, S the Domain of Consequences, and K the Personal Domain. Solid lines represent enactment and dashed lines reflection.

Kathryn also presents a good example of a growth network resulting in explicit change to her knowledge and beliefs. Kathryn came to the program from industry and had prior experience working with other disciplines,

> "I have worked with engineers for many years and am very familiar with what good and bad collaboration on technical teams in the corporate environment looks like and how it impacts the process and the resulting solution."

The breadth of the interdisciplinarity of the DFI program was new to Kathryn. Kathryn reflects specifically on the outcomes of the interdisciplinary nature of the program in terms of outcomes for Design students (Kathryn's field).

> "Through group collaboration, there appears to be less stubbornness to stick with one design from the beginning and never change it or adapt based on user feedback. Design students sometimes have a hard time breaking away from their first idea (which is often not the strongest idea), and it helps to have diverse multidisciplinary teams to prevent that from happening."

Kathryn notes that the interdisciplinary nature of DFI is distinct in her experience,

> "I have never before collaborated or asked other designers to collaborate with a psychology student or any of the majors represented by Boston College in this cohort. For me, this was the first time that I have seen firsthand how beneficial it is to a solution and its intended users to have the students from those programs contribute to the human-centered design process. There seemed to be more people advocating for the end user in their final presentations."

This reflection leads Kathryn to reframe her expectations for the future direction of work in her field,

> "In the future, I anticipate that the design process at companies will evolve from a siloed process (one designer in a cubicle or a handful of designers in a room) to a team process (designers bring in intended users from outside of the company, marketing, sales, etc. specialists from within the company) because of the pressure that is being felt by companies to be transparent, to advocate for the environment and for their customers. I expect that there will be more interdisciplinary teams selected to develop products and social skills will be more important than they have historically been. "

### *4.2 Examples of Distributed Change Networks*

Often, the knowledge or experience of one faculty member results in implementation of what is a new practice to other faculty. In this case, the DFI program itself acts similarly to the External Domain in Clarke and Hollingsworth's model. However, unlike a more typical professional development intervention, such as a training workshop, here faculty can reflect directly and authentically on both the salient outcomes and the implementation of the professional experimentation.

As an example, in response to the question "What were some of the new pedagogical techniques that you saw in DFI? How have you applied any of these pedagogical techniques in your other courses/mentoring/professional practice?", Kathryn replies,

> "Systems thinking mapping and brainstorming techniques. I've started using some of the systems thinking techniques in my undergraduate studios to help students visualize how the client for a sponsored project is connected to other stakeholders."

Here, faculty other than Kathryn have implemented a system thinking framework to assist students in considering multiple and disparate stakeholders (Step 1, Step 2 of Fig. 4). Kathryn observes not only the outcome of helping students visualize clients (Step 3 of Fig. 4), but she is also able to reflect on how systems thinking was implemented into the course (implicit in her statement) (Step 4 of Fig. 4). When Kathryn next implements the practice in her other courses (Step 5 of Fig. 4), she will not necessarily need to decouple reflection on salient outcomes with reflection on her implementation of the practice, as she has seen implementation firsthand.

We also saw distributed reflection on implementation of professional practices. Here a faculty member reflects on a practice that might already be a part of their personal domain, but the implementation of which might not be ideal. For example, David writes,

> "One of the biggest takeaways from me was the importance of peer evals and studio critiques in the design space. I really saw that rich, timely feedback is powerful at multiple stages of the design process. In reflection, I think that I have far too often not provided enough or timely enough feedback to my students in other classes."

Here, both David and other faculty in the program understand the need for feedback in an educational

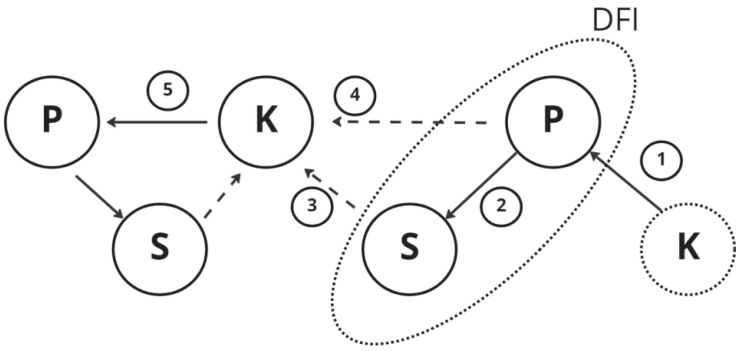


**Fig. 4.** Schematic representation of a distributed change network where the Personal Domain of one instructor (K at right) ultimately led to implementation of new practices in a different course of a second instructor (K at left and P). Symbols here are simplified versions of Clarke and Hollingsworth's model with K representing Person Domain, P Domain of Practice, and S Domain of Consequences. Solid lines are enactments, and dashed lines are reflections.

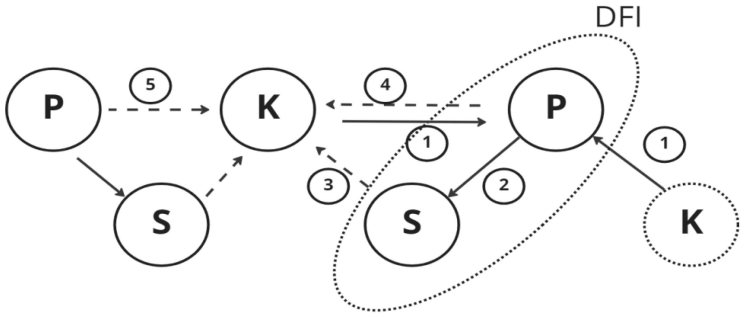


**Fig. 5.** Schematic representation of distributed change network where the Personal domains of two instructors (circles marked K) lead to implementation of professional experimentation that is a blended version of what each instructor might implement outside of the co-teaching environment. Reflection on the methods of implementation and resulting outcomes then informs reflection of one instructor on their own practices of implementation in other courses.

setting, and so implement mechanisms for feedback into the program (Step 1, Fig. 5). David reflects not only on the salient outcomes of the feedback in the program (Fig. 5, Step 3), but also the timing and frequency of the feedback – how the practice is implemented (Fig. 5, Step 4). Reflection on the studio critique outcomes and implementation led David to reconsider how he implements feedback in his other courses (Fig. 5, Step 5).

At times, reflection of a faculty on the knowledge and beliefs of others within the program served as a distributed change network. Julia notes that reflection on the work of the DFI program led her to reevaluate her assumptions of other disciplines. In response to a prompt querying personal change, Julia says,

> "Much more appreciation for other disciplines, inspired by other faculty and students. Sometimes, we have a preset assumption about people outside of our own disciplines. These premature assumptions and attitudes keep us from truly meaningful collaboration. These projects were able to trigger my reflections and facilitate the change of attitude."

Julia is reflecting on the knowledge and beliefs of both the faculty and the students in the DFI program (Step 2, Fig. 6) mediated through the Domain of Practice of both the faculty and the students (Step 1, Fig. 6).

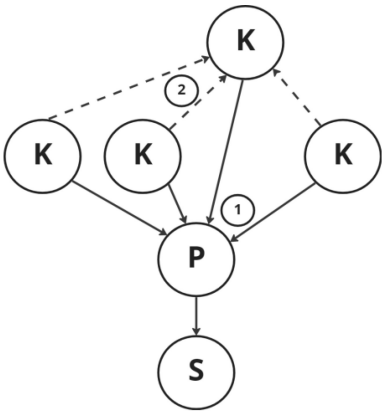


**Fig. 6.** Schematic illustration where Personal Domains of multiple instructors lead to implementation of new practices. One instructor reflects on the Personal Domains of the other instructors (offset K). Symbols here represent Personal Domain (K). Domain of Practice (P) and Domain of Consequences (S). Solid lines are enactments, and dashed lines are reflections.

### *4.3 Unresolved Reflections*

The nature of the DFI program allowed multiple opportunities for faculty to reflect together, specifically on Professional Domains and Domains of Consequence. While students enjoyed the in-person time as an opportunity to collaborate on design projects, faculty were able to use the time to reflect on aspects of the program. Often these group reflection sessions illuminated instances of change in faculty knowledge and beliefs.

There were instances where individual reflection on aspects of the program were noted, but change was not achieved. David and Kathryn both noted certain aspects of the program structure and layout that resulted in perceived suboptimal outcomes. In response to a prompt regarding the impact of external factors, Kathryn notes,

> "Once per week meetings making it difficult to keep up with teams and see that they are moving forward and making progress weekly. Limited time for faculty feedback on calls with students. Students want more face time"

For the same question, David noted,

> "There was a difference in how the program was implemented in each university – a single credit course in VT, and a component of a 6-credit studio course at Clemson, for example. As such, the student resources were disparate across the institutions. At VT we offered the course as a 1-credit independent study course."

In this instance, the institutional context for both David and Kathryn operated as parallel but distinct external domains to the combined DFI course, constraining the Domain of Practice in terms of course implementation (Step 1, Fig. 7). The difference in course implementation resulted in slightly disparate outcomes perceived in their respective institutions relative to some of the other students (Step 2, Fig. 7). Kathryn and David both reflected individually on these outcomes and arrived at different but similar destinations – Kathryn noting inadequate time for feedback and David noting inadequate time for student devotion to the course (Step 3, Fig. 7). This aspect of the course implementation was not reflected on with the entire group (Step 4, Fig. 7), leading to an unresolved flaw in the program. This is in effect an incomplete growth network whose resolution is complicated by the nature of an intercollegiate program co-taught by faculty with limited resources.

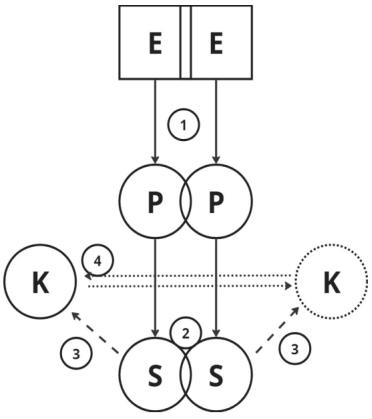


**Fig. 7.** Schematic representation of uncompleted growth networks. Here the External Domains (E), Domains of Practice (P), and Domains of Consequence (S) of two instructors (circled Ks) are parallel but slightly different. Solid lines represent enactment, dashed lines reflection, and dotted lines represent missing relationships.

## 5. Discussion

### *5.1 Expansion of Clarke and Hollingsworth – Distributed Growth Networks*

Clarke and Hollingsworth present a framework where the nonlinear growth of an instructor is conceptualized as an interaction between the various domains of the instructor, external, personal, practice, and consequence. The context of Clarke and Hollingsworth is a single instructor, often centered around an intervention, such as a workshop or specific assessment or activity in the class. The model then explores the interplay of the various domains, with a final result in permanent change realized in one or more of those domains.

As the context of Design for Impact differs significantly from the supposed context of Clark and Hollingsworth's model, our work suggests and necessitates inclusion of both parallel and overlapping domains. The context of our work is a group of 5 faculty co-teaching a design course with students from multiple institutions and disciplines. As in Clarke and Hollingsworth, each faculty in our program teaches from their own personal domain, clearly separating the other domains is not practical (as with external domains), or inaccurate (in the case of the domain of practice). As shown in Fig. 7, in a co-teaching environment, rather than existing as unique domains, many are rather parallel, aligned domains. This is particularly the case with respect to the domains of practice and consequence, which are essentially overlapping in the context of DFI (see Fig. 8).

The richness of the individual and overlapping domains in our context also results in a more nuanced interplay between the domains. In an expansion of Clarke and Hollingsworth, we observed multiple recurring pathways for reflection between an instructor's own domain, and those of the co-teaching faculty exploring how change is simultaneously experienced within a group of faculty who are leading a program together.

Our expansion of Clark and Hollingsworth not

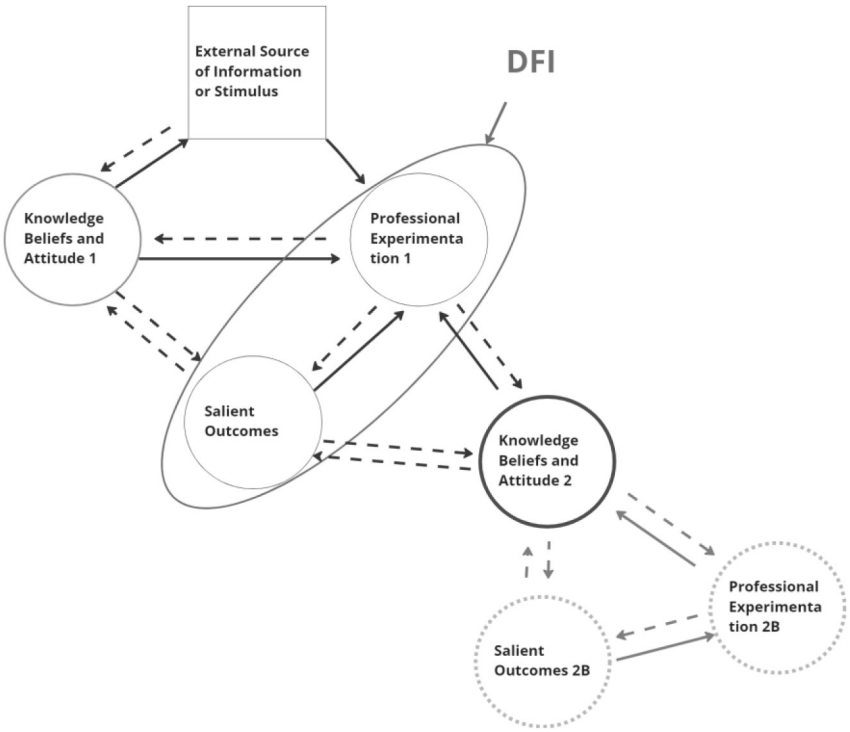


**Fig. 8.** The FDI program features a co-teaching model where nonlinearities in Clarke and Hollingsworth model is extended to include not only reflection on one's own personal views of the change environment but also on the domains of a peer instructor. The networks are further complicated by the effects of collaborative reflection practices.

only introduces concepts of parallel and overlapping domains, but also explores the distributed effects of professional growth. Here, we introduce the concept of distributed growth networks. In the most basic sense, a distributed growth network is one where the Personal Domain of one of the co-instructors serves as the External Domain for one of the other faculty in the program. Here, a faculty member implements a pedagogical tool or device that to them is not experimentation but brings new elements of teaching and learning to the viewpoint of another faculty. In this case the second faculty can reflect on the professional practice, as well as the salient outcomes of the technique. As a co-instructor, there is potentially more depth in the interaction of the faculty with the implementation and the outcomes, compared to participation in a teaching workshop or other intervention in their External Domain.

The DFI program exists as a shared context, but each faculty described how the separate contexts of their teaching portfolio in their home institutes were affected by the professional development arising from the DFI context. These effects are clearer in an intercollegiate co-teaching context where the shared environment is so drastically different than the individual context. Here faculty are more able to discuss 'their' teaching portfolio as something outside of and disparate to the DFI context. We were thus able to capture examples where changes to the Personal Domain of a participating faculty member arising from a distributed growth network, then propagate to new professional experimentation and reflection on salient outcomes in 'their' teaching portfolios. These distributed growth networks instigate changes in student outcomes in multiple other courses.

### *5.2 Importance of Reflective Practices*

Instructor reflection in a co-teaching environment has been suggested as a principal means for professional growth resulting in enhanced classroom performance and renewed energy for teaching in both experienced and newer faculty [32]. Our work builds on this idea, postulating that reflective practices, including both individual and group reflection, are the critical pathway to professional growth in a co-teaching context. Kathryn and David are relative newcomers to the field of higher education, whereas Julia, Dan, and Lu each bring over a decade of experience in teaching. Understandably, Kathryn and David were relatively vocal in their descriptions of growth, both within DFI and across their teaching portfolio, Julia, Dan and Lu also described.

Perhaps the most salient outcomes of this auto-ethnography lie in the different pathways for reflection that can mediate new growth networks. We

observed many instances of reflection by one faculty member on the Personal and Professional domains of other faculty, as well as the shared Domain of Consequences. What is not captured well in our survey instrument are the multiple occasions for group reflective practices that enable faculty to share and compare the importance and relevance of practices and outcomes. Here multiple instructors co-create value and narratives, noting different outcomes and collaboratively linking correlated and causal factors of the program. Although this work does not explicitly capture those reflective meditations, the lack of adequate collaborative reflections is evident in unresolved outcomes of the program, as noted by both Kathryn and David, both relatively junior members of the team with respect to time as a faculty. When all the instructors are invested in the program, reflection is imperative and facilitated in a way that is not straightforward when teaching a course alone.

### *5.3 Practical Implications*

Co-teaching experiences, particularly interdisciplinary and cross-academic unit contexts present an efficient and enduring environment for professional development of faculty. Presenting a more immersive view of experimental pedagogies and real-world outcomes, co-teaching in these spaces generates change in faculty that is distributed across their teaching portfolios, scaling the benefits of the program well beyond the immediate classroom.

It is critical to develop intentional collaborative reflection practices and spaces within programs where multiple instructors are co-instructing a course. The more distinct the positionalities disciplines involved in the collaborative teaching environment, the greater the effect of the changes in professional practice and the greater the opportunities for reflective practices to influence instructor knowledge, beliefs, and attitudes of the instructor. Our work further reinforces an importance of qualitative research for better understanding faculty growth and career development through reflective practice into conceptions of our teaching work (siloed or transdisciplinary) that influence faculty development, faculty-adjacent development, and student outcomes. Without such mediation, individual and distributed growth networks are broken, complicating resolution of the growth network and precluding effective, lasting change in the Personal Domain. This is more pronounced in interdisciplinary, intercollegiate contexts where shared disciplinary languages, practices, and cultures do not exist. As these changes propagate from the shared program out to the broader Professional Domain of the instructor, failing to close these loops risks results in distributed loss in favorable student outcomes in courses not directly associated with the shared teaching environment.

## 6. Conclusions and Future Work

The diversity of Domain content in shared, interdisciplinary teaching contexts creates environments of mutual professional experimentation that can lead to propagation of new pedagogies and favorable student outcomes well beyond the immediate shared teaching environment. These outcomes are enabled through distributed growth networks mediated by personal and collaborative reflection on diverse domain knowledge. Our group was successful in developing a culture of interdisciplinary respect and appreciation among the participating faculty. Through open dialogue, mutual learning, and shared personal respect, this culture has played a pivotal role in shaping our collective growth. Our research can help inform university curriculum, program development, and pedagogical approaches that support project-based design and foster interdisciplinary thinking and consciousness among faculty, faculty-adjacent, and students across various fields of study.

However, despite the benefits of this culture, the constraints of limited time allocated for intentional, mutual reflection have posed challenges in fully resolving reflective pathways in our learning and growth. Therefore, while reflective practices remain essential for completing growth networks and ensuring lasting change in the Personal Domain, addressing the limitations of time for reflection is crucial for optimizing the effectiveness of these practices.

Moving forward, we would like to further explore how faculty co-create collaborative reflection spaces and practices. The nature of interdisciplinary programs is such that they cross traditional boundaries of academic units. These boundaries are more evident in intercollegiate programs, where not only academic unit boundaries must be crossed, but also institutional and physical boundaries. Crossing such spaces often requires explicit and intentional effort and comes with an associated cost in terms of mental load. Future iterations of the DFI program would seek to incorporate themes of local importance to each university partner into overall DFI course content and collaborative projects with the potential for cross-institution interdisciplinary research and relevant local community engagement initiatives. We plan to conduct further analysis on faculty growth and career development trajectories resulting from DFI design project collaborations that seek to address complex societal challenges. We would also like to examine how we have established time and space within and around our program to participate in mutual reflection and

what specifically some of the resulting change networks look like and to further examine the social and administrative structure of these spaces – how are they moderated, how are topics selected and prioritized within the group, etc.

Our work delves into the intricacies of faculty growth and professional development within the Design for Impact (DFI) program, offering a nuanced understanding of the interconnected nature of professional growth among faculty from diverse disciplinary backgrounds and universities. By employing Clarke and Hollingsworth's model of instructor professional growth and autoethnographic methodology, our study sheds light on the transformative potential of collaborative teaching environments in fostering lasting change in faculty's growth, self concept, teaching practices and, consequently, in student outcomes. At the heart, our work lies in the recognition of the profound impact that DFI has and can have on both educators and students. Faculty members are not only responsible for delivering course content but also for shaping the learning experiences and outcomes of students. Therefore, investing in design based transdisciplinary faculty development models is paramount for ensuring the delivery of high-quality education that meets the evolving needs of both faculty and students in today's complex world.

Through collaborative teaching environments like our DFI program, faculty have been empowered to explore innovative pedagogical approaches, engage in reflective practices, and continuously refine teaching methods. As a result, faculty and students benefit from a more dynamic and enriching learning environment that fosters critical thinking, creativity, and interdisciplinary collaboration – skills that are essential for success in the 21st-century workforce. Furthermore, by examining the distributed effects of professional growth among faculty, our work highlights the potential ripple effects of faculty development initiatives on student outcomes across multiple courses and disciplines. This underscores the importance of fostering a culture of continuous improvement among and across faculty, as their growth and development not only enhance their own teaching effectiveness but also the teaching of those faculty adjacent to them and contribute to broader institutional goals of student success and academic excellence.

In sum, our DFI model and this research matters greatly because it speaks to the fundamental mission of higher education: to empower faculty and students with the knowledge, skills, and competencies they need to thrive in a rapidly changing career and work world. By providing insights into effective faculty development practices and their impact on individual faculty, faculty-adjacent, and student learning outcomes, our work contributes to the ongoing dialogue on how best to support the professional growth of faculty educators and to optimize the learning experiences of our students. Ultimately, the stakes are high because the quality of education that faculty provide directly shapes the future prospects for all those involved and the success of the next generation of leaders, innovators, and global citizens.

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## Appendix

*Survey Instrument for Faculty*

Our data collection instrument was loosely based on Clarke and Hollingsworth's interconnected model of instructor professional growth (Clarke & Hollingsworth, 2002). The survey was distributed via Google Forms and collectively analyzed in a Google Doc.

- How did you become involved in the DFI Initiative?
- What were some of the new pedagogical techniques that you saw in DFI? How have you applied any of these pedagogical techniques in your other courses/mentoring/professional practice?
- What were some of the student outcomes you experienced? What are some of the larger outcomes of the project, (on you, on your program, etc.)? What outcomes do you project from the program in the future?
- What were some of the external factors that influenced this project either for good or bad. Were there factors outside your control that facilitated or complicated the implementation of the project?
- What has changed about you from this program? What beliefs or attitudes of yours have shifted as a result of this project?
- Is there anything else you'd like to add? Any interaction between any of the questions listed above?

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